Author(s)	Title	Session ID	Type of Representation
Acton, Loren, McKenzie, David, Takeda, Aki, Welsch, Brian, Hudson, Hugh	East-West Asymmetry of the Yohkoh Soft X-ray Corona	S3-572	poster
Afanasiev, Nikolay, Afanasiev, Alexandr	Determining the density of the CME frontal structure by radio sounding from a spacecraft	S2-502	poster
Afanasiev, Alexandr, Vainio, Rami	Monte Carlo simulations of solar flare proton transport through self-generated waves	S2-498	poster
Agueda, Neus, Lario, David, Vainio, Rami, Sanahuja, Blai	Multi-spacecraft Study of the 2000 November 8 SEP Event: Electron Injection Histories 80° Apart	S3-533	poster
Aran, Angels, Marsden, Richard, Lario, David, Tranquille, Cecil, Toni, Andrea	Why would the proton intensity spectrum invert for more than 2 days in a SEP event?	S2-503	poster
Aran, Angels, Jiggens, Piers, Sanahuja, Blai, Jacobs, Carla, Heynderickx, Daniel, Lario, David	Developing a new model for SEP peak intensity and fluences within 1.6 AU	S2-506	poster
Arrazola Perez, David, Blanco Avalos, Juan Jose, Rodriguez-Pacheco, Javier, Hidalgo Moreno, Miguel Ang	Study of local HCS variations from multi-spacecraft observations	S2-650	0 min. poster only
Aschwanden, Markus, Sandman, Anne	Magnetic Stereoscopy with STEREO and SDO	S2-358	poster
Aurass, Henry	Large scale magnetic connectivity how to find “active connections?	S3-420	oral
Banerjee, Dipankar, Samaymanthula, Krishnapra	High frequency oscillations in active region loops	S1-556	oral
Battarbee, Markus, Laitinen, Timo, Vainio, Rami	Heavy Ion Aacceleration and Self-Generated Waves in Coronal Shocks	S2-541	poster
Bein, Bianca, Temmer, Manuela, Veronig, Astrid, Vourlidas, Angelos	Propagation direction and true mass of CMEs derived from STEREO observations	S2-421	poster
Belheouane, Soraya, Zaslavsky, Arnaud, Mann, Ingrid, Meyer-Vernet, Nicole, Issautier, Karine, Maksimovic, Milan	Detection of interstellar dust with Stereo-Waves at 1AU	S3-555	poster
Bemporad, Alessandro, Zuccarello, Francesco, Jacobs, Carla, Mierla, Marilena	CME latitudinal deflection in an asymmetric coronal field configuration	S2-457	poster
Bemporad, Alessandro, Mierla, Marilena, Tripathi, Durgesh	Study of an erupting prominence rotation with STEREO data	S2-458	oral
Berger, Lars	The Solar Wind	S1-632	oral
Bilenko, Irina	Global Solar Magnetic Field, IMF, and Solar Wind Evolution	S2-370	poster
Blanco, JuanJose, Hidalgo, MiguelAnge, Rodriguez-Pacheco, Javier, Heber, Bernd, Wimmer-Schweingruber, Robert, Gomez-Herrero, Raul, Martin, Cesar	The effect of magnetic clouds on energetic particles above 50 MeV as observed by the HELIOS spacecraft	S2-649	0 min. poster only
Blanco-Cano, Xochitl, Kajdic, Primoz, Aguilar-Rodriguez, Ernesto, Russell, Christophe, Jian, Lan , Luhmann, Janet	Interplanetary shocks and foreshocks observed by STEREO	S1-397	oral
Boden, Sebastian, Solar Orbiter STEIN, Team, Lin, RobertP., Dong-Hun Lee, HoJin, Limousin, Olivier	Thermal Modeling for the STEIN sensor on Solar Orbiter	S3-652	0 min. poster only
Bonnet, Roger-Maur	Sun and heliospheric physics: visions of the future	S3-465	oral
Bosman, Eckhard, Bothmer, Volker, Nistico, Giuseppe, Vourlidas , Angelos, Howard , RussellA., Davies , Jackie	3D Structure of CMEs The STEREO/SECCHI view	S2-424	oral
Braune, Stephan, Aurass, Henry	On the magnetic field in the X-class flare ARs October November 2003	S2-451	poster
Braune, Stephan, Aurass, Henry	On a special stage of impulsive flare meter wave and HXR emission	S2-453	poster
Bucik, Radoslav, Mall, Urs, Korth, Axel, Mason, Glenn M.	Abundances of Suprathermal Ions in CIRs on STEREO during the Minimum of Solar Cycle 23	S1-423	oral
Chifu, Iulia, Inhester, Bernd	3D reconstruction of a prominence from 3 views	S3-645	0 min. poster only
Crosby, Norma	How 4pi will be used for space weather monitoring and forecasting	S3-494	oral
Crosby, Norma, Veronig, Astrid, Robbrecht, Eva, Vrsnak, Bojan, Vennerstrøm, Susanne, Malandraki, Olga, Dalla, Silvia	Forecasting the Space Weather Impact : the COMESEP Project	S2-563	poster
Crosby, Norma, and the SEPEM Team,	SEPEM: the ESA Solar Energetic Particle Environment Modelling Project	S2-564	poster
D’Huys, Elke, Seaton, Daniel, De Groof , Anik, Jacobs, Carla, Poedts , Stefaan	Multi-spacecraft analysis and modeling of a solar eruption on August 14, 2010	S2-561	poster
Dadashi, Neda, Teriaca, Luca, Solanki, Sami	The quiet Sun average Doppler-shift of coronal lines up to 2 MK	S1-447	poster
Dalla, Silvia, Fletcher, Lyndsay, Mackay, Duncan H.	Visibility of Active Region emergence in magnetogram data	S2-578	poster
Davila, Joseph	Slitless Spectroscopy	S2-643	0 min. poster only
Dayeh, Maher, Kozarev, Kamen, Ebert, Rob, Desai, Mihir, Schwadron, Nathan	Modeling SEP onset times and proton intensities between 0.1 - 1.5 AU using EPREM: Comparison with Helios, Imp-8, and Voyager observations for the November 22, 1977 event.	S2-621	poster
de Patoul, Judith, Inhester, Bernd, Feng, Li, Wiegelmann, Thomas	2-D and 3-D polar plume analysis from the three vantage positions of STEREO/SECCHI A, B and SoHO/EIT	S1-366	oral
DeForest, Craig, Howard, Tim, Tappin, James	Detailed Imaging of Solar Wind Structures From the Sun to 1 A.U.	S1-510	oral
Demoulin, Pascal	The active Sun and dynamic Heliosphere - Initiation of CME	S2-550	oral
DeRosa, Marc, Schrijver, Carolus, Nitta, Nariaki, Barnes, Graham	A sampling of topological features of the solar corona	S2-558	oral
Dolla, Laurent	A comparison of quasi-periodic pulsations in different wavebands	S2-356	oral
Dresing, Nina, Gómez-Herrero, Ra’ul, Klassen, Andreas, Heber, Bernd, Kartavykh, Yulia, Dröge, Wolfgang	The longitudinal spread of solar energetic particles at the January 17, 2010 solar energetic particle event	S2-536	poster
Dresing, Nina, Gómez-Herrero, Ra’ul, Malandraki, Olga, Heber, Bernd, Klassen, Andreas, Kilpua, Emilia	Solar Activity at Minimum: A CIR dominated inner Heliosphere	S1-543	oral
Drews, Christian, Berger, Lars, Wimmer-Schweingruber, RobertF., Bochsler, Peter, Galvin, Antoinette, Möbius, Eberhard, Klecker, Berndt	Interstellar and Inner-Source Pickup Ions at 1 AU	S1-474	poster
Dröge, Wolfgang	4 π Models of Solar Energetic Particle Events	S3-505	oral
Ebert, R. W., Dayeh, M. A., Desai, M. I., Mason, G. M.	Temporal Evolution of Suprathermal Heavy Ion Intensities and Anisotropies in CIR-Associated Particle Events at 1 AU	S1-586	oral

Author(s)	Title	Session ID	Type of Representation
Farrugia, C., UNH and UNIGRAZ teams,	Evolution of solar wind energy densities during solar minimum 2007-2009, and features of its effects on the Earth's magnetopause and magnetosheath	S1-641	0 min. poster only
Feng, Li, Wei, Yong, Inhester, Bernd, Wang, Mingyuan, Gan, Weiqun, Wiegelmann, Thomas	On the propagation of a CME in the heliosphere	S2-571	poster
Fichtner, Horst, Effenberger, Frederic, Kleimann, Jens, Scherer, Klaus, Barra, Stephan	On the fully anisotropic turbulent diffusion of charged energetic particles in the heliosphere	S1-598	poster
Fletcher, Lyndsay	Flares: Roles and Consequences	S2-475	oral
Floyd, Olivier, Lamy, Philippe, Llebaria, Antoine	The role of coronal mass ejections in reconfiguring the coronal magnetic field	S2-583	oral
Foullon, Claire, HCS-Plasmoid cooperation,	Plasmoid Releases in the Heliospheric Current Sheet and Associated Coronal Hole Boundary Layer Evolution	S1-407	oral
Foullon, Claire, Verwichte, Erwin, Nakariakov, Valery M., Nykyri, Katariina, Farrugia, Charles J.	Magnetic Kelvin-Helmholtz Instability at the Sun	S2-409	poster
Galvin, Antoinette, Simunac, Kristin, Wang, Shuoyang, Popecki, Mark, Farrugia, Charles	STEREO Solar Wind Trends from the Depths of Solar Minimum	S1-594	poster
Gieseler, Jan, Boezio, Mirco, Casolino, Marco, De Simone, Nicola, Di Felice, Valeria, Heber, Bernd, PAMELA, Team	Spatial Gradients of Galactic Cosmic Ray Protons in the Inner Heliosphere - PAMELA and Ulysses Observations	S3-467	poster
Gopalswamy, Nat, Nitta, Nariaki, Akiyama, Sachiko, Makela, Pertti, Yashiro, Seiji	Hemispherical Nature of EUV Shocks Revealed by SOHO, STEREO, and SDO Observations	S2-468	oral
Gosain, Sanjay	Evidence for expansion and subsequent implosion of coronal loops during 15 Feb 2011 X-class flare: SDO AIA and HMI observations	S2-634	poster
Gosain, Sanjay	SDO/AIA Observations of Flare Induced Oscillations of a Quiescent Prominence	S2-438	poster
Grunau, J., Kulkarni, S.R., Martin, C., Wimmer-Schweingruber, R.F., Boettcher, S., Seimetz, L., Schuster, B., Kulemzin, A.	Calibration of the HET-Demonstration Model for Solar Orbiter	S2-477	poster
Guerrero, Antonio, Cid, Consuelo, Saiz, Elena, Cerrato, Yolanda	Geoeffective events combining Imaging and In-situ observations in the beginning of solar cycle 24	S2-642	0 min. poster only
Gunár, Stanislav, Parenti, Susanna, Anzer, Ulrich, Heinzel, Petr, Vial, Jean-Claud	Synthetic DEM curves of prominence fine structures	S1-464	poster
Gómez-Herrero, Ra'ul, Kartavykh, Yulia, Droege, Wolfgang, Klassen, Andreas, Dresing, Nina, Klecker, Berndt, Heber, Bernd, Malandraki, Olga	Multipoint observations of the August 18, 2010 solar energetic particle event	S2-647	0 min. poster only
Hartlep, Thomas, Kosovichev, Alexander, Mansour, Nagi, Parchveksy, Konstantin, Zhao, Junwei	Time-Distance Helioseismology with SDO/HMI: Inferences and Simulations	S2-584	oral
He, Jiansen, Tu, Chuanyi, Marsch, Eckart, Yao, Shuo, Tian, Hui	Two populations of magnetic helicity in solar wind turbulence	S1-382	oral
Hoeksema, J. Todd	Global Modeling of the Coronal and Heliospheric Field	S1-442	oral
Hurlburt, Neal, Berger, Tom	A Study of Flows near Filaments using HEK services	S2-427	poster
Jian, Lan, Russell, Christophe, Luhmann, Janet	Solar Wind and Large-Scale Solar Wind Structures in the Rising Phase of Solar Cycle 24	S2-577	poster
Jian, Lan, Russell, Christophe, Luhmann, Janet, Leske, Rick, Mewaldt, Richard	STEREO Observations of ICMEs and LET/SEP Events: 2007-2010	S2-581	oral
Joshi, Anand, Srivastava, Nandita	Kinematics of Two Eruptive Prominences	S2-330	poster
Kajdič, Primovz, Blanco-Cano, X'ochitl, Aguilar Rodríguez, Ernesto, Russell, Christophe, Jian, Lan K., Luhman, Janet G.	Waves upstream and downstream of interplanetary shocks driven by coronal mass ejections	S2-398	poster
Kamio, Suguru, Wiegelmann, Thomas, Curdt, Werner, Peter, Hardi, Solanki, Sami	Origin of flows in coronal loops	S2-481	oral
Kartavykh, Yulia, Droege, Wolfgang, Gómez-Herrero, Raul, Dresing, Nina, Kovaltsov, Gennady, Klecker, Berndt, Heber, Bernd	Three-dimensional anisotropic transport simulations a parameter study	S3-490	oral
Kelly, James, Dalla, Silvia, Laitinen, Timo	Cross-field transport of SEPs in Large Scale Fluctuations	S2-557	oral
Kilpua, Emilia, Lee, Christina, Luhmann, Janet, Li, Yan	Transition from the minimum to the rising phase of solar cycle 24	S2-323	oral
Klassen, Andreas, Gómez-Herrero, Raul, Heber, Bernd, Klein, Ludwig, Kartavykh, Julia	Solar origin of in-situ electron spikes observed with SEPT/STEREO	S2-525	poster
Kleimann, Jens	4pi models of CMEs and ICMEs	S3-365	oral
Klein, Karl-Ludwi	Sonnenforscher sehen STEREO	S2-631	oral
Kliem, B., Toeroek, T., Thompson, W.T.	A parametric study of CME rotation in the corona	S2-573	poster
Kliem, B., Forbes, T.G., Vourlidas, A., Patsourakos, S.	Modeling the coronal expansion of CME cavities	S2-574	oral
Kocharov, Leon, Valtonen, Eino	Three-dimensional view of major solar energetic particle events	S3-546	poster
Kocharov, Leon, Vainio, Rami, Pomoell, Jens	Diversity of energetic particle spectra from coronal shock acceleration	S2-549	oral
Kopp, Andreas, Strauss, R. Du Toit, Büsching, Ingo, Potgieter, Marius S.	A stochastic approach to heliospheric propagation	S2-473	poster
Kulkarni, S.R., Martin, C., Grunau, J., Wimmer-Schweingruber, R.F., Boettcher, S., Boehm, E., HET-EPT, -Team	A High Energy Telescope for the Solar Orbiter Mission	S2-391	poster
L. van Driel-Gesztelyi (1,2,3), D. Baker (2), J. , L.	Plasma outflows from active regions and their imprint in the solar wind	S1-508	oral
Laitinen, Timo, Dalla, Silvia, Kelly, James	Energetic particle propagation in structured turbulence	S2-531	poster
Lamy, Philippe, Frazin, Richard, Vibert, Didier, Boursier, Yannick	Tomographic reconstruction of the coronal electron density from calibrated LASCO-C2 images of the K-corona total radiance	S2-579	oral
Lara, Alejandro, Niembro, Tatiana, Borgazzi, Andrea	The Source Region of Coronal Mass Ejections	S2-523	poster
Lario, D., Decker, R.B., Aran, A.	SEP events at distances <1 AU: Particle intensities above threshold values	S2-517	poster
Leamon, Robert, McIntosh, Scott	Evolution of small-scale flux elements over three solar cycles	S1-588	oral
Lee, Arrow, Muller, Jan-Peter, Matthews, Sarah	Quantifying the accuracy of the models used for the 31 December 2007 CME	S3-417	poster

Author(s)	Title	Session ID	Type of Representation
Leske, R.A., Cohen, C.M.S., Mewaldt, R.A., Cummings, A.C., Stone, E.C., Wiedenbeck, M.E., von Rosenvinge, T.T.	Large Anisotropies in the 18 August 2010 Solar Particle Event	S2-429	poster
Liewer, Paulett, Hall, J.R., Gonzalez-Hernandez, Irene, Hill, Frank, Thompson, WilliamT., DeJong, Eric	Comparison of Farside Observations of Solar Activity from STEREOs Extreme UltraViolet Imager and the Global Oscillations Network Group (GONG)	S3-519	oral
Linker, Jon, Lionello, Roberto, Titov, Viacheslav, Mikic, Zoran, Riley, Pete	The Solar Magnetic Field and Its Influence on the Global Corona	S1-470	oral
Liu, Ying, Luhmann, Janet, Bale, Stuart, Lin, Robert	Sun-to-Earth propagation of CMEs and connection with in situ signatures	S2-526	oral
Llebaria, Antoine, Lamy, Philippe, Floyd, Olivier	Solar Cycle evolution of the magnetic topology of the corona as deduced from LASCO-C2 observations of the corona.	S2-576	poster
Lugaz, No'e, Möstl, Christian, Vourlidas, Angelos, Roussev, Ilia	Methods to Determine CME Properties from HI Observations and 4π Challenges	S3-399	oral
Lugaz, No'e, Downs, Cooper, Roussev, Ilia, Kazunari, Shibata, Asai, Ayumi, Gombosi, Tamas	MHD Simulation of a CME from an Anemone Active Region and Comparison with EUV Images	S2-400	poster
Luhmann, J.G. and c	Special attributes of the solar wind and IMF sources during the STEREO mission	S1-597	oral
Maddox, MarloM., the iSWA team,	Browsing Space Weather Data and Models with the Integrated Space Weather Analysis (iSWA) System	S2-591	poster
Malandraki, Olga, the SEPServer , WP5 team	Scientific data analysis within SEPServer: new perspectives in SEP research	S2-530	poster
Manchester, Ward, van der Holst, Bart, Frazin, Richard, Vasquez, Alberto, Toth, Gabor, Gombosi, Tamas	The Coupled Evolution of Electrons and Ions in CME-Driven Shocks	S1-585	oral
Marsh, Mike, Ireland, Jack, Walsh, Robert	Sunspot Shocks with SDO	S2-562	poster
Mason, Glenn	Solar Energetic Particle multipoint observations old and new	S2-425	oral
McIntosh, Scott	Ubiquitous Outflows and Waves in the Outer Solar Atmosphere	S1-582	oral
Mewaldt, R.A, Mason, G.M., Cohen, C.M.S, Gomez-Herrero, R., Haggerty, D.K., Leske, R.A., Wiedenbeck, M.E., von Rosenvinge, T.T.	Evolution of Seed Particle and Solar Energetic Particle Abundances	S2-513	oral
Mierla, Marilena	Analysis of the 13 April 2010 prominence eruption using SWAP and EUVI data	S2-419	poster
Miesch, Mark	Exploring the Dynamo from All Angles	S3-413	oral
Miteva, Rositsa, Klein, K.-Ludwig, Malandraki, Olga	The role of the IP environment on the SEP events	S2-486	poster
Mueller, D., Dimitoglou, G., Garcia Ortiz , J.P., Hughitt, V.K., Ireland, J., Fleck, B.	JHelioviewer: Open-Source Software for Discovery and Image Access in the Petabyte Age	S1-377	poster
Muhr, Nicole, Veronig, Astrid, Kienreich, Ines, Temmer, Manuela, Vršnak, Bojan	Analysis of characteristic parameters of large-scale coronal waves	S2-404	poster
Möstl, Christian	Lessons learned from multi-point observations of ICMEs	S2-445	oral
Nakariakov, Valery, Vasheghani Farahani, Soheil, Van Doorsselaere, Tom, Verwichte, Erwin	Nonlinear long-wavelength torsional Alfven waves	S2-518	poster
Nieves-Chinchilla, T., Colaninno, R., Vourlidas, A., Szabo, A., Lepping, R.P., Boardsen, S.A., Anderson, B.J., Korth, H.	The ambiguous evolution of a coronal mass ejection in the interplanetary medium	S2-593	poster
Nindos, Alexander, Patsourakos , Spiros, Wiegelmann, Thomas	On the initiation of the 2011 February 15 coronal mass ejection	S2-532	oral
Nisticò, Giuseppe, Zimbardo, Gaetano, Patsourakos, Spiros, Bothmer, Volker	North-South Asymmetry in the Magnetic Deflection of Polar Coronal Hole Jets	S1-501	oral
Nitta, Nariaki	CME-driven shocks and early development of SEP events	S2-528	poster
Ontiveros, Veronica, Patsourakos, Spiros	Multi-spacecraft Study of the Kinematics of a Fast Coronal Mass Ejection and its Associated Shock: AIA, SECCHI and LASCO Observations.	S2-547	oral
Opitz, Andrea	Temporal evolution and spatial variation of the solar wind properties on different scales	S1-608	poster
Pariat, Etienne, Aulanier, Guillaume, Masson, Sophie	Data-driven MHD modeling of dynamical features	S2-372	oral
Paspirgilis, Rolf, Wimmer-Schweingruber, Prof. Dr. , Burmester, Dr. Soenke	Numerical Simulations for EPT onboard Solar Orbiter	S2-478	poster
Patsourakos, Spiros	EUV Waves: The Evolving View from SOHO to Hinode, STEREO and SDO	S1-509	oral
Pesnell, W. Dean	Solar Cycle Prediction	S1-437	oral
Pomoell, Jens, Vainio, Rami	MHD Modeling of Coronal Large-Amplitude Waves, Disturbances and CME Lift-off	S2-499	oral
Popecki, Mark, Galvin, A, Simunac, K, Klecker, B	He+ Suprathermal Tails as Observed by STEREO/PLASTIC	S1-589	poster
Posner, Arik, Rother, Oliver, Heber, Bernd, Mueller-Mellin, Reinhold, Lee, Jason	An update on the live Relativistic Electron Alert System for Exploration	S2-426	oral
Rodriguez-Pacheco, Javier, Blanco, JuanJose, Heber, Bernd, Gomez-Herrero, Raul	The Gnevyshev Gap as detected by Ulysses/HET/LET	S2-648	0 min. poster only
Rodríguez-Gasén, Rosa, Aran, Angels, Sanahuja, Blai, Jacobs, Carla, Poedts, Stefaan	Variation of proton flux profiles with the observer's latitude in gradual SEP events	S3-514	poster
Ruffenach, Alexis, Lavraud, Benoit, Owens, Matthew,J., Sauvaud, Jean-Andre, Savani, Neel, Rouillard, Alexis, SWEA/STEREO Team,	Observation of magnetic cloud erosion by magnetic reconnection	S2-369	poster
Safari, Hossein	Application of Probabilistic Neural Network on Autumatic Identification of Solar Coronal Loops	S2-343	poster
Savani, Neel,P., Davies, Jackie,A., Shiota, Daikou, Davis, Chris,J., Rouillard, Alexis,P., Owens, Matt,J., Kusano, Kanya, Bothmer, Volker	Directly estimating the 2-D morphology of CMEs in the inner heliosphere from remote observations	S1-411	oral
Schrijver, Karel	Learning from the global view of a variable Sun: large-scale connectivity	S3-415	oral
Schroeder, Peter, Luhmann, Janet, Marchant, Will	Real-Time Visualization Tool Integrating STEREO, ACE, SOHO and the SDO	S2-511	poster

Author(s)	Title	Session ID	Type of Representation
Schwadron, Nathan, IBEX Team, The	The Suns Evolving Interaction with the Local Galactic Medium from Energetic Neutral Atoms	S1-329	oral
Seaton, Daniel, Mierla, Marilena, Berghmans, David, Zhukov, Andrei, Dolla, Laurent	What Causes Solar Eruptions: Observations of a Mass-Loading Type CME	S2-461	oral
Shimojo, Masumi, Tsuneta, Saku, Shiota, Daiko, Ito, Hiroaki	The Solar Polar Region observed with Hinode	S1-479	oral
Shugay, Yulia, Veselovsky, Igor, De Groof, Anik, Seaton, Dan, Berghmans, David	Areas of coronal holes in the source regions of the high speed solar wind streams during 2010-2011: initial results of the Proba2/SWAP observations	S2-515	poster
Simunac, K.D.C., and In Situ HPS Team,	Differences in the heliospheric plasma sheet as observed by three spacecraft in one day	S1-512	oral
Solanki, Sami	Unserem lebenspendenden Stern auf der Spur: Einblicke in die Sonnenforschung	S1-455	oral
Solar Orbiter STEIN team, Kiel, Lin, RobertP., Dong-Hun, Lee, Ho, Jin, Limousin, Olivier	The SupraThermal Electrons, Ions and Neutrals detector for Solar Orbiter	S2-485	poster
St. Cyr, O.C., Davis, C., Meyer-Vernet, N., Zaslavsky, A, Kaiser, M.L., Adrian, M., Goetz, K, Maksimovic, M	STEREO Interplanetary Dust Measurements	S1-379	oral
Steed, Kimberley, Lapenta, Giovanni	Understanding the evolution of an eruptive active region and the consequences for the associated CMEs/ICMEs	S2-527	poster
Sternal, O., Engelbrecht, N.E., Burger, R.A., Fichtner, H., Heber, B., Kopp, A., Potgieter, M.S., Scherer, M.	Possible Evidence for a Fisk-type Heliospheric Magnetic Field Structure founf in Ulysses/KET Observations	S1-529	poster
Sun, Xudong, Hoeksema, Todd, Liu, Yang, Wiegelmann, Thomas, Hayashi, Keiji	Magnetic Field Topology and Energetics in the Flaring Active Region 11158	S2-384	oral
Tadesse, Tilaye, Wiegelmann, Thomas, Inhester, Bernd, Pevtsov, Alexei	Magnetic Connectivity between Active Regions 10987, 10988, and 10989 by Means of Nonlinear Force-Free Field Extrapolation	S2-559	poster
Temmer, Manuela	CME-flare relationship	S2-352	oral
Thalmann, J. K., Inhester, B., Wiegelmann, T.	Estimating the magnetic energy and helicity in solar active regions	S2-396	poster
Thompson, William	Triangulation with STEREO at 180 degrees separation	S3-360	oral
Thompson, William	STEREO COR1-A/B Intercalibration at 180 Degrees Seperation	S3-375	poster
Tian, Hui, McIntosh, Scott, De Pontieu, Bart, Martinez-Sykora, Juan, Sechler, Marybeth, Wang, Xin	Two components of the coronal emission revealed by both spectroscopic and imaging observations	S1-628	poster
Tian, Hui, McIntosh, Scott, Habbal, Shadia, He, Jiansen	High-speed Outflows on Plume-like Structures of the Quiet Sun and Coronal Holes	S1-629	poster
Valtonen, Eino, and the SEPserver WP2 team, .	Observational Solar Energetic Particle Data for the SEPServer Project	S2-604	poster
van Ballegooijen, A.A., Asgari-Targhi, M., Cranmer, S.R., DeLuca, E.	Heating of the Solar Chromosphere and Corona by Alfvén Wave Turbulence	S2-633	poster
Verbeeck, Cis, Callebaut, Benoit, Berghmans, David, Delouille, Veronique, Mampaey, Benjamin, the AFFECTS team,	The AFFECTS Solar Activity Viewer	S2-534	poster
Vilmer, Nicole, Reid, Hamish, Aulanier, Guillaume	Energetic Particles in Solar Flares and Magnetic Environment	S2-469	poster
von Rosenvinge, Tycho, Christian, Eric, Cummings, Alan, Cohen, Christina, Leske, Richard, Mewaldt, Richard, Stone, Edward, Wiedenbeck, Mark	STEREO Observations of Solar Energetic Particles	S1-553	oral
Watanabe, Tetsuya, Sterling, Alphonse,C, Harra, Louise,K., Hara, Hirohisa	Small Loop-loop Interaction in the Initial Phases of A C9.7 Flare	S2-432	poster
Webb, David	The Characteristics of CMEs from Combined STEREO Imaging and In-situ Observations	S2-418	oral
Wiedenbeck, M.E., Mason, G.M., Cohen, C.M.S., Nitta, N.V., Gómez-Herrero, R., Haggerty, D.K.	The Longitudinal Extent of ^{3}He-rich Solar Energetic Particle Events	S2-401	oral
Wiegelmann, Thomas, Thalmann, Julia, Inhester, Bernd, Tadesse, Tilaye, Chifu, Julia	Data driven active region modelling from SDO and STEREO	S2-333	oral
Wimmer-Schweingruber, RobertF.	Solar Probe Plus and Solar Orbiter, the next Heliospheric missions	S3-644	0 min. poster only
Wood, Brian	Three-Dimensional Reconstuction of Four Fast CMEs from 2011 March 7-8	S2-414	oral
Zharkov, Sergey, Zharkova, Valentina, Popova, Helen	Two off-phase dynamo waves detected with Principal Component Analysis of the solar magnetic field in the cycles 21-23	S1-545	poster
Zharkova, Valentina, Khabarova, Olga	3D PIC simulations of particle acceleration in the heliopsheric current sheet: theory versus observations	S3-551	poster
Zimovets, I.	On the origin of different types of non-thermal emission in the course of CME development	S2-539	oral

Acton, Loren, McKenzie, David, Takeda, Aki, Welsch, Brian, Hudson, Hugh
East-West Asymmetry of the Yohkoh Soft X-ray Corona
S3-572
poster
X-ray diffuse corona as observed by Yohkoh/SXT. Synoptic maps made from a range of heliolongitudes show clearly that the familiar chevron shapes associated with differential rotation weaken or even disappear at west longitudes. Geometrically, this suggests a large-scale tilt of the diffuse corona, but not of the active regions.This effect is increasingly prominent with temperature; it is present in SXT and in EIT 284 Å, is much less evident in EIT 195 Å, and virtually disappears at EIT 171 Å.A tilt suggests the participation of the streamer structures in the Parker spiral. This would require a lower height of formation of this motion than previously known, since the SXT images have intensity scale heights, at the limb, of order only 0.1 $R_{\odot}$. We note that such a systematic tilt cannot be represented by a potential-field extrapolation of the photospheric field. We also discuss other possible mechanisms.

Afanasiev, Nikolay, Afanasiev, Alexandr
Determining the density of the CME frontal structure by radio sounding from a spacecraft
S2-502
poster
The information on coronal mass ejections (CMEs) is derived basically from measurements with white-light coronagraphs installed onboard spacecraft, and using the radio sounding from spacecraft. To study CMEs using the radio sounding technique, the following effects are measured: spectral line broadening, Faraday variations of the polarization plane of a linearly polarized signal, signal intensity oscillations, frequency fluctuations, etc. There are a number of analytical formulas that allow some physical parameters of CMEs to be obtained based on the radio measurements. Those formulas usually implement radio path integration in the unperturbed plasma. However, quite strong regular electron density gradients associated with a CME (in particular, those associated with its frontal structure) can lead to a large difference between the radio paths in the unperturbed and perturbed environments. We consider the problem of radio sounding of a CME, taking into account the radio path variations. We have derived analytical formulas relating the signal group time delay and some parameters of the CME 3D structure. Based on that, we show that the density of the CME frontal structure can be determined from the group time delay measurements at two separated radio frequencies.

Afanasiev, Alexandr, Vainio, Rami
Monte Carlo simulations of solar flare proton transport through self-generated waves
S2-498
poster
We perform Monte Carlo simulations to study the transport of flare-generated energetic protons through self-generated Alfvén waves in the low corona. We consider protons propagating inside an open flux tube after being released isotropically from a small-sized source located in the flux tube. While moving in the tube the particles experience resonant scattering off Alfvén waves, giving rise to an increase in the wave intensity. Particles are assumed to be absorbed if they reach the solar surface and escaped if they reach the opposite end of the simulation domain, taken to be connected to the interplanetary medium. Under conditions corresponding to strong particle acceleration, the proton release can have a two-component structure. One of the components is formed by fast protons that experience quite weak scattering off the background spectrum of waves, and the other one is associated with protons trapped by the amplified intensities of Alfvén waves.

Agueda, Neus, Lario, David, Vainio, Rami, Sanahuja, Blai
Multi-spacecraft Study of the 2000 November 8 SEP Event: Electron Injection Histories 80° Apart
S3-533
poster
We present the analysis of a large solar near-relativistic (> 50 keV) electron event simultaneously observed by the Ulysses and ACE spacecraft on 2000 November 8. Ulysses was located beyond the Earth orbit (2.4 AU) and at the most southern latitudes ($\sim$80 deg). Both spacecraft observed a $\sim$400 km/s solar wind flow with stable interplanetary magnetic field. ACE observed an intense electron event with isotropic pitch-angle distributions early in the event. On the other hand, the event observed by Ulysses reached smaller intensities and showed very anisotropic distributions. We use a particle propagation model to infer the interplanetary transport conditions and the injection histories of near-relativistic electrons for both spacecraft. We find different transport conditions but

similar injection profiles; with the injection at Ulysses being smaller and starting later. The injection profile for both spacecraft extends for many hours and coincides with the timing of a type II radio burst.

Aran, Angels, Marsden, Richard, Lario, David, Tranquille, Cecil, Toni, Andrea
Why would the proton intensity spectrum invert for more than 2 days in a SEP event?
S2-503
poster
A common characteristic among Solar Energetic Particle (SEP) events is that the lower the proton energy, the higher the intensity. We study here a unique event observed by Ulysses where the 8-19 MeV proton intensities measured by the LET telescope were higher than the 1.8-8 MeV proton intensities for more than 2.5 days. This occurred at the beginning of the SEP event on 5-12 December 2006 when Ulysses was located at 2.8 AU, -72° in latitude and separated 119° in longitude from the Earth. We present a description of possible particle sources for this event and analyze the particle intensities measured by different telescopes of Ulysses/COSPIN, together with the solar wind plasma and magnetic field data measured by the SWOOPS and VHM-FGM instruments, respectively. In order to test plausible scenarios leading to the observed flux profiles, we use a particle transport model to simulate the observed proton intensities. We discuss the results from our simulation and give an interpretation as to why the inversion of the proton flux profiles is observed in this particular case.

Aran, Angels, Jiggens, Piers, Sanahuja, Blai, Jacobs, Carla, Heynderickx, Daniel, Lario, David
Developing a new model for SEP peak intensity and fluences within 1.6 AU
S2-506
poster
The capability to consider the contribution of CME-driven shocks to particle intensities and fluences of SEP events is necessary to assess the particle radiation environment that missions like Solar Orbiter or Solar Probe Plus may encounter. Within the Solar Energetic Particle Environment Modelling (SEPEM) Project we developed a method to couple a statistical model of SEP events at 1 AU with the outputs of a physics-based model for the description of gradual SEP events from 0.2 AU to 1.6 AU in the ecliptic plane. This latter model combines MHD simulations of shocks with a particle transport model to obtain the intensity-time profiles of 5-200 MeV protons, as seen by different observers placed along the same interplanetary magnetic field line. We calibrate the resulting profiles with 1 AU data and we estimate the contribution of the downstream region to the fluence. With this, the model allows us to derive the upstream flux profiles of the event at other radial distances. We apply this method to a few SEP events and derive the radial variations of the peak intensity and fluence. We discuss the results and propose a way to extend the statistical model to other radial distances.

Arrazola Perez, David, Blanco Avalos, Juan Jose, Rodriguez-Pacheco, Javier, Hidalgo Moreno, Miguel Ang
Study of local HCS variations from multi-spacecraft observations
S2-650
0 min. poster only
Local magnetic structure of Heliospheric Current Sheet (HCS) is observed as a boundary that separate magnetic field opposite directions. Local variability of the HCS has been studied. MVA, CVA and HYTARO have been used to evaluate changes in HCS local orientations. Solar wind features and magnetic field variations obtained from multi- spacecraft observations (ACE, WIND and STEREO A and B) have been used to estimate temporal and spatial dependences in the local HCS structure. Important changes in some of the events are shown, probably related with transient as magnetic cloud events. Connection with the neutral line at the Corona has been estimated for each event analyzed. This work analyzes the importance of the propagation of the HCS on its local structure and the connection between different observations points in the space.

Aschwanden, Markus, Sandman, Anne
Magnetic Stereoscopy with STEREO and SDO
S2-358
poster
Stereoscopic 3D reconstruction of coronal loops was carried out for large numbers of coronal loops in active regions, using STEREO-A and B in the early phase of the mission at small spacecraft separation angles. Novel methods of reconstructing the 3D geometry

of coronal loops have also been explored by combining stereoscopic triangulation with magnetic field models, such as magnetic potential fields calculated from a number of buried unipolar magnetic charges (Aschwanden and Sandman 2010), buried dipoles (Sandman and Aschwanden 2011), or linear force-free fields (Wiegelmann and Neukirch 2002), methods that are also called "magnetic stereoscopy". We present some new results to model the coronal magnetic field with parameterized forward-fitting of potential fields to stereoscopically triangulated loops from STEREO, as well as to automatically traced loops in AIA/SDO images. With these methods, a smaller misalignment angle can be achieved between theoretical and observed magnetic field lines. We demonstrate that such improved coronal magnetic field models can be derived with a combination of AIA and HMI data alone, while STEREO data can be used for validation of the optimized solutions.

Aurass, Henry
Large scale magnetic connectivity how to find "active connections?
S3-420
oral
It is common belief that quasi-separatrices, magnetic nulls, bald patch points, and current sheets (terms used in discussing connectivity changes by reconnection in the corona) play an important part as potential sites of energy release such as solar flares and coronal mass ejections. They denote regions where the coronal magnetic field is most sensibly reacting on small disturbances (emerging flux, footpoint motions). We followed a suggestion by Antiochos et al. (1999) that the break-out of a CME could be announced by minor amounts of nonthermal electrons released somewhere along large-scale magnetic connections of a flaring active region, and be visible in solar radio emission. On Oct. 28, 2003 (X17 flare, halo CME, AR 10486) we found this situation starting 5 min before the impulsive phase, and with synchronism at remote sites and in the active region.

Banerjee, Dipankar, Samaymanthula, Krishnapra
High frequency oscillations in active region loops
S1-556
oral
High frequency waves, of less than a minute periodicity has been detected from eclipse and radio observations. Their contribution to coronal heating depends on their life time and characteristics. They have been interpreted as fast magneto-acoustic waves. Though there exits quite a few studies on this mode from ground based eclipse observations, it is not well studied in the EUV regime, due to its high cadence requirement. In an attempt to study this, one needs simultaneous imaging and spectroscopic observations and we ran a HOP with sit-n-stare observations of 5s to 10s cadence in a few chosen lines using EIS on Hinode. Data from AIA/SDO fulfills the high cadence imaging requirement in various passbands. Our analysis indicates that these high frequency modes are concentrated close to the loop footpoints. Plasma diagnostics using a density sensitive line pair will be discussed. The distribution of power at different frequency band and their implication will be presented. We will also touch on the subject of flows versus waves within coronal loops on the current context.

Battarbee, Markus, Laitinen, Timo, Vainio, Rami
Heavy Ion Aacceleration and Self-Generated Waves in Coronal Shocks
S2-541
poster
Particles accelerated in coronal-mass-ejection (CME) driven shocks are currently considered to be the primary component of large solar energetic particle (SEP) events. Using a Monte Carlo method with self-consistent Alfvénic turbulence we have simulated the diffusive shock acceleration of minor ions and protons. We find that the effect minor ions have on wave generation is small but non-negligible. The simulations show a cut-off energy dependence on the charge-to-mass ratio to be $(Q/A)^{1.5}$, i.e., different from previous analytical estimates based on wave-generation by protons alone and using simplifying assumptions on the form of the wave spectrum at low wavenumbers. The minor ions in the simulation also exhibit harder energy spectra than protons, especially during early phases of acceleration, which we identify as a result of the time-dependence of the coupled particle acceleration and wave generation.

Bein, Bianca, Temmer, Manuela, Veronig, Astrid, Vourlidas, Angelos
Propagation direction and true mass of CMEs derived from STEREO observations
S2-421

poster
For our study we use the unique possibility of the STEREO (Solar Terrestrial Relations Observatory) mission to observe CMEs from 2 different vantage points. We use coronagraphic observations (COR1 and COR2) to determine the kinematics and mass evolution of a sample of well observed CMEs up to 15 R_{Sun}. The combination of STEREO-A and STEREO-B measurements and the assumption that from both spacecrafts the same amount of mass should be observed, enables us to estimate the true CME mass (see Colaninno and Vourlidas, 2009). In the course of mass calculations also a propagation direction can be derived, which is compared with the results of triangulation methods.

Belheouane, Soraya, Zaslavsky, Arnaud, Mann, Ingrid, Meyer-Vernet, Nicole, Issautier, Karine, Maksimovic, Milan
Detection of interstellar dust with Stereo-Waves at 1AU
S3-555
poster
Most in-situ measurements of cosmic dust have been carried out with dedicated dust instruments. Dust particles can also be detected with radio and plasma wave instruments. The high velocity impact of a dust particle generates a small crater on the spacecraft. The dust particle and the crater material are vaporized and partly ionized. This charge can be detected with plasma instruments designed to measure electric and magnetic fields. Since 2007 the Stereo-Waves instrument recorded a large number of events due to dust impacts. Here we will concentrate on the discussion of those impacts that were recorded with all three antennas. We interpret them as being produced by dust grains originating from the local interstellar cloud and by β-meteorites. From the study of these fluxes during 4 years of the Stereo mission and their modelisation, we determine the direction of arrival of interstellar dust and the temporal variation of its flux at 1AU between 2007 and 2010.

Bemporad, Alessandro, Zuccarello, Francesco, Jacobs, Carla, Mierla, Marilena
CME latitudinal deflection in an asymmetric coronal field configuration
S2-457
poster
We focus on the latitudinal deflection of a slow Coronal Mass Ejection (CME), which occurred on September 21, 2009. The 3D trajectory of the event has been reconstructed with STEREO data via triangulation (applied to EUVI HeII data), forward modeling and polarization ratio (applied to COR1 data) techniques. The CME leaves from a latitude of 35°S propagating Northward, then it interacts with the surrounding coronal structures, being deflected along the equatorial plane, and finally resulting in a CME directed towards the Earth. A small longitudinal deflection by 10° also occurs during the CME propagation. To further investigate this event we have performed numerical MHD simulations in an axisymmetric spherical geometry. By applying photospheric shearing motions at the inner boundary of a streamer, we have initiated a CME. Due to the magnetic tension of the coronal streamer, the simulated CME experiences a latitudinal deflection of about 30°, eventually approaching the solar equator.

Bemporad, Alessandro, Mierla, Marilena, Tripathi, Durgesh
Study of an erupting prominence rotation with STEREO data
S2-458
oral
On August 31, 2007 a prominence eruption was observed by STEREO/EUVI and later on by STEREO/COR1, as the core of a three-part CME. We employed the tie-pointing technique to reconstruct the 3D shape and trajectory of the prominence, which has been followed up to 2.4 solar radii. Data show evidence for a progressive clockwise prominence rotation by 90, occurring not only in the early phase of the eruption sampled by EUVI, but also at larger heliocentric distances as seen by COR1. Counter-clockwise rotation of the H-alpha filament and clockwise rotation of the potential field extrapolated at different times possibly suggest that a magnetic helicity storage occurred not in the filament itself, but in the global magnetic field configuration of the surrounding corona. The observed rotation of an erupting prominence, if representative of the flux rope rotation, may have a strong impact in the definition of geo-effectiveness of CMEs for space weather forecasting purposes.

Berger, Lars
The Solar Wind
S1-632

oral
More than sixty years of space flight - What have we learned about the solar wind? A simple answer to this question would be 'a hell of a lot'. Here, we will address this question in greater detail and present an overview of the progress that has been made. From giving proof of the existence of a constant particle radiation emanating from our Sun a lot has been learned about processes in 'exotic' plasmas that are ubiquitous in the universe but can not be reproduced in the laboratory. A new view of our direct environment in the universe has been developed by understanding how the heliosphere is formed and new insights about our Sun were gained. Even a whole new field of science termed 'space weather' arose. All told, we will tell a success story about the interplay between theory and experiment that will inevitably lead us to still outstanding challenges.

Bilenko, Irina
Global Solar Magnetic Field, IMF, and Solar Wind Evolution
S2-370
poster
The magnetic field in the heliosphere evolves in response to the solar photospheric and coronal magnetic fields. This evolution, together with the rotation of the Sun, determines the interplanetary magnetic field and solar wind parameter changes. Based on modern comprehensive solar data an analysis is made of the global events on the Sun and their consequence in the heliosphere. Relatively slow variations of interplanetary magnetic field and solar wind parameters as well as their fast changes have been analyzed. Peculiarities of the fast global changes of the photospheric magnetic fields, accompanied by the rapid coronal magnetic field structure reconfiguration, resulting in the reorganization of coronal hole distribution on the solar disk, solar wind, and interplanetary magnetic field alteration are under consideration.

Blanco, JuanJose, Hidalgo, MiguelAnge, Rodriguez-Pacheco, Javier, Heber, Bernd, Wimmer-Schweingruber, Robert, Gomez-Herrero, Raul, Martin, Cesar
The effect of magnetic clouds on energetic particles above 50 MeV as observed by the HELIOS spacecraft
S2-649
0 min. poster only
The two twin spacecraft, HELIOS A and HELIOS B, explored the inner heliosphere from about 0.29 AU to 1 AU from the mid 1970's to early 1980's. The E6 Experiment aboard Helios was constructed and builds by the Christian-Albrechts-University Kiel. It has been shown previously that the anticoincidence as well as the calorimeter of the instrument is mainly sensitive to charged particles with energies above 50 MeV/nucleon. These detectors have large geometric factors and allow therefore a detailed study of Forbush Decreases, which were first observed by neutron monitors. Among other sources magnetic clouds can cause such Forbush Decreases. In this work, we analyze the time profiles of these single detector counters in order to detect a passage of magnetic clouds. The shape and depth are than studied in terms of the solar wind and magnetic field properties of the magnetic cloud.

Blanco-Cano, Xochitl, Kajdic, Primoz, Aguilar-Rodriguez, Ernesto, Russell, Christophe, Jian, Lan , Luhmann, Janet
Interplanetary shocks and foreshocks observed by STEREO
S1-397
oral
In this work we use STEREO data to study the characteristics of interplanetary shocks driven by stream interactions, and compare them to shocks driven by interplanetary coronal mass ejections (ICMEs). During the extended solar minimum around 100 shocks were driven by solar wind stream interactions and observed at 1 AU. These shocks have low-moderate Mach numbers (Mms 1.1-2.5) and are in most cases quasi-perpendicular. In contrast, during the years 2007-2010 only 16 shocks associated to ICMEs were observed by STEREO. They had Mach numbers, Mms ¡ 3 and most were quasi-perpendicular. As solar activity increases in the rising part of cycle 24 we observe more shocks driven by ICMEs. For very fast ICMEs, these shocks can be stronger with higher Mach numbers than shocks driven by stream interactions. Shocks modify solar wind properties and participate in the acceleration of solar energetic particles. They are responsible for the generation of extended foreshock regions where low frequency waves and suprathermal ions are present. The extension and characteristics of the waves and ion foreshocks depend strongly on shock geometry and Mach number. In this work we study upstream waves and extensions of suprathermal ion foreshocks for both, shocks generated by stream interactions and shocks driven by ICMEs. We find that shocks driven by ICMEs tend to have larger foreshocks than shocks driven by stream interactions. The difference in foreshock extensions is related to the fact that while ICME driven shocks

are formed closer to the Sun and therefore begin to accelerate particles very early in their existence, , stream interaction shocks form at 1 AU and have less time to accelerate particles to suprathermal energies.

Boden, Sebastian, Solar Orbiter STEIN, Team, Lin, RobertP., Dong-Hun Lee, HoJin, Limousin, Olivier
Thermal Modeling for the STEIN sensor on Solar Orbiter
S3-652
0 min. poster only
The Solar Orbiter Mission is designed to provide coordinated remote-sensing and in-situ studies of the physics of the Sun, corona, and inner heliosphere. For this purpose it carries a variety of instruments and will reach a perihelion of 0.28 AU. The Energetic Particle Detector (EPD) will measure charged particles in an energy range from a few keV/nuc up to hundreds of MeV/nuc. It consists of five different sensors to cover this energy range. The SupraThermal Electrons, Ions and Neutrals (STEIN) detector is part of EPD and has heritage from the STEREO SupraThermal Electron (STE) instrument. The STEIN telescope will measure electrons from 2 keV to 100 keV and protons (ions) from 4 keV to 100 keV and is located near the end of the boom of the spacecraft. Due to the mission profile STEIN has to work in a variety of different thermal environments. This work shows the thermal modeling done in the design phase of STEIN and implications of the thermal environment on the design.

Bonnet, Roger-Maur
Sun and heliospheric physics: visions of the future
S3-465
oral
Only a small number of the missions in the 2003 Decadal Survey of the US Academy have started or have been launched. Solar Probe, now foreseen to launch in 2018, has been able to survive at the expense of eliminating a large number of smaller missions. As far as ESA is concerned, the "Cosmic Vision" was never transformed into a real program of missions and launches. In view of that situation, the community must react. That is however very challenging: solar and heliospheric missions span a large volume in space, and operate in extreme environments. They last long and require sophisticated technologies whose development should never start too late. The future is in fact not so bleak looking at the appearance of new partners and that should be seen as an opportunity. International cooperation should soon be the frame in which future large missions should be developed. The international community should agree on may be one or two large missions plus a set of smaller ones to further our understanding of the Sun and in order to place Space Weather on a sound and realistic scientific and programmatic basis.

Bosman, Eckhard, Bothmer, Volker, Nistico, Giuseppe, Vourlidas , Angelos, Howard , RussellA., Davies , Jackie
3D Structure of CMEs The STEREO/SECCHI view
S2-424
oral
Since the start of the STEREO mission operations in early 2007, 565 classical large-scale coronal mass ejections (CMEs) have been identified in STEREO/SECCHI/COR2 synoptic movies until the end of 2010. These CME events compare about one to one with those SOHO/LASCO/C2 CMEs of the SOHO/LASCO CME catalogue when the angular widths exceed forty degrees, i.e., the typical widths of classical three part-structured CMEs. Out of these events, a best-of list of almost 120 CMEs has been established based on the clearance of the CMEs white-light appearances in the COR2 field of view ranging from 2.5-15 solar radii. The events were observed under spacecraft separation angles ranging from 0 to 175 degrees. Each CME was studied carefully by applying the Graduated Cylindrical Shell (GCS) model developed by Thernisien, Howard and Vourlidas (2006) based on the 3-D concept for CMEs derived by Cremades and Bothmer (2004). We present a statistical overview of the SECCHI GCS modeling results, including a comparison with the photospheric and low corona source region characteristics. For a number of cases, the CME modeling could be applied successfully to heliocentric distances reaching well inside the field of view of the SECCHI/HI 1 telescope (¿ 40 solar radii). Analysis of deviations from the modeling results with respect to the identified CME source region locations yields important implications for the overall 3D topology of CMEs and their near Sun and heliospheric evolution.

Braune, Stephan, Aurass, Henry
On the magnetic field in the X-class flare ARs October November 2003
S2-451

poster
In the 7th framework EU program, a 3 years collaborative effort is carried out with focus on open questions between solar energetic particles (SEP) near Earth and related solar electromagnetic data (WP 3). As a first step, a repository with representative events and analysis tools will be prepared.

The X class events from Oct 28th, and from Nov 2nd to Nov 4th, 2003 are good starting points for detailed investigations, because some of them were registered as SEP near Earth and one of them isn't. The pfss extrapolation of SOHO MDI data shows the difference: Open fields for Nov 2nd and 4th (AR10486) but only closed ones for Nov 3rd (AR10488). On Oct 28th, 2003 there are closed fields lines in AR10486, only, but open ones in ARs10488/91. Aurass et al. (2006) found radio evidence of whistler propagation from AR10486 to 10488/91. It follows a solar-determined release delay of $\geq$ 12min which fits with the delay of gradual electrons of SEPs.

Braune, Stephan, Aurass, Henry
On a special stage of impulsive flare meter wave and HXR emission
S2-453
poster
This investigation compares emission in meter wave radio radiation, and of hard X-rays in solar flares during the strongest HRX emission.

The meter wave radio emission is a remote ground-based indicator of the low energy electron component of flare-accelerated particles. The hard X-ray data are most indicative for the precipitation of high energy particles from the corona into the denser solar atmosphere, and thus for the onset of acceleration of particles to high energies.

As a first step for a still better understanding of data about the early stage of flare particle acceleration, spectra and images in radio and X-rays of two characteristic, and well observed events are presented.

Bucik, Radoslav, Mall, Urs, Korth, Axel, Mason, Glenn M.
Abundances of Suprathermal Ions in CIRs on STEREO during the Minimum of Solar Cycle 23
S1-423
oral
We examine the composition of the 0.1 - 1 MeV/n interplanetary heavy ions from H to Fe in corotating interaction regions (CIRs) measured by the SIT (Suprathermal Ion Telescope) instrument. We use observations taken on board the two STEREO spacecraft (s/c) during the unusually long minimum of Solar Cycle 23 from January 2007 through December 2010. During this period instruments on STEREO observed more than 70 CIR events making it possible to investigate CIR ion abundances during solar minimum conditions with unprecedentedly high statistics. The observations reveal annual variations of relative ion abundances in the CIRs during the 2007-2008 period. In 2010 the elemental composition in CIRs were influenced by solar energetic particle events. We compare the elemental composition measured on the two STEREO s/c. We observed several CIR events with noticeably different elemental ratios on the two s/c when the two STEREO s/c were well separated in heliographic longitude.

Chifu, Iulia, Inhester, Bernd
3D reconstruction of a prominence from 3 views
S3-645
0 min. poster only
STERO mission is highly used for 3D reconstruction of solar features. Now,the launch of SDO (Solar Dynamic Observatory) satellite give the possibility to have a third eye for a more accurate 3D reconstruction. We used 3 views (STERO A,B and SDO) to realize the 3D reconstruction and time evolution of a prominence which triggered a spectacular CME. This event from 1 August 2010 occurred after long time of quiet Sun. Using coronagraph images from STERO we analysed the time evolution of the core and the leading edge of the CME produced by this prominence.

Crosby, Norma
How 4pi will be used for space weather monitoring and forecasting
S3-494
oral

With the two STEREO spacecraft, combined with SDO and SOHO, humanity is now equipped with a unique 360-degree view of the Sun. This offers unprecedented opportunities for 4pi space weather monitoring and forecasting. Specifically it allows one to gain new insights into the physical processes underlying the phenomena responsible for unwanted space weather effects. Combined with data from other satellites, as well as ground-based observations, this acquired know-how will offer new input (data and models) for space weather forecasting purposes. This paper will review the combined - space weather phenomena and their effects - picture, where 4pi monitoring and forecasting is offering unique opportunities in regard to our dependence on space technology . Three - present and future - space weather scenarios will be discussed: 1.) near-Earth environment, 2.) Earth-Moon, 3.) Mars.

Crosby, Norma, Veronig, Astrid, Robbrecht, Eva, Vrsnak, Bojan, Vennerstrøm, Susanne, Malandraki, Olga, Dalla, Silvia
Forecasting the Space Weather Impact : the COMESEP Project
S2-563
poster
The FP7 COronal Mass Ejections and Solar Energetic Particles (COMESEP) project is developing tools for forecasting geomagnetic storms and solar energetic particle (SEP) radiation storms. By analysis of historical data, complemented by the extensive data coverage of solar cycle 23, the key ingredients that lead to magnetic storm and SEP events and the factors that are responsible for false alarms are being identified. To enhance our understanding of the 3D kinematics and interplanetary propagation of CMEs, the structure, propagation and evolution of CMEs are being investigated. In parallel, the sources and propagation of SEPs are being examined and modeled. Based on the insights gained, and making use of algorithms for the automated detection of CMEs, forecasting tools for geomagnetic and SEP radiation storms will be developed and optimised. Validation and implementation of the produced tools into an operational Space Weather Alert system will be performed. This work has received funding from the European Commission FP7 Project COMESEP (263252).

Crosby, Norma, and the SEPEM Team,
SEPEM: the ESA Solar Energetic Particle Environment Modelling Project
S2-564
poster
Developed by an international Consortium, the ESA Solar Energetic Particle Environment Modelling (SEPEM) project has created new SEP engineering models and tools to address current and future needs by incorporating recent scientific results and a complete set of cross-calibrated data. Both statistical and physical modelling techniques have been addressed, covering SEP environments ranging from 0.2AU to 1.6AU. SEPEM moves beyond mission integrated fluence statistics to peak flux statistics and durations of high flux periods. Furthermore SEPEM has integrated effects tools to allow calculation of single event upset rate and radiation background for a variety of engineering scenarios. Essential supporting elements also developed within the framework of SEPEM have been the creation of a reference solar energetic particle dataset and a user-friendly webserver with access to the models developed under this project and a number of industry standards. The complete set of SEPEM functionalities is being phased-in with completion scheduled for summer 2011. For more information, see the SEPEM website < http://sepem.aeronomie.be/ >.

D'Huys, Elke, Seaton, Daniel, De Groof , Anik, Jacobs, Carla, Poedts , Stefaan
Multi-spacecraft analysis and modeling of a solar eruption on August 14, 2010
S2-561
poster
A central question regarding solar eruptions is exactly how magnetic reconnection converts stored magnetic energy into heat, radiation, and kinetic energy. A second important question is what mechanisms trigger such eruptions and initiate the reconnection that drives them. Several models offer an explanation for these triggers. One of the proposed mechanisms is solar flux emergence, which assumes that an initial flux rope equilibrium breaks down as a reaction to the injection of magnetic energy when additional flux emerges on the nearby solar surface. On August 14, 2010 a striking eruption occurred on the NW limb of the sun. SDO/HMI magnetogram observations show a significant amount of flux emergence in the eruption region, which suggests it played a role in triggering this eruption. In this poster, we will offer a first interpretation of this event combining observations made by STEREO, SDO/AIA and PROBA2/SWAP. We discuss ongoing efforts on the modeling of this event.

Dadashi, Neda, Teriaca, Luca, Solanki, Sami

The quiet Sun average Doppler-shift of coronal lines up to 2 MK
S1-447
poster
The average Doppler-shift shown by spectral lines formed from the chromosphere to the corona reveals important information on the mass and energy balance of the solar atmosphere, providing an important observational constraint to any models of the solar corona. Previous spectroscopic observations of Vacuum Ultra-Violet (VUV)lines have revealed persistent average wavelength shift of lines formed at temperatures up to 1 MK. At higher temperatures, the behavior was, so far, essentially unknown.

Here we analyze combined SUMER (Solar Ultraviolet Measurements of Emitted Radiation)/SoHO (Solar and Heliospheric Observatory) and EIS (EUV Imaging Spectrometer)/Hinode observations of the quiet Sun around disk center to determine, for the first time, the average Doppler-shift of several spectral lines formed between 1 and 2 MK, where the largest part of the quiet coronal emission is formed.

The measurements are based on a novel technique applied to EIS spectra to measure the difference in Doppler-shift between lines formed at different temperatures. Simultaneous wavelength-calibrated SUMER spectra allow establishing the absolute value at the reference temperature of $T \approx 1$ MK.

The average line shifts at 1 MK $< T <$ 1.8 MK are modestly but clearly bluer than those observed at 1 MK. By accepting an average blue-shift of about (-1.8 ± 0.6) km s^{-1} at 1 MK (as provided by SUMER measurements), this translates into a maximum Doppler-shift of (-4.4 ± 2.2) km s^{-1} around 1.8 MK. The measured value appears to decrease to about (-1.3 ± 2.6) km s^{-1} at the Fe XV formation temperature of 2.1 MK.

The measured average Doppler shift between 0.01 and 2.1 MK, for which we provide here a parametrization, appears to be qualitatively and roughly quantitatively consistent with what foreseen by 3-D coronal models where heating is produced by dissipation of currents induced by photospheric motions and by reconnection with emerging magnetic flux.

Dalla, Silvia, Fletcher, Lyndsay, Mackay, Duncan H.
Visibility of Active Region emergence in magnetogram data
S2-578
poster
The emergence of a new Active Region (AR) on disk is typically detected via analysis of full-disk continuum images or magnetograms. The presence of an asymmetry in the longitudinal distribution of new emergences as deduced from continuum images is well known (both from ground based and SOHO/MDI data). It can be explained as due to the centre-to-limb variation of the visibility of small sunspots [eg Dalla et al 2008], for example due to the Wilson effect [Watson et al 2009]. Here we analyse whether a similar asymmetry (and consequent strong centre-to-limb variation of visibility threshold) also exists for the detection of new AR emergences in magnetograms. We use the NSO Kitt Peak magnetogram dataset, which covers the time range between 1974 and 2003 with its 512 channel magnetograph and the more recent spectromagnetograph. We automatically detect new emergences, analyse their distribution on the solar disk and derive parameters of the visibility functions for line of sight magnetograms.

Davila, Joseph
Slitless Spectroscopy
S2-643
0 min. poster only
Spectrographs have traditionally suffered from the inability to obtain line intensities, widths, and Doppler shifts over large spatial regions of the Sun quickly because of the narrow instantaneous field of view. This has limited the spectroscopic analysis of rapidly varying solar features like, flares, CME eruptions, coronal jets, and reconnection regions. Imagers have provided high time resolution images of the full Sun with limited spectral resolution.

In this paper we present recent advances in deconvolving spectrally dispersed images obtained through broad slits. We use this new theoretical formulation to examine the effectiveness of various potential observing scenarios, spatial and spectral resolutions, signal to noise ratio, and other instrument characteristics.

This information will lay the foundation for a new generation of spectral imagers optimized for slitless spectral operation, while retaining the ability to obtain spectral information in transient solar events.

Dayeh, Maher, Kozarev, Kamen, Ebert, Rob, Desai, Mihir, Schwadron, Nathan

Modeling SEP onset times and proton intensities between 0.1 - 1.5 AU using EPREM: Comparison with Helios, Imp-8, and Voyager observations for the November 22, 1977 event.
S2-621
poster
As solar activity increases, attention turns again to the hazardous Solar Energetic Particle (SEP) events that can affect many aspects of modern life on Earth as well as manned and unmanned space missions. Understanding intensity variations of SEP events and the way these events evolve in interplanetary (IP) space is a major key to ultimately predict their properties in the near-Earth environment. The Energetic Particle Radiation Environment Module (EPREM) is a 3-D particle transport code and is a part of the Earth-Moon-Mars Radiation Exposure Module (EMMREM) which characterizes time-dependent radiation exposure in IP space environments. EPREM utilizes SEP intensities simulated or measured by instruments on board spacecraft at different locations and projects them into the 3-D heliosphere. The model treats particles along each magnetic field line for transport, adiabatic focusing, adiabatic cooling, convection, pitch-angle scattering, and stochastic acceleration in the framework of a modified formalism of the diffusion-focused transport equation [Kota et al., ICRC, 1, 125, 2005]. Using proton measurements from Helios-1, Helios-2, Imp-8, and Voyagers 1 & 2 at energies between 4 MeV and 50 MeV during the November 22, 1977 SEP event, we utilize EPREM to model the onset times and study the radial dependence of peak intensities and fluences at different locations between 0.1 and 1.5 AU. We discuss the effects of EPREM transport parameters and boundary conditions on the energetic particle profiles at different locations and comment on the capabilities of EPREM in predicting particle intensities in the Earths vicinity. Results show that EPREM is well suited to study and investigate the longitudinal and radial properties of SEP events observed simultaneously by STEREO and ACE.

de Patoul, Judith, Inhester, Bernd, Feng, Li, Wiegelmann, Thomas
2-D and 3-D polar plume analysis from the three vantage positions of STEREO/SECCHI A, B and SoHO/EIT
S1-366
oral
Polar plumes are seen as elongated objects starting at the pole and extending super-radially. We analyze these objects from a sequence of images taken simultaneously by the three spacecraft telescopes STEREO/SECCHI A and B, and SoHO/EIT. Firstly, we automatically identify projected plumes in solar EUV images close to the limb at 1.01-1.39 $R_{\odot}$ and study their temporal evolution. This plume identification method is based on a multiscale Hough-wavelet analysis. Then we determine their 3-D localization and orientation using tomography techniques including the differential rotation of the sun and, and using conventional stereoscopic triangulation. We show that tomography and stereoscopy are complementary to study polar plumes. We also show that this systematic 2-D identification and the proposed methods of 3-D reconstruction are well suited, on one hand, to identify plumes individually and on the other hand, to analyze the distribution of plumes and inter-plume regions. Finally, the results will be discussed focusing on the plume position with their cross section area and this relation to coronal holes.

DeForest, Craig, Howard, Tim, Tappin, James
Detailed Imaging of Solar Wind Structures From the Sun to 1 A.U.
S1-510
oral
We have recently developed image processing techniques to carry out absolute background subtraction on STEREO-HI2 and STEREO-HI1 data. Combining background-subtracted heliospheric data with coronal imagery from the STEREO-COR instruments enables the first continuous remote sensing observation of solar wind structures from their origin in the low corona out to 1 A.U. and beyond. Obvious first results from spectacular Sun-to-Earth image data collected in 2008-Dec through 2009-Jan include movies of CMEs from early three-part-structure formation through impact with Earth; origin and history of CME-associated disconnection events, and clear imagery of CIRs sweeping across the solar system.

We will describe the inversion technique, present first results, and speculate on scientific applications to come as more of the rich STEREO data set is processed.

Demoulin, Pascal
The active Sun and dynamic Heliosphere - Initiation of CME
S2-550
oral

The coronal magnetic configuration of an active region typically evolves quietly during few days before becoming suddenly eruptive and launching a coronal mass ejection (CME). The precise origin of the eruption is still debated. Several mechanisms have been proposed, such as tether-cutting, loss of equilibrium, torus instability or breakout model. Different studies of well observed CME initiations have provide arguments in favor or against each of these mechanisms, but without reaching a consensus on the key mechanism for eruption. The recent development of 3D MHD simulations has permitted to test the proposed mechanisms in simplified magnetic configurations, clarifying the physical implications of each mechanism. In this talk, I will describe our present knowledge on CME initiation combining both observational and theoretical view points.

DeRosa, Marc, Schrijver, Carolus, Nitta, Nariaki, Barnes, Graham
A sampling of topological features of the solar corona
S2-558
oral
The topology of the solar coronal magnetic field has been the subject of much recent interest, due to its apparent importance in determining (for example) the sector structure of the solar wind, the evolution of coronal hole boundaries, and whether the configurations of coronae overlying active regions are unstable and thus possibly eruption-prone. We identify the topological skeleton (null points, spine lines, separators, and separatrix surfaces) for a selection of dates spanning the SOHO, STEREO, and SDO eras, and provide visualizations of topological features in three dimensions. The selected fields contain several topological features of interest, including exceedingly narrow channels of open field and separators associated with inferred reconnection sites, and evidence of the coronal origins of streamers and pseudostreamers in the heliosphere. Such topological features appear frequently in potential field models of the magnetic corona, thus implying that the actual solar corona is likely to involve even more complex topologies, especially as its dynamics and evolution are taken into account.

Dolla, Laurent
A comparison of quasi-periodic pulsations in different wavebands
S2-356
oral
Quasi-periodic oscillations (or "pulsations") have been observed in the rising phase of solar flares for many years. Here we compare the short-period oscillations (around 10 s) observed during several events by many instruments: the radiometer channels of PROBA2/LYRA (soft X-ray, Lyman alpha, Herzberg continuum), the radiometer channels of SDO/EVE-ESP (soft X-ray, coronal and chromospheric passbands), the RHESSI passbands and short-wavelength radio observations. For the first time, we observed and studied significant and systematic phase delays between oscillations in different wavelength bands. Our results show a quarter period phase shift between the soft X-ray emission and EUV emission. This suggests an interpretation of the quasi-periodic pulsations in terms of MHD oscillations in the flaring loops.

Dresing, Nina, Gómez-Herrero, Ra'ul, Klassen, Andreas, Heber, Bernd, Kartavykh, Yulia, Dröge, Wolfgang
The longitudinal spread of solar energetic particles at the January 17, 2010 solar energetic particle event
S2-536
poster
During the rising phase of solar cycle 24 several solar energetic particle (SEP) events have been observed by three well separated viewpoints provided by the STEREO and SOHO/ACE spacecraft. Longitudinal separations of more than 130 degrees of the two STEREO spacecraft, as in January 2010, offer a unique possibility to investigate the angular distributions of SEPs at 1 AU. We present multi-spacecraft observations of the January 17, 2010 SEP event, which exhibits a remarkable large longitudinal spread of energetic particles. lectron increases were measured by the Solar Electron and Proton Telescopes (SEPT) aboard the twin STEREO observatories and the Electron Proton Helium Instrument (EPHIN) aboard SOHO. The longitudinal separation between the active region and the nominal magnetic footpoint of the spacecraft varies between 108 degrees for STEREO B and 169 degrees for SOHO. The events are characterized by a long delay by more than 50 minutes with respect to the type III radio burst, missing velocity dispersion and nearly isotropic time profile at all three locations. In order to describe the observations the propagation model by Dröge et al., 2010 has been applied.

Dresing, Nina, Gómez-Herrero, Ra'ul, Malandraki, Olga, Heber, Bernd, Klassen, Andreas, Kilpua, Emilia

Solar Activity at Minimum: A CIR dominated inner Heliosphere
S1-543
oral
During solar minimum Corotating Interaction Regions (CIRs) build a prevailing source of energetic ions in the inner heliosphere. Multi-spacecraft in-situ observations in combination with the backmapping technique and remote sensing observations of the source regions of the solar wind are appropriate tools to study CIRs. The Ulysses spacecraft crossed the ecliptic plane in August 2007, which was an undisturbed period by Solar Energetic Particle (SEP) events. This offered the opportunity to determine a radial gradient of about 200%/AU for CIR-associated MeV ions by multi-point measurements of the Ulysses, ACE, and STEREO spacecraft. While some CIR observations show very stable behavior of the solar wind structure and associated ion increases, discrepancies between the observations at different spacecraft are also often found. These differences can be explained by spacial effects like latitudinal separations but can also be due to temporal changes as the presence of interplanetary transients or changes of the parent coronal hole boundaries. Examples of variable CIR observations are presented and discussed.

Drews, Christian, Berger, Lars, Wimmer-Schweingruber, RobertF., Bochsler, Peter, Galvin, Antoinette, Möbius, Eberhard, Klecker, Berndt
Interstellar and Inner-Source Pickup Ions at 1 AU
S1-474
poster
STEREO PLASTIC's big geometric factor and the unusual prolonged solar minimum allows for the first time investigation of heavy pickup ions with unprecedented quality. Within the framework of our analysis we were able to identify signatures of inner-source carbon, nitrogen, and oxygen as well as interstellar helium and neon using STEREO PLASTIC's Pulse Height Analysis data.

By comparing mass-per-charge spectra inside and outside the helium focusing cone, we have succeeded in distinguishing interstellar from inner-source Ne^+ pickup ions and were able to identify the neon focusing cone for the first time.

In addition, we have performed a superposed epoch analysis of four consecutive STEREO A orbits that allowed us to reveal in-situ the spatial evolution of heavy pickup ions at 1 AU. Consequently we were able to confirm the angular dependency of pickup ion spectra that are predicted by the existing theory with real data.

Dröge, Wolfgang
4 π Models of Solar Energetic Particle Events
S3-505
oral
The modeling of solar particle events offers the possibility to study properties of particle transport in the Heliosphere as well as to obtain information about the plasma conditions and the nature of acceleration and injection processes of the particles close to the Sun. Recent work has shown that features of the transport parallel to the average magnetic field (pitch-angle scattering coefficients, mean free paths and their rigidity dependence) can be phenomenologically understood by models which take into account dynamic effects in the particle scattering and the geometry of the fluctuations. The diffusion of particles perpendicular to the magnetic field however, which is important for the interpretation of the longitudinal variation of solar particle events and also for other problems such as shock acceleration and the modulation of cosmic rays in the heliosphere, appears to require non-linear theories which, in turn, seem in some aspects not to be consistent with the observed propagation of solar particles. To explore the possibilities of multi-spacecraft observations in this respect we will apply our numerical three-dimensional transport model to selected particle events observed simultaneously on ACE, Wind, and STEREO during the time period 2007 until present. In particular, we will discuss how lateral gradients observed in these events can provide information about a possible transport perpendicular to the interplanetary magnetic field. Also we will take a look on how Ulysses observations at high latitudes and future particle measurements on Solar Orbiter and possible Messenger and Bepi Colombo at smaller radial distances can contribute to a better understanding of particle transport in the Heliosphere.

Ebert, R. W., Dayeh, M. A., Desai, M. I., Mason, G. M.
Temporal Evolution of Suprathermal Heavy Ion Intensities and Anisotropies in CIR-Associated Particle Events at 1 AU
S1-586
oral

Energetic particle enhancements are often observed in association with corotating interaction regions (CIRs) at 1 AU, even in the absence of shocks. One possible explanation, based on the Fisk and Lee model, is that these enhancements arise from the sunward propagation of particles accelerated at CIR-driven shocks between ∼2 – 5 AU. This model also predicts that these sunward moving particles will suffer from adiabatic deceleration, resulting in a roll-over in the energy spectra below ∼1 MeV/n. Recent observations have shown that this roll-over does not occur, raising the alternate possibility that these CIR-associated suprathermal ions are locally accelerated near 1 AU. In this study, we survey 73 CIR-related particle events observed at ACE, STEREO-A and STEREO-B between 2007 and 2010. We selected these events on the basis of enhancements in the <1 MeV/n heavy ion intensities in conjunction with well defined compression regions. We examine the time intensity profiles for <1 MeV/n He and O ions within each CIR and find that the ion intensities peak at the reverse boundaries of the compression regions in ∼20% of the events. We further explore the role of the compression regions in locally accelerating these ions to suprathermal energies by investigating the relationship between the compression ratios and ion intensities at the reverse boundaries for all events. We also derive anisotropies and infer the flow directions of ∼0.03 - 1.9 MeV/n CNO ions for 24 CIR-related particle events using observations from the STEP instrument on Wind. Our results show the average <0.1 MeV/n CNO flow direction is sunward in both the compression and rarefaction regions for ∼90% of the CIR events. Thus, although in some CIR events the suprathermal heavy ions appear to exhibit evidence of local acceleration, we conclude that the majority of the CIR-associated ions observed at 1 AU originate from sources beyond Earth orbit.

Farrugia, C., UNH and UNIGRAZ teams,
Evolution of solar wind energy densities during solar minimum 2007-2009, and features of its effects on the Earth's magnetopause and magnetosheath
S1-641
0 min. poster only
We quantify the distribution of magnetic and kinetic energy densities of the solar wind at 1 AU during the deep minimum in solar activity (2007-2009). For this we use data from near–Earth spacecraft Wind and the STEREO-A and B probes, the latter giving us a more comprehensive description by extending the longitudinal coverage. We relate general trends in interplanetary data to observations on the Sun. We then pick out a 4-month period, characterized by minima in both the kinetic and magnetic energy densities, and examine the profiles of the plasma and magnetic field parameters. They show slow-slower solar wind interactions with pronounced compressions, and low field strengths in slow solar wind streams. These are compared with the general plasma and field properties of the slow solar wind and differences in geoeffects are documented. Using Cluster crossings of the magnetopause, we determine the average shapes of the bow shock and magnetopause for this period. We compare these with Fairfield's (1971) classic empirical results. We also compare our data-based results for the magnetopause and bow shock shapes with popular analytical models. Major features of observations in the Earth's magnetosheath are discussed. This work is meant as a contribution to Sun-Earth connection studies.

Feng, Li, Wei, Yong, Inhester, Bernd, Wang, Mingyuan, Gan, Weiqun, Wiegelmann, Thomas
On the propagation of a CME in the heliosphere
S2-571
poster
We have developped a new method to geometrically localize the CME position in the heliosphere by using the the SECCHI/COR data and SOHO/LASCO data. This method is compared to the forward-modelling GCS model. We have applied it to one CME event with its source region associated to a solar flare. The trajectory of the CME is determined by applying the method to a series of image setsCOR+LASCO. It turns out that the CME was expelled in the direction of planet Venus. The prediction of the arrival time at VENUS is estimated from the propagation of the CME. The responses of the VENUS atmosphere to this CME are also discussed in terms of the magnetic field and plasma structures.

Fichtner, Horst, Effenberger, Frederic, Kleimann, Jens, Scherer, Klaus, Barra, Stephan
On the fully anisotropic turbulent diffusion of charged energetic particles in the heliosphere
S1-598
poster
The nature and evolution of turbulence of large-scale ordered magnetic fields determine the principle directions for the diffusion of

energetic charged particles, i.e. the axes of a field-aligned coordinate system. The correct determination of these axes is important for the case of fully anisotropic diffusion. We derive the general form of the diffusion tensor in an arbitrary magnetic field. The new tensor elements are illustrated by considering the diffusion of energetic particles in the heliosphere with its complex three-dimensionally structured magnetic field.

Fletcher, Lyndsay
Flares: Roles and Consequences
S2-475
oral
A solar flare is essentially a coronal magnetic 'convulsion', the main characteristics of which are the acceleration of large numbers of non-thermal particles in the lower atmosphere, and the generation of an intense radiation flash. The magnetic field very often reconfigures in such a way that plasma is expelled into the heliosphere as a CME. The precise relationship between solar flares and CMEs continues to be a topic of energetic debate, as do the direct heliospheric consequences of flare-accelerated particles, but there is clearly a close physical link between all of these phenomena. The CME launch and flare impulsive phase occur within a very few minutes of each other, and there is approximate energy equipartition between flare-accelerated non-thermal particles and CME kinetic energy. How does a single magnetically-driven process results in these two dominant forms of energy? Understanding this requires multi-spectral imaging, encompassing non-thermal diagnostics and ranging from sub-arcsecond to whole-Sun scales, as well as modeling which treats the non-thermal particles as an energetically important component in the overall magnetic evolution. This talk will overview solar flare theoretical and observational developments, and the relationship of flares and CMEs, from the flare perspective, and will anticipate the advances that may be made with the exceptional suite of instruments available to us now and in the future.

Floyd, Olivier, Lamy, Philippe, Llebaria, Antoine
The role of coronal mass ejections in reconfiguring the coronal magnetic field
S2-583
oral
The question of the role of CMEs in reconfiguring the coronal magnetic field has been a matter of debate since their discovery. While CMEs do not represent a significant mass-loss process, they may be effective in removing the magnetic flux and helicity that would otherwise accumulate and thus making room for the incoming flux of the new cycle. We are exploring the interaction of CMEs with the streamer belt using synoptic maps of of unsurpassed spatial and temporal resolutions generated from the LASCO-C2 images with a dual approach. First, a statistical analysis of the deviation of the neutral sheets after a CME passage has been performed over 15 years so as to globally characterize the interaction over a solar cycle. Second, we have analyzed a set of about 30 events in detail to explore in detail the mechanism of the interaction.

Foullon, Claire, HCS-Plasmoid cooperation,
Plasmoid Releases in the Heliospheric Current Sheet and Associated Coronal Hole Boundary Layer Evolution
S1-407
oral
As the Heliospheric Current Sheet (HCS) is corotating past STEREO-B, near-Earth spacecraft ACE, *Wind* and *Cluster*, and STEREO-A over more than 3 days between 10 and 14 January 2008, we observe various sections of (near pressure-balanced) flux-rope and magnetic-island type plasmoids in the associated Heliospheric Plasma Sheet (HPS). The plasmoids can qualify as slow Interplanetary Coronal Mass Ejections and are relatively low proton beta (< 0.5) structures, with small length scales (an order of magnitude lower than typical magnetic cloud values) and low magnetic field strengths (2-8 nT). One of them, in particular, detected at STEREO-B, corresponds to the first reported evidence of a detached plasmoid in the HPS. The in-situ signatures near Earth are associated with a long-decay X-ray flare and a slow small-scale streamer ejecta, observed remotely with white-light coronagraphs aboard STEREO-B and SOHO and tracked by triangulation. Before the arrival of the HPS, a Coronal Hole Boundary Layer (CHBL) is detected in-situ. The multi-spacecraft observations indicate a CHBL-stream corotating with the HCS but with a decreasing speed distribution suggestive of a localised or transient nature. While we may reasonably assume that an interaction between ejecta and CHBL provides the source of momentum for the slow ejecta's acceleration, the outstanding composition properties of the CHBL near Earth provide here circumstantial evidence that this interaction or possibly an earlier one, taking place

during streamer swelling when the ejecta rises slowly, results in additional mixing processes.

Foullon, Claire, Verwichte, Erwin, Nakariakov, Valery M., Nykyri, Katariina, Farrugia, Charles J.
Magnetic Kelvin-Helmholtz Instability at the Sun
S2-409
poster
Flows and instabilities play a major role in the dynamics of magnetised plasmas including the solar corona, magnetospheric and heliospheric boundaries, cometary tails and astrophysical jets. The non-linear effects, multi-scale and microphysical interactions inherent to the flow-driven instabilities are believed to play a role, e.g., in plasma entry across a discontinuity, generation of turbulence and enhanced drag. However, in order to clarify the efficiency of macroscopic instabilities in these processes, we lack proper knowledge of their overall morphological features. Here we show the first observations of the temporally and spatially resolved evolution of the magnetic Kelvin-Helmholtz instability. Unprecedented high-resolution imaging observations of vortices developing at the surface of a fast coronal mass ejecta are taken by the new Solar Dynamics Observatory, validating theories of the non-linear dynamics involved. The new findings are a corner stone for developing a unifying theory on flow-driven instabilities in rarefied magnetised plasmas, important to shed light on the fundamental processes at work in key regions of the Sun-Earth system.

Galvin, Antoinette, Simunac, Kristin, Wang, Shuoyang, Popecki, Mark, Farrugia, Charles
STEREO Solar Wind Trends from the Depths of Solar Minimum
S1-594
poster
We discuss the nature of the solar wind during the most recent solar minimum, which has been termed "peculiar" in comparison with earlier minima, and look how trends in solar wind kinetic and compositional parameters have progressed in the two years since minimum. A unique aspect to the longitudinal coverage provided the the STEREO and near-Earth assets has also allowed us to examine spatial and temporal behavior of solar wind structures during minimum conditions.

Gieseler, Jan, Boezio, Mirco, Casolino, Marco, De Simone, Nicola, Di Felice, Valeria, Heber, Bernd, PAMELA, Team
Spatial Gradients of Galactic Cosmic Ray Protons in the Inner Heliosphere - PAMELA and Ulysses Observations
S3-467
poster
The PAMELA (Payload for Antimatter Matter Exploration and Light-nuclei Astrophysics) space borne experiment was launched on the 15th of June 2006 and is continuously collecting data since then. The apparatus measures electrons, positrons, protons, antiprotons and heavier nuclei from about 100 MeV to several hundreds of GeV. Ulysses, launched on the 6th of October 1990, was placed in an elliptical, high inclined (80.2 degrees) orbit around the Sun, and was switched off in June 2009. It has been the only spacecraft exploring high-latitude regions of the inner heliosphere. The Kiel Electron Telescope (KET) aboard Ulysses measures electrons from 3 MeV to a few GeV and protons and helium in the energy range from 6 MeV/nucleon to above 2 GeV/nucleon. Due to the spacecraft's trajectory, the measurements reflect not only the temporal variations but also the spatial distribution. In this contribution we combine Ulysses/KET and PAMELA measurements to determine the spatial gradients of galactic cosmic ray protons in the very low GeV-range in the inner heliosphere during the extended minimum of solar cycle 23.

Gopalswamy, Nat, Nitta, Nariaki, Akiyama, Sachiko, Makela, Pertti, Yashiro, Seiji
Hemispherical Nature of EUV Shocks Revealed by SOHO, STEREO, and SDO Observations
S2-468
oral
EUV wave transients associated with type II radio bursts are manifestation of CME-driven shocks in the solar corona. We use recent EUV wave observations from SOHO, STEREO, and SDO for a set of CMEs to show that the EUV transients have a spherical shape in the inner corona. We demonstrate this by showing that the radius of the EUV transient on the disk observed by one instrument is approximately equal to the height of the wave above the solar surface in an orthogonal view provided by another instrument. The study also shows that the CME-driven shocks often form very low in the corona at a heliocentric distance of 1.2 Rs, even smaller than the previous estimates from STEREO/COR1 data (Gopalswamy et al., 2009, Solar Phys. 259, 227). These results have important implications for the acceleration of solar energetic particles by CMEs.

Gosain, Sanjay
Evidence for expansion and subsequent implosion of coronal loops during 15 Feb 2011 X-class flare: SDO AIA and HMI observations
S2-634
poster
The unprecedented high-resolution images of the full sun at a high-cadence by SDO/AIA instrument are used to study the evolution of the geometry of coronal loops in a flaring region. It is found that before the onset of X-2.2 class flare in NOAA 11158 the overlying loops show gradual expansion. Further, the loop system show clear evidence for an inward motion resulting in the so-called c̈oronal implosion:̈ The evolution of the loops in relation to the flare fits very well with the scenario proposed by Hudson (2000, ApJ. vol.531, L75). The energy build up phase shows slow rising of the loops while the energy release is accompanied by sudden contraction of the loops suggests an overall deflation in the coronal volume above the active region. At photospheric level we examine the magnetic field inclination angle of the penumbral regions close to the polarity inversion line (PIL) using HMI vector field observations. We find a clear evidence for a change in field inclination on either side of the PIL. The changes in the inclination angle of the magnetic field vector are such that the field on either side becomes more horizontal by about $\tilde{1}5$ degrees, over coherent patches of about $\tilde{1}$-5 arc-sec^2. These observations match the predictions for vector field changes during flares by Hudson et al. (2008, ASPC, vol.383, p221). We make estimates of the work done by the Lorentz forces in backreaction on the photosphere.

Gosain, Sanjay
SDO/AIA Observations of Flare Induced Oscillations of a Quiescent Prominence
S2-438
poster
We present the observations of flare induced oscillation in a quiescent prominence. The observations were obtained with an unprecedented spatial and temporal resolution by the Atmospheric Imaging Assembly (AIA) instrument onboard Solar Dynamics Observatory (SDO) mission. The full disk filtergrams were obtained in EUV wavelengths with spatial resolution of 1.2 arc-sec and time cadence of 12 seconds. It is for the first time that we can observe the dynamics of the solar corona with such spatial and temporal coverage. Here we present the observations of an oscillating quiescent prominence which were induced by a nearby flare. The location of the flare and prominence were favorable for studying the whole body horizontal oscillations excited by a flare. The flare was accompanied by a CME event. The hydromagnetic disturbance produced during flare/CME, also called as EIT or EUV wave, reaches the prominence within about 300 seconds with an estimated speed of about 1300 km/s. On impact the prominence sheet starts to oscillate laterally as a whole with a period of about 30 minutes. These oscillations are damped within about 160 minutes i.e., within about six periods of oscillation. We apply the free oscillator model developed by Klezeck and Kuperus (1969) and deduce the magnetic field strength in the prominence to be of the order of 25 Gauss. Also, we estimate the kinetic energy gained by the filament to be of the order of 10^{26} ergs. Further, we apply the local correlation technique (LCT) to derive the velocity of the oscillating structure locally. The top part of the prominence shows twice as large a velocity ($\sim$10 km/s) as compared to the lower part ($\sim$5 km/s).

Grunau, J., Kulkarni, S.R., Martin, C., Wimmer-Schweingruber, R.F., Boettcher, S., Seimetz, L., Schuster, B., Kulemzin, A.
Calibration of the HET-Demonstration Model for Solar Orbiter
S2-477
poster
The High-Energy Telescope (HET) is a sensor head of the Energetic Particle Detector (EPD) of the Solar Orbiter mission. HET will measure electrons from 300 keV to 30 MeV, protons from 10 to 100 MeV, and heavy ions from approximately 20 to 200 MeV/nuc. These measuring ranges are achieved with a combination of solid-state detectors and a scintillating crystal. To verify the functionality of our instrument we built a demonstration model which contains the basic parts of the sensor head. The model was tested and calibrated with cosmic muons, a bismuth source and heavy ions at an accelerator. To compare these results, we carried out Monte-Carlo simulations with the Geometry and Tracking (GEANT4) toolkit. Here we will present the results our experiments as well as simulations and compare them.

Guerrero, Antonio, Cid, Consuelo, Saiz, Elena, Cerrato, Yolanda
Geoeffective events combining Imaging and In-situ observations in the beginning of solar cycle 24

S2-642
0 min. poster only
After a long solar minimum, solar cycle 24 arises with seven geoeffective events in year 2010. These events were considered as an extraordinary opportunity to study the whole chain from the Sun to the Earth, not only because they were expected to be isolated events as the solar cycle was just in the beginning, but also because we can explore them with an almost 360-degree view of the Sun for the first time. After a careful analysis of interplanetary data related to the disturbance at terrestrial environment, we have looked for the solar source of those interplanetary features using SOHO, SDO, PROBA2 and STEREO images. The careful analysis with the complete set of data reveals that at least four out of the seven events were not isolated events. Our results evidence that interplanetary data are essential in order to get a right conclusion about the solar triggers of geomagnetic disturbances.

Gunár, Stanislav, Parenti, Susanna, Anzer, Ulrich, Heinzel, Petr, Vial, Jean-Claud
Synthetic DEM curves of prominence fine structures
S1-464
poster
We combine for the first time the hydrogen Lyman-line observations and modelling with the UV and EUV lines observations and the differential emission measure (DEM) determination for a prominence observed on June 8, 2004. We use a trial-and-error method to derive the 2D multi-thread prominence fine-structure models producing synthetic Lyman spectra in good agreement with the observations. We then employ a newly developed numerical method for the forward determination of the DEM from 2D multi-thread models and we compare the synthetic DEM curves with those derived from observations using inversion techniques. The available observations of the June 8, 2004 prominence allow us to determine the range of input parameters of the models producing synthetic Lyman spectra in good agreement with the observations. We select three models, which well represent this parametric-space area and compute the synthetic DEM curves for multi-thread realizations of these models. The so obtained DEM curves of the selected models very well agree with the DEM curves derived from the observations. We show that the evaluation of the prominence fine-structure DEM is complementary to the analysis of the prominence hydrogen Lyman spectra and that its combination with the detailed radiative-transfer modelling of prominence fine structure provides a useful tool for investigating the prominence temperature structure from the cool core to the prominence-corona transition region.

Gómez-Herrero, Ra'ul, Kartavykh, Yulia, Droege, Wolfgang, Klassen, Andreas, Dresing, Nina, Klecker, Berndt, Heber, Bernd, Malandraki, Olga
Multipoint observations of the August 18, 2010 solar energetic particle event
S2-647
0 min. poster only
On August 18, 2010, a Solar Energetic Particle (SEP) event was observed by the two STEREO spacecraft separated by 152 degrees, as well as by near-Earth spacecraft. This event was originating from active region 11099, slightly behind the west solar limb (as viewed from the Earth) and it was associated with a long duration C4.5 X-ray flare accompanied by a fast CME and type II radio-emission. The relatively large intensity increase permits the study of time profiles and anisotropies measured at three different locations with good statistical accuracy. We combine multi-spacecraft in-situ and remote-sensing observations with a three-dimensional particle propagation model in order to investigate the physical processes resulting in the large angular spread of the energetic particles during this event.

Hartlep, Thomas, Kosovichev, Alexander, Mansour, Nagi, Parchveksy, Konstantin, Zhao, Junwei
Time-Distance Helioseismology with SDO/HMI: Inferences and Simulations
S2-584
oral
The HMI instrument onboard SDO provides continuous observations of the acoustic wavefield in the solar photosphere. For routine processing of these observations, a time-distance helioseismology pipeline was developed, and has provided results for more than a full year. New measurements of large-scale subsurface flows, sound-speed structures, differential rotation and meridional circulation have been obtained. The pipeline currently provides inversion results for the near-surface down to about 20 Mm below the photosphere. Using numerical simulations, we test the accuracy of helioseismic inferences and study how these can be reliably extended to deeper depths. The simulations model the propagation of acoustic waves in the global solar interior, from the chromosphere to the

center of the Sun, and take into account 3D flows, rotation and the thermal structure of the Sun. In addition, we have performed high-resolution 3D simulations of MHD oscillations and waves in strong magnetic field regions of sunspots. These simulations reveal the complex interaction of the oscillations with sunspots. We present recent results from the SDO/HMI observations, their assessment based on theoretical simulation models, and discuss future perspectives of acoustic imaging of the deep interior.

He, Jiansen, Tu, Chuanyi, Marsch, Eckart, Yao, Shuo, Tian, Hui
Two populations of magnetic helicity in solar wind turbulence
S1-382
oral
We use the STEREO/MAG measurements in the solar wind to study the normalized reduced magnetic helicity (σ_m) in solar wind turbulence, in order to reveal the possible ion-scale waves. We present σ_m as a function not only of the frequency (f) but also the angle (θ_{rB}) between the solar radial direction and local mean magnetic field (B0) direction. The magnetic-field outward sectors and inward sectors are both investigated. As a result, we find the following remarkable features of the σ_m distributions: σ_m (0.1<f(Hz)<1, θ_{rB}<30) < 0 and σ_m (0.1<f(Hz)<1, 30<θ_{rB}<150) > 0 for outward sectors; σ_m (0.1<f(Hz)<1, θ_{rB}>150) > 0 and σ_m (0.1<f(Hz)<1, 30<θ_{rB}<150) < 0 for inward sectors. This indicates the existence of Alfven-cyclotron waves propagating quasi-parallel or anti-parallel to B0, besides the possible existence of kinetic-Alfven or whistler waves propagating obliquely to B0. Such kind of two-population magnetic helicity may be explained by a turbulence filled with two populations of fluctuations (kinetic Alfven waves and Alfven cyclotron waves in small scales).

Hoeksema, J. Todd
Global Modeling of the Coronal and Heliospheric Field
S1-442
oral
The advent of 360-degree solar observations is an important milestone for understanding the heliosphere and improving space weather forecasting. We have long known that the structure and dynamics of the heliosphere depend on evolution of both the local and global distribution of magnetic field on the solar surface. The deep solar minimum just recently completed highlighted the important role of gradual changes in widely distributed locations. Even during more active phases of the solar cycle, associated eruptions with no apparent local triggers can be separated by a million kilometers. Nevertheless, the quotidian solar wind - its velocity, radial field direction and strength, at least - can be forecast at 1 AU and beyond from photospheric observations. For modelers, the missing information has been simultaneous knowledge of the entire magnetic field of the Sun - including the elusive polar field and the obscured far side, with untracked evolution of flux patterns and the unseen emergence of new activity. With greater knowledge of the ambient conditions, events and their propagation can be better understood throughout the solar cycle.

Hurlburt, Neal, Berger, Tom
A Study of Flows near Filaments using HEK services
S2-427
poster
Large scale flows in the vicinity of filaments are investigated. We identify a large set of filaments recorded in the Heliophysics Events Knowledgebase (HEK) over the past year. We use these event lists to select subsets of HMI and AIA data for further analysis. Surface velocities are extracted from data cubes using a spectral optical flow method and are compared with the characteristics of the corresponding filament as recorded in the HEK.

Jian, Lan, Russell, Christophe, Luhmann, Janet
Solar Wind and Large-Scale Solar Wind Structures in the Rising Phase of Solar Cycle 24
S2-577
poster
We have done long-term study of solar wind and large-scale solar wind structures, interplanetary CMEs (ICMEs), stream interaction regions (SIRs), and their associated shocks at 1 AU over 1995-2010. At this writing, the solar polar field is nearing its reversal, indicating the approach of solar maximum 24. However, currently, the sunspot number is only about 60, and the solar wind dynamic pressure and magnetic field are still weak, lower than the conditions at the beginning of 1998, suggesting a peculiar

rising phase for Solar Cycle 24. We compare this rising phase with the one of Cycle 23, and study how the weak solar cycle affects the solar wind and large-scale solar wind structures, and their possible influence on geomagnetic activity.

Jian, Lan, Russell, Christophe, Luhmann, Janet, Leske, Rick, Mewaldt, Richard
STEREO Observations of ICMEs and LET/SEP Events: 2007-2010
S2-581
oral
Low Energy Telescope (LET) of IMPACT suite onboard STEREO spacecraft measures H to Ni ions over the energy range of about 3-30 MeV/nucleon. Based on the intensity variations of 1.8-3.6 MeV proton, we have identified solar energetic particle (SEP) events in 2007-2010. Some of these SEP events are observed by both STEREO A and B spacecraft. From the surveys of solar flares, interplanetary CMEs (ICMEs), stream interaction regions, and their associated shocks, we identify the sources of these SEP events. We sort out the events when both spacecraft see ICME and SEP together versus just ICME or SEP, and aim to build the statistics of the various occurrences and find out the conditions of encountering both ICME and SEP.

Joshi, Anand, Srivastava, Nandita
Kinematics of Two Eruptive Prominences
S2-330
poster
The 304 Å images from Extreme UltraViolet Imager (EUVI) on board the STEREO spacecraft were used to analyse two erupting northern polar crown prominences showing a twist in their spines. True heliographic coordinates of several features along the prominence spine were obtained by employing a stereoscopic reconstruction technique developed by us. The sense of helical twist in the prominence spines was determined from the changes in latitudes and longitudes, while a significant decrease in latitude values implied an equatorward non-radial propagation direction during the eruption. The prominences showed a 2-phase eruption comprising of the slow rise and the fast-eruptive phase. A constant value of acceleration was observed during the fast-eruptive phase, which was however different from one leg of the the prominence to the other. We infer that this difference in acceleration is a result of the combined effect of helical twist and non-radial motion, i.e., the leg in which the two forces of acted in the same direction showed a higher acceleration than the other leg in which the two forces acted in opposite directions.

Kajdič, Primovz, Blanco-Cano, X'ochitl, Aguilar Rodríguez, Ernesto, Russell, Christophe, Jian, Lan K., Luhman, Janet G.
Waves upstream and downstream of interplanetary shocks driven by coronal mass ejections
S2-398
poster
We study properties of the waves that appear in the upstream and downstream regions of interplanetary (IP) shocks driven by interplanetary coronal mass ejections (ICMEs) that were observed by the STEREO spacecraft during the years 2007 - 2009. We also study the connection between the observed waves and shock parameters, such as shock's Mach number, upstream plasma β, shock criticality and the shock geometry defined by the angle between the shock normal and the upstream interplanetary field, θ_{Bn}. Eleven shocks driven by ICMEs were observed during the selected interval. Most of the shocks in the sample are low-Mach number shocks (all but one have Mms < 2); all but one are supercritical, and in most cases some kind of waves appear in the regions adjacent to them. We analyze the waves by performing minimum variance analysis and calculating their power spectra. We determine their degree of compressibility, polarization, direction of propagation, etc. We observe ultra-low frequency waves and higher-frequency whistler precursors upstream of the ICME shocks as well as irregular fluctuations and high-frequency waves downstream of them. We find that even relatively small Mach-number IP shocks, such as those in our sample, can excite waves in large regions in front of them, thereby forming large ULF foreshocks, which can be accompanied by suprathermal ions.

Kamio, Suguru, Wiegelmann, Thomas, Curdt, Werner, Peter, Hardi, Solanki, Sami
Origin of flows in coronal loops
S2-481
oral
We study dynamics of coronal loops employing spectroscopic and imaging observations. Hot channels of SDO/AIA show apparent upward motion near the footpoints of coronal loops, while cool channels exhibit sporadic downward motion. Doppler shifts

determined by Hinode/EIS also indicate hot upflows and cool downflows around the loop footpoints. Based on a linear force-free magnetic field extrapolation into the corona, the observed flows are interpreted as siphon flow along the loop originating in a hot upflow and terminating in a cool downflow. The intermittent nature of cool downflows results from catastrophic cooling at the loop top, while hot upflows are fairly continuous. The results suggest that the heating is localized near the footpoints of coronal loops.

Kartavykh, Yulia, Droege, Wolfgang, Gómez-Herrero, Raul, Dresing, Nina, Kovaltsov, Gennady, Klecker, Berndt, Heber, Bernd
Three-dimensional anisotropic transport simulations a parameter study
S3-490
oral
Our three-dimensional model of SEP propagation incorporates anisotropic pitch-angle scattering by magnetic inhomogeneities in the solar wind, focusing, streaming along the large-scale magnetic field, adiabatic energy losses and pitch-angle-dependent diffusion perpendicular to the magnetic field. In our simulations we considered the locations of spacecraft at heliospheric distances from 0.3 to $\geq$ 1 AU, and at different angular positions relative to the flare source, including non-ecliptic locations at large distances. We report the results of our parameter study of SEP time profiles, anisotropy and pitch-angle distribution as a function of different propagation parameters and positions of spacecrafts. A comparison of the simulation results with multi-spacecraft observations allows to diagnose the propagation conditions in interplanetary space.

Kelly, James, Dalla, Silvia, Laitinen, Timo
Cross-field transport of SEPs in Large Scale Fluctuations
S2-557
oral
The results of numerical simulations of Solar Energetic Particles (SEPs) travelling in an Interplanetary Magnetic Field (IMF) which exhibits large-scale fluctuations are presented. The IMF is modelled as a Parker spiral with superimposed large-scale turbulence due to magnetic footpoint motion at the solar surface, as proposed by Giacalone (2001). SEP propagation is analysed by means of a full-orbit test particle code. We compare scatter-free propagation with the case when SEPs suffer ad-hoc isotropic pitch-angle scattering and investigate differences in spatial distributions and arrival times at 1AU for populations of various energies. We find that introducing scattering results in a fraction of the particles experiencing cross-field transport. We analyse how this phenomenon depends on the turbulence properties and discuss its physical causes.

Kilpua, Emilia, Lee, Christina, Luhmann, Janet, Li, Yan
Transition from the minimum to the rising phase of solar cycle 24
S2-323
oral
The minimum following the solar cycle 23 (SC 23 minimum) was atypical in many aspects when compared to previous minimum periods. For this study, we focus on the SC 23 minimum period through the rising phase of cycle 24, and use near-Earth observations as well as those from STEREO. We will discuss the variations in the sunspot number, the structure of the streamer belt and the rates of coronal mass ejections (CMEs) as well as their interplanetary counterparts (ICMEs). In addition, we will discuss the properties of ICMEs and their geomagnetic response. During the SC 23 minimum period, ICMEs had on average lower magnetic fields than during the previous minimum, implying intrinsically weaker CMEs or ICMEs that were crossed far away from its center. At this time, the ICME and CME rates diverged, especially during the deepest part of the minimum period (based on sunspot numbers), such that the ICMEs were regularly embedded in the near-ecliptic solar wind. We propose that this divergence is due to the contribution by the slow and weak CMEs that deflected towards the equator, and also due to the significant changes in the streamer belt structure throughout this minimum period.

Klassen, Andreas, Gómez-Herrero, Raul, Heber, Bernd, Klein, Ludwig, Kartavykh, Julia
Solar origin of in-situ electron spikes observed with SEPT/STEREO
S2-525
poster
During 2010-2011 the Solar Electron and Proton Telescope (SEPT) aboard the twin STEREO spacecraft detected a number of usual impulsive electron events showing a prompt intensity onset followed by a long decay, as well several so-called electron spike

events.

These spikes are characterized by very short durations below 20 min, almost symmetric time profiles, and strong anisotropy revealing nearly "scatter-free" particle propagation from the Sun to STEREO. The spikes are detected in the energy range below 200 keV, show one to one coincidence with type III radio bursts detected with SWAVES/STEREO and with narrow EUV jets in active regions.

Using particle, EUV and radio imaging observations we found that the mildly relativistic electrons of spike events were accelerated at the same time and at the same location as the accompanying type III emitting electrons and coronal EUV jets. Furthermore, the type III radio sources match very well the trajectory of the associated EUV jet.

We discuss characteristics of interplanetary space in the model, explaining the formation of spike events.

Kleimann, Jens
4pi models of CMEs and ICMEs
S3-365
oral
Coronal mass ejections (CMEs), which dynamically connect the solar surface to the far reaches of interplanetary space, represent a major manifestation of solar activity. They are not only of high principal interest but also play a pivotal role in the context of space weather predictions. The steady improvement of both numerical methods and computational resources during recent years has allowed for the creation of increasingly realistic models of interplanetary CMEs (ICMEs), which can now be compared to high-quality observational data from various space-bound missions. In this review, I shall discuss existing models of CMEs, characterizing them by scientific aim and scope, CME initialization method, and physical effects included, thereby stressing the importance of fully 3-D spatial coverage.

Klein, Karl-Ludwi
Sonnenforscher sehen STEREO
S2-631
oral
Astronomische Objekte sehen wir gewöhnlich in zwei Dimensionen. Sie sind zu weit entfernt, als dass man um sie herumfahren könnte. Auch bei der Sonne war das lange so. Im Dezember 2006 sandte die NASA die beiden STEREO (Solar TErrestrial RElations Observatory) Raumsonden ins Weltall, jede mit denselben wissenschaftlichen Instrumenten ausgerüstet. Die beiden laufen, von der Erde aus gesehen, in entgegengesetzten Richtungen um die Sonne. Dadurch sehen sie die Sonne unter zwei verschiedenen Blickwinkeln - in Stereo eben.

Die Instrumente der STEREO-Sonden zeigen uns Bilder der Sonnenkorona wie bei einer Sonnenfinsternis, aber auch bei kurzen UV-Wellenlängen, für die unsere Augen nicht empfindlich sind. Andere Instrumente messen den Sonnenwind und elektrisch geladene Teilchen (Elektronen, Protonen, Ionen) sehr hoher Energie. Wieder andere Radiowellen. Dadurch wollen wir besser verstehen, was die Sonnenkorona ist jenes Gas, das wir mit den Augen bei einer Sonnenfinsternis sehen. Was sagt uns die eigenartige Form dieser Korona, die im Gegensatz zur täglich sichtbaren Sonne nicht rund ist ? Woraus besteht die Korona ? Wo hört sie eigentlich auf ? Eine besondere Eigenschaft der Korona ist die permanente Veränderung, die in ihr vorgeht. Manchmal werden große Strukturen in den Raum ausgestoßen. Was bedeutet das für das Sonnensystem, in dem sich diese Störungen dann ausbreiten ? Dieser Vortrag handelt von der Korona, dem Sonnenwind, von Sonnenflecken und hochenergetischen Teilchen. Wir brauchen STEREO und andere Instrumente, um zu verstehen, was in der Sonne vor sich geht, wie Physik im Weltraum funktioniert. Und um zu verstehen, welche Störungen von der Sonne im erdnahen Rum zu erwarten sind, wo Satelliten, die Magnetosphäre und die Ionosphäre der Erde ihnen ausgesetzt sind.

Kliem, B., Toeroek, T., Thompson, W.T.
A parametric study of CME rotation in the corona
S2-573
poster
Many erupting filaments and coronal mass ejections rotate about the direction of ascent, often already in the low corona. The resulting orientation of CMEs is one of the two major parameters that determine the geoeffectiveness of ejections directed at the Earth. Two mechanisms have been proposed to explain the rotation at coronal heights: the helical kink instability and the Lorentz

force by a shear field component due to sources external to the erupting flux. We present a parametric study of these effects in force-free equilibria containing a flux rope, confirming the relevance of both mechanisms. Three parameters of strong influence on the resulting total rotation are identified: twist, external shear field strength, and height profile of the external field. The individual contributions of the two mechanisms to the total rotation are difficult to disentangle. However, the height profile of the rotation, which can now be obtained for some events from stereoscopic observations, allows to constrain the individual contributions to some degree. This will be illustrated using the first such profile, derived from STEREO data of the "Cartwheel CME" on 9 April 2008.

Kliem, B., Forbes, T.G., Vourlidas, A., Patsourakos, S.
Modeling the coronal expansion of CME cavities
S2-574
oral
We present MHD simulations of flux rope CMEs which address the strong expansion of a cavity in the inner corona recently found for the first time in stereoscopic SECCHI data of a fast CME (Patsourakos et al. 2010). The expansion is found to consist of two components. The first of these is due to an ideal MHD effect. The information of decreasing flux rope current in the course of the rope's ascent propagates into the medium surrounding the flux rope and causes it to expand all around the rope by virtue of flux conservation. The second is due to the addition of flux to the rope by flare reconnection. The ideal MHD effect dominates initially if the ambient field is only weakly sheared, producing a cavity outside of the growing flux rope. This rapidly growing "outer cavity" is a prime candidate for the formation of coronal EUV waves and shocks. Subsequently, the growth of the rope due to flare reconnection leads to an approach of the rope and outer-cavity edges. We conclude that the CME cavity may be larger than the CME flux rope low in the corona if the ambient field is only weakly sheared and that cavity and rope tend to coincide in the outer corona and solar wind.

Kocharov, Leon, Valtonen, Eino
Three-dimensional view of major solar energetic particle events
S3-546
poster
Using SOHO particle and EUV detection and radio spectrograms from both ground-based and spaceborne instruments, we study the first phase of two major solar energetic particle (SEP) events associated with solar eruptions centered at different solar longitudes. A major SEP event observed on 4 April 2000 was associated with western solar flare and fast and wide coronal mass ejection (CME). The SEP event near the eruption's center starts with deka-MeV/n helium- and relativistic electron- rich production from coronal sources identified with the electromagnetic diagnostics. Observations of the initial phase of the "well connected" event support the idea that acceleration of SEPs starts in the helium-rich plasma of the eruption's core, in association with coronal shocks and magnetic reconnection caused by the CME liftoff. The 12 September 2000 eruption's center was angle-distant with respect to the SOHO-connected heliolongitude. At magnetic connection to the eruption's periphery, onset of SEP emission is delayed for a time of lateral expansion that is visualized by global coronal (EIT) waves.

Kocharov, Leon, Vainio, Rami, Pomoell, Jens
Diversity of energetic particle spectra from coronal shock acceleration
S2-549
oral
A nature of seed particle population for shock acceleration is often left beyond scope of solar energetic particle (SEP) acceleration models. However, our modeling indicates that it is a crucial issue. We find that energy distribution of seed particles and shock history can affect the final particle spectrum achieved after the shock acceleration. If the shock geometry in a particular magnetic tube changes from nearly parallel to perpendicular and the seed particle energy distribution is not wide, the resulting SEP spectrum in most distant sections of the acceleration region can be much harder than the classic power law expected in a steady state case. We compare our model SEP spectra with proton spectra observed by SOHO/ERNE in the beginning of major SEP events.

Kopp, Andreas, Strauss, R. Du Toit, Büsching, Ingo, Potgieter, Marius S.
A stochastic approach to heliospheric propagation
S2-473

poster
A newly developed numerical code is presented that solves general Fokker-Planck type transport equations by means of stochastic differential equations (SDEs) in four dimensions (space and momentum) and time. Besides propagation the code is capable of describing the full diffusion tensor as well as particle sources and linear loss terms. The approach was to design the code very general and flexible, so that it can be applied to a large variety of physical problems. Adaption to graphics cards within the CUDA framework significantly improves the performance. Here, we present applications to the propagation of energetic electrons, in particular to Jovian electrons, in the heliosphere. Our results can be shown to be consistent with previous models and, moreover, to provide additional informations not accessible for traditional finite-difference approaches.

Kulkarni, S.R., Martin, C., Grunau, J., Wimmer-Schweingruber, R.F., Boettcher, S., Boehm, E., HET-EPT, -Team
A High Energy Telescope for the Solar Orbiter Mission
S2-391
poster
The High-Energy Telescope (HET) on ESAs Solar Orbiter mission, will measure electrons from 300 keV up to about 30 MeV, protons from 10 to 100 MeV, and heavy ions from 20 to 200 MeV/nuc. Thus, HET covers the energy range which is of specific interest for studies of the space environment and will perform the measurements needed to understand the origin of high-energy events at the Sun which occasionally accelerate particles to such high energies that they can penetrate the Earths atmosphere and be measured at ground level (ground-level events). These measurement capabilities are reached by a combination of solid-state detectors and a scintillator calorimeter which allows use of the dE/dx vs. total E technique for particle identification and energy measurement. The upper limits on energy listed above refer to particles (ions) stopping in the scintillator and careful modeling of HET properties will allow discrimination of forward/backward penetrating particles in a wider energy range. Here we will present design, simulation and initial calibration results of the instrument.

L. van Driel-Gesztelyi (1,2,3), D. Baker (2), J. , L.
Plasma outflows from active regions and their imprint in the solar wind
S1-508
oral
When active regions are adjacent to coronal holes, interchange reconnection may lead to significant evolution of coronal hole boundaries. Reconnection can also take place between field lines of the same magnetic polarity but with a large connectivity gradient. Outcomes may include variability of active region-associated hot plasma outflows and the modulation of the solar wind flows on open field lines. During 2-18 January, 2008 we observed with Hinode a pair of opposite-polarity coronal holes on the Sun with two active regions between them. The latter are separated by the HPS. We use the Hinode EIS instrument to locate active region-related outflows and measure their velocities. SOHO/EIT imaging is used to follow the evolution of the coronal hole boundaries. STEREO imaging and in-situ data are also employed as are ACE in-situ observations, to assess the resulting impacts on the interplanetary solar wind structures.

Laitinen, Timo, Dalla, Silvia, Kelly, James
Energetic particle propagation in structured turbulence
S2-531
poster
Observations of solar particle events at wide range of heliolongitudes and -latitudes have given rise to the question of particle propagation across the mean magnetic field. Many studies have addressed this problem by using full-orbit test particle simulations. These often use a synthetic model of the turbulent magnetic field consisting of a sum of infinite plane waves. The solar wind plasma originates, however, from a dynamically changing Sun, and transient changes within it may affect particle propagation. In this work, we introduce localised structure in the turbulence by means of 1D envelopes containing infinite waves. The wave field in the envelopes consists of 2D and slab mode waves, overlaid on a constant background magnetic field. We study how particles propagate in such fields and compare the transport coefficients obtained for this locally structured turbulence with the infinite wave case. We analyse how the parameters of the localised structures affect transport.

Lamy, Philippe, Frazin, Richard, Vibert, Didier, Boursier, Yannick

Tomographic reconstruction of the coronal electron density from calibrated LASCO-C2 images of the K-corona total radiance
S2-579
oral
Carefull monitoring of the performances of LASCO-C2 over its 15 years of operation using stars crossing its field of view has enabled us to obtain accurately calibrated images in both total (B) and polarized (pB) radiances and B for the entire mission. The B and pB reconstructions have been compared, and the differences explained in terms of line-of-sight weighting functions in Thomson scattering (Frazin et al. Solar Phys. 265, 19-30, 2010) allowing to conclude that the LASCO-C2 B archive, which is vastly larger than the pB archive, is suitable for determining the 3D electron density throughout the SOHO mission. We will present test results obtained over one month and a parallel on-going effort to develop time-dependent tomography to remove the limitation of the present reconstruction.

Lara, Alejandro, Niembro, Tatiana, Borgazzi, Andrea
The Source Region of Coronal Mass Ejections
S2-523
poster
In a previous work, through a statistical analysis of the SOHO/LASCO Coronal Mass ejection (CME) data base, we found evidences that large trans-equatorial loops are the source structures of coronal mass ejections. In this work we have used CMEs observed by Stereo/SECHII and SOHO/LASCO to trace back to the low corona the CME trayectory and look for their source region. We present preliminary results and a case study.

Lario, D., Decker, R.B., Aran, A.
SEP events at distances <1 AU: Particle intensities above threshold values
S2-517
poster
The longitudinal dependence of time-intensity profiles in large solar energetic particle (SEP) events is usually consistent with the presence of a traveling CME-driven shock that continuously injects SEPs. When the same event is observed at different helioradii, the shape of the time-intensity profiles depends not only on the magnetic connection between the shock and the observers, but also on how the efficiency of the shock accelerating particles varies as the shock propagates and how energetic particles and shocks are transported. The prediction of time-intensity profiles at different helioradii from SEP data collected by spacecraft orbiting either the Earth or the Sun-Earth L1 point must consider the relative motion of the Earth with respect to the traveling spacecraft. A critical issue regarding future missions going close to the Sun is the prediction of periods with particle intensities above certain thresholds that may affect instrument performance or spacecraft guidance. We present a method that using observational data and models of SEP transport allows us to predict the duration of intervals with particle intensities exceeding pre-defined values.

Leamon, Robert, McIntosh, Scott
Evolution of small-scale flux elements over three solar cycles
S1-588
oral
We recently showed by analysis of SOHO MDI magnetograms that the recent extended solar minimum was due, in part, to the monopolarity, i.e., the non-zero total signed magnetic flux of the Sun and that in turn was affected by the supergranules and supergranule-scale photospheric magnetic field elements. We extend these analyses forward to include magnetograms from SDO and backwards with NSO Kitt Peak data, to cover over three solar cycles (1974–2011). Cross-calibration of data from different sources is ongoing, but initial results suggest the Sun's imbalance of magnetic flux has persisted for a lot longer than the recent unusual solar minimum.

Lee, Arrow, Muller, Jan-Peter, Matthews, Sarah
Quantifying the accuracy of the models used for the 31 December 2007 CME
S3-417
poster
When STEREO was launched in 2006, measurement requirements were pre-specified for the accuracy of the characterisation of

CMEs (1). In an attempt to quantify the observed accuracy, many of the reconstructions of CMEs in the past 3 years have been compared to the results found by Thernisien, Vourlidas and Howard in 2008 (2). At MSSL, 'truth' measurements of the irregular event on 31 December 2007 have been produced to the greatest possible accuracy through repeated manual stereo feature matching measurements by several individuals, both expert and novice, using the stereo workstation developed by Shin and Muller (3). We have used these data to compute a quantifiable error calculation for the model constructed by Thernisien et al.

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(2) A. Thernisien, A. Vourlidas, R. A. Howard: 2009, Forward modelling of coronal mass ejections using STEREO/SECCHI data. Solar Physics 256, 111-130.

(3) D. Shin, J.-P. Muller: 2009, Stereo workstation for the Mars rover image analysis, EPSC (Europlanets), Europlanets, Potsdam, Germany, EPSC2009-390.

Leske, R.A., Cohen, C.M.S., Mewaldt, R.A., Cummings, A.C., Stone, E.C., Wiedenbeck, M.E., von Rosenvinge, T.T.
Large Anisotropies in the 18 August 2010 Solar Particle Event
S2-429
poster
The SEP event observed at STEREO-A on 18 Aug 2010 displayed a rich variety of behavior in particle anisotropies. Sectored rates measured by LET showed large bidirectional anisotropies in 4-6 MeV H for the first ∼18 hours of the event, with intensities along the field direction several hundred to nearly 1000 times greater than those perpendicular to the field for much of that time. Part of this period seems to include the passage of a magnetic flux rope, after which the protons were isotropic for ∼3 hours, followed by an extended period of more than a day in which there was a modest (less than a factor of 2) excess of particles from the sunward direction. Associated with the arrival of a shock on 20 Aug was a series of brief (<10 minute duration), relatively narrow (< 45° FWHM) shock spikes. We present the LET observations of this interesting event, along with solar wind context observations, and compare it with others in the literature or seen by STEREO.

Liewer, Paulett, Hall, J.R., Gonzalez-Hernandez, Irene, Hill, Frank, Thompson, WilliamT., DeJong, Eric
Comparison of Farside Observations of Solar Activity from STEREOs Extreme UltraViolet Imager and the Global Oscillations Network Group (GONG)
S3-519
oral
Beginning February 18, 2011, the STEREO mission, for the first time, gave us an All Sun view of the entire corona in extreme ultraviolet (EUV) light. At this time, the twin STEREO spacecraft reached 180 degree separation, with each approximately 90 degrees from Earth. Here, we compare STEREO/EUVI views of solar activity on the farside to predictions of far side magnetic activity from helioseismology using National Solar Observatory/ Global Oscillation Network Group (GONG) observations (see http://gong.nso.edu/data/farside/). The GONG project produces All Sun Carrington maps of strong magnetic field regions; farside regions with a probability of 70% or higher are labeled. We have produced All Sun Carrington maps of coronal magnetic activity by combining STEREO A and B EUVI data and SDO AIA data at each of the four EUVI wavelengths. We then visually determine whether or not magnetic activity is seen in the corona (as evidenced by brightening in EUV) at the locations predicted by GONG. We have analyzed 57 GONG farside predictions between February and April 2011. For 49 of the 57 predictions, activity is observed in the corona by STEREO A or B. For 7 predictions, no activity was seen at the predicted region. For 1 prediction, the STEREO observations were inadequate. Thus generally the GONG predictions are very reliable (better than 85%). We will also show cases where known farside active regions are NOT predicted by GONG.

Linker, Jon, Lionello, Roberto, Titov, Viacheslav, Mikic, Zoran, Riley, Pete
The Solar Magnetic Field and Its Influence on the Global Corona
S1-470
oral
The solar magnetic field is of paramount importance in solar and heliospheric physics. In addition to being the energy source for solar activity, the magnetic field defines the structure of the solar corona and inner heliosphere, including the position of the heliospheric current sheet and the regions of fast and slow solar wind. Most attempts to model the global coronal field have used steady-state descriptions. STEREO, SDO, SOHO, and other spacecraft observations now give us a global view of the structure and

evolution of the solar corona. These results challenge us to understand the time-dependent behavior of the large-scale solar magnetic field. In this talk, we describe different approaches to modeling the solar magnetic field, and their strengths and weaknesses. An emphasis of the talk will be on how smaller scale structure in the magnetic field may influence the evolution of the large-scale field.

Research supported by NASA and NSF.

Liu, Ying, Luhmann, Janet, Bale, Stuart, Lin, Robert
Sun-to-Earth propagation of CMEs and connection with in situ signatures
S2-526
oral
The wide-angle imaging observations from STEREO provide a unique capability to characterize CME propagation from the Sun all the way to the Earth. Evolving CME properties determined from imaging observations can also be compared with in situ measurements for a better understanding of the CME-ICME relationship. We have analyzed about 10 Earth-directed events with coordinated imaging observations and in situ measurements, in an effort to investigate CME propagation in interplanetary space. In this presentation we will summarize the results from this statistical analysis, focusing on (1) predicting CME arrival and speed at the Earth; (2) CME interaction with the heliosphere including CME acceleration and deceleration; (3) imaging CME-driven shocks in interplanetary space; and (4) CME-CME interaction. We will also discuss a triangulation concept for future CME observations and space weather forecasting based on the results.

Llebaria, Antoine, Lamy, Philippe, Floyd, Olivier
Solar Cycle evolution of the magnetic topology of the corona as deduced from LASCO-C2 observations of the corona.
S2-576
poster
The magnetic topology of the corona that extends in the inner heliosphere is clearly revealed by the structures in the solar corona. The LASCO-C2 coronagraph aboard SOHO has now completed over 15 years of quasi-continuous observations of the corona from 2 to 6 solar radii, thus allowing a full view of the evolution of the magnetic topology over more than a full solar cycle. From this data set, we have produced synoptic maps of of unsurpassed spatial and temporal resolutions. The periodic sampling (2 x 14 days) of this series best shows the global evolution of the whole corona. The onset of the Sun activity period is clearly marked by increasing twists of the neutral sheet, shifting the activity to higher and higher latitudes. The neutral sheet then splits into two or more oscillating branches characterized by long, oscillating periods. Transient, low latitude coronal holes surprisingly migrate eastward until they completely vanish.

Lugaz, No'e, Möstl, Christian, Vourlidas, Angelos, Roussev, Ilia
Methods to Determine CME Properties from HI Observations and 4π Challenges
S3-399
oral
In the past four years, analysis techniques have been developed to determine the properties of coronal mass ejections (CMEs) from remote-sensing observations by STEREO/SECCHI, resulting in important progresses in linking remote-sensing observations with in situ measurements as well as space weather forecasting. Some of these techniques make use of the stereoscopic capabilities of STEREO, whereas others take advantage of geometrical effects to determine the CMEs' properties. Here, based on numerical simulations and data analysis, we will discuss how the increased separation of the STEREO spacecraft, as well as the intensified solar activity (and faster CME speeds) affect these methods.

Lugaz, No'e, Downs, Cooper, Roussev, Ilia, Kazunari, Shibata, Asai, Ayumi, Gombosi, Tamas
MHD Simulation of a CME from an Anemone Active Region and Comparison with EUV Images
S2-400
poster
We present a numerical investigation of the coronal evolution of the coronal mass ejection (CME) on 2005 August 22 using a 3-D thermodynamics MHD model, the SWMF. The source region of the eruption was anemone AR 10798, which emerged inside a coronal hole. We validate our modeled corona by producing synthetic EUV images, which we compare to EIT images. The eruption yields a mix of open and closed field lines due to interchange reconnection. We discuss the CME reconnection process with the

ambient magnetic field of the AR and the surrounding coronal hole and show how it is related to a long-lasting dimming region.

Luhmann, J.G. and c
Special attributes of the solar wind and IMF sources during the STEREO mission
S1-597
oral
With the help of coronal models we examine inferred solar wind/IMF sources for the years since the start of the STEREO mission in late 2006. We also compare these results with the inferred sources for the previous cycle, and find several essential differences. One is the previously noted contribution of low latitude coronal holes/open fields to the ecliptic wind and field throughout most of the cycle 23-24 minimum. Another is the likely contribution of pseudostreamer sources compared to the two previous cycles. The cause of these is the weaker and more multipolar photospheric field distribution during the period of STEREO. (coauthors: C.O. Lee, M. Ellenburg and P. Schroeder (SSL); P. Riley (PSI); E. Kilpua (U. of Helsinki); J. Lan and C.T. Russell (UCLA); K. Simunac and A.B. Galvin (UNH); C. Foullon (Warwick U.); B. Lavraud, A. Opitz and E. Penou (CESR))

Maddox, MarloM., the iSWA team,
Browsing Space Weather Data and Models with the Integrated Space Weather Analysis (iSWA) System
S2-591
poster
The Integrated Space Weather Analysis (iSWA) System is a comprehensive web-based platform for space weather information that combines data from solar, heliospheric and geospace observatories with forecasts based on the most advanced space weather models. The iSWA system collects, generates, and presents a wide array of space weather resources in an intuitive, user-configurable, and adaptable format - thus enabling users to respond to current and future space weather impacts as well as enabling post-impact analysis.

iSWA currently provides over 200 data and modeling products, and features a variety of tools that allow the user to browse, combine, and examine data and models from various sources. This presentation will consist of a summary of the iSWA products and an overview of the customizable user interfaces, and will feature several tutorial demonstrations highlighting the interactive tools and advanced capabilities.

Malandraki, Olga, the SEPServer , WP5 team
Scientific data analysis within SEPServer: new perspectives in SEP research
S2-530
poster
SEPServer WP5 team: N.Vilmer(2),K.-L.Klein(2),B.Heber(3),E.Valtonen(4), R.Vainio(5),B.Sanahuja(6),A.Nindos(7),I.Usoskin(8),F.S
A.Papaioannou(1*),N.Agueda(6) SEPServer is a three year collaborative project funded by FP7-SPACE of the European Union. One of the primary goals of the project is to lead to novel knowledge on the source, acceleration and transport of Solar Energetic Particles (SEPs) during solar eruptions, a topic directly related to progress on Space Weather. This acquired knowledge will also serve as the basis for future solar missions such as Solar Orbiter. This goal will be accomplished by both the extensive data analysis of energetic particle measurements hosted at SEPServer and the simulation-based data analysis methods capable of deconvolving the effects of interplanetary transport and solar injection from SEP observations. SEPServer will thus provide a comprehensive and up to date SEP analysis service. The scientific data driven analysis within SEPServer is being performed both for 1 AU and for greater 1 AU and out of the ecliptic plane using data from SOHO, ACE, WIND, Ulysses experiments and ground-based neutron monitors. SEPServer will also provide for the first time the release of the HELIOS data set in a reasonable format and in full time resolution, thus making available data also for orbits inside 1 AU (down to 0.3 AU). Observational data-analysis methods and direct comparison of the observed SEP fluxes, spectra and abundance ratios with the associated electromagnetic emission data (e.g. Nancay Radioheliograph, radio spectrographs ARTEMIS-IV, Potsdam, Nancay and Wind/WAVES; hard X-ray and gamma-ray instruments) will be applied. As a result, an online catalog of SEP events, with complete coverage over solar cycle 23, will be compiled. In this contribution, a status report of the ongoing efforts in the data driven analysis part will be furnished.

Manchester, Ward, van der Holst, Bart, Frazin, Richard, Vasquez, Alberto, Toth, Gabor, Gombosi, Tamas
The Coupled Evolution of Electrons and Ions in CME-Driven Shocks

S1-585
oral
We present simulations of CMEs performed with a new two-temperature coronal model developed at the University of Michigan, which is able to reproduce several features of the observed solar wind with the improved thermodynamics. This model employs heat conduction for electrons, constant adiabatic index (=5/3), and includes Alfven waves to drive the solar wind. In addition, the Alfven waves are dissipated resulting in ion heating. Coulomb collisions low in the corona couple the ions and electrons allowing heat exchange between the two species. The model includes SOHO/MDI magnetogram data to calculate the coronal field, and also uses SOHO/EIT observations to specify the density and temperature at the coronal boundary by the Differential Emission Measure Tomography (DEMT) method. The Wang-Sheeley-Arge empirical model is used to determine the Alfven wave pressure necessary to produce the observed solar wind speeds. The new model is much better able to reproduce the solar wind densities. With this model, we study the propagation of CMEs and find correct compression at the CME-driven shock due to the fixed adiabatic index. Most significantly, we find electrons are heated by Ohmic dissipation of the erupting magnetic field, while ions are heated by the CME-driven shock. We find heat conduction by electrons rapidly propagates ahead of the shock front forming a precursor that alters the solar wind ahead of the shock.

Marsh, Mike, Ireland, Jack, Walsh, Robert
Sunspot Shocks with SDO
S2-562
poster
There is much evidence for the presence of magnetoacoustic waves within sunspot regions, propagating oscillations having been observed from the photosphere, chromosphere, transition region and into the corona. It is thought that acoustic waves generated in the photosphere may be waveguided along the strong magnetic field in umbral regions. Using SDO/AIA, we present observations which suggest that these waves coherently propagate upwards through the sunspot within all of the observed temperature channels. These waves possess a non-linear signature, implying the presence and propagation of slow magnetoacoustic shock waves into the corona.

Mason, Glenn
Solar Energetic Particle multipoint observations old and new
S2-425
oral
Early studies of large solar energetic particle (LSEP) events found that they were associated with flares or eruptions over a broad portion of the solar disk, indicating that the events filled a large portion of the inner heliosphere with energetic particles. Spacecraft observations in the 1970s and 1980s established the role of coronal mass ejections and associated large interplanetary shocks in particle acceleration, thus providing a basic physical model for acceleration in these events. However, detailed comparisons between observations and theoretical models revealed many discrepancies that are still not understood. Beginning with the launch of the STEREO probes in 2006, multipoint observations of the Sun through remote sensing as well as in situ sensors were extended beyond L1 to provide a stereoscopic view of SEPs. This permits new tests of SEP acceleration models. We review the observational properties of LSEP events showing recent advances from STEREO and other current missions, and discussing current outstanding problems in models used to understand them.

McIntosh, Scott
Ubiquitous Outflows and Waves in the Outer Solar Atmosphere
S1-582
oral
Recent observations of the outer solar atmosphere that have revealed ubiquitous episodic outflows and waves rooted in the magnetic network and plage. These phenomena have been visible for a long time, but have often been presented with a muddied physical interpretation as a result of poor signal-to-noise and/or the low spatio-temporal resolution. The recent exciting advances in observation allow us to look in more detail at the discrimination and/or coupling of waves and flows in the outer atmosphere. We will look at a few contemporary datasets that can reveal the breadth of the response of the outer atmosphere to the magneto-convective forcing of the solar interior.

Mewaldt, R.A, Mason, G.M., Cohen, C.M.S, Gomez-Herrero, R., Haggerty, D.K., Leske, R.A., Wiedenbeck, M.E., von Rosenvinge, T.T.
Evolution of Seed Particle and Solar Energetic Particle Abundances
S2-513
oral
A variety of data from solar cycle 23 have shown that CME-driven shocks accelerate primarily suprathermal ions rather than bulk solar wind. This is most easily demonstrated by comparing the composition of solar energetic particles (SEPs) with that of interplanetary suprathermal ions. Using data from ACE, GOES, SOHO, and STEREO we report on a study that looks at long-term trends in the composition of suprathermal tails and solar energetic particles including data from the years 1998 to 2011, focusing on data from 2007-2011. We observe significant variations in several elemental abundance ratios which we attempt to relate to the sources of these ions.

Mierla, Marilena
Analysis of the 13 April 2010 prominence eruption using SWAP and EUVI data
S2-419
poster
Observations of the early rise phase of solar prominences can provide clues on the mechanisms involved in the destabilisation of the magnetic configuration by comparing their power-law rise with numerical simulations. As described in Schrijver et al. 2008, it is possible to derive the initiation mechanism of an erupting prominence, depending of the value of the exponent m in the power law. We have analysed such an event, observed on 13 April 2010 by SWAP on PROBA2 and EUVI on STEREO. We have applied the 3D-HT technique described in Mierla et al. 2008 in order to derive the true direction of propagation and the true speed of the top of the prominence. Our results (m = 3.77) may point towards a torus instability scenario.

Miesch, Mark
Exploring the Dynamo from All Angles
S3-413
oral

For over half a century, solar dynamo models have focused on the evolution of the axisymmetric poloidal and toroidal magnetic field components. Such models have produced deep insights into how the solar activity cycle may arise but a thorough understanding of the origins of solar magnetism must eventually take into account the complex hierarchy of 3D magnetic structures evident in solar observations. Now is the time to face this complexity, with the help of a new generation of observing missions and 3D numerical models. In this talk I will focus in particular on how multi-vantage point observations of the solar surface could impact solar dynamo theory. Promising areas of discovery include: elucidating the structure of meridional and zonal flows in the polar regions and their coupling to surface magnetism, investigating the global 3D magnetic topology of the photospheric and coronal field and linkages between large and small scales, quantifying the energy and flux budgets of the dynamo, and assessing the role of flux emergence and magnetic helicity in establishing the solar activity cycle.

Miteva, Rositsa, Klein, K.-Ludwig, Malandraki, Olga
The role of the IP environment on the SEP events
S2-486
poster
We study the role of the interplanetary (IP) transport conditions, as inferred from a variety of remote and in situ observations, on the solar energetic particle (SEP) fluxes as detected by the GOES and ACE satellites near Earth. We consider only solar flares of X-class strength in the western solar hemisphere, associated with an increase in the particle fluxes (the SEP events) in the period from 1997 to 2006. The aim is to identify to which extent transient IP structures, i.e. interplanetary coronal mass ejections (ICMEs) and shock waves, affect the SEP fluxes near Earth. In the list of 42 SEP events that we analyzed: 13 were detected when the satellites and Earth were affected by an ICME, 12 propagated through a relatively quiet IP environment (i.e. no ICME was reported in the previous two days) and 9(8) SEP events were detected before(after) the ICME. Depending on the

location of the particle source with respect to the roots of the ICME, the ICMEs can either guide the particle propagation towards or screen the Earth. We present a detailed study on the conditions for these scenarios to occur and study the effects of the IP structure on the correlation between the SEP parameters and those of the associated IP (and coronal) activity. The details of the IP structure are an important element for understanding SEP measurements with multiple spacecraft such as the STEREO mission.

Mueller, D., Dimitoglou, G., Garcia Ortiz , J.P., Hughitt, V.K., Ireland, J., Fleck, B.
JHelioviewer: Open-Source Software for Discovery and Image Access in the Petabyte Age
S1-377
poster
The unprecedented torrent of data returned by the Solar Dynamics Observatory is both a blessing and a barrier: a blessing for making available data with significantly higher spatial and temporal resolution, but a barrier for scientists to access, browse and analyze them. With such staggering data volume, the data is bound to be accessible only from a few repositories and users will have to deal with data sets effectively immobile and practically difficult to download. From a scientist's perspective this poses three challenges: accessing, browsing and finding interesting data while avoiding the proverbial search for a needle in a haystack.

To address these challenges, we have developed JHelioviewer, an open-source visualization software that lets users browse large data volumes both as still images and movies. We did so by deploying an efficient image encoding, storage, and dissemination solution using the JPEG 2000 standard. This solution enables users to access remote images at different resolution levels as a single data stream. Users can view, manipulate, pan, zoom, and overlay JPEG 2000 compressed data quickly, without severe network bandwidth penalties. Besides viewing data, the browser provides third-party metadata and event catalog integration to quickly locate data of interest, as well as an interface to the Virtual Solar Observatory to download science-quality data.

As part of the Helioviewer Project, JHelioviewer offers intuitive ways to browse large amounts of heterogeneous data remotely and provides an extensible and customizable open-source platform for the scientific community.

Muhr, Nicole, Veronig, Astrid, Kienreich, Ines, Temmer, Manuela, Vršnak, Bojan
Analysis of characteristic parameters of large-scale coronal waves
S2-404
poster
The kinematics of 4 well pronounced EUV wave events observed by STEREO-EUVI is studied by the visual tracking as well as by a semi-automatized perturbation profile method leading to results matching each other within error limits. The derived mean velocities are 220-350 km/s. The fastest event reveals significant deceleration of -190 m/s^2 while the others show a constant velocity during wave propagation. The evolution of the maximum intensity values reveals initial intensification by 20-70%, and decays to original levels while the width at half maximum and full maximum of the profiles is broadening by a factor of 2-4. The integral below the profile remains basically constant in two cases, while it strongly decreases in the others. From peak perturbation amplitudes we estimate the corresponding magnetosonic Mach numbers to be 1.08-1.21. The profiles reveal three distinct features behind the propagating wave fronts: coronal dimmings, stationary brightenings and rarefaction regions. They appear after the wave passage and are slowly fading away. Our findings indicate that the events under study are weak shock fast-mode MHD waves initiated by the CME lateral expansion.

Möstl, Christian
Lessons learned from multi-point observations of ICMEs
S2-445
oral
Interplanetary coronal mass ejections (ICMEs) form a centerpiece in space weather research, as they are known to cause the strongest geo-magnetic storms. The major problem one faces when trying to understand the 3D structure of ICMEs, which is necessary to obtain better predictions of their geo-effects, is the fact that single-spacecraft in situ observations of ICMEs leave researchers with too many free parameters, and strong assumptions about their global shape and field topology have to be made. However, few exceptions exist where the same ICME has been observed at sufficiently separated points in the heliosphere, letting us scrutinize these assumptions. I will mainly review some classic papers and give attention to recent multi-point ICME observations by STEREO. Using data from this mission, new techniques have been developed combining the strengths of in situ data with heliospheric imaging and numerical simulations to foster our understanding of the global ICME configuration.

Nakariakov, Valery, Vasheghani Farahani, Soheil, Van Doorsselaere, Tom, Verwichte, Erwin
Nonlinear long-wavelength torsional Alfven waves
S2-518
poster
Long-wavelength torsional (Alfvén) waves in solar and stellar coronal structures experience geometrical amplification with height and hence are subject to nonlinear effects. We analyse this regime in frames the second order thin flux-tube approximation of Zhugzhda, which describes axisymmetric (sausage) magnetohydrodynamic perturbations of a straight untwisted and non-rotating magnetic flux-tube, representing e.g. a polar plume or a jet, or a coronal loop or a prominence filament. Attention is paid to the compressible motions nonlinearly induced by long-wavelength torsional waves of small, but finite amplitude. We obtained that propagating torsional waves induce compressible perturbations oscillating with double the frequency of the torsional waves. In contrast with plane shear Alfvén waves, the amplitude of compressible perturbations is independent of the plasma-beta. Moreover, nonlinear evolution of torsional waves is not affected by the singularity appearing at the height when the local Alfvén speed is equal to the sound speed. This result significantly reduces the efficiency of nonlinear cascade, and hence suggests that the present theories of the solar and stellar wind heating and acceleration by Alfvén waves, based upon the plane wave theory, require modification.

Nieves-Chinchilla, T., Colaninno, R., Vourlidas, A., Szabo, A., Lepping, R.P., Boardsen, S.A., Anderson, B.J., Korth, H.
The ambiguous evolution of a coronal mass ejection in the interplanetary medium
S2-593
poster
On June 16th, 2010, an Earth-directed solar event was observed by the instruments onboard STEREO/SECCHI, SOHO/LASCO, MESSENGER and Wind. This event is the first direct detection of a rotating coronal mass ejection (CME) in the middle corona. In this work, we present a study of the evolution of this event in the interplanetary medium. We carry out a comprehensive analysis using combined in-situ data and remote observations, with the analytical models and techniques available in the bibliography. We discuss the ambiguous interpretation of the evolution for this CME.

Nindos, Alexander, Patsourakos , Spiros, Wiegelmann, Thomas
On the initiation of the 2011 February 15 coronal mass ejection
S2-532
oral
When significant amount of magnetic helicity is injected into the corona, its main part is put in a magnetic flux rope. When the flux rope forms in the corona, it would expand and propagate outward unless its confinement is efficient. In active regions, the principal confinement agent is provided by the overlying background anchored magnetic field whose tension acts to hold the flux rope in place. Using magnetic field data from both the Helioseismic and Magnetic Imager (HMI) aboard Solar Dynamic Observatory (SDO) and the spectropolarimeter of the Solar Optical Telescope (SOT/SP) aboard Hinode spacecraft, we calculate the magnetic helicity injected into the corona from a few days prior to a major coronal mass ejection (CME) until well after the eruption. For the same time interval, we also assess how the overlying magnetic field inhibits eruptions by calculating the temporal evolution of its decay index (i.e. how fast the field decreases with height). The CME was associated with an X2.2-class flare that occurred relatively close to the disk center on 2011 February 15 in active region NOAA 11158. The early stages of the CME are further constrained by comparing the temporal evolution of both the injected magnetic helicity and the magnetic field's decay index with data provided from the Atmospheric Imaging Assembly (AIA) imagers aboard SDO and the EUV imagers and white-light coronagraphs aboard Solar Terrestrial Relations Observatory (STEREO) spacecraft.

Nisticò, Giuseppe, Zimbardo, Gaetano, Patsourakos, Spiros, Bothmer, Volker
North-South Asymmetry in the Magnetic Deflection of Polar Coronal Hole Jets
S1-501
oral
We present observations of coronal jets observed with the STEREO spacecraft using data from the EUVI (Extreme Ultra-Violet Imager) and COR1 (CORonagraph) telescopes. Jets were observed during the solar minumum from 2007 to 2008 at polar and mid-low latitudes within coronal holes (Nisticò et al., Solar Phys., 259, 87, 2009; Nisticò et al, Ann. Geophys., 28, 687, 2010).

We made temperature measurements with the technique of the filter ratio at EUV wavelengths (Nisticò et al., ASR, submitted) in order to understand the physical mechanism at the basis of their origins and for comparison with existing models and numerical simulations. From observations of jets at polar latitudes, we have found a systematic change in the jet Position Angle (PA) when going from the EUVI FOV (Field Of View) at 1 $R_\odot$ to the COR1 FOV at 2 $R_\odot$. This change in PA is consistent with the jet motion along the Sun dipolar magnetic field, confirming that the polar corona is a low β plasma. However, this magnetic deflection is found to be larger at the North pole than at the South pole. This kind of asymmetry is consistent with the North-South asymmetry of the heliospheric magnetic field inferred from the Ulysses in situ measurements, and gives clues to the study of the large scale solar magnetic field (Erdos&Balogh, JGR, 710, 1806, 2010; Virtanen&Mursula, JGR, 115, A09110, 2010).

Nitta, Nariaki
CME-driven shocks and early development of SEP events
S2-528
poster
Solar energetic particle (SEP) events with elevated proton fluxes are called gradual due largely to their associations with solar flares that last long (long duration events, LDEs). It is generally believed that particles in these events are accelerated at CME-driven shocks. Because of the large angular extension of these shocks, magnetic field connection around the flare region is not as frequently discussed for gradual SEP events as for 3He-rich SEP events. However, the magnetic field connection should play at least some role in the observed dependence of SEP time profiles on the longitude of the source regions. According to Cliver et al. (1982), the first arriving particles are released as the acceleration region intersects with field lines that are connected to the observer. In a handful of small proton events that occurred in 2010, we track the CMEs and their associated coronal waves using SDO AIA, and STEREO EUVI and COR1/2 data, and estimate the 3-d propagation of the shocks assuming simple geometry. This is compared with well-connected field lines obtained using the potential field source surface (PFSS) model. We study the onsets of SEP events at Earth and STEREO A and B, and discuss how they can be explained by shock acceleration and whether there are direct contributions from the flares.

Ontiveros, Veronica, Patsourakos, Spiros
Multi-spacecraft Study of the Kinematics of a Fast Coronal Mass Ejection and its Associated Shock: AIA, SECCHI and LASCO Observations.
S2-547
oral
It has been recently shown that CME-driven shocks can be directly observed and quantitatively analyzed from white light images. However, the full tracking of the 3D morphology and kinematics of the CME-shock system requires a set of high cadence observations, both in the inner and outer corona and well-separated viewpoints. We present here the multi-spacecraft analysis of the fast March 7th, 2011 CME ($\sim$1800 km/s) and its associated shock observed by the AIA/SDO, SECCHI/STEREO and LASCO/SOHO instruments. For the date of the event, the separation between Earth and STEREO A was 87 degrees, and Earth and STEREO B was 85 degrees which gives an ideal configuration for performing this kind of study. Using forward modeling, we find evidence of self-similar expansion of the shock and the CME up to 15 solar radii, but with a clear displacement of the CME leading edge and the shock wave front, that we attribute to the inhomogeneous nature of the background corona. We combine the measurements obtained by the different coronagraphs and EUV telescopes to track back the full impulsive phase to derive the full kinematic profile of the CME-shock from its source region up to 15 solar radii. This unique set of observations will allow us to determine whether the shock is still driven in coronagraph field of view.

Opitz, Andrea
Temporal evolution and spatial variation of the solar wind properties on different scales
S1-608
poster
We study the temporal evolution and spatial variation of the solar wind properties on different scales between Venus and Mars orbits in the ecliptic during solar minimum. The twin STEREO spacecraft have reached the 180-degree longitudinal spacecraft separation, which allows a complete time scan of the solar wind evolution. We show how the different solar wind parameters evolve on different time scales from 0.1 day up to several Carrington rotations using in-situ observations from STEREO supported by

Venus Express and Mars Express measurements. These results help the prediction of the solar wind parameters for different heliospheric positions. We use imaging data and modeling results to explain occasional deviations from the nominal solar wind evolution.

Pariat, Etienne, Aulanier, Guillaume, Masson, Sophie
Data-driven MHD modeling of dynamical features
S2-372
oral
In order to understand the underlying mechanism of the solar activity, a world-wide effort is being pursued in order to simulate the active events occurring in the solar atmosphere. The path to more realistic models involves the inclusion of observational information more and more directly within the numerical experiments. The differences between the typical scales (lengths, time, velocities) of the solar atmosphere and what is achievable given our actual computational power forces the numerical investigator to many simplifications and/or treatment of the observational data.

During this presentation, I will first introduce the state-of-the-art of Magnetohydrodynamics (MHD) data-driven simulations of active solar events. I will present some of the obstacles one is confronted to in this type of experiments and possible solutions. I will then focus on a series of recent 3D MHD numerical simulations of a flaring region. These experiments include magnetic field measurements as initial condition and an observationally-based synthetic velocity field as boundary driving constraint.

Paspirgilis, Rolf, Wimmer-Schweingruber, Prof. Dr. , Burmester, Dr. Soenke
Numerical Simulations for EPT onboard Solar Orbiter
S2-478
poster
The ESA mission Solar Orbiter will research the sun's atmosphere and heliosphere from a distance of about 0.3 AU. Onboard, the Energetic Particle Detector (EPD) will measure the composition, timing and distribution functions of suprathermal and energetic particles. The EPD consists of five seperate sensors – one of them is the Electron Proton Telescope (EPT). Together with the High Energy Telescope (HET), the CAU is given the task to design and build the EPT.

As a part of the EPD detector suite, the Electron Proton Telescope (EPT) is designed to detect and measure electrons and protons in the Solar Wind at 0.3 AU. The particles' energies to be observed range from 20 keV to 450 keV for electrons and from 20 keV to 7 MeV for protons. We use a three silicon detector design utilizing the $\frac{dE}{dx}$-E-method together with a foil/magnet-combination to distinguish between electrons and protons and to determine their energies.

Patsourakos, Spiros
EUV Waves: The Evolving View from SOHO to Hinode, STEREO and SDO
S1-509
oral
Large-scale propagating intensity fronts, often covering a significant fraction of the Sun's surface, and which are associated with solar eruptive phenomena were one of the major discoveries of the Extreme Ultraviolet Telescope on-board SOHO in late 90's. Since their discovery these transients, often called EUV waves, attracted and continue to attract significant interest and their interpretation is sometimes the subject of intense debate. Starting with SOHO every major solar mission (Hinode, STEREO and SDO) constantly increased and improved (and continue to do so) our knowledge and hopefully our understanding of these fascinating phenomena.

With this talk we will attempt a review of the current state-of-art of the EUV wave phenomenon. This will include: (1) observational properties of EUV waves (e.g., kinematics,energetics, dispersion properties, 3D structure) from SOHO/Hinode/STEREO/SDO; (2) trigger mechanism(s), (3) relationships with CMEs, (4) interactions with the background corona (deflections, oscillations etc), (5) relationships with chromospheric (Moreton) and coronal (type II) shocks and (6) modeling. We will finally set for a view into possible developments into EUV wave science from both the observational and modeling points of view.

Pesnell, W. Dean
Solar Cycle Prediction
S1-437
oral

Solar cycle predictions are needed to plan long-term space missions; just like weather predictions are needed to plan your next vacation. Fleets of satellites circle the Earth collecting many types of science data, protecting astronauts, and relaying information. All of these satellites are sensitive at some level to solar cycle effects. Predictions of drag on LEO spacecraft are one of the most important. Launching a satellite with less propellant can mean a higher orbit, but unanticipated solar activity and increased drag can make that a Pyrrhic victory. Energetic events at the Sun can produce crippling radiation storms that endanger all assets in space. Testing solar dynamo theories by quantitative predictions of what will happen in 5-20 years is the next arena for solar cycle predictions. I will describe the current state of solar cycle predictions and anticipate how those predictions could be made more accurate in the future.

Pomoell, Jens, Vainio, Rami
MHD Modeling of Coronal Large-Amplitude Waves, Disturbances and CME Lift-off
S2-499
oral
Different kinds of transient phenomena occur commonly in the solar corona during the lift-off of coronal mass ejections (CMEs), such as EUV waves, metric type II bursts and solar energetic particle (SEP) events. While the exact nature and genesis of these disturbances is under debate, it is clear that erupting CMEs induce large-amplitude waves in the solar corona during the lift-off process that influence the coronal environment. Therefore, knowledge of the waves produced by evolving CMEs is essential for gaining insight into the interrelationship and nature of the various solar transient phenomena.

One avenue of probing these issues is by developing models capable of capturing the dynamics following the onset of an eruption. In this talk, we present our magnetohydrodynamic (MHD) simulation model with which we study the mass motions, shocks and other large-amplitude waves induced by an erupting CME. In particular, we address the relation of the large-amplitude waves to observed wave phenomena on the solar disk, and discuss the potential of the coronal shocks to produce energetic particles.

Popecki, Mark, Galvin, A, Simunac, K, Klecker, B
He+ Suprathermal Tails as Observed by STEREO/PLASTIC
S1-589
poster
Suprathermal tails in He+ have been investigated using the STEREO/PLASTIC instrument, in the energy range of 1-20 keV/nuc. In this energy range, a persistent power law spectrum with an index of -5 has been reported by Gloeckler et al. (e.g. 2007) for He+ in the solar wind frame. V/Vsw is the ratio of the particle speed to the solar wind speed. In this investigation, He+ tails were characterized for the first 10 months of 2008, using the STEREO A spacecraft. This period featured many corotating interaction regions. Incorporating a transformation from the spacecraft frame to the solar wind frame, the PLASTIC A observations for the He+ tail have a spectral index of -6.1 $\pm$ 0.9, for $1.5 \leq V/Vsw \leq 5$ in the solar wind frame. This is somewhat steeper than the Gloeckler et al. (2007) result. Interestingly, if only periods of slow solar wind are included, the spectrum steepens. The suprathermal tail spectral index for solar wind speeds of 327 km/s or less is is -7.5 $\pm$ 0.7.

Posner, Arik, Rother, Oliver, Heber, Bernd, Mueller-Mellin, Reinhold, Lee, Jason
An update on the live Relativistic Electron Alert System for Exploration
S2-426
oral
For the past three years, the REleASE method of short-term forecasting of the intensity of prompt solar energetic protons of hazardous energies (about 40 MeV) with relativistic electrons had been implemented. Since February 2008, REleASE translates near-real-time electron data of the SOHO/COSTEP instrument from L1 into near-future proton fluxes. The live forecasting output is available online. Electrons are well known to provide the first sign of a solar particle event in progress, approximately one hour ahead of more dangerous protons. The forecasting of the sudden increase in intensity of protons from solar energetic particle events is relevant for radiation protection of humans on exploration missions. The method utilizes the speed advantage of electrons over up to 40 MeV protons and the correlations of inverse rise time and intensity between electrons and protons in solar particle events. The effectiveness of this tool is based on the observed similarities in particle transport between the Sun and 1 AU. Electrons act as test particles by probing the ever-changing heliospheric transport conditions that act on the slower moving protons. This presentation is an early detailed analysis of the REleASE output and shows its strengths and weaknesses through the early signs

of solar activity in 2010 and 2011.

Rodriguez-Pacheco, Javier, Blanco, JuanJose, Heber, Bernd, Gomez-Herrero, Raul
The Gnevyshev Gap as detected by Ulysses/HET/LET
S2-648
0 min. poster only
The Gnevyshev gap is a period of anomalous low solar magnetic activity coincident with the Solar Magnetic Field Polarity Reversal. In this work, we broaden the work already done for the energetic fluxes in the ecliptic plane during solar cycle 23rd by adding the effect of this phenomenon on the energetic particle fluxes out of the ecliptic plane as measured by the HET and LET instruments onboard the Ulysses spacecraft during the same maximum. Our results show that despite the decreases on the energetic particle fluxes appear at all the energies that we have studied, they are more pronounced as the energy of the particles increases. We have also studied the solar eruptive activity at high latitudes during this period.

Rodríguez-Gasén, Rosa, Aran, Angels, Sanahuja, Blai, Jacobs, Carla, Poedts, Stefaan
Variation of proton flux profiles with the observer's latitude in gradual SEP events
S3-514
poster
We study the variation of the shape of proton intensity-time profiles in gradual SEP events with the relative position of the observer in space with respect to the main direction of propagation of an interplanetary shock. We use a 3D MHD simulation of such shock to determine the plasma jumps evolution at its front. We assume a relation between the jump in speed across the shock front and the injection rate of shock accelerated particles. This allows us to model the transport of the particles and to obtain the proton flux profiles to be measured by a grid of nine virtual observers located at 0.4 and 1.0 AU, with different latitudes and longitudes with respect to the nose of the shock. Differences among flux profiles are the result of the way each observer establishes magnetic connection with the shock front, and we find that variations on the latitude of the observer may result in intensity changes of up to one order of magnitude. This is the first time that the latitudinal dependence has been quantified by simulating gradual SEP events. We also derive the peak intensity variation with the radial distance for the pair of observers located at the same angular positions.

Ruffenach, Alexis, Lavraud, Benoit, Owens, Matthew,J., Sauvaud, Jean-Andre, Savani, Neel, Rouillard, Alexis, SWEA/STEREO Team,
Observation of magnetic cloud erosion by magnetic reconnection
S2-369
poster
Magnetic clouds, a subset of interplanetary coronal mass ejections, are characterized by a twisted magnetic flux rope topology. During propagation, the structure interacts with its environment and may thus at least partially reconnect, potentially eroding away part of the original magnetic cloud flux impinging on Earth. We quantitatively analyze the complex interaction that occurred between a magnetic cloud (MC), the solar wind ahead of it, and a trailing high-speed stream observed by STEREO A, B and ACE. We first determine the orientation of the flux rope using different methods. We then estimate the amount of eroded magnetic flux, and associated errors, based on the observation of azimuthal flux imbalance during the spacecraft sampling of the flux rope. We show that small deviations in cloud axis determinations have an appreciable impact on the estimated eroded flux. However, the use of various methods for errors analyses, combined with other signatures observed in the data permit to demonstrate the occurrence of erosion with confidence. Interestingly, significant erosion occurs despite the CME being slow.

Safari, Hossein
Application of Probabilistic Neural Network on Autumatic Identification of Solar Coronal Loops
S2-343
poster
Identification of solar coronal loops from EUV images is a key process in data analysis and coronaseismology. Here, we used a Probabilistic Neural Network as an automated tools for identification of solar coronal magnetic loops from sequences EUV images. Using the 2-D B-Spline method, the loop of an image are labeled. The Zernike moments of loops are calculated. The Zernike

moments of an image are rotation, scaling and translation invariant. These array moments are feed to the network as our train set. In the similar manner, the next sequences images are tested using the network for identification the same loops. This is done for 14 SDO/AIA 171 A images.

Savani, Neel,P., Davies, Jackie,A., Shiota, Daikou, Davis, Chris,J., Rouillard, Alexis,P., Owens, Matt,J., Kusano, Kanya, Bothmer, Volker
Directly estimating the 2-D morphology of CMEs in the inner heliosphere from remote observations
S1-411
oral
The STEREO mission provides high cadence and resolution images of the structure and morphology of coronal mass ejections (CMEs) in the inner heliosphere. Their direction and propagation speed have often been estimated through the use of time-elongation maps produced from Heliospheric imager (HI) data. The wide field-of-view of HI allows scientists to directly observe the 2D structures, while the relative simplicity of the time-elongation format for presenting such observations allows us to statistically scale many events, thereby providing a much deeper understanding of how CMEs evolve between the Sun and the Earth. For events with certain orientations, both the rear and front edge of the CME can be monitored at varying heliocentric distances (R) between the Sun and beyond 1AU. Here we consider four example events with measurable radial extents, first identified by citizen scientists. We show a linear dependency with R for the growth of the radial width and the 2-dimensional (2D) aspect ratio, which are measured out to ∼0.7AU. By tracking CMEs, we find a power law for the average CME expansion rate (Vex) as a fraction of bulk flow speed (Vbulk).

Schrijver, Karel
Learning from the global view of a variable Sun: large-scale connectivity
S3-415
oral
Early in 2011 mankind had, for the very first time in history, a comlete view of the surface and atmosphere of the variable star that makes Earth habitable. If all continues to go well with the spacecraft observing the Sun, this marks the beginning of a period of somewhat more than 8 years during which solar, heliospheric, space, and climate physicists can study, without interruptions, the evolution of the solar magnetic field that drives the atmospheric activity. We are rapidly learning from this new capability: we can study how active regions evolve and interact; how magnetic field emerges and subsequently evolves; how the Sun's open field evolves on long time scales and how coronal mass ejections plow through the closed field, ... and how perturbations propagate from one location to affect what is going on far away, aided by the multi-perspective views that are needed to interpret what happens in the transparent, glowing gases that envelop the Sun.

Schroeder, Peter, Luhmann, Janet, Marchant, Will
Real-Time Visualization Tool Integrating STEREO, ACE, SOHO and the SDO
S2-511
poster
The STEREO/IMPACT team has developed a new web-based visualization tool for near real-time data from the STEREO instruments, ACE and SOHO as well as relevant models of solar activity. This site integrates images, solar energetic particle, solar wind plasma and magnetic field measurements in an intuitive way using near real-time products from NOAA and other sources to give an overview of recent space weather events. This site enhances the browse tools already available at UC Berkeley, UCLA and Caltech which allow users to visualize similar data from the start of the STEREO mission. Our new near real-time tool utilizes publicly available real-time data products from a number of missions and instruments, including SOHO LASCO C2 images from the SOHO teams NASA site, SDO AIA images from the SDO teams NASA site, STEREO IMPACT SEP data plots and ACE EPAM data plots from the NOAA Space Weather Prediction Center (SWPC), STEREO IMPACT MAG and STEREO PLASTIC data plots from the NOAA SWPC, ACE MAG and SWEPAM data plots also from the NOAA SWPC and STEREO spacecraft positions from the STEREO Science Center.

Schwadron, Nathan, IBEX Team, The
The Suns Evolving Interaction with the Local Galactic Medium from Energetic Neutral Atoms

S1-329
oral
The first all-sky maps of Energetic Neutral Atoms (ENAs) from the Interstellar Boundary Explorer (IBEX) exhibited smoothly varying, globally distributed flux and a narrow ribbon of enhanced ENA emissions. The IBEX ribbon has ENA flux over a narrow region ≈20° wide, and a factor of 2-3 higher than the more globally distributed ENA flux. We have separated ENA emissions in the ribbon from the globally distributed flux revealing global characteristics of the interstellar interaction. We compared the second set of sky maps to the first in order to assess the possibility of temporal changes over the 6 months between views of each portion of the sky. Overall, the IBEX ENA maps, while very different from initial predictions, reveal the profound influence of the interstellar magnetic field on the Suns interstellar interaction, and the first insight into global properties of the evolving interstellar boundaries.

Seaton, Daniel, Mierla, Marilena, Berghmans, David, Zhukov, Andrei, Dolla, Laurent
What Causes Solar Eruptions: Observations of a Mass-Loading Type CME
S2-461
oral
Though solar eruptions have been known to the scientific community for decades, the mechanisms responsible for their initiation remain the subject of much discussion. One reason for this is that a number of different mechanisms contribute to the loss of equilibrium that launches CMEs and triggers solar flares. Additionally, clear observations of the events that lead to eruptions remain relatively scarce.

Here we present one such case: an eruptive flare near sun center that occurred on 3 April 2010. A three-dimensional reconstruction of this eruption using observations from SWAP onboard PROBA2 and SECCHI onboard STEREO reveals that the event unfolded in two parts: an initial flow of cooler material from very low in the corona, followed by a flux rope eruption higher in the corona. We conclude that mass off-loading from the first phase triggered a rise, and, subsequently, catastrophic loss of equilibrium of the flux rope.

We discuss the implications of this analysis on CME and flare initiation models and conclude that, though it is clear that mass-loading can trigger these events, it is only one of several mechanisms that plays an important role in triggering and driving eruptions.

Shimojo, Masumi, Tsuneta, Saku, Shiota, Daiko, Ito, Hiroaki
The Solar Polar Region observed with Hinode
S1-479
oral
The distribution and time variation of the magnetic fields in the solar polar region are very important for investigating solar dynamo and solar wind. The polar magnetic fields are thought to be a direct manifestation of the global poloidal fields in the interior, which serve as seed fields for the global dynamo that produces the toroidal fields responsible for active regions and sunspots. We know also that the polar coronal hole is the birthplace of the fast solar wind, and the polar magnetic fields are thought to provide the energy for accelerating the solar wind. However, the polar magnetic fields have not been well understood yet because it is hard to measure the polar magnetic field with high accuracy from the previous solar magnetic observations.

The spectral-polarimetric observations from the orbit with high-spatial resolution and high accuracy were achieved by the Solar Optical Telescope (SOT) aboard Hinode satellite and presented the new views of the solar polar region. From the SOT observations, we found that there are many vertical oriented magnetic field tubes with field strengths as strong as 1 kG, and the flux tubes are responsible for the magnetic flux of major polarity in the region. The X-Ray Telescope aboard Hinode revealed also that the polar region is not quiet, and produces numerous coronal jets around the flux tubes.

In this talk, we report the distribution and time variation of the polar magnetic field based on the observation data obtained with SOT/Hinode during 5 years, and discuss the relation between the polar field, the solar cycle and the coronal activities.

Shugay, Yulia, Veselovsky, Igor, De Groof, Anik, Seaton, Dan, Berghmans, David
Areas of coronal holes in the source regions of the high speed solar wind streams during 2010-2011: initial results of the Proba2/SWAP observations
S2-515
poster

The rising phase of solar cycle 24 was marked by the coexistence of rather stable, but variable recurrent and increasing sporadic activity manifested also in the solar wind (SW) properties. Most of the high speed SW streams observed at the Earths orbit during this period originate from the coronal holes on the Sun with the negative magnetic polarity that correspond to positive values of the Bx components of the interplanetary magnetic field. The areas of coronal holes where calculated using developed algorithms and calibrated Proba2/SWAP images in 17.4 nm spectral pass band as an input information for the time period January 2010-April 2011. Calculations are compared with different definitions including SDO/AIA observations to identify and evaluate the coronal holes in the channels 17.1nm and 19.3nm. The results show general consistency and sensitivity to selected criteria regarding intensity thresholds in the channels for the identification of coronal holes. Calculated areas demonstrate rather high correlation coefficients up to 0.6-0.9 in several instances with the daily averaged fast SW streams, with speeds >550 km/s observed by ACE satellite. The periods of reconfiguration in recurrent SW streams were observed during July 2010 to April 2011. The reconfiguration processes have different character and are manifested differently in the high-speed SW flows and in CH areas depending on the spectral range. Days of poor correspondence between SW velocity and coronal hole areas are mostly the same as when using the method based on photospheric magnetic field (Wang-Sheeley-Arge model) for prediction SW velocity. We discuss long lasting plasma streams not registered by coronographs as ordinary coronal mass ejections or flows in the CACTUS and other catalogues. This type of fast plasma outflows from the corona probably can have the development time comparable or longer than the plasma transit time from the Sun to the Earth and needs more investigations.

Simunac, K.D.C., and In Situ HPS Team,
Differences in the heliospheric plasma sheet as observed by three spacecraft in one day
S1-512
oral
We present in situ observations of the heliospheric plasma sheet (HPS) from STEREO-A, WIND, and STEREO-B. We focus on a period in June 2007 when the maximum heliographic latitude separation between the three spacecraft is 2 degrees, and the temporal separation is less than 1 day. The HPS was identified using the following criteria: reversal of the interplanetary magnetic field sector, enhanced proton density, and local minima in both the proton specific entropy argument and in the alpha to proton number density ratio. The proton density enhancement associated with the HPS was larger at WIND by a factor of about 2.5 than at either STEREO observatory, though the physical location of the WIND spacecraft was in between the two STEREO observatories. We attribute this difference in the in situ proton density to both small separations in heliographic latitude and radial evolution of the solar wind leading to the development of a compression region associated with a stream interaction region.

Solanki, Sami
Unserem lebenspendenden Stern auf der Spur: Einblicke in die Sonnenforschung
S1-455
oral
Die gleissend helle und heisse Sonne beeinflusst unser Leben in vielfltiger Art und Weise. Am Wichtigsten ist aber, dass ihre Strahlung die Erde warm hlt und sie zur wohligen Wiege des Lebens im kalten und unwirtlichen Weltraum macht. Wie funktioniert denn unser Tagesgestirn und wie beeinflusst sie unsere Umwelt und uns? Unser Wissen darber hat sich in den letzten Jahren, dank dem Einsatz neuer Teleskope, sowohl am Boden wie auch im Weltraum, stark zugenommen und unser Verstndnis hat sich grundlegend verndert. Die Sonne hat uns ihre innersten Geheimnisse, ihre wilden Seiten und ihre magnetische Persnlichkeit offenbart. In dem Vortrag soll ein kleiner Einblick in die vielfltigen, oft dynamischen und manchmal explosiven Phnomene der Sonne und der darunterliegenden Krfte gegeben werden sowie in die Methoden der Sonnenforschung. Zudem soll kurz auf die Frage eingegangen werden wie denn die Sonne die Erde und ihre Bewohner beeinflusst.

Solar Orbiter STEIN team, Kiel, Lin, RobertP., Dong-Hun, Lee, Ho, Jin, Limousin, Olivier
The SupraThermal Electrons, Ions and Neutrals detector for Solar Orbiter
S2-485
poster
Solar Orbiter will be launched in 2017 and reach a perihelion of 62 Solar radii (about 0.3 AU). This will allow unprecedented coordinated remote-sensing and in-situ studies of the physics of the Sun, corona, and inner heliosphere.

The SupraThermal Electrons, Ions and Neutrals (STEIN) detector will measure electrons from 2 keV to 100 keV and protons

and neutral atoms from 4 keV to 100 keV. It has two viewing directions covered with an array of 32 semiconductor detector (SSD) pixels each. An electrostatic deflection unit is used to separate oppositeley charged and neutral particles.

In this work, we will show results of ongoing GEANT4 simulations to study the angular acceptance of the telescope, which give implications for the layout of the pixel detectors. Also initial studies of the collimator are presented, along with first experiments with the detector electronics.

St. Cyr, O.C., Davis, C., Meyer-Vernet, N., Zaslavsky, A, Kaiser, M.L., Adrian, M., Goetz, K, Maksimovic, M
STEREO Interplanetary Dust Measurements
S1-379
oral
In the months following the launch of STEREO, observers realized that several instruments (the SECCHI suite and S/WAVES) were recording the impact of interplanetary dust on the twin spacecraft. Several manuscripts described the observations, the physical mechanism(s) of these impacts, and the differences between dust observations on Ahead versus Behind. The size of dust particles spans eight (8) orders of magnitude, ranging from 10 nm to 10 microns. No obvious modulation has been seen with time; with increasing distance from Earth; or through the passage of the L4/L5 regions. Based on the SECCHI Heliospheric Imager (HI) observations, there is no obvious correlation with the occurrence of individual meteor streams at Earth; however, there are broad longitudinal features in the distributions that are also observed in the toroidal and apex sources of the sporadic meteor population. Here we review these observations, and we compare their modulation to numeric simulations of the behavior of dust in the solar system.

Steed, Kimberley, Lapenta, Giovanni
Understanding the evolution of an eruptive active region and the consequences for the associated CMEs/ICMEs
S2-527
poster
On 7 August 2010, a partial halo CME originating in NOAA AR11093 is observed by STEREO B. Fourteen days later this active region erupts again and a halo CME is observed by STEREO A on 14 August 2010. At this time, the separation between the STEREO spacecraft is $\sim 150^{\circ}$, allowing us to study the evolution of the active region between these eruptions as it transits the solar disk. In the case of each CME eruption, the location of the active region is such that it can be observed with multiple spacecraft, including STEREO, SDO and SOHO.

Here, we discuss the implications of the observed changes in the active region morphology, such that the active region is able to produce further eruptive activity some time after the first eruption. We compare and contrast these two eruptions using both remote sensing observations of the Sun and *in situ* observations of the associated ICMEs.

Sternal, O., Engelbrecht, N.E., Burger, R.A., Fichtner, H., Heber, B., Kopp, A., Potgieter, M.S., Scherer, M.
Possible Evidence for a Fisk-type Heliospheric Magnetic Field Structure founf in Ulysses/KET Observations
S1-529
poster
The propagation of energetic charged particles in the heliospheric magnetic field is one of the fundamental problems in heliophysics. Especially the structure of the heliospheric magnetic field remains an unsolved question and is discussed controversely.A promising method to trace the magnetic field structure is the propagation of electrons in the energy range of a few MeV. Employing 3D and time-dependent simulations of the propagation of energetic electrons, this work shows that the influence of a Fisk-type field on the particle transport in the heliosphere leads to characteristic variations of the electron intensities on the time scale of a solar rotation. We show that the Ulysses count rates of 2.5 - 7 MeV electrons contain the imprint of a Fisk-type heliospheric magnetic field. From a comparison of simulation results and Ulysses count rates, realistic parameter values for the Fisk theory are derived.

Sun, Xudong, Hoeksema, Todd, Liu, Yang, Wiegelmann, Thomas, Hayashi, Keiji
Magnetic Field Topology and Energetics in the Flaring Active Region 11158
S2-384
oral

We report on the evolution of magnetic field topology and pertinent free energy of NOAA AR 11158 over a period of 5 days. Flux emergence and strong shear motion created a complex quadrupolar structure which led to multiple eruptions, including the first X-class flare of the current solar cycle. We analyze a series of vector magnetograms from the Helioseismic and Magnetic Imager (HMI) on board the Solar Dynamic Observatory (SDO) and reconstruct the coronal field by using a non-linear force-free (NLFF) field extrapolation. The estimated free magnetic energy shows a great increase that accompanies flux emergence, while a significant decrease is found after the X-class flare. We relate this decrease to a rapid coronal field reconfiguration during the flaring process, which is supported by coronal loop observation and manifests itself through a previously reported, sudden change of the photospheric flux distribution. Due to the loss of energy, the coronal magnetic structure becomes more compact after the flare, with lower layers more stressed but overall less energetic.

Tadesse, Tilaye, Wiegelmann, Thomas, Inhester, Bernd, Pevtsov, Alexei
Magnetic Connectivity between Active Regions 10987, 10988, and 10989 by Means of Nonlinear Force-Free Field Extrapolation
S2-559
poster
Extrapolation codes for modeling the magnetic field in the corona in Cartesian geometry do not take the curvature of the Sun's surface into account and can only be applied to relatively small areas, e.g., a single active region. We apply a method for nonlinear force-free coronal magnetic field modeling of photospheric vector magnetograms in spherical geometry which allows us to study the connectivity between multi-active regions. We use vector magnetograph data from the Synoptic Optical Long-term Investigations of the Sun survey (SOLIS)/Vector Spectromagnetograph(VSM) to model the coronal magnetic field, where we study three neighboring magnetically connected active regions (ARs: 10987, 10988, 10989) observed on 28, 29, and 30 March 2008, respectively. We compare the magnetic field topologies and the magnetic energy densities and study the connectivities between the active regions(ARs). We have studied the time evolution of magnetic field over the period of three days and found no major changes in topologies as there was no major eruption event. From this study we have concluded that active regions are much more connected magnetically than the electric current.

Temmer, Manuela
CME-flare relationship
S2-352
oral
Flares and CMEs are the most violent activity phenomena which are observed at the Sun. Very often, though not always, both develop in a combined manner physically linked by the underlying magnetic field. Usually this behavior is explained by the standard flare-CME picture, which connects the large-scale CME and the small-scale flare through magnetic reconnection that occurs in a current sheet formed behind the erupting CME and that may cause a feedback loop between both phenomena. Evidence for the coupling between CMEs and flares is given from several observational studies. This paper will summarize and review recent findings on this topic based on statistical as well as case studies.

Thalmann, J. K., Inhester, B., Wiegelmann, T.
Estimating the magnetic energy and helicity in solar active regions
S2-396
poster
During solar eruptions the reconfiguration of the magnetic field causes part of the previously stored magnetic energy to be transformed into kinetic and thermal energy. These topological changes are due to magnetic reconnection, which not only requires free magnetic energy but is also constraint by the magnetic helicity. To define the magnetic helicity as a well-defined quantity, the relative helicity is usually evaluated. Extrapolation of the coronal magnetic field based on photospheric magnetic field measurements is well established and a newly developed method to calculate the relative magnetic helicity allows us to monitor the coronal energy and relative helicity content during solar eruptions.

Thompson, William
Triangulation with STEREO at 180 degrees separation
S3-360

oral
The multiple views of the Sun afforded by the STEREO mission can be used to triangulate solar features. Much work has done using triangulation for data taken in the early part of the mission, when the separation between the spacecraft was moderately small. However, now that the two STEREO spacecraft are on opposite sides of the Sun, it's also possible to apply triangulation to features above the solar limb. So long as the corona is optically thin, the process of triagulation for separation angles a few degrees away from 180 degrees is mathematically the same as at a few degrees separation. The triangulation technique is applied to STEREO EUVI and COR1 observations of a massive erupting prominence on 6 December 2010, when the STEREO separation angle was 171.6 degrees. This geometry, with a small equivalent separation of only 8.4 degrees, was useful for resolving ambiguities between threads, thus disentangling the detailed fine structure of the prominence. The derived three-dimensional structure is compared with SDO/AIA observations of the same event. Only part of the prominence structure erupts. The remaining prominence becomes activitated, and then undergoes a failed eruption the following day. Both the original eruption and the failed eruption are associated with separate coronal mass ejections. The relationship between the different sections of the prominence is explored. The multi-view observations are used to derive information about the helicity of the prominence material.

Thompson, William
STEREO COR1-A/B Intercalibration at 180 Degrees Seperation
S3-375
poster
The two STEREO spacecraft achieved 180 degree separation on 6 February 2011. This allows the first-ever view of the entire Sun. Another advantage of being at 180 degree separation is that it serves as a unique opportunity to check the cross-calibration of the STEREO telescopes. At 180 degrees, both spacecraft see the same corona from opposite sides. Where the corona is optically thin, the images from the two spacecraft should appear as mirror images of each other. We analyze the COR1 data from the time of opposition, and show that the COR1-A and COR1-B images agree with each other to a high degree of accuracy, thus validating both the radiometric intercalibration, and the background subtraction methodology. We also show from stellar observations that the COR1 radiometric calibrations have not changed since launch.

Tian, Hui, McIntosh, Scott, De Pontieu, Bart, Martinez-Sykora, Juan, Sechler, Marybeth, Wang, Xin
Two components of the coronal emission revealed by both spectroscopic and imaging observations
S1-628
poster
Recent spectroscopic observations have revealed the ubiquitous presence of blueward asymmetries of emission lines formed in the solar corona and transition region. These asymmetries are most prominent in loop footpoint regions, where a clear correlation of the asymmetry with the Doppler shift and line width determined from the single-Gaussian fit is found. Such asymmetries suggest at least two emission components: a primary component accounting for the background emission and a secondary component associated with high-speed upflows. The latter has been proposed to play a vital role in the coronal heating process and there is no agreement on its properties. Here we slightly modify the initially developed technique of redblue (RB) asymmetry analysis and apply it to both artificial spectra and spectra observed by the Extreme-ultraviolet Imaging Spectrometer on board Hinode, and demonstrate that the secondary component usually contributes a few percent of the total emission, has a velocity ranging from 50 to 150 km/s, and a Gaussian width comparable to that of the primary one in loop footpoint regions. The results of the RB asymmetry analysis are then used to guide a double-Gaussian fit and we find that the obtained properties of the secondary component are generally consistent with those obtained from the RB asymmetry analysis. Through a comparison of the location, relative intensity, and velocity distribution of the blueward secondary component with the properties of the upward propagating disturbances revealed in simultaneous images from the Atmospheric Imaging Assembly on board the Solar Dynamics Observatory, we find a clear association of the secondary component with the propagating disturbances.

Tian, Hui, McIntosh, Scott, Habbal, Shadia, He, Jiansen
High-speed Outflows on Plume-like Structures of the Quiet Sun and Coronal Holes
S1-629
poster
Observations from the Atmospheric Imaging Assembly onboard the Solar Dynamics Observatory reveal ubiquitous episodic outflows

(jets) with an average speed around 120 km/s at temperatures often exceeding a million degree in plume-like structures, rooted in magnetized regions of the quiet solar atmosphere. These outflows are not restricted to the well-known plumes visible in polar coronal holes, but are also present in plume-like structures originating from equatorial coronal holes and quiet-Sun (QS) regions. Outflows are also visible in the inter-plume regions throughout the atmosphere. Furthermore, the structures traced out by these flows in both plume and interplume regions continually exhibit transverse (Alfvenic) motion. Our finding suggests that high-speed outflows originate mainly from the magnetic network of the QS and coronal holes (CHs), and that the plume flows observed are highlighted by the denser plasma contained therein. These outflows might be an efficient means to provide heated mass into the corona and serve as an important source of mass supply to the solar wind. We demonstrate that the QS plume flows can sometimes significantly contaminate the spectroscopic observations of the adjacent CHsgreatly affecting the Doppler shifts observed, thus potentially impacting significant investigations of such regions.

Valtonen, Eino, and the SEPserver WP2 team, .
Observational Solar Energetic Particle Data for the SEPServer Project
S2-604
poster
SEPServer project will provide a new tool for comprehensive investigation of solar energetic particles (SEPs) and their origin. A server will be established providing SEP data and related electromagnetic observations with analysis methods, and maintaining a catalogue of SEP events from both space and ground-based observations. This catalogue will cover SEP events of the 23rd solar cycle and selected well-observed SEP events from the 21st, 22nd, and 24th solar cycle. The data of space-based observations of SEP events provided for the SEPServer project consist of electron and proton intensities, and intensities of heavier ions. The key observations are directional fluxes of energetic electrons and protons and elemental and isotopic abundances of ions. The data for the project will be delivered by the PI-institutes of instruments onboard SOHO, Ulysses, STEREO, and Helios missions. In addition, data will be provided from several other instruments onboard Ulysses and STEREO and from various instruments of the ACE and WIND spacecraft. Examples of the data sets concentrating on specific SEP events will be presented.

van Ballegooijen, A.A., Asgari-Targhi, M., Cranmer, S.R., DeLuca, E.
Heating of the Solar Chromosphere and Corona by Alfvén Wave Turbulence
S2-633
poster
We developed a three-dimensional MHD model for the propagation and dissipation of Alfvén waves in a coronal loop. The model includes the lower atmospheres at the two ends of the loop. The waves originate on small spatial scales (less than 100 km) inside the kilogauss flux elements in the photosphere. The model describes the nonlinear interactions between Alfvén waves using the reduced MHD approximation. The increase of Alfvén speed with height in the chromosphere and transition region (TR) causes strong wave reflection, which leads to counter-propagating waves and turbulence in the photospheric and chromospheric parts of the flux tube. Part of the wave energy is transmitted through the TR and produces turbulence in the corona. We find that the hot coronal loops typically found in active regions can be explained in terms of Alfvén wave turbulence, provided the small-scale footpoint motions have velocities of 1 - 2 km/s and time scales of 60 - 200 s. The heating rate per unit volume in the chromosphere is 2 to 3 orders of magnitude larger than that in the corona. We construct a series of models with different values of the model parameters, and find that the coronal heating rate increases with coronal field strength and decreases with loop length. We conclude that coronal loops and the underlying chromosphere may both be heated by Alfvénic turbulence.

Verbeeck, Cis, Callebaut, Benoit, Berghmans, David, Delouille, Veronique, Mampaey, Benjamin, the AFFECTS team,
The AFFECTS Solar Activity Viewer
S2-534
poster
The AFFECTS Solar Activity Viewer is a dynamical online tool that will provide a whole gamut of solar activity proxies. It is currently being developed at the Royal Observatory of Belgium (ROB) as part of the FP7 project AFFECTS (Advanced Forecast For Ensuring Communications Through Space), and will allow the user to easily plot and export any combination of proxies in a selected time interval. The viewer will serve near real time data as well as the full available archive of all of its proxies.

It is built on a database of timeline parameters that define the solar activity, concentrating on those parameters with expected

influence on ionospheric conditions. Next to classical parameters of solar activity such as the International Sunspot Index, 10.7 cm radio flux, and GOES X-ray curves, novel proxies extracted automatically from coronal EUV images (AIA, SWAP, EIT) will be provided. Examples are the total flux observed in the telescope passband, active region area, and total EUV intensity within active regions.

Vilmer, Nicole, Reid, Hamish, Aulanier, Guillaume
Energetic Particles in Solar Flares and Magnetic Environment
S2-469
poster
In recent years, a lot of progress has been done in understanding the magnetic topology of complex active regions leading to energetic flares and in developing MHD models to simulate the evolution of the coronal magnetic field in a flare. Even if several studies have been performed to try to relate the topology of the magnetic field (separatrixes, null points,) to the location of energetic particle interaction sites as revealed by UV and HXR emissions, the understanding of the location of the HXR footpoints and of their motions with respect to flare ribbons and magnetic topology still remains a challenging issue. In this contribution, we shall revisit the observations of the 2002 November 16 flare by Masson et al. (2009) in which the magnetic topology (with a null point) and its evolution as derived from a MHD simulation was used to interprete the evolution of the flare observed by TRACE (temporal and spatial evolution of the UV ribbons). We shall investigate here if the RHESSI observations of HXR sources (spatial configuration and evolution with time) support or not the previous interpretation

von Rosenvinge, Tycho, Christian, Eric, Cummings, Alan, Cohen, Christina, Leske, Richard, Mewaldt, Richard, Stone, Edward, Wiedenbeck, Mark
STEREO Observations of Solar Energetic Particles
S1-553
oral
We report on observations of Solar Energetic Particle (SEP) events as observed by instruments on the STEREO Ahead and Behind spacecraft and on the ACE spacecraft. We will show observations of an electron event observed by the STEREO Ahead spacecraft on June 12, 2010 located at W74 essentially simultaneously with electrons seen at STEREO Behind at E70. Some similar events observed by Helios were ascribed to fast electron propagation in longitude close to the sun. We will look for independent verification of this possibility. We will also show observations of what appears to be a single proton event with very similar time-history profiles at both of the STEREO spacecraft at a similar wide separation. This is unexpected. We will attempt to understand all of these events in terms of corresponding CME and radio burst observations.

Watanabe, Tetsuya, Sterling, Alphonse,C, Harra, Louise,K., Hara, Hirohisa
Small Loop-loop Interaction in the Initial Phases of A C9.7 Flare
S2-432
poster
The 2007 June 6 16:55 flare was well observed with high time-cadence sparse rasters of the EUV Imaging Spectrometer (EIS) on board the Hinode spacecraft. The observation covers an AR area of 240 arcsec 240 arcsec, with the 1 arcsec slit in about 160 seconds.

Tiny loops with apparently cusp-like structures about 1 arcmin west of the main flaring loops (seen in XRT images) are heated and show dyanamic behavior in velocity during the impulsive phases of the flare: The HeII line at 256.32A shows the existence and rapid temporal changes of the bi-directional flow, the line-of-sight velocity of which reaches about -70 - +100 km/sec. On the other hand, the FeXVI line at 262.98A formed in higher coronal temperatures show only a slight increase of its intensity.

Combining a time series of Stereo-A/B Secch-EUVI 171A images, we conclude that the region was heated via magnetic reconnection taking place as a result of tiny loop-loop interaction in the transition region.

Webb, David
The Characteristics of CMEs from Combined STEREO Imaging and In-situ Observations
S2-418
oral

Since the start of STEREO observations early in 2007 and despite being in an extended period of low solar activity, there have been at least 20 events in which a CME observed at the Sun by one or both STEREO (SECCHI) and/or SOHO (LASCO) spacecraft has passed over one of them or the Earth, as detected from in-situ data. The source regions of the CMEs on the Earth-facing Sun have been well observed by SOHO and Hinode and, since last April, by the Solar Dynamics Observatory. The heliospheric propagation of these events has also been observed by the heliospheric imagers (HIs) on STEREO and/or from the Solar Mass Ejection Imager (SMEI) in Earth orbit. HI and SMEI observations of the same ICMEs provide complementary information. This class of events can provide important information on the characteristics of the geometry, propagation and internal structure of CMEs. Most of these ICMEs also have magnetic cloud signatures at 1 AU. I will summarize the characteristics of these events and what they can tell us about CMEs.

Wiedenbeck, M.E., Mason, G.M., Cohen, C.M.S., Nitta, N.V., Gómez-Herrero, R., Haggerty, D.K.
The Longitudinal Extent of ^{3}He-rich Solar Energetic Particle Events
S2-401
oral
Under the solar minimum conditions prevailing from 2007 through 2010, the two STEREO spacecraft moved to their present positions leading and trailing the Earth by $\sim 90^\circ$ in its orbit about the Sun. We have used the data from energetic-particle instruments on the STEREOs and ACE to made correlated observations of the ^{3}He-rich solar energetic particle (SEP) events that occurred over this time period. We find that particle fluences have a strong dependence on heliolongitude and that the longitudinal extent of ^{3}He-rich SEP events is often significantly larger than the rms spread previously inferred from single-spacecraft studies. We suggest that this apparent discrepancy may be attributable to instrumental sensitivity limitations. We also discuss the implications of the multispacecraft results for understanding the observed rate of ^{3}He-rich SEP events and the fraction of the time that energetic ^{3}He is detected in the interplanetary medium near 1 AU.

Wiegelmann, Thomas, Thalmann, Julia, Inhester, Bernd, Tadesse, Tilaye, Chifu, Julia
Data driven active region modelling from SDO and STEREO
S2-333
oral
Solar active regions are the origin of eruptive phenomena like flares and coronal mass ejections and the source region of space weather activity. The driving force for solar eruptions is magnetic energy, which is converted into kinetic and thermal energy. While we cannot measure the magnetic energy content in the solar corona above active regions directly, we derive information about the topology of coronal field lines by EUV-observations from the two STEREO/SECCHI spacecraft and from SDO/AIA. Additional, direct measurements of the photospheric magnetic field vector are available from SDO/HMI. We describe, how these observations can be used to model active regions by a sequence of force-free equilibria. The 3D model equilibria are analysed regarding the content of free magnetic energy, helicity and strong current concentrations. Free magnetic energy is required to drive the eruption, but it's conversion to other energy forms by magnetic reconnection is constrained by the magnetic helicity. Furthermore, current driven micro-instabilities occur by it's very nature only in strong current concentrations, which are also (additional to free energy) a prerequisite for eruptions.

Wimmer-Schweingruber, RobertF.
Solar Probe Plus and Solar Orbiter, the next Heliospheric missions
S3-644
0 min. poster only
This decade will see the launch of two spectacular missions to dive deep into the inner heliosphere and unveil mysteries of the Sun and how it controls space around us. Solar Orbiter and Solar Probe Plus with their unique and highly complementary payloads will reshape our understanding of the Sun, corona, and how it affects our life. These missions will not stand alone - as the result of truly international scientific collaboration a great heliospheric observatory is evolving and ready to help us understand solar and heliospheric phenomena from their microscopic solar origins to their macroscopic heliospheric consequences. In this poster I will detail science issues which are likely to be solved by Solar Orbiter and Solar Probe Plus in collabortion with, e.g., the Kuafu and Solar C missions as well many spacecraft already operational in space. Some examples are dynamo action in the Sun, its photospheric and coronal manifestations, or the microscopic origin of the solar wind and of eruptive phenomena.

Wood, Brian
Three-Dimensional Reconstuction of Four Fast CMEs from 2011 March 7-8
S2-414
oral
Coronagraphic and heliospheric images from STEREO are used to study the morphology of four fast CMEs from 2011 March 7-8, which we label CME1-CME4. All four have appearances that can be reproduced assuming a 3-D flux rope morphology. The particularly rapid (over 1600 km/s) flux rope driver of CME2 produces a visible shock, the shape of which we also model. The CME's location near a coronal hole results in this shock expanding asymmetrically relative to the flux rope driver, both laterally and radially. This shock hits both STEREO-A and the Wind spacecraft near Earth. The morphological reconstruction of the shock based on the imaging is able to reproduce the shock arrival times at STEREO-A and Earth. At Earth there is ejecta observed following the shock, which yields a daylong magnetic storm on March 11. The morphological model implies that the ejecta following the CME2 shock may actually be the shocked flux rope of CME1 rather than the flux rope driver of CME2.

Zharkov, Sergey, Zharkova, Valentina, Popova, Helen
Two off-phase dynamo waves detected with Principal Component Analysis of the solar magnetic field in the cycles 21-23
S1-545
poster
We present the analysis of solar background and sunspot magnetic fields in the cycles 21-23 by using the Principle Component Analysis technique. This analysis allowed to identify in each cycle the two main latitude components of the opposite polarities reflecting two primary waves of the background magnetic field travelling off-phase from one hemisphere to another. The similar complementary waves with different characteristics are detected in each hemisphere for the sunspot magnetic fields. By applying several modifications of Parker dynamo theory we attempt to reproduce latitudinal distributions of these waves and to study the phase relations between weak background solar magnetic (poloidal) field and strong (toroidal) sunspot magnetic fields. Possible implications of these findings for understanding the solar activity are discussed.

Zharkova, Valentina, Khabarova, Olga
3D PIC simulations of particle acceleration in the heliopsheric current sheet: theory versus observations
S3-551
poster
We apply 3D PIC simulations of particle acceleration in reconnecting current sheet with the parameters of the heliospheric current sheet and derive the key parameters of electrons and protons: particle trajectories, energy spectra, density and angle distributions inside and outside the HCS. The polarisation electric field induced by accelerated particles due to the separation with respect to the midplane of the particles with the opposite charge is shown to define the particle dynamics at large distances about the HCS. As result, we discovered striking similarities between the simulated profiles of the ion charge density, spatial profiles of the polarisation electric field and Langmuir turbulence and the plasma parameters of the HCS measured in the solar wind. These similarities can indicate a long-lasting (continuous) magnetic reconnection process occurring at the HCS along all its length, at least, up to 1 AU distance from the Sun where it is measured. We discuss possible implications of these findings for understanding a 3D picture of the heliosphetic activity.

Zimovets, I.
On the origin of different types of non-thermal emission in the course of CME development
S2-539
oral
Results of analysis of multi-wavelength multi-instrumental (AIA/SDO, RHESSI, NRH, LASCO/SOHO, MDI/SOHO, SECCHI/STERE spatially-resolved observations of the 2010 November 3 partially behind-the-East-limb solar flare are presented. Special attention is given to relationships between different phases of the flux rope eruption (CME formation) observed by AIA in details and the sources of different types of non-thermal electromagnetic emission in the active region. The main findings are: 1) initial stage of the eruption was associated with appearance of double coronal hard X-ray source whose lower part was associated with the tops of the flare loops and whose upper part was associated with the erupting blob of hot (T=10 MK) plasma; 2) the sources of Type IV radio

burst and DCIM have appeared at the periphery of the active region aside from the erupting flux rope just at the time of the double coronal hard X-ray source appearance; 3) spatial link between the source of Type IV burst, the double coronal hard X-ray source, and the erupting flux rope was evident; 4) the source of Type II radio burst has appeared slightly above (or inside) the hot plasma blob just after the disappearance of the coronal hard X-ray source and its trajectory seemed to coincide with that of the erupting flux rope and CME; 5) no Type III radio bursts were observed during the event implying an absence of non-thermal electrons escape from the erupting structure that is in agreement with its closed morphology. Generalizing, the eruptive event under study represents a prominent and potentially unexhausted example for verification of different flare models (especially the "standard" one) and reveals close links between different episodes of the eruption and the origins of non-thermal emission of different types.