EP 11: Sonne und Heliosphäre III

Zeit: Freitag 11:15–13:15 Raum: HS 9

Hauptvortrag EP 11.1 Fr 11:15 HS 9

State and future of coronal seismology — •Erwin Verwichte — University of Warwick, UK

Coronal seismology is a technique that uses measurements of waves in the corona of the Sun to probe the structures they travel through and to provide information that would otherwise be difficult to measure directly. The past decade of solar observation has revealed the ubiquitous nature of waves of all types present in the corona. As a result, great strides have been made in wave modelling using theories that have relevance for coronal heating and solar wind acceleration. I will review the current state of coronal wave studies and highlights results using observations from the Solar Dynamics Observatory and discuss the limits and opportunities for coronal wave physics. I will show that seismology should not be seen in isolation but together with magnetic extrapolation and spectroscopy efforts.

EP 11.2 Fr 11:45 HS 9

Transport modeling of an energetic electron event observed on WIND, STEREO-A/B and MESSENGER on 18 August 2010 — •Wolfgang Dröge[1], Julia Kartavykh[1], Nina Dresing[2], Bernd Heber[2], Andreas Klassen[2], Raul Gómez-Herrero[3], and David Lario[4] — [1]Institut für Theoretische Physik und Astrophysik, Universität Würzburg, D-97074 Würzburg, Germany — [2]Institut für Experimentelle und Angewandte Physik, Universität Kiel, D-24118 Kiel, Germany — [3]Universidad de Alcalá, Dpto. de Física, E-28871 Alcalá de Henares, Spain — [4]The Johns Hopkins University, Applied Physics Laboratory, Laurel, MD 20723 USA

We present an analysis of near-relativistic electrons which were observed simultaneously by instruments onboard WIND, StEREO-A/B, and MESSENGER following a solar flare on 18 August 2010. At the time of the event the magnetic footpoints of STEREO-A and WIND were approximately equidistant (+/- 40 degrees) from the flare site, whereas the footpoint of STEREO-B was about 110 degrees east of the flare site. MESSENGER (at R = 0.31 AU) and STEREO-A (at R = 1.0 AU) were approximately on the same nominal field line. We have applied our numerical three-dimensional transport model which incorporates pitch angle diffusion, focusing and pitch-angle dependent diffusion perpendicular to the magnetic field to model intensity profiles and angular distributions observed on the above spacecraft. An attempt is made to disentangle the effects of electron injection close to the Sun from transport parallel and perpendicular to the magnetic field in interplanetary space.

EP 11.3 Fr 12:00 HS 9

Wide-spread SEP events observed with STEREO, SOHO and ACE — •Nina Dresing[1], Raúl Gómez-Herrero[2], Andreas Klassen[1], Bernd Heber[1], Wolfgang Dröge[3], Yulia Kartavykh[3,4], and Olga Malandraki[5] — [1]IEAP Universität Kiel, Kiel, Deutschland — [2]Space Research Group, University of Alcalá, Alcalá, Spain — [3]Institut für Theoretische Physik und Astrophysik, Universität Würzburg, Würzburg, Germany — [4]Ioffe Physical-Technical Institute, St. Petersburg, Russian Federation — [5]National Observatory of Athens, Athens, Greece

The two STEREO spacecraft, in combination with near-Earth observatories like SOHO and ACE, provide three well separated viewpoints, which are best suited to investigate SEP events and their longitudinal dependences.
Requesting a minimum longitudinal separation angle of 80 degrees between the source active region at the Sun an the magnetic footpoint of one spacecraft observing the event we find an ensemble of 21 widespread events which were observed at least by two spacecraft. We investigate the events in a statistical manner in terms of maximum intensities, onset delays, rise times, anisotropies and correlation to other phenomena like CMEs or type II radio bursts to shed some light on the physical processes yielding such extremely large angular particle distributions. For events with sufficient anisotropies and pitch angle coverage we apply a 1D propagation model to determine the mean free path and injection function fitting these observations.

EP 11.4 Fr 12:15 HS 9

The AD 774/5 cosmic-ray event - from the Sun or a short Gamma-Ray Burst ? — •Ralph Neuhaeuser and Valeri Hambaryan — AIU, Univ. Jena, Schillergaeeschen 2, Jena

In the year AD 774/5, there was a strong short peak in 14C seen in tree rings and ices cores (Miyake et al. 2012). The energy input was 7e24 erg within up to one year. The cause remained unknown (Miyake et al. 2012), neither historic supernovae nor young nearby supernova remnants or pulsars are known for this age or year. We have shown that a short Gamma-Ray Burst in our Galaxy is consistent with all observables, including the production rate of both 14C and 10Be (Hambaryan & Neuhaeuser in press). More recently, it was also suggested by others that this event could have been due to either an impact of a comet onto the Sun or the very large solar flare of proton event. We will compare those possibilities in particular regarding the event rates and the differential production rate of 14C and 10Be. We can also speculate on possible effects of such an event on the Earth biosphere.

EP 11.5 Fr 12:30 HS 9

Spectrum of galactic and jovian electrons — •Patrick Kühl[1], Nina Dresing[1], Phillip Dunzlaff[1], Horst Fichtner[2], Jan Gieseler[1], Raul Gomez-Herrero[3,1], Bernd Heber[1], Andreas Klassen[1], Jens Kleimann[2], Andreas Kopp[1], Marius Potgieter[4], Klaus Scherer[2], and Du Toit Strauss[4] — [1]IEAP, Christian-Albrechts-Universität Kiel — [2]Theoretische Physik IV, Ruhr-Universität Bochum — [3]Universidad de Alcala, Alcala de Henares, Spain — [4]Unit for Space Physics, North-West University, Potchefstroom, South Africa

The electron intensities in the energy range from a few hundred keV to a few tenth of MeV in the inner heliosphere is determined by the intensitiy of Jovian and galactic cosmic ray electrons, with sporadic intensity increases of solar origin. In contrast to galactic cosmic rays Jovian electrons are emitted from a point source. Thus the magnetic connection of the Planet to the observer close to Earth as well as parallel and perpendicular diffusion on the propagation of these electrons is of major importance to understand the measured intensity variations. Here we discuss these variation by analysing the electron intensity near Earth as a function of the Earth's position with respect to Jupiter. I.e. Electron spectra for time series, in which jovian electrons can reach the Earth by perpendicular diffusion only and mainly by parallel diffusion are presented. By comparing these different spectra we can estimate an upper limit for the galactic cosmic ray electron spectrum in the energy range from a few hundred keV to about 10 MeV.

EP 11.6 Fr 12:45 HS 9

The role of electrons at the solar wind termination shock — Hans Joerg Fahr and •Mark Siewert — Argelander Institut für Astronomie, Universität Bonn, Auf dem Hügel 71, 53121 Bonn

Describing the solar wind termination shock as a multi-fluid MHD Rankine-Hugoniot shock structure, it is usually assumed that electrons and protons experience identical jumps in density and pressure at the plasma passage over the shock. When analysing the specific kinetic conditions for electrons and ions at this MHD shock crossing, we find that electrons react very much different from protons at their shock passage undergoing an over-adiabatic heating due to conversion of electrically induced overshoot energies into downstream thermal energies. In case of an electron-proton two-fluid plasma , electrons constitute the dominant contribution to the downstream thermal plasma pressure and thereby determine the resulting compression ratio at the shock. We show that taking this over-adiabatic electron heating into account will then deliver a correct representation of all shock data taken with VOYAGER-2.

EP 11.7 Fr 13:00 HS 9

Energetic neutral atoms from the outer heliosphere and the thickness of the heliosheath — •Martin Hilchenbach — Max-Planck-Institut für Sonnensystemforschung, Katlenburg-Lindau, Germany

The particle instrument CELIAS/HSTOF onboard SOHO is observing the energetic neutral atom (ENA) flux in the ecliptic plane since 1996. During quiet time periods, the ENA flux is well separated from the energetic ion flux, originating in the solar corona and/ or heliosphere. The instrument is capable to measure the energetic neutral hydrogen (ENH) and helium (ENHe) fluxes along the line-of-sight of the instrument field-of-view. We will discuss the neutral energetic flux measurements of hydrogen and helium in the 28 to 88 keV/n energy/mass range of CELIAS/HSTOF and the resulting thickness of the heliosheath.