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Title	Discovering sub-micron ice particles across Dione' surface
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Solar System and that the lunar cataclysm is a preserved record of this apocalyptic event that began when slow secular chaos generated orbital instability in our former super-Earth system.

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507.11 – Exoplanet Population Estimate from Kepler Data

The intrinsic population of exoplanets around Kepler target stars is estimated by comparing the observed numbers of planets at each radius and period against a simulation that accounts for the probability of transit and the estimated instrument sensitivity. By assuming that the population can be modeled as a function of period times a function of radius, and further assuming that these functions are broken power laws, sufficient leverage is gained such that the well-measured short-period planet distribution can effectively be used as a template for the less-well sampled long-period terrestrial planets. The resulting population distribution provides a challenge to models of the origin and evolution of planetary systems.

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508 – Icy Satellites

508.01 – From One Come Many: A diversity of crater populations from a single impacting population, with application to the Saturnian (and Galilean) Satellites

We present our recent analyses that quantify the spatial and size-frequency distribution (SFD) of crater populations on the mid-sized Saturnian (and Galilean) satellites. The results demonstrate that a single-sized impactor will generate both (i) different-sized primary craters on the icy satellites, and (ii) observably different secondary crater populations (both in terms of SFDs and spatial distributions) between the satellites.
Relative magnitude of secondaries and their SFDs: The number of secondary craters generated by a primary impact is a function of the size of the primary crater; v_min, the minimum speed needed to make a secondary ;and v_esc, the escape speed of the target body. The primary crater size controls the amount of ejected material, v_min defines the lower limit of that ejected mass that can make secondaries, and v_esc defines the upper limit of the mass that can make secondaries (i.e. material that escapes the target body cannot make secondaries). Because a single-sized impactor will make different-sized primaries on each of the satellites (resulting in different masses available to make secondaries), and v_esc also varies between the satellites, different amounts of ejecta are available to make secondaries. Because surface gravity is a factor in the size of a crater, a given-sized ejecta fragment will make a different-sized secondary on the satellites even given the same impact speed.
Spatial distribution of secondaries: Because of varying surface gravities, g, of planetary bodies, a given ejectum speed will launch a fragment different distances. In conjunction with v_min, the spatial density of adjacent secondaries (or even their existence) will vary depending on surface gravity. At progressively smaller g, v_min results in greater distances, and dense annular clusters surrounding the primary crater won't appear, except for the largest primary craters. On the lower-g objects, v_min corresponds to travel distances that are significant fractions of the object's circumference. Ejecta that make adjacent secondaries on a higher-g object may make a significant population of background secondaries on low-g objects.

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508.02 – Crustal Failure in Large Icy Bodies from a Strong Tidal Encounter

Close tidal encounters among large planetesimals and satellites are more common than grazing or direct impacts. Using a mass spring model simulation, we look at the deformation of the surface of an elastic spherical body caused by a nearly parabolic close tidal encounter with a body that has mass similar to that of the primary body. We delineate a regime for tidal encounters that induce sufficient stress on the surface for brittle failure of an icy crust. Simulated cracks caused by extension of the crust extend a large fraction of the radius of body. Tidal encounters give an alternative mechanism for formation of long graben complexes and chasma on icy satellites such as Dione, Tethys, Ariel and Charon.

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508.03 – Discovering sub-micron ice particles across Dione' surface

Water ice is the most abundant component of Saturn's mid-sized moons. However, these moons show an albedo asymmetry – their leading sides are bright while their trailing side exhibits dark terrains. Such differences arise from two surface alteration processes: (i) the bombardment of charged particles from the interplanetary medium and driven by Saturn's magnetosphere on the trailing side, and (ii) the impact of E-ring water ice particles on the satellites' leading side. As a result, the trailing hemisphere appears to be darker than the leading side. This effect is particularly evident on Dione's surface. A consequence of these surface alteration processes is the formation or the implantation of sub-micron sized ice particles.
The presence of such particles influences and modifies the surfaces' spectrum because of Rayleigh scattering by the particles. In the near infrared range of the spectrum, the main sub-micron ice grains spectral indicators are: (i) asymmetry and (ii) long ward minimum shift of the absorption band at 2.02 μm; (iii) a decrease in the ratio between the band depths at 1.50 and 2.02 μm; (iv) a decrease in the height of the spectral peak at 2.6 μm; (v) the suppression of the Fresnel reflection peak at 3.1 μm; and (vi) the decrease of the reflection peak at 5 μm relative to those at 3.6 μm.
We present results from our ongoing work mapping the variation of sub-micron ice grains spectral indicators across Dione' surface using Cassini-VIMS cubes acquired in the IR range (0.8–5.1 μm).
To characterize the global variations of spectral indicators across Dione' surface, we divided it into a 1°x1° grid and then averaged the band depths and peak values inside each square cell.
We will investigate if there exist a correspondence with water ice abundance variations by producing water ice' absorption band depths at 1.25, 1.52 and 2.02 μm, and with surface morphology by comparing the results with ISS color maps in the ultraviolet, visible and infrared ranges. Finally, we will compare the results with those obtained for Enceladus, Tethys, and Mimas

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508.04 – High energy electron processing of icy regoliths on Saturn's moons

A unique space weathering phenomenon has been identified on several icy Saturnian moons. Cassini revealed anomalous lens shaped regions in both optical and thermal wavelengths, colloquially known as the 'PacMan' feature, which are centered on the leading hemispheres and approximately symmetric about the equators. In particular, the Cassini InfraRed Spectrometer (CIRS) measurements of thermal emission in the mid-IR showed that surface temperature variations during a diurnal cycle were smaller inside the anomalous regions. The locations of the anomalies were shown to closely match the expected deposition profile of high energy (~ MeV) electrons moving counter rotational to the moons, suggesting an energetic source to drive their formation. However, the mechanisms by which thermal conductivity enhancement occur lack quantitative comparison with theoretical and experimental results.