EP 15: Planeten und kleine Körper II

Time: Thursday 10:30–12:30 Location: V55.02

Invited Talk EP 15.1 Thu 10:30 V55.02

Herschel solar system observations: latest results — •Paul Hartogh — Max-Planck-Institut für Sonnensystemforschung, Katlenburg-Lindau, Germany

The HssO (Herschel solar system Observations) program aims at determining the distribution, the evolution and the origin of water in Mars, the outer planets, Titan, Enceladus and comets, using the three Herschel instruments HIFI, PACS and SPIRE. It addresses the broad topic of water and its isotopologues in planetary and cometary atmospheres. The nature of cometary activity was investigated by studying water excitation in a sample of comets. The D/H ratio, the key parameter for constraining the origin and evolution of Solar System materials, was determined for the first time in a Jupiter family comet. A comparison with measurements of D/H in Oort cloud comets constrains the composition of pre-solar cometary grains and evolution of the protosolar nebula. New measurements of D/H in giant planets, similarly constraining the composition of proto-planetary ices, will be obtained. The D/H and other isotopic ratios, diagnostics of the evolution of the Mars atmosphere, were accurately measured in H2O and CO. The role of water vapour in the atmospheric chemistry of Mars will be studied by monitoring vertical profiles of H2O and HDO and by searching for several other species. A detailed study of the source of water in the upper atmosphere of the giant planets and Titan is in progress. By monitoring the water abundance and input fluxes in the various objects, and with the help of mapping observations, we will discriminate between the possible sources of water in the outer planets.

Invited Talk EP 15.2 Thu 11:00 V55.02

Giant planets and their radio phenomena — •Helmut O. Rucker — Space Research Institute, Austrian Academy of Sciences, 8042 Graz, Austria

Novel findings of the Cassini Radio and Plasma Wave Science experiment on the Saturn Kilometric Radiation (SKR), in particular the enigma of the variability of Southern and Northern Saturn hemispheric SKR periodicities, will be addressed. Another highlight of recent discoveries is a new type of periodicity found in the Jovian decametric radio emission (DAM), potentially attributed to specific plasma configurations in the Io plasma torus. And the stereoscopic view of both NASA STEREO spacecraft for the first time enables the unambiguous determination of the origin of radio emission and, in the case of Jupiter DAM their conical beam structure.

The general overview of giant planets radio phenomena will be rounded off by a short introduction in spacecraft radio antenna calibration methods in order to minimize any inherent error in radio data analysis.

EP 15.3 Thu 11:30 V55.02

New type of periodic bursts of Jovian non-Io DAM and its relation to interchange instability in the Io plasma torus — •M. Panchenko[1], H.O. Rucker[1], and W.M. Farrell[2] — [1]Space Research Institute, Austrian Academy of Sciences, Graz, Austria — [2]NASA Goddard Space Flight Center, Greenbelt, Maryland, USA

The radio instruments onboard Cassini, Wind and STEREO spacecraft have recorded a new type of the periodic radio bursts of the Jovian decametric radio emission (DAM). These bursts, which are attributed to the non-Io component of DAM, are observed in a decametric frequency range of dynamic spectra as a series of reoccurring arc-like radio bursts with a period ~1.5% longer than the rotation rate of the planet's magnetosphere. The stereoscopic multispacecraft observations have shown that the radio sources of the periodic bursts radiate in a non-axisymmetric hollow cone-like pattern and sub-corotate with Jupiter, being active during several Jupiter rotations. In this study we investigate the relations between the occurrence of the non-Io DAM periodic bursts and VLF components of the Jovian radiation and solar wind activity at Jupiter. We discuss that the sources of the non-Io DAM periodic bursts which are located in the auroral regions of the Jovian magnetosphere may be connected with the ends of plasma fingers in the Io torus. These latitudinal extended and nearly sub-corotating plasma fingers can be developed in course of the strong interchange instability which may operate along the outer Io torus edge. The interchange instability in the Io plasma torus can be triggered by the strong solar wind impulses.

EP 15.4 Thu 11:45 V55.02

On the arc shapes of the SKR saturnian emission — Mohammed Boudjada[1], Patrick Galopeau[2], and •Helmut Rucker[1] — [1]Space Research Institute, Austrian Academy of Sciences, Graz, Austria — [2]Université Versailles St-Quentin; CNRS/INSU, LATMOS-IPSL, Guyancourt, France

The Cassini Radio and Plasma Wave Science Experiment (RPWS) revealed prominent arcs when the data are displayed in time-frequency coordinates, in the so-called dynamic spectra. We show that the Saturnian Kilometric Radiation (SKR) presents different kinds of characteristic appearances like arc structures. Those arcs may be classified in two sets: the vertex early arcs (VEA) and the vertex late arcs (VLA). The arcs of the first group set open toward increasing time, while the arcs of the other one open towards decreasing time. Those arcs are observed in the frequency range between 80 kHz and 1 MHz. We investigate the possible dependence on the Cassini observational parameters like the distance to the planet, the local time and the spacecraft latitude. Similar VEA and VLA arc structures have been reported in the case of the Jovian hectometric (HOM) and decametric (DAM) radio emissions. In this contribution, we emphasize on the common and unusual arc features by comparing the auroral emissions related to Jupiter and Saturn.

EP 15.5 Thu 12:00 V55.02

Turbulente Fluktuationen in der Magnetosphäre des Saturn — •Michael von Papen[1], Joachim Saur[1] und Olga Alexandrova[2] — [1]Institut für Geophysik und Meteorologie, Universität zu Köln, Deutschland — [2]LESIA, Observatoire de Paris, CNRS, UPMC, Université Paris Diderot, France

Wir analysieren die statistischen Eigenschaften der Magnetfeldfluktuationen, die von der Raumsonde Cassini in der Magnetosphäre des Saturn im Bereich von 6.5-15 Saturnradien gemessen wurden und untersuchen diese im Rahmen der Wellenturbulenz. In den Powerspektren der Fluktuationen der ersten fünf Orbits identifizieren wir einen Inertialbereich zwischen 0.05-0.5 Hz und berechnen Mittelwerte aus der Verteilung der spektralen Indizes. Der berechnete spektrale Index ist 2.5 ± 0.4 bzw. 2.6 ± 0.5 für die Fluktuationen senkrecht bzw. parallel zum magnetischen Hintergrundfeld. Weiterhin untersuchen wir die statistischen Momente dritter und vierter Ordnung der Inkrementzeitreihen und zeigen, dass die Inkremente deutliche Abweichungen zu einer Gauß-Verteilung aufweisen, was auf Intermittenz hindeutet.

EP 15.6 Thu 12:15 V55.02

State of the art and future developments in calibration of spacebourne electric field sensors — •Manfred Sampl, Thomas Oswald, and Helmut O. Rucker — Austrian Academy of Sciences, Space Research Institute, Graz, Austria

We show the state of the art, and outline a future method, in calibrating antennas and electric field sensors onboard spacebourne radio astronomy observatories. Calibration in this context means finding the true antenna properties of the applied antenna system and investigate the influence of connected receiver hardware. The overall performance of a scientific radio and plasma wave instruments depends crucially on the knowledge of the true properties of the connected antenna system, since the typical spaceborne multiport scatterer is subject to significant parasitic influence due to the conducting spacecraft body and other large structures such as the solar panels. State of the art is to find the antenna characteristics conducting (1) numerical EM field calculations, (2) rheometry measurements using an electrolytic tank, and (3) inflight calibration.

In future the implementation of another well proven method, i.e. the use of an anechoic chamber, will bring a new quality, as it is systematically independent to the other named methods:

(4) UHF measurements in an anechoic chamber using a scale model

The anechoic chamber measurement equipment also allows to conduct experiments with arbitrary waveforms or polarizations.