EP 8: Planets and Exoplanets

Zeit: Donnerstag 14:15–16:00 Raum: HS 19

Hauptvortrag EP 8.1 Do 14:15 HS 19

Mercury, the Innermost Planet: State of Knowledge and Prospects for the BepiColombo Mission — •Hauke Hussmann — DLR Institute of Planetary Research, Berlin, Germany

After its successful launch on Oct 20 2018, ESA's BepiColombo mission is on its way to Mercury the innermost planet of the solar system. Mercury is an intriguing planetary object with respect to its dynamical state and evolution. The planet is differentiated and contains a large iron core overlain by a relatively thin silicate mantle and crust. Mercury is locked in a unique 3:2 spin-orbit coupling (three rotations around its axis equal two revolutions about the sun), and its intrinsic magnetic dipole field tells us that at least part of Mercury's iron core is liquid. From libration measurements (small periodic changes in the planet's spin-rate) it has been concluded that Mercury's outer core is liquid, decoupling the silicate mantle from the deep interior. Phases of global contraction and phases of volcanic activity constrain the thermal evolution of the planet. Here the current knowledge on the evolution of Mercury, focusing on its dynamical, rotational and orbital state is summarized. Prospects for investigations with BepiColombo and its various instruments will be discussed.

EP 8.2 Do 14:45 HS 19

Analysis of JUNO-observed Pitch Angle Spectra of heavy Ions in Jupiter's Middle Magnetosphere — •Michael Schöffel[1], Joachim Saur[1], Barry Mauk[2], and George Clark[2] — [1]Institut für Geophysik und Meteorologie, Universität zu Köln, Köln, Deutschland — [2]Applied Physics Laboratory, The Johns Hopkins University , Laurel, Maryland, USA

Here we analyze He, S, O and H ions measured by the JEDI instrument in the energy range from (60 to 1350) keV, (486 to 10.000) keV, (370 to 10.000) keV and (30 to 2600) keV, respectively, at rotational equator crossing distances to Jupiter between 30 - 100 R_J. We study how the energy and pitch angle spectra of these ions change inside and outside the current sheet and look at their radial and latitudinal dependency. A prime objective is to investigate the energization mechanism of the heavy ions observed in the middle magnetosphere that heats up ions to much higher temperatures than expected for an adiabatic process. We further use the JUNO data to estimate the thickness of Jupiter's current sheet.

EP 8.3 Do 15:00 HS 19

Mapping the Brightness of Ganymede's UV Aurora using HST STIS Observations — •Alexander Marzok[1], Joachim Saur[1], Denis Grodent[2], and Lorenz Roth[3] — [1]University of Cologne, Institute for Geophysics and Meteorology — [2]University of Liège, Institute for Astrophysics and Geophysics — [3]KTH Institute of Technology, Department of Space and Plasma Physics

Ganymede is the only known moon in the solar system with an intrinsic magnetic field and two auroral ovals around its magnetic north and south poles. In this work we analyze Hubble Space Telescope (HST) observations of Ganymede at OI 1356 Å to study the structure of its auroral ovals. Our aim is to combine HST observations from various epochs to generate a brightness map of Ganymede's two auroral ovals. Charged particles from Jupiter's magnetosphere can not excite the brightest emissions of 300 R only from the reported electron temperatures, but need to be accelerated due to magnetic reconnection happening between the magnetic field lines of Jupiter and Ganymede. The sub-alfvénic speed of the charged particles makes the Ganymede system different compared to the planets in the solar wind because no bow shock is formed, resulting in a non-turbulent environment that is ideal to study the phenomenon. Our created map is intended to serve as a diagnostic tool helping to investigate the process of magnetic reconnection responsible for the emissions and structure of the aurora.

Hauptvortrag EP 8.4 Do 15:15 HS 19

The Impact of Space Weather on the Atmosphere of Proxima Centauri b — •Vanessa Schmidt and Miriam Sinnhuber — Karlsruhe Institute of Technology, Institute of Meteorology and Climate Research, Hermann-von-Helmholtz-Platz 1, 76344 Eggenstein-Leopoldshafen, Germany

Proxima Centauri is an M-dwarf star and the Sun's nearest stellar neighbor. It is orbited by a planet within its habitable zone at a distance of approximately 0.05 AU. Due to the planet's close proximity to its host star and the comparatively high stellar activity of Proxima Centauri, it is subjected to stellar energetic particles fluxes many times higher than those received on Earth - with potentially considerable implications for the planet's atmosphere.

In our work, we study the interaction of ionizing radiation with the atmosphere of Proxima Centauri b in order to quantify the impact of stellar radiation on molecules influenced by biogenic processes such as ozone, nitrous oxide, and methane. Using a 1-dimensional stacked box column model of the neutral and ionized atmosphere, we can obtain the production rates of several important neutral species, which allows us to determine the long time effect of stellar activity on the atmospheric concentrations of bioindicators.

This research is a joint operation between the University of Kiel, the Technical University Berlin and the Karlsruhe Institute of Technology and funded by the DFG.

EP 8.5 Do 15:45 HS 19

Time-variable Star-Planet Interaction in the TRAPPIST-1 system — •Christian Fischer and Joachim Saur — Institut für Geophysik und Meteorologie, Universität zu Köln, Köln, Deutschland

Star-planet interaction (SPI) describes the electromagnetic coupling of an exoplanet to its host star. Due to the bright intrinsic emissions of stars SPI is difficult to observe. Accordingly there is no entirely convincing observational evidence for SPI so far. Therefore we present different mechanisms that cause time-variability in SPI and allow to identify related signals as of planetary origin. We chose the TRAPPIST-1 system as an example to apply our findings and show that there are hints of SPI in existing observations of the system.