EP 9: Planets and Small Bodies I

Zeit: Mittwoch 8:30–10:30 Raum: KGI-Aula

Hauptvortrag EP 9.1 Mi 8:30 KGI-Aula

Europas innerer Ozean — •Nico Schilling, Joachim Saur und Fritz M. Neubauer — Institut für Geophysik, Universität zu Köln

Geologische und geophysikalische Beobachtungen, die mit Hilfe der Raumsonde Galileo beim Jupitermond Europa durchgeführt wurden, deuten auf einen salzhaltigen Ozean unter der Eiskruste des Mondes hin. Beobachtete Magnetfeldstörungen sind konsistent mit induzierten Magnetfeldern aus dem Inneren Europas. Diese Magnetfelder werden durch elektromagnetische Induktion in einem möglichen stark elektrolytisch leitfähigem Ozean unter der Eiskruste von Europa verursacht. Ein weiterer Prozess, der ebenfalls Magnetfeldstörungen erzeugt und daher in Konkurrenz zur Induktion steht, ist die Wechselwirkung von Europas Sauerstoff-Atmosphäre mit dem magnetosphärischen Plasma, in welches der Mond eingebettet ist. Ein genaues Verständnis dieser komplexen Wechselwirkung ist daher wichtig, um einen möglichen inneren Ozean besser zu charakterisieren. Mit Hilfe eines zeitabhängigen 3D Modells können wir sowohl die Leitfähigkeitsverteilung im Inneren Europas als auch die zeitlich variable Wechselwirkung zwischen der Jupitermagnetosphäre und der Europaatmosphäre untersuchen und selbstkonsistente Lösungen erhalten. Durch den Vergleich unserer Modellergebnisse mit den Messdaten der Raumsonde Galileo sind wir in der Lage, wesentlich verbesserte Aussagen über Leitfähigkeit und Dicke des Ozeans zu gewinnen. Entgültigen Aufschluß über die Existenz und die Eigenschaften des Eismondes könnte Laplace liefern, eine im Rahmen des "Cosmic Vision" Programmes der ESA vorgeschlagene Orbitermission zu Europa.

Hauptvortrag EP 9.2 Mi 9:00 KGI-Aula

Searching for exo-planets with CoRoT — •Heike Rauer — Institut für Planetenforschung, Rutherfordstr. 2, 12489 Berlin — Zentrum für Astronomie und Astrophysik, Technische universität Berlin, Hardenbergstr. 36, 10623 Berlin

The COROT satellite was successfully launched on the 27th of December 2006 and started its science observations in February 2007.The space mission is the first satellite launched to perform a systematic search for exoplanets using the transit method. The planet domain down to a size of about two Earth radii and orbital periods of less than two months will be explored. During the presentation the satellite and the mission profile will be described together with the latest scientific results obtained.

EP 9.3 Mi 9:30 KGI-Aula

Variability characterization of the COROT target fields with the BEST and BEST II telescope systems — •Petr Kabath and The BEST team — Institut für Planetenforschung, Rutherfordstr. 2, 12489 Berlin

DLR-PF operates two small-aperture telescopes (BEST and BEST II) as a ground-based support for the CoRoT space mission in order to perform a dedicated photometric variability characterization of the satellite target fields. Both systems have the ability to monitor thousands of stars within a wide magnitude range and with a precision of a few millimagnitudes, allowing the observation of variable stars in general and transiting Jupiter-sized extrasolar planets.

BEST consists of a 19.5 cm aperture telescope with a 3×3 degrees field of view (FOV) equipped with a 2k CCD. The system is located at Observatoire de Haute Provence, France and it is operated in a remote mode from Berlin. BEST II consists of a 25 cm aperture telescope with a 1.7×1.7 degrees FOV equipped with a 4k CCD. The system is located at Observatorio Cerro Armazonas, Chile and operates in an automatic mode.

We will report on the present status and latest scientific results of both experiments.

EP 9.4 Mi 9:45 KGI-Aula

The physics of protoplanetary dust agglomerates: Erosion by the impact of micron sized grains — •Rainer Schräpler and Jürgen Blum — Institut für Geophysik und extraterrestrische Physik, TU Braunschweig

Collisions between micron-sized grains and large agglomerates with relative velocities up to several 10m/s are believed to be an important physical processes in protoplanetary nebulae. We present experimental results on the erosion of macroscopic agglomerates consisting of micron-sized spherical particles via the impact of micron sized particles. The experiments cover a velocity range from 15m/s to 60m/s. We find that after an initial phase, in which an impacting particle erodes up to 10 particles of an agglomerate, the impacting particles compact the agglomerates surface and cause a valley hill structure on their surface, which passivates the agglomerates against the erosion. Due to this effect the erosion halts within our error bars for impact velocities up to 30m/s. For larger velocities the erosion is reduced by an order of magnitude. The influence of charging of the impactors and the target is discussed.

EP 9.5 Mi 10:00 KGI-Aula

The complete set of gas giant structures: calculating all protoplanetary equilibria that could exist — •Christopher Broeg[1], Günther Wuchterl[2], and Willy Benz[1] — [1]Weltraum und Planetenforschung, Universität Bern, Schweiz — [2]Thüringer Landessternwarte, Tautenburg, Deutschland

To characterize the planet population around different host stars at small orbital separations (up to 64 days orbital period), we have calculated structures of gas giants in this regime. We have varied the parameters in a scale-free way so that the resulting solution-set of gas-giant structures is representative of the full set of possible gas giants in any protoplanetary disk.

It turns out that there are characteristic masses for each separation, i.e. masses that are far more frequent than others in the full set of structures. This naturally leads to a classification of gas giant planets: They can be grouped into three different classes G, H, and J with distinct properties, e.g. characteristic masses at different orbital separations and for different host stars.

We applied the described method to the corot target fields. Taking into account the known distribution of star masses in the fields, we could compute the expected mass distribution for each orbital separation ranging from 1 to 64 days orbital period.

EP 9.6 Mi 10:15 KGI-Aula

Extrasolar climate modelling – condensation and chemical processes in the atmospheres of gas giant planets and substellar objects — •Derek Homeier[1] and France Allard[2] — [1]Institut für Astrophysik, Georg-August-Universität Göttingen, Germany — [2]Centre de Recherche Astrophysique de Lyon, ENS Lyon, France

Condensate cloud formation and greenhouse heating by molecular absorption are primary factors in forming the thermal structure and spectral appearance of cool compact objects from the stellar/substellar boundary into the regime of gas giant planets. Condensation and chemical reactions in these cool atmospheres are often far removed from a thermodynamical equilibrium state. We present a model describing the vertical distribution of dust particles as an equilibrium between the timescales involved in the condensation, growth and sedimentation of grains, and the replenishment of gaseous material by convective mixing and overshoot. The velocity fields are described by an extension of classical mixing length theory based on the results of radiative hydrodynamic simulations. We find a strong dependence of mixing efficiency, and thus dust cloud formation, on surface gravity, allowing us to reproduce observed patterns of the spectral energy distribution and use these as a tracer of mass. Departures from equilibrium chemistry caused by finite reaction timescales, such as an enhancement of CO or N_2 observed in the coolest known brown dwarfs of spectral type T, can be modelled by the same approach.