EP 3 Transport energetischer Teilchen

Zeit: Samstag 09:15–11:15 Raum: TU BH349

EP 3.1 Sa 09:15 TU BH349

Ulysses EPAC and KET observations of Jovian electron jets during the distant Jupiter encounter — •B. Heber[1], N. Krupp[2], L. Rodriquez[2], and H. Kunow[3] — [1]Fachbereich Physik, Universität Osnabrück, Barbarastr. 7, 49076 Osnabrück — [2]Max Planck Institute for Solar System Resarch, 37191 Katlenburg-Lindau — [3]Institut für Experimentelle und Angewandte Physik der Christian-Albrechts-Universität Kiel, 24118 Kiel

The Energetic PArticles Composition instrument (EPAC) consists out of four detector heads and was designed to provide information on the flux, anisotropy and chemical composition of energetic particles in interplanetary space. During the mission it became evident that important informations about a few hundred keV electrons can be extracted from the four telescopes. The COSPIN/KET experiment on-board Ulysses has been monitoring the flux of 3-20 MeV electrons in interplanetary space since the launch in October 1990. Between 1 and 10 AU Jovian, and galactic particles contribute continously to the few-MeV electron intensities. During it's recent descend to low latitudes the Ulysses spacecraft approached the planet Jupiter within 1 AU. However, in addition to the average intensity level well accounted for by diffusion, we report about very short duration electron events, which are called Jovian electron jets, characterized by: (i) a sharp increase and decrease of flux: (ii) a spectrum identical to the electron spectrum in the Jovian magnetosphere; and iii) a strong anisotropy. We compare our results with similar events, observed during the Jovian flyby in 1992.

EP 3.2 Sa 09:30 TU BH349

Zeitabhängige 3-D Modellierung der Ulysses/KET-Beobachtungen von Jupiterelektronen — •Dennie Lange und Horst Fichtner — Institut für Theoretische Physik IV: Weltraum- und Astrophysik, Ruhr Universität Bochum

Auf der Basis eines dreidimensionalen Modells zur Beschreibung der Modulation kosmischer Strahlung in der Heliosphäre werden erstmals die mit dem Kiel Electron Telescope (KET) an Bord der Raumsonde Ulysses gemachten Messungen energetischer Elektronen über einen vollen solaren Aktivitätszyklus zeitabhängig simuliert. Im Rahmen der Simulationen werden zwei Modelle für das mit der solaren Aktivität variablen Geschwindigkeitsfeldes des Sonnenwindes getestet, und unter Verwendung eines jüngst vorgeschlagenen, entsprechend variierenden anisotropen Diffusiontensors wird untersucht, was über eine in der Literatur diskutierte Variabilität der Quellstärke der Jupiterelektronen aus den KET-Beobachtungen geschlossen werden kann.

EP 3.3 Sa 09:45 TU BH349

Linear and Nonlinear Theories of Cosmic Ray Transport — •Andreas Shalchi — Theoretische Physik IV,Ruhr-Universität Bochum

The transport of charged cosmic rays in plasmawave turbulence is a modern and interesting field of research. We are mainly interested in spatial diffusion parallel and perpendicular to a large scale magnetic field. During the last decades quasilinear theory was the standard tool for the calculation of diffusion coefficients. Through comparison with numerical simulations we found several major problems of transport theory. I will demonstrate that new nonlinear theories which were proposed recently can solve at least some of these problems.

EP 3.4 Sa 10:30 TU BH349

Kinetic aspects of coronal heating — •Eckart Marsch — Max-Planck-Institut für Sonnensystemforschung

In order to understand coronal heating, the microphysics of the dissipation at small scales of various forms of mechanical, electric and magnetic energy (contained in waves, turbulence and nonuniform flows and currents) must be addressed. In fluid treatments this difficult problem is often circumvented by enhancing artificially the dissipation, e.g. through an increase of the collision rates for the tenuous corona, and by lowering thus the Reynolds number by many orders of magnitude. We critically discuss the basic assumptions underlying collisional transport theory and the related heating rates, and briefly describe collisionless alternatives. We elucidate some kinetic aspects of coronal heating in association with resonant excitation and damping of plasma waves, and discuss instabilities that are typically found in the solar wind and expected to occur in the corona.

EP 3.5 Sa 10:45 TU BH349

Beschleunigung und interplanetare Ausbreitung energetischer Eisenionen in impulsiven solaren Ereignissen — •Wolfgang Droege[1], Julia Kartavykh[2], Berndt Klecker[3], Eberhard Möbius[4] und Mark A. Popecki[4] — [1]Bartol Research Institute, University of Delaware, Newark, DE 19716 USA — [2]Ioffe Physical-Technical Institute, St. Petersburg 194021, Russia — [3]Max-Planck-Institut für extraterrestrische Physik, 85741 Garching, Germany — [4]Department of Physics and EOS, UNH, Durham, NH 03824, USA

Neuere Messungen der Ladungszustände schwerer Ionen nach impulsiven solaren Ereignissen mit den Experimenten SEPICA auf ACE und CELIAS auf SOHO haben einen signifikanten Anstieg der mittleren Ionenladung von Fe als Funktion der Energie im Bereich von 0.01 - 0.55 MeV/n gezeigt. Wir untersuchen die Auswirkungen von Transportprozessen im Sonnenwind auf die oben genannten Beobachtungen. Die Transportgleichung unter Berücksichtigung der Effekte von Pitchwinkelstreuung, adiabatischer Dezeleration und Konvektion wird mit Hilfe einer Monte-Carlo-Methode gelöst und die Verteilungsfunktionen der von der Sonne emittieren Eisenionen rekonstruiert. Ein Vergleich der Beobachtungen mit Modellrechnungen zur Beschleunigung unter Berücksichtigung von Coulomb-Wechselwirkungen und Ladungstausch liefert Informationen über die Parameter Dichte und Temperatur in der Beschleunigungsregion, sowie über die Zeitskalen des Beschleunigungsprozesses.

EP 3.6 Sa 11:00 TU BH349

Electron halo and strahl formation in the solar wind by resonant interaction with whistler waves — •Christian Vocks and Gottfried Mann — Astrophysikalisches Institut Potsdam, An der Sternwarte 16, 14482 Potsdam

Observations of solar wind electron velocity distribution functions (VDFs) reveal considerable deviations from a simple Maxwellian VDF. A thermal core and a suprathermal halo and anti-sunward, magnetic field-aligned beam or "strahl" can be distinguished. A kinetic model of the electrons in the solar corona and wind is presented that includes resonant interaction between electrons and whistler waves. The resonance condition with anti-sunward propagating whistler waves can only be fulfilled by sunward moving electrons, and vice versa. Anti-sunward propagating whistlers can accelerate suprathermal electrons significantly in the solar corona. In interplanetary space, the escaping electrons lead to an enhancement of suprathermal electron fluxes above the core flux, in agreement with observations. But the magnetic mirror force focuses these electrons into an extremely narrow beam that is not confirmed observationally. Thus, a diffusion mechanism for anti-sunward moving electrons must exist. Sunward propagating whistler waves can provide this diffusion. Their wave power is estimated as a small fraction of the total wave power that is measured in interplanetary space. The kinetic results show that the whistler waves are capable of influencing the solar wind electron VDFs significantly, leading to the formation of both the halo and strahl populations, and a more isotropic distribution at higher energies, in good agreement with solar wind observations.