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Title:

Cassini ISS Observations Of The Early Stages Of The Formation Of Titan's South Polar Hood And Vortex In 2012

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Abstract:

Northern spring equinox on Titan occurred on August 11, 2009. In March of 2012 the Imaging Science Subsystem (ISS) on the Cassini spacecraft saw the first evidence for the formation of a polar hood in the atmosphere above Titan's south pole. Views of the limb showed an optical thickening primarily at about 360 km altitude across a few degrees of latitude centered on the pole. Images of Titan in front of Saturn provide a nearly direct measure of the line-of-sight optical depth as a function of latitude and altitude from about 250 km and higher. Two or more distinct layers are seen, both near the pole and at other latitudes. The highest of these, near 360 km altitude, hosts the embryonic polar hood.

On June 27, 2012 ISS observed the pole from high latitude. These images show a distinct and unusual cloudy patch, elongated and not centered on the pole and with an elevated perimeter. The morphology and color indicate an unfamiliar (for Titan) composition and dynamical regime. The interior of the feature consists of concentrations of cloud/haze organized on spatial scales of tens of kilometers. Its morphology is reminiscent of the open cellular convection sometimes seen in the atmospheric boundary layer over Earth's oceans under conditions of large-scale subsidence. Unlike Earth, where such convection is forced by large surface heat fluxes or the onset of drizzle, convection at 360 km on Titan is more likely to be driven from above by radiative cooling. During the 9 hours we observed Titan, this feature completed a little over one rotation around the pole, providing direct evidence for a polar vortex rotating at a rate roughly consistent with angular-momentum-conserving flow for air displaced from the equator.

Part of this work was performed by the Jet Propulsion Laboratory, California Institute of Technology.

Category:

Titan

Facility Keywords:

Additional Information (Complete):

Did you give a contributed presentation in 2010 (Pasadena)? Yes - oral

Did you give a contributed presentation in 2011 (Nantes)? Yes - poster

Student Status: None

I am willing to serve as a Chair: Yes

(1) Area of Expertise: Titan

(2) Area of Expertise: Jovian Planets: Atmosphere

I have a video for Press Officer review: Yes

Newsworthy?: Yes

Status: Complete

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