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Morphology and time evolution of observed mid-latitude clouds on Titan as tracers of storm types, waves and instabilities.

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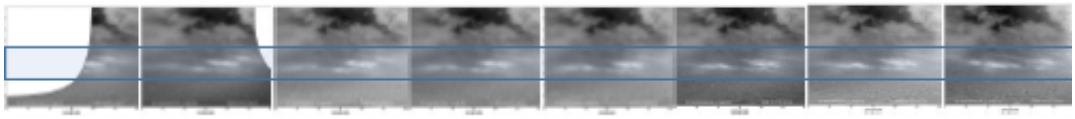
ABSTRACT

Examining the morphologies of Titan's clouds can provide a general physical interpretation of observed storms and their relation to atmospheric dynamics of the moon. Through a combined analysis of observations of images collected by Cassini ISS during Titan flybys, we search for cloud phenomena to identify various types of storms. Several of the observed cloud features also give us both spatial and temporal information that reveals how the clouds evolve in time. We employ the cloud activity of the observed clouds to describe their characteristics and search for time evolution patterns to try to identify the dynamics behind them, for instance Rossby and gravity waves.

Observations of a predominant example of a mid-latitude cloud system was captured by Cassini ISS cameras over a period of about 24 hours from Dec. 13 to 14, 2009, after the onset of a new season of the Saturn system. The images show methane clouds in the troposphere concentrated in a band between 45^{o} and 63^{o} south latitude, a streak-shaped mid-latitude cloud system extending across half the globe, traveling several hundred kilometers during the observation period. The sequence of images obtained throughout this flyby allowed us to create maps (see image below) that were made into movies of clouds moving across the moon's surface background.



We present the analysis of these "streamer clouds", as we have dubbed them, and a handful of other mid-latitude cloud system events based on observations of the movies produced from their ISS-mapped images. The results of the analysis and the implications for Titan's atmospheric instabilities will be discussed.