CIPS PLANETARY SCIENCE LUNCH SEMINAR

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544 Campbell Hall
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How Titan got a cloak: Saturn's moon and the origin of its nitrogen atmosphere

Titan, the largest moon of Saturn, has an extensive nitrogen atmosphere, with methane and higher order hydrocarbons as secondary constituents. Data collected by the Huygens Gas Chromatograph Mass Spectrometer and the Cassini Ion Neutral Mass Spectrometer indicate that nitrogen abundance in Titan's atmosphere was greater in the past than now, but it was not brought in from the outer solar system in a form of molecular nitrogen. Most likely, the present nitrogen was converted photolytically from the ammonia, which sublimated from the ammonia-water ice brought into Titan during its accretionary period. Presently, ammonia cannot be converted into nitrogen in Titan's atmosphere, as the surface temperatures are too cold for ammonia to remain in the gas phase and facilitate this conversion. In the past however, Titan was warmer.

In this talk I will present and examine a bevy of models for the formation and maintenance of Titan’s nitrogen atmosphere, with the goal of understanding its past, present and future. The roles of methane and interior evolution, together with the needed laboratory and in situ measurements, will also be discussed.