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Seasonal changes in Titan's meteorology and surface features

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Since Cassini's arrival at Saturn in July 2004, the seasons on Titan have progressed from southern summer to just past the southern autumnal equinox (to date, the equivalent of 12 January to 26 March), and accompanying changes in cloud distribution and activity have been observed by Cassini's Imaging Science Subsystem (ISS). Through 2004, large convective cloud systems were common over Titan's South Pole (e.g., Schaller et al., 2006; Porco et al., 2005). However, since 2005 such storms have been less common. Elongated streaks of clouds (several hundred km long) have been observed consistently at mid-southern latitudes, and became common at high northern latitudes starting in 2007. Only recently have such clouds been detected at mid-northern latitudes. ISS has also observed changes in surface features at high southern latitudes. A new large dark area appeared between July 2004 and June 2005 (Turtle et al., 2009), and may have subsequently faded. Recent observations of Ontario Lacus suggest that its shoreline may have receded as well (e.g., Hayes et al., 2009). Such changes are interpreted to be the result of precipitation and ponding of liquid methane and the subsequent evaporation thereof (Turtle et al., 2009). No changes have been observed to date in the lakes and seas at high northern latitudes. Intriguingly, Cassini RADAR observations of areas near Titan's south pole (Lunine et al., 2008) reveal far fewer lakes than have been identified at high northern latitudes (Stofan et al., 2007) and fewer than suggested by the number of dark features observed by ISS in this area (Turtle et al., 2009). This apparent discrepancy may simply be a result of the fact that not all of the dark south-polar features identified by ISS are filled with liquid. However, another possible explanation is that some lakes are ephemeral and have disappeared as a result of a combination of evaporation and infiltration into the subsurface in the time that elapsed between the observations by ISS in mid-2005 (equivalent of $\sim$25 January) and those by RADAR of similar territory starting in late 2007 (equivalent of $\sim$28 February). Further investigation comparing ISS and RADAR observations is underway to better understand the implications of the differences observed. We will present observations of Titan's atmospheric behavior and surface features, documenting changes that have resulted from weather and seasonal changes and their implications for Titan's active methane cycle and atmospheric circulation.