EP 6: Heliosphere II

Zeit: Dienstag 14:00–15:00 Raum: AKM

EP 6.1 Di 14:00 AKM

Analytical and numerical study of dynamics of self-similarly evolving magnetic clouds — •Giorgi Dalakishvili[1,2,3], Giovanni Lapenta[2], Stefaan Poedts[2], and Andria Rogava[2,3] — [1]Institut für Weltraum und Astrophysik, Ruhr-Universität Bochum, Universitätsstrasse 150 44780, Bochum, Germany — [2]Centre for Plasma Astrophysics, K.U.Leuven, Celestijnenlaan 200B, 3001 Leuven, Belgium — [3]Georgian National Astrophysical Observatory, Chavchavadze State University, Kazbegi 2a, Tbilisi, Georgia

Magnetic clouds (MC) are "magnetized plasma clouds" moving in the solar wind. MCs transport magnetic flux and helicity from the Sun. These structures present signature of evolution in time. In our study, MCs are considered as cylindrically symmetric magnetic structures with low plasma β. In order to describe the dynamics of MCs we seek for self-similar solutions of the MHD equations. We consider longitudinal and radial expansion of MCs, and as a particular case only radial expansion is described. Also it is shown that in the self-similarly evolving, cylindrically symmetric magnetic structure the forces are balanced. We have derived explicit analytical expressions for magnetic field, plasma velocity, density and pressure. The solutions obtained here are characterized by conserved values of magnetic flux and helicity. The dynamics of self-similarly evolving MCs was investigated using the numerical code "graale“. The MCs expansion in a medium with higher pressure and higher plasma β was studied. It was shown that physical parameters maintain self-similar character.

EP 6.2 Di 14:15 AKM

Improved data analysis for EPHIN aboard SOHO — •Christoph Terasa, Raúl Gómez-Herrero, Andreas Klassen, Reinhold Müller-Mellin, and Bernd Heber — Institut für Experimentelle und Angewandte Physik, Christian-Albrechts-Universität zu Kiel

The COSTEP instrument aboard the Solar and Heliospheric Observatory (SOHO) spacecraft consists of two separate energetic particle detectors, the Low Energy Ion and Electron Instrument (LION) and the Electron Proton Helium Instrument (EPHIN). These detectors allow measurement of electrons, protons and helium of solar, interplanetary or galactic origin in the energy range of 44 keV per particle up to several tens of MeV per nucleon. The objectives of these instruments are the study of particle emissions from the Sun, the galaxy and the heliosphere. EPHIN is collecting data since the launch of the mission in December 1995 covering more than a full 11-year solar cycle. Late in 1996 one of the semiconductor detectors became noisy, affecting the quality of the data in the upper energy range. We used the energy-range empiric relation by Goulding et al. to resconstruct the energy loss of nuclei in the affected detector. New dynamic spectra and long-term quiet time spectra using these techniques are presented.

EP 6.3 Di 14:30 AKM

Spatial gradients of galactic cosmic rays in the inner heliosphere at the end of solar cycle 23 — •Jan Gieseler[1], Bernd Heber[1], Nico De Simone[2], and Valeria Di Felice[2] — [1]IEAP, Christian-Albrechts-Universität zu Kiel, 24118 Kiel, Germany — [2]INFN, Structure of Rome Tor Vergata and Physics Department of University of Rome Tor Vergata, 00133 Rome, Italy

Ulysses was launched in October 1990 in the maximum phase of solar cycle 22, reached its final, highly inclined (80.2°) Keplerian orbit around the Sun in February 1992, and was finally switched off in June 2009. During its 18 years of measurements, the spacecraft performed three so-called fast latitude scans, in 1994-1995, 2000-2001, and 2007-2008, traveling from highest southern to northern latitudes within one year. This provides the opportunity to study the propagation of galactic cosmic rays over a wide range of heliographic latitudes during different levels of solar activity and different polarities in the inner heliosphere. Because the Ulysses measurements reflect not only the spatial but also the temporal variation of the energetic particle intensities, it is essential to know the intensity variations for a stationary observer in the heliosphere. This was accomplished in the past with the IMP 8 spacecraft until it was lost in 2006. Fortunately, the satellite-borne experiment PAMELA was launched in June 2006 and can be used as a reliable 1 AU baseline for measurements of the Kiel Electron Telescope aboard Ulysses. Thus, we have the opportunity to determine spatial gradients for protons and electrons from below 1 GV to above 4 GV with an accuracy never been achieved before.

EP 6.4 Di 14:45 AKM

Time Variatons of MeV Electrons at high Latitudes and their Implications on Heliospheric Magnetic Field Models — •O. Sternal[1], R.A. Burger[2], P. Dunzlaff[1], N.E. Engelbrecht[2], S.E.S. Ferreira[2], H. Fichtner[3], B. Heber[1], A. Kopp[1], M.S. Potgieter[2], and K. Scherer[3] — [1]Institut für Experimentelle und Angewandte Physik, Christian-Albrechts-Universität zu Kiel, Leibnizstr. 11, 24118 Kiel, Germany — [2]School of Physics, North-West University, 2520 Potchefstroom, South Africa — [3]Institut für Theoretische Physik, Lehrstuhl IV: Weltraum- und Astrophysik, Ruhr-Universität Bochum, 44780 Bochum, Germany

The transport of energetic particles in the heliosphere is described by the Parker transport equation including the physical processes of diffusion, drift, convection and adiabatic energy changes. The Ulysses spacecraft provides unique insight into the flux of MeV electrons at high latitudes. In this contribution, we compare our model results for the Parker HMF model and the Fisk-type Schwadron-Parker HMF model to Ulysses measurements. The electron flux at high latitudes has been used as a remote sensing method in order investigate the imprint of a Fisk-type HMF on the their time profile. We show here for the first time that such an imprint exists and deduce a limitation of the Fisk HMF angle β.