LATE PAPER ABSTRACTS FROM THE 26th MEETING OF THE DIVISION FOR PLANETARY SCIENCES
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Abstracts of Presented Papers

Opposition Effect of Asteroids: New Results


The results of long-term observational program of the asteroid magnitude-phase dependences at Kharkiv Astronomical Observatory are presented. The opposition effect values were measured at extremely small phase angles up to 0.1–0.3 deg. for different type of asteroids: 10 Hygiea, 24 Themis, 47 Aglaia, 55 Pandora, 59 Elpis, 79 Eurynome, 126 Velleda, 130 Elektra and 201 Penelope. Dependences of the opposition effect amplitude and width on asteroid type and albedo are discussed.

Sublimation Rates of Icy Dust Grains in Planetary Rings

J. E. Colwell (LASP, University of Colorado)

Micron-sized dust grains in planetary rings are subject to a number of forces that give them short orbital lifetimes. These include exospheric and plasma drag, Lorentz force perturbations for charged grains, sputtering, and sweep up by large ring particles. At the low temperatures in the outer solar system evaporation is slow compared to the ~ 1 – 10^3 year time scales for the other processes. However, micron-sized grains can reach temperatures far different from their blackbody temperatures due to wavelength dependent emissivities in the infrared. The equilibrium temperature of small grains depends critically on their size and on their optical properties (principally the complex index of refraction). I will present results for the detailed energy balance for small grains in the outer solar system and their equilibrium temperatures and sublimation rates. Because the temperatures are size-dependent, sublimation could lead to modification of the ring size distribution for ~ micron-sized particles.

The Non-detection of HCN on Jupiter

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The only reported detection of hydrogen cyanide in Jupiter's atmosphere was by Tokunaga et al. in 1981, who measured three absorption lines near 13.5 μm using a Fabry-Perot spectrometer on the IRTF. By comparison with a radiative transfer calculation, they inferred a mixing ratio in the upper troposphere of 2×10^-9, with an uncertainty of a factor of 2. Although this measurement has never been independently confirmed, chemical models of the Jovian atmosphere were modified on the basis of this single result and a series of deep tropospheric absorption lines were predicted to exist throughout the infrared and submillimetre spectrum due to HCN.

We have attempted to detect the predicted millimetre and submillimetre lines on several occasions using a Fourier transform spectrometer on the JCMT. The combination of broad spectral range and intermediate spectral resolution afforded by this instrumentation is ideally suited to the study of strongly pressure-broadened absorption features in planetary atmospheres. Although the J=2 HCN line at 266 GHz and the J=3 line at 354 GHz were predicted to be 28 K deep with widths of ~2 GHz, we have obtained firm non-detections in both cases with uncertainties of less than 1 K. We conclude that the HCN abundance on Jupiter is a factor of at least 25 smaller than originally claimed by Tokunaga et al.

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A Monte Carlo calculation of the formation of planetesimals from fluffy aggregates

B. Donn and M. Pospieszalsia (Univ. Virginia)

We report the status of a Monte Carlo study of planetesimal formation by the coagulation of fluffy aggregates resulting from the accumulation of micrometer size grains. This study is based on two papers: Meakin, P and Donn, B. (Ap.J. Lett. 329, L39, 1988; Donn, B. and Duva, J.M. (Astroph. Sp. Sci. 212, 43, 1994). The study seeks to find out if km size bodies can grow from impacts between compressible objects before the relative density reaches 0.65, the density of a compact aggregate of fine grains.

To facilitate the calculation we start with an array of 10 cm cubes with relative density 0.1. The impact mechanism of Donn and Duva determines the result of a collision. The experimental results of Peak et al (Lunar and