EP 3: Erdnaher Weltraum / Planeten

Time: Tuesday 10:30–12:30 Location: DO24 1.103

Invited Talk EP 3.1 Tue 10:30 DO24 1.103

Sources of ECMWF-resolved gravity waves revealed by raytracing — •Peter Preusse[1], Manfred Ern[1], Silvio Kalisch[1], Stephen Eckermann[2], Hye-Yeong Chun[3], and Martin Riese[1] — [1]IEK-7, Forschungszentrum Jülich — [2]Naval Reasearch Laboratory, Washington DC, USA — [3]Yonsei University, Seoul, Korea

Can we employ global ECMWF high-resolution data to infer quantities of resolved GWs? Does this give us insight for the characteristics and relative importance of real GW sources? And can we use such data safely for, e.g., campaign planing?

We here determine amplitudes and 3D wave vectors of GWs at different levels (25km, 35km and 45km altitude) in the stratosphere from their 3D wave structure. Based on the 3D wavevectors backward raytracing is employed to characterize specific sources. For instance, in northern winter strong GWMF stems from mountain waves from Norway and Greenland as well as from waves emitted in the lower troposphere by a storm approaching Norway. Together these three events form a burst in the total hemispheric GWMF of a factor of 3.

In the tropical region, GWs have significantly larger horizontal wavelengths but shorter vertical wavelengths than in observations. Likely, the reason is that the convective parametrization of ECMWF treats convection inside a single model cell and couples only the net effects to the global dynamical fields.

EP 3.2 Tue 11:00 DO24 1.103

Vertical shifts between OH Meinel bands due to quenching by atomic oxygen — •Christian von Savigny[1], Olexandr Lednytskyy[1], and Kai-Uwe Eichmann[2] — [1]Institut für Physik, Ernst-Moritz-Arndt-Universität Greifswald, Greifswald — [2]Institut für Umweltphysik, Universität Bremen, Bremen

OH Meinel emissions from different vibrational levels are known to occur at slightly different altitudes in the terrestrial airglow. Model studies suggest quenching by atomic oxygen to be the principal cause of these vertical shifts. Here we employ the tropical mesopause region - characterized by pronounced semiannual variations - as a natural laboratory to test the hypothesis that vertical shifts between different OH Meinel bands are a consequence of quenching by atomic oxygen. Nighttime satellite measurements of OH(3-1) and OH(6-2) volume emission rate profiles and atomic oxygen with Scanning Imaging Absorption Spectrometer for Atmospheric Chartography on Envisat are used for this purpose. Upper mesospheric atomic oxygen profiles are retrieved from measurements of the O(1S-1D) green line emission. The results demonstrate that vertical shifts between the OH bands investigated are indeed correlated with the amount of atomic oxygen in the upper mesosphere, corroborating the hypothesis.

EP 3.3 Tue 11:15 DO24 1.103

Metal atom and ion number densities retrieval from SCIAMACHY/Envisat Limb mesophere and lower thermosphere states — •Martin Langowski[1], Christian von Savigny[2], Miriam Sinnhuber[3], Art C. Aikin[4], and John P. Burrows[1] — [1]University of Bremen, Bremen, Germany — [2]University of Greifswald, Greifswald, Germany — [3]Karlsruhe Institute of Technology, Eggenstein-Leopoldshafen, Germany — [4]Catholic University of Maryland, Maryland, US

A very uncertain amount of meteoric material ranging between 2 to 300 tons per day enters the earth's atmosphere every day. The meteoric material partly ablates in the upper atmosphere between 80 and 120 km altitude, which leads to the formation of metal atom layers. Furthermore metal ion layers are formed at the top of the metal layers through charge exchange with the mayor species. The metal atoms and ions show very strong resonance fluorescence signals. This emission is used to retrieve the densities of theses species.

EP 3.4 Tue 11:30 DO24 1.103

20 Rotationsperioden von äußeren Saturnmonden — •Tilmann Denk[1] und Stefano Mottola[2] — [1]FU Berlin — [2]DLR Berlin

Mit der ISS-Kamera an Bord der internationalen Raumsondenmission Cassini-Huygens beobachten wir die irregulären (äußeren) Monde des Saturn. Die Bestimmung der Rotationsperioden dieser Objekte ist dabei ein Forschungsziel. Bislang wurden die Eigenumdrehungen von 8 progradenund 12 retrograden Objekten wie folgt gemessen.

Prograde Monde: Siarnaq (S29) 10,2 h; Tarvos (S21) 10,7 h; Ijiraq (S22) 13,0 h; Albiorix (S26) 13,3 h; Bebhionn (S37) ˜15,8 h; Paaliaq (S20) 18,7 h; Kiviuq (S24) 21,8 h; Erriapus (S28) ˜28 h.

Retrograde Monde (bei mehreren Angaben für einen Mond ist die Anzahl der Extrema in der Lichtkurve noch unsicher): Hati (S43) 5,4 h; Mundilfari (S25) 6,7 h; Suttungr (S23) ˜7,4 h; Kari (S45) 7,7 h; Phoebe (S9) 9,3 h; Skoll (S47): 10,9 h (oder 7,4 h?); Ymir (S19) 11,9 h; Skathi (S27): ˜11,9 h (oder ˜18 h?); Hyrrokkin (S44) 12,8 h; Bestla (S39) 14,6 h; Narvi (S31): ˜15,6 h (oder ˜11,3 h?); Thrymr (S30): ˜27 h (oder ˜40 h?).

Merkwürdigerweise scheinen leichte Zusammenhänge zwischen den Rotationsdauern und Bahnparametern der Monde zu bestehen. Von allen Monden im Sonnensystem, von denen eine Rotationsperiode bekannt ist, sind Hati und Mundilfari die schnellsten Rotatoren.

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EP 3.5 Tue 11:45 DO24 1.103

Titan's Magnetotail from Hybrid Modelling and Observations — •Moritz Feyerabend[1], Sven Simon[1], Joachim Saur[1], and Uwe Motschmann[2] — [1]Institut für Geophysik und Meteorologie, Universität zu Köln — [2]Institut für Theoretische Physik, TU Braunschweig

We study Titan's plasma interaction by applying a 3D hybrid model which treats the ions as particles and the electrons as a fluid. As a consequence of the impinging Kronian magnetospheric plasma interacting with Titan's ionosphere, a magnetotail is formed downstream of Titan. The shape of the magnetotail can be very asymmetric with respect to the direction of the convective field and is highly influenced by the directions of the background magnetic field and the velocity vector of the impinging plasma. It is also influenced by the position of the ionospheric density peak which is determined by the direction of the incident solar radiation. We model Titan's plasma interaction during the Cassini flybys T9, T63 and T75, which all crossed through the distant wake of Titan. The ionosphere is generated by a realistic and statistically consistent implemented photoionization model. Finally the model results are compared with Cassini plasma and magnetic field observations from these encounters.

EP 3.6 Tue 12:00 DO24 1.103

Transient Water Vapor at Europa's South Pole — •Lorenz Roth[1,2], Joachim Saur[2], Kurt Retherford[1], Darrell Strobel[3], Paul Feldman[3], Melissa McGrath[4], and Francis Nimmo[5] — [1]Southwest Research Institute — [2]Universität zu Köln — [3]Johns Hopkins University — [4]Marshall Space Flight Center, NASA — [5]University of California Santa Cruz

In November and December 2012 the Hubble Space Telescope (HST) imaged Europa's ultraviolet emissions in the search for vapor plume activity. We report statistically significant coincident surpluses of hydrogen Lyman-α and oxygen OI130.4 nm emissions above the southern hemisphere in December 2012. These emissions are persistently found in the same area over $\sim$7 hours, suggesting atmospheric inhomogeneity; they are consistent with two 200 km high plumes of water vapor with line-of-sight column densities of about 10^{20} m^{-2}. Non- detection in November and in previous HST images from 1999 suggests varying plume activity that might depend on changing surface stresses based on Europa's orbital phases. The plume is present when Europa was near apocenter, and not detected close to its pericenter in agreement with tidal modeling predictions.

EP 3.7 Tue 12:15 DO24 1.103

MHD-model of Io's interaction with Jupiter's magnetosphere: Influence of asymmetries in Io's atmosphere, induction in a magma ocean, and the ionospheric Hall currents — •Aljona Blöcker and Joachim Saur — Institut für Geophysik und Meteorologie, Universität zu Köln, Köln, Deutschland

We developed a three-dimensional MHD model to study the influence of various effects on the interaction of Jupiter's magnetosphere with Io's atmosphere. Io's atmosphere is supported by sublimation of SO2 surface frost and by direct volcanic injection of SO2, which both lead to partly unknown density variations with latitude and longitude. In our MHD model we have included different types of asymmetries in the model atmosphere to study their influence on the local plasma interaction and the Alfvén wings. Additionally, our model takes into account the ionospheric Hall effect, which is responsible for the rotation of the plasma flow and the magnetic field in the interaction. Khurana et al. (Science 2011) claimed that the perturbations in the magnetic field measured by the Galileo spacecraft are due to induction signals from a global and partially molten magma ocean. By comparing our simulation results with observations from the Galileo spacecraft we demonstrate that the measured perturbations can likewise be explained without induction signals from an electrically conductive layer, but by considering the asymmetries of the atmosphere.