EP 10 Saturn: Plasmaumgebung, Staub und Magnetosphäre

Zeit: Mittwoch 10:00–11:00 Raum: B

Fachvortrag EP 10.1 Mi 10:00 B

Plasma environment of Titan: A 3D hybrid simulation study — •Sven Simon, Alexander Bösswetter, Thorsten Bagdonat, and Uwe Motschmann — Institute for Theoretical Physics, TU Braunschweig

Titan possesses a dense atmosphere, consisting mainly of nitrogen. Titan's orbit is located within the Kronian magnetosphere most of the time, where the corotating plasma flow is superalfvenic, yet subsonic and submagnetosonic. Since Titan does not possess an intrinsic magnetic field, the plasma interacts directly with the ionosphere. This situation features the possibility of having the densest ionosphere located on a face not aligned with the ram flow of the corotating plasma. Due to the characteristic length scales of the interaction region being comparable to the mean ion gyroradii, MHD models can only offer a rough description of the interaction region. For this reason, Titan's plasma environment has been studied by using a 3D hybrid simulation code (fluid electrons, kinetic ions). The calculations are performed on a curvilinear grid with spherical symmetry. The simulations show the formation of a magnetic draping pattern and an extended pick-up region, being highly asymmetric with respect to the direction of the convective electric field. The mechanism giving rise to these structures exhibits many similarities to the interaction of the Martian ionosphere with the solar wind.

Fachvortrag EP 10.2 Mi 10:15 B

Exploration of Saturns dusty environment with Cassini — •Ralf Srama, Sascha Kempf, Georg Moragas-Klostermeyer, Stefan Helfert, Uwe Beckmann, Frank Postberg, Anna Mocker und Eberhard Grün — MPI-Kernphysik, Heidelberg, Germany

The Cassini spacecraft is in orbit around Saturn since July 2004. During the first year, amazing discoveries of the dust environment at Saturn were achieved by the dust instrument onboard Cassini, the Cosmic Dust Analyzer (CDA). Here, an overview is given about the discoveries and achievements of CDA. Highlights are the flybys at Saturns moon Rhea and Enceladus and measurements in the extended E ring. Elemental composition of ring particles were measured and Cassini crossed Saturns ring plane at G ring distance.

Fachvortrag EP 10.3 Mi 10:30 B

Dynamics of dust particles in Saturn's magnetosphere — •Uwe Beckmann[1], Sascha Kempf[1], Ralf Srama[1], Georg Moragas-Klostermeyer[1], Stefan Helfert[1], and Eberhard Grün[1,2] — [1]MPI für Kernphysik, Saupfercheckweg 1, 69117 Heidelberg — [2]University of Hawaii, 1680 East West Road POST 512c, Honolulu, HI 96822, USA

Saturn, the second largest planet of our solar system, is distinguished by a pronounced ring system. Its enigmatic E ring is the largest planetary ring of the solar system and extends from three to at least nine Saturnian radii (Saturnian radius $R_S = 60330$km). Knowing the dynamics of the micron-sized ring particles is key to interpret the measurements by the Cosmic Dust Analyser (CDA) on the Cassini spacecraft.

Probably the E ring is also one source of the recently discovered Saturnian dust streams composed of nanometer-sized solid particles. Since those particles are accelerated to very high speeds within the inner Saturnian system a dust sensor will mostly detect both kind of dust particles simultaneously. Thus, a careful data analysis needs to be based on realistic model calculations of the long term evolution of dust grains within a broad mass range.

Here we will report about first model calculations of the grain dynamics based on realistic magnetic field as well as plasma data.

Fachvortrag EP 10.4 Mi 10:45 B

Energiereiche feldlinien-parallele Elektronen in der Saturnmagnetosphäre — •Joachim Saur[1], B.H. Mauk[2], D.G. Mitchell[2], N. Krupp[3], K.K. Khurana[4], S. Livi[2], P.T. Newell[2], D.J. Williams[2], P.C. Brandt[2], A. Lagg[3], E. Roussos[3] und M.K. Dougherty[5] — [1]Institut f. Geophysik u. Meteorologie, Universität zu Köln — [2]APL, USA — [3]MPI Lindau — [4]UCLA — [5]Imperial College

Das Raumfahrzeug Cassini hat auf Teilen seiner fast äquatorialen Orbits in der Saturnmagnetosphäre energiereiche feldlinien-parallele Elektronenverteilungen gemessen. Die Energieverteilung dieser Elektronen gehorcht einem Potenzgesetz in einem Energiebereich von 20-800 keV. Wir gehen davon aus, dass diese Elektronen nahe Saturn beschleunigt werden. Wenn wir diese Elektronen entlang der Magnetfeldlinien der Saturnmagnetosphäre bis zu Saturn hin verfolgen, stellen wir fest, dass diese in einem statistischen Sinne gut mit der Lage der Saturnaurora übereinstimmen. Überraschend ist dabei, dass wir feldlinien-parallele Elektronen von der Magnetopause bis tief in die mittlere Magnetosphäre (bis zu 11 Saturnradien) finden. Standardtheorien für die Entstehung der Saturnaurora nehmen an, dass die Saturnaurora von Prozessen in der Nähe der Magnetopause getrieben wird. Die von uns beobachteten Elektronen liegen auf oder in der Nähe von Feldlinien, die zur Aurora passen. Sie müssen zudem von Saturn weg beschleunigt worden sein. Zusammen mit ähnlichen Beobachtung bei der Erde und Jupiter, impliziert dies, dass Elektronenbeschleunigung vom Planeten weg ein universeller Prozess der Aurora ist.