EP 20 Monde, Ringe und kleine Körper

Zeit: Donnerstag 16:30–17:30 Raum: B

Hauptvortrag EP 20.1 Do 16:30 B

Moonlets in Planetary Rings? Implications for an Origin Scenario. — •Frank Spahn — Uni Potsdam

To date it is nor clear whether planetary rings have formed by cogenetic accretion together with their central planet or has a catastrophic disruption of a parent body (satellite, comet) created these magnificent cosmic structures. Based upon dynamical arguments the former scenario would ab initio exclude the existence of boulders larger than 10 meters in diameter because they cannot stand the planet's tides. On the other hand, if there were such moonlets with sizes between 50 meters up to few kilometers in diameter a strong argument pro the hypothesis of a "violent birth" of these cosmic disks would have been found. In order to improve the detectability of such moonlets we investigated and modeled structures created by such larger ring-boulders. We modeled the counteracting processes of gravitational scattering and nonlinear viscous diffusion and obtained a "propeller-shaped" structure interfered with density wakes. They scale radially with the Hill radius and in azimuthally with the ratio of mass to ring-viscosity. In order to check the structures predicted by the hydrodynamical model we performed particle simulations to study the density structures in the ring caused by an embedded small moonlet. We verified the formation of the "propellers" flanked by density wakes. Kilometer-sized moonlets – Pan and Daphne – have already been detected in Saturn's A ring by the Cassini cameras which both show all essential density features, and there are good chances to resolve even smaller boulders in Saturn's rings. Based on these results the catastrophic origin scenario seems to be more likely.

Fachvortrag EP 20.2 Do 17:00 B

Mm-sized dust grains in the trail of comet 67P/Churyumov-Gerasimenko: observation and modelling — •Jessica Agarwal[1], Michael Mueller[2], Hermann Boehnhardt[3], and Eberhard Gruen[1,4] — [1]MPI-K, Saupfercheckweg 1, 69117 Heidelberg — [2]EDS-Deutschland, ESA/ESOC, Robert-Bosch-Str. 5, 64293 Darmstadt — [3]MPS, Max-Planck-Str. 2, 37191 Katlenburg-Lindau — [4]HIGP, University of Hawaii,1680 East West Road POST 512c, Honolulu, HI 96822, USA

We present optical and infrared (24 μm) imaging data of the dust trail of comet 67P/Churyumov-Gerasimenko, obtained with the Wide Field Imager at the MPG/ESO 2.2m telescope in La Silla and with NASA's Spitzer Space Telescope, respectively. Based on these images, we constrain the size distribution and material properties of mm-sized dust grains emitted from the comet. These particles remain close to the comet's orbit because of weak radiation pressure and low emission speeds, thereby forming the comet's dust trail. Such particles contain a significant fraction of the total mass which a comet contributes to the interplanetary dust environment. We evaluate the size distribution of the trail particles by fitting simulated images to the measured intensities. As far as possible, the model parameters are derived from the observed emission history of Churyumov-Gerasimenko. The size distribution is a crucial parameter for estimating the number density of large particles in the neighbourhood of the comet nucleus and for the safety of ESA's Rosetta spacecraft which will pass through the trail region on its approach to Churyumov-Gerasimenko in 2013.

Fachvortrag EP 20.3 Do 17:15 B

Simulation von nahen Vorbeiflügen der Raumsonde Rosetta an Asteroiden — •Thomas Andert[1], Martin Pätzold[1] und Bernd Häusler[2] — [1]Institut für Geophysik und Meteorologie, Universität zu Köln — [2]Institut für Raumfahrttechnik, Universität der Bundeswehr München

Die Raumsonde Rosetta wird auf ihrer 10 Jahre langen Reise zum Kometen 67P/Churyumov-Gerasimenko an den Asteroiden 2867 Steins am 05. September 2008 in einer Entfernung von 1700 km und 21 Lutetia am 10. Juli 2010 in einer Entfernung von 3000 km vorbeifliegen. Mit einem Durchmesser von ca. 100 km ist Lutetia gegenüber einem Durchmesser von ca. 10 km von Steins der weitaus größere Asteroid.

Es wird eine Simulation der Vorbeiflüge bezüglich der Schwerefeldmessungen durch das Radio-Science Experiment RSI auf Rosetta präsentiert, Aussagen über die Durchführbarkeit sinnvoller Schwerefeldmessungen getroffen und eine Inversionsmethode zur Auswertung von Schwerefeldmessungen bei nahen Vorbeiflügen, z.B. Mars-Express am Marsmond Phobos, vorgestellt.