EP 8: Poster Session

Zeit: Mittwoch 16:30–18:30 Raum: BSZ - Pabel HS

Brief oral introduction of Posters (2 min for each poster)

EP 8.1 Mi 17:00 BSZ - Pabel HS

GLE72 as seen by Neutron Monitors — •Christian Steigies[1], Dennis Galsdorf[1], Rolf Bütikofer[2], Athanasios Papaioannou[3], and Christos Sarlanis[4] — [1]Institut für Experimentelle und Angewandte Physik, Christian-Albrechts-Universität zu Kiel — [2]Physikalisches Institut, Universität Bern, Schweiz — [3]IAASARS, National Observatory of Athens — [4]ISNet Co, Athens

On 10 September 2017 the main sunspot group was the active region 2623. It produced a major X8.2 solar flare, which started on 15:35 UT and peaked at 16:06 UT. At that time this active region was situated at S08W88 on the Sun. The flare was further accompanied by a halo CME, which was recorded by SOHO/LASCO as well as by the STEREO coronographs. The estimated speed of the CME was 3287.6 km/sec. After 16:10 UT several ground based neutron monitors measured an increase in their counting rate caused by the arrival of solar energetic particles (SEPs) (i.e. relativistic protons). The maximum count rate increase, in the 5-minute averaged data, was about 10%. It was observed by the Dome C neutron monitor station in Antarctica. This ground level enhancement (GLE) event, on 10 September 2017 was only the second one after the event on 15 May 2012 (GLE71) in the current solar activity cycle. With the GLE Inversion software developed in the Horizon 2020 project HESPERIA (http://www.hesperia-space.eu) we try to determine the characteristics of the relativistic proton injected into the interplanetary space from the acceleration region at or near the Sun based on data of the worldwide network of neutron monitors publically available from the NMDB database (http://nest.nmdb.eu).

EP 8.2 Mi 17:00 BSZ - Pabel HS

Investigation of a Boron-doped scintillation counter — •C. Wallmann, S. Böttcher, S. Burmeister, B. Heber, and R. Wimmer-Schweingruber — Christian-Albrechts-Universität zu Kiel, Germany

Neutron detection and energy measurements in the atmosphere are a complex task. Bonner spheres as deployed on the Zugspitze are used to determine the neutron spectra. In this work an alternative using a boron-doped scintillator is investigated. The plastic scintillator used consists to one half of Hydrogen and has therefore a large cross section for elastic scattering of neutrons. The proton is accelerated and will deposit its energy in the scintillator. The boron captures the slow neutron and decays and an alpha particle is emitted that deposits a characteristic energy of 2.34 MeV in the scintillator. The time delay between the two processes is approximately 2.7μs. In order to measure incoming neutrons we trigger on signals for that the second pulse corresponds to the capture line. The first pulse then carries information about the incoming energy of the neutron.

EP 8.3 Mi 17:00 BSZ - Pabel HS

Abstract: Application of Adaptive Filtering Techniques to Measurements in the Upper Atmosphere — •Jerry Czarnecki, Dimitry Pokhotelov, Gunter Stober, and Jorge Chau — Leibniz Institut für Atmosphärenphysik, Schlossstraße 6, 18225 Kühlungsborn, Germany

Results of upper atmospheric investigations using radar wind measurements suggest the usefulness of using an adaptive filtering technique developed to separate the velocity contributions of gravity wave components from those of planetary waves and tide components. The use of traditional analyses based on Fourier or Wavelet decompositions requires the data to be continuous and evenly-spaced, presenting a challenge when relying on intermittent measurements. The adaptive technique overcomes these limitations by varying the period of the wave components to be extracted according to the oscillation period of the wave to be filtered, i.e. 24-hour or 12-hour tides, and employing a least squares technique within successive time windows to extract these wave components. This work is concerned with investigating whether such adaptive techniques can be used to separate tidal components of waves in the Mesosphere-Lower Thermosphere. A comparison of results using this method on radar data to those given by numerical models is made.

EP 8.4 Mi 17:00 BSZ - Pabel HS

Error analysis of telescope observations using Monte Carlo tests — •Stephan Schlegel and Joachim Saur — Universität zu Köln

Telescope observations of faint objects are afflicted with multiple errors, both statistical and systematical. To investigate structures on those objects, their significance has to be calculated. Since the error sources are usually correlated, the analytical forward propagation is often difficult and nontransparent. To address these problems, a Monte Carlo test for a synthetic dataset containing a superposition of two Poisson distributed signals, one for each, background and target signal, was carried out. The background field is considered to be either homogeneous or with a gradient. Furthermore, systematical errors of the detector were added. The aim of this approach is to estimate the significance of the target signal observed by the Hubble Space Telescope using processed telescope data for the Monte Carlo test algorithm including the internal error sources of the instrument. Here we focus on the comparison between commonly used analytical calculation of signal to noise ratio, which were biased by simplifications and assumptions with the newly developed Monte Carlo approach.

EP 8.5 Mi 17:00 BSZ - Pabel HS

Interpretation of solar energetic particle flux increases as measured with SEPT aboard the STEREO spacecraft in the presence of contamination — S. Wraase[1], •B. Heber[1], S. Böttcher[1], R. Bucik[2], N. Dresing[1], R. Goméz-Herrero[3], A. Klassen[1], and R. Müller-Mellin[1] — [1]Christian-Albrechts-Universität zu Kiel, Germany — [2]Georg-August-Universität Göttingen, Germany — [3]Universidad de Alcalá, Madrid, Spain

Among others, shocks are known to be accelerators of energetic charged particles. However, the acceleration efficiency and the required conditions are not fully understood and many questions remain. In particular, the acceleration of electrons by shocks is often questioned. Recurrent energetic particle events (REPE) are caused by the passage of Corotating Interaction Regions (CIRs). Measurements of the Solar Electron and Proton Telescope (SEPT) aboard STEREO are utilized to investigate the electron event on August 9, 2011. Due to its measurement principle, the magnet foil technique, ions can contribute to the electron channels. During REPEs the averaged helium to proton ratio is enhanced to more than 10% with energy per nucleon spectra following a Band function. Computations using a GEANT4 simulation of the SEPT instrument resulted in response functions for ions and electrons. These have been utilized to analyze the above mentioned event. We found that electron and ion measurements can be explained by the contribution of helium and protons with a helium to proton ratio of about 16%. Thus no electron enhancements are needed to explain the SEPT measurements.

EP 8.6 Mi 17:00 BSZ - Pabel HS

Data driven MHD model of a CME — •Beili Ying[1,2], Thomas Wiegelmann[1], and Li Feng[2] — [1]Max-Planck-Institut für Sonnensystemforschung, Justus-von-Liebig-Weg 3, D-37077, Göttingen, Germany — [2]Key Laboratory of Dark Matter and Space Astronomy, Purple Mountain Observatory, Chinese Academy of Sciences, 210008 Nanjing, China

Improved knowledge of the physical conditions (electron temperatures Te, densities Ne and mass flow velocities V_{flow}) of coronal mass ejections (CMEs) is critical to the development of an understanding the physical mechanism transport of mass, momentum and energy. The HI Lyα line provides one of the primary tools for studying the upper corona. Here, we utilize self-similar magnetohydrodynamic (MHD) simulations to model a CME. In this model we combine a MHD solar wind model with the Gibson-Low flux rope model. Making use of the results (Te, Ne, V_{flow}) obtained from the MHD simulation, we compute symthetic HI Lyα images, showing the intensity I_{MHD} of the CME. Further, we can determine different parameters (Te, V_{flow}) of the observed CME from a comparison between I_{MHD} and the coronagraphic observations of the HI Lyα intensity (supplied by the LST instrument on board the future ASO-S mission of China and the Metis instrument on board the ESA-Solar Orbiter mission).

EP 8.7 Mi 17:00 BSZ - Pabel HS

Magneto-static modelling from Sunrise/IMaX — •Thomas

Wiegelmann[1], Thomas Neukirch[2], Dieter Nickeler[3], Sami Solanki[1,4], and Sunrise Team[1] — [1]Max-Planck-Institut für Sonnensystemforschung, 37077 Goettingen — [2]School of Mathematics and Statistics, University of St. Andrews, UK — [3]Astronomical Institute, AV CR, Fricova 298, 25165 Ondrejov, Czech Republic — [4]School of Space Research, Kyung Hee University, Yongin, Gyeonggi, 446-701, Republic of Korea

Our motivation is modelling the interface region between solar photosphere and corona. We extrapolate Sunrise/IMaX photospheric magnetic field measurements upwards into the chromosphere and corona. A problem is that the interface layer is very complex. Relative importance of magnetic and plasma forces vary over several orders of magnitude. In the magneto-static approach the Lorentz-force is compensated by the plasma pressure gradient force and the gravity force.

EP 8.8 Mi 17:00 BSZ - Pabel HS

PAMIS: A Partially Multiplexed High Resolution Imaging Spectrometer — •Adalbert Ding[1,2] and Shadia Rifai Habbal[3] — [1]Institut für Technische Physik, Berlin — [2]Institut für Optik und Atomare Physik, Technische Universität Berlin — [3]Institute for Astronomy, University of Hawaii, USA

A multi-channel partially multiplexed spectrometer (PAMIS) has been developed for the investigation of sparse spectra as they are typical for emission and absorption processes in the Sun and it's corona. The analysed object is imaged onto a slit mirror (a mirror where a slit-like portion has been removed by laser ablation) the image being monitored by a separate camera. Light transmitted through this slit is then analysed by the PAMIS spectrometer. The spectrometer separates the incoming light into different broad spectral regions with the use of multi-layer dichroic mirrors in combination with colour cut-off and band filters. The output from each of these channels is then analysed by a an echelle gratings (one for each channel) operated in higher - typically 40th to 60th - order thus obtaining a resolution between 15000 and 20000 for slit sizes of 50 micron. Each spectral line appears several times in the spectrum in different order, the separation of the lines being a function of wavelength. Due to the well defined positions of each of these higher order lines a unique assignment is possible for at least 200 lines in each channel. Data taken by a 2-channel and a 3-channel PAMIS will be shown which have been collected during the 2015 and the 2017 total Solar eclipses. Data reduction techniques will be discussed.

EP 8.9 Mi 17:00 BSZ - Pabel HS

A regularised full-Newton VARPRO iteration for the stereoscopic reconstruction of loops in EUV images — Bernd Inhester[1] and •Iulia Chifu[1,2] — [1]Max Planck Institute for Solar System Research,Goettingen,Germany — [2]Astronomical Institute of Romanian Academy, Bucharest,Romania

The reconstruction of bright coronal loops from stereo pairs of EUV images is considered an important tool to disentangle the complex 3D topology of the coronal magnetic field. Reconstructed loops have been used in different cases for the study of the magnetic field topology. Also, stereoscopically reconstructed prominences when seen as arch-like structures have been used in the determination of the CME kinematics.

For the stereoscopic reconstruction one must follow two steps. First step is the tie-pointing of the same loop structure in each of the pair images. In this work, we present a reconstruction approach which takes care of the second step which is stereoscopic inversion. The procedure can take the placed tie-points from an image pair and calculate a spline-based approximation of the 3D loop shape from them. A preliminary version of our procedure has already been applied to observed image data in several cases. The work we present now is more robust since is using precise projective geometry for the image projection and can systematically be extended to any number of view directions.

EP 8.10 Mi 17:00 BSZ - Pabel HS

Reproducibility of a given anisotropic power spectrum using single- and multi-spacecraft analysis methods — •Marc Kreger, Supratik Banerjee, and Joachim Saur — Department of Geophysics and Meteorology, University of Cologne, Germany

The anisotropy of solar wind turbulence is often investigated in terms of the magnetic power spectra. For single spacecraft data, the power spectra is calculated using the wavelet transform technique whereas in the case of multi-spacecraft data, the power spectral indices are calculated indirectly through the scaling relations of structure functions. Our main objective is to compare those two methods using artificial/ synthetic data. The present study concentrates on the synthetic data which are generated for a given critically balanced power spectrum which contains power on MHD scales representing Alfvenic fluctuations (Goldreich & Sridhar,1995).

Here we follow the methodology of (Klein et al., 2012). For a known power law, we calculate the magnetic power spectrum. Then by taking the Fourier transform of its square-root, we generate the magnetic field data. The field components are attributed phases which are consistent with the divergence-free condition of the magnetic field and for simplicity we assume axisymmetry. In future, this data will be applied to obtain a power spectrum and its anisotropy based on the synthetic spacecraft data.

EP 8.11 Mi 17:00 BSZ - Pabel HS

Electron acceleration by turbulent plasmoid reconnection — •Xiaowei Zhou[1,2], Jörg Büchner[1], Fabian Widmar[3], and Patricio Munoz[1] — [1]MPI for Solar System Research, Göttingen, Germany — [2]Purple Mountain Observatory, Nanjing, China — [3]CEA, IRFM, France

In space and astrophysical plasmas, e.g., in planetary magnetospheres, energetic electrons are often found near current sheets (CSs). The observation of CSs hints at electron acceleration by magnetic reconnection. In this study, we aim to investigate electron acceleration by turbulent plasmoid reconnection via test particle guiding center calculations together with MHD simulations. In order to avoid to resolve scales beyond the grid resolution of MHD simulations, a mean-field turbulence model is used to describe the turbulence in the sub-grid scales and their effects on the grid-scale dynamics via turbulent electromotive force(EMF). In particular, the mean-fields model we consider in this study describes the turbulent EMF as a function of the mean values of current density, vorticity, magnetic field as well as of the energy, cross-helicity and residual helicity of the turbulence. We found that, around X-points of turbulent reconnection, localized strong EMFs cause enhanced electron acceleration and energetic electrons following power-law spectra. Magnetic-field-aligned EMFs, caused by the turbulence, dominate the electron acceleration process. Scaling the acceleration processes to parameters of, e.g., the Hermean magnetotail, electron energies up to 60 keV can be reached out of the thermal plasma.