EP 9: Sonne und Heliosphäre II

Zeit: Freitag 9:30–11:00 Raum: HS 9

EP 9.1 Fr 9:30 HS 9

Can magnetic reconnection in the quiet Sun heat the chromospheric and coronal plasma? — •Thomas Wiegelmann[1], Sami Solanki[1], Juan Borrero[2], Hardi Peter[1], and and the Sunrise Team[1] — [1]MPI fuer Sonnensystemforschung — [2]Kiepenheuer-Institut fuer Sonnenphysik

We extrapolate a 22-minute long time series of photospheric magnetic field measurements from the balloon-borne Sunrise/IMaX instrument into the upper solar atmosphere. Using the extrapolated 3D magnetic-field lines as tracer, we investigate the temporal evolution of the magnetic connectivity in the quiet Sun's atmosphere. The majority of magnetic loops are asymmetric in the sense that the photospheric field strength at the loop footpoints is very different. We find that the magnetic connectivity of the loops changes rapidly with a typical connection recycling time of about 3 minutes in the upper solar atmosphere and 12 minutes in the photosphere. This is considerably shorter than previously found. Nonetheless, our estimate of the energy released by the associated magnetic-reconnection processes is not likely to be the sole source for heating the chromosphere and corona in the quiet Sun.

EP 9.2 Fr 9:45 HS 9

Coronal active region modeling based on SDO data — •Stephan Barra[1,2], Thomas Wiegelmann[1], and Horst Fichtner[2] — [1]MPI für Sonnensystemforschung, Katlenburg-Lindau — [2]Ruhr-Universität Bochum, Lehrstuhl f. Theor. Weltraum- u. Astrophysik

The heating of the solar corona, which has a temperature of order of 10^6 K compared to 5000K in the photosphere, is yet a puzzling problem.

Several models to describe the physical parameters, e.g. temperature or density, along coronal loops with different assumptions for the relevant physical processes (like wave damping) were suggested in the past, for example the RTV78 model by Rosner, Tucker and Vaiana. With these models and the knowledge of the 3D configuration of the magnetic field above an active region it is possible to calculate the radiation emitted by the coronal loops above this region. This 3D field configuration is provided for an active region with the help of a nonlinear force free field optimization code from photospheric SDO/HMI vector magnetograms as boundary conditions.

We use this field to model the plasma along these loops with the RTV78 model and create artificial coronal images in different wavelength, which we compare with images obtained with the multispectral imager SDO/AIA. Such comparisons allow us to evaluate the quality of our model approach.

EP 9.3 Fr 10:00 HS 9

Kinetic Simulations of Nonlinear Wave Interactions in Type II Bursts — •Urs Ganse[1], Felix Spanier[2], Patrick Kilian[2], and Rami Vainio[1] — [1]Department of Physics, University of Helsinki, Finland — [2]Lehrstuhl für Astronomie, Universität Würzburg

Type II radiobursts are commonly accepted to originate from CME- and flare driven shocks, with observational evidence of electron beam populations in the purported emission regions. Using the kinetic particle-in-cell code ACRONYM, we have investigated nonlinear wave interaction processes in CME foreshock regions in presence of electron beams. Focus lay on the quantitative analysis of wave kinematics: excitation of electrostatic waves by the electron beams and and nonlinear coupling to tranverse magnetic modes can be observed in the simulation data. By varying parameters of the background plasma, the emission process at low and high heliocentric distances have been compared, and found to be very similar despite a significant difference in density and magnetization.

EP 9.4 Fr 10:15 HS 9

Shock accelerated electrons in the solar corona — •Mann Gottfried, Braune Stephan, and Aurass Henry — Leibniz-Institut für Astrophysik Potsdam, Potsdam, Germany

In the solar corona, shocks are generated either by flares or by coronal mass ejections. They appear as type II bursts in dynamic spectra of the solar radio radiation. The energetic electrons are regarded to be generated by shock drift acceleration resulting in the production of beams of energetic electrons in the upstream region. These electrons excite Landmuir waves, which convert into escaping radio waves as observed as type II radio bursts. The aim of this talk is to discuss, what can we learn from both observations and theory for a better understanding of shock acceleration of electrons in the solar corona. In result, a consistent picture of type II radio bursts and the associated shocks are obtained by this study.

EP 9.5 Fr 10:30 HS 9

On the heating and acceleration of the solar wind due to modified plasma wave spectra — Bidzina Shergelashvili and •Horst Fichtner — Ruhr-Universität Bochum, Institut für Theoretische Physik IV, Universitätsstrasse 150, 44780 Bochum

A new aspect of the turbulent heating and acceleration of the solar wind is investigated. A physical meaning of the lower boundary of the Alfven wave turbulent spectra in the solar atmosphere and the solar wind is studied and its significance is demonstrated. Via an analytical and quantitative treatment of the problem we show that a truncation of the wave spectra from the lower frequency side, which is a consequence of the solar magnetic field structure and its cyclic changes, results in a significant reduction of the heat production and acceleration rates, particularly at low heliographic latitudes being consistent with slow solar wind emanating from these regions.

EP 9.6 Fr 10:45 HS 9

Helicity transport in a simulated coronal mass ejection — •Norbert Seehafer[1] and Bernhard Kliem[1,2] — [1]Institut für Physik und Astronomie, Universität Potsdam, Karl-Liebknecht-Str. 24/25, 14476 Potsdam, GERMANY — [2]Mullard Space Science Laboratory, University College London, Holmbury St. Mary, Dorking, Surrey, RH5 6NT, UK

It has been suggested that coronal mass ejections (CMEs) remove the magnetic helicity of active regions from the Sun. Such removal is often regarded to be necessary due to the hemispheric sign preference of the helicity, which inhibits a simple annihilation by reconnection between volumes of opposite chirality. We have monitored the relative magnetic helicity contained in the coronal volume of a simulated flux rope CME, as well as the upward flux of helicity through a horizontal plane in the simulation box, both based on exact new expressions for the computation of the relative helicity from the magnetic field in the box. The unstable and erupting flux rope carries away only part of the initial helicity through the open upper boundary; the larger part remains in the volume. We suggest a simple physical explanation for this result and perform a parametric study of the helicity shedding in our CME model.