EP 7: Planets and small Objects I

Time: Thursday 11:00–12:30 Location: H-HS VIII

Invited Talk EP 7.1 Thu 11:00 H-HS VIII

Juno observations of Jupiter's aurora: Wave-particle Interaction in Jupiter's stressed magnetosphere — •Joachim Saur — University of Cologne, Germany

Observations by NASA's Juno spacecraft which is in a polar orbit around Jupiter have revolutionized our understanding of Jupiter's aurora. In our talk we will review particle and field measurements taken by the Juno spacecraft above Jupiter's main auroral oval and within the auroral tails of Jupiter's Galilean moons. We will show that wave-particle interactions of Alfvén waves plasma plays a crucial role in particle energization within Jupiter's magnetosphere. The radial transport of plasma outward from Io's orbit causes the magnetospheric plasma to sub-corotate, which generates large scale magnetic stresses that couple the magnetosphere to the ionosphere. These stresses are the root cause for the reacceleration of the magnetospheric plasma towards corotation. The magnetic stresses also include small scale, non-force balanced magnetic field fluctuations, which partly travel as Alfvén waves along Jupiter's magnetospheric field lines. We show that wave-particle interaction of these Alfvén waves occurs within distances of approximately L= 30 dominantly at high latitudes leading to auroral electron acceleration.

EP 7.2 Thu 11:30 H-HS VIII

MHD-Simulation of Io's Alfven Wings — •Stephan Schlegel and Joachim Saur — Institut für Geophysik und Meteorologie, Universität zu Köln

The electromagnetic interaction between Jupiter and its innermost Galilean moon Io is a prime example for moon-planet and star-planet interaction. A very striking feature is the Io Foot Print (IFP) in Jupiter's upper atmosphere.

With the Juno spacecraft orbiting Jupiter, new insights about the complex structure of the IFP have been achieved which can not be fully explained by the current models. A deeper understanding is necessary to explain current observations. For that purpose a simulation of the system with the single fluid MHD-Code Pluto is set up to analyse the effects of different aspects of the interaction. In this ongoing study, parameters like the density profile along the flux tube and the assymetry and substructure of Io's ionosphere are investigated.

EP 7.3 Thu 11:45 H-HS VIII

TRIPLE-IceCraft - A Retrievable Melting Probe for Transporting Scientific Payloads — •Dirk Heinen[1], Lutz Deriks[1], Christopher Wiebusch[1], Simon Zierke[1], Clemens Espe[2], Marco Feldmann[2], Gero Francke[2], and Lars Schickendanz[2] — [1]RWTH Aachen University, III. Physikalisches Institut, Templergraben 55, 52056 Aachen — [2]GSI - Gesellschaft für Systementwicklung und Instrumentierung mbH, Liebigstraße 26, 52070 Aachen

Within TRIPLE, initiated by the DLR Space Administration, Technologies for Rapid Ice Penetration and subglacial Lake Exploration are being researched. The TRIPLE scenario is divided into three components and aims to explore the subglacial ocean of the Jovian moon Europa. The first component is a melting probe which penetrates the icy shield and navigates to the ocean below. It anchors itself at the ice water boundary and releases the second component into the water: The nanoAUV, a small autonomous submarine, will explore the ocean, identify points of interests and take samples. The samples will be transported back to the melting probe and then processed and analysed by the AstroBioLab, the third component. We present the concept of the TRIPLE-IceCraft, a melting probe which is currently in development. It will be a modular bus system for transporting standardized payloads through ice. The current design will be suitable for the transport of a scientific payload through several hundred meters of ice penetrating into a subglacial ocean or lake and return later to the surface. For the demonstration the TRIPLE-IceCraft aims for an analog scenario at the Ekström Ice Shelf in Antarctica in 2022.

EP 7.4 Thu 12:00 H-HS VIII

Das MPO-MAG Magnetometer auf dem Weg zum Merkur — •Daniel Heyner — TU Braunschweig, Institut für Geophysik und extraterrestrische Physik, Mendelssohnstr. 3, 38106 Braunschweig

BepiColombo ist auf dem Weg nach Merkur. Der Messausleger mit den Magnetometern (MPO-MAG-Instrument) wurde am 25. Oktober 2018 im Weltraum ausgeklappt. Dadurch wurden die magnetischen Störungen, die vom Raumfahrzeug ausgehen, stark verringert. Seitdem messen die Fluxgate-Sensoren kontinuierlich das Sonnenwindmagnetfeld. Umfangreiche Kalibrierungs- und Datenverarbeitungsaktivitäten haben es uns ermöglicht, die Stärke der von Raumfahrzeugen erzeugten Störungen erheblich zu senken. Diese Aktivitäten sind ein wichtiger Schritt vor der weiteren wissenschaftlichen Analyse. Wir stellen einige Fälle magnetischer Störungen vor und diskutieren die Auswirkungen auf die Hauptfeldbestimmung vom Planeten Merkur. Wir vergleichen auch MPO-MAG-Messungen mit Beobachtungen vom Sonnenwindmonitor Advanced Composition Explorer. Wir schließen mit einem Überblick über die wissenschaftlichen Ziele des Instrumententeams für die In-Orbit-Missionsphase.

EP 7.5 Thu 12:15 H-HS VIII

Laboratory studies on laser-induced plasma shockwaves for LIBS measurements on Mars — •Fabian Seel[1,2], Susanne Schröder[1], David Vogt[1], Peder Hansen[1], and Michael Gensch[1,2] — [1]Institut für Optische Sensorsysteme, DLR, Berlin, Germany — [2]IOAP, TU Berlin, Germany

With the upcoming launch of the NASA Mars 2020 rover, a new mobile laboratory will be on the way to Mars. The rover will carry the sensor suite SuperCam, combining different spectroscopic methods to study the composition of geological samples at the rover's landing site. One of the applied methods is laser-induced breakdown spectroscopy (LIBS). For the first time, the rover will also carry a microphone to detect audible signals from Mars, which can also be used to improve the analysis of the LIBS measurements [*Space Sci. Rev.* 2012, 170:167-227., *Spectroscopy* 2017, 32.]. When taking a LIBS measurement, a pulsed laser is used to generate a plasma that can be analysed spectroscopically. An acoustic wave is emitted from the pressure shock of the expanding plasma plume that can be recorded to gain insight into material properties and laser-matter interaction [*Spectrochim. Acta B* 2019, 153:50-60., *EPSC* 2017, #239]. The laser-induced plasma in experimentally simulated Martian atmospheric conditions is studied with temporally and spatially resolved spectra. We investigate the plasma and its shockwave for applications on Mars in particular to link the acoustic signal to the LIBS spectral features [*LPSC* 2019 #2793]. First results will be presented here.