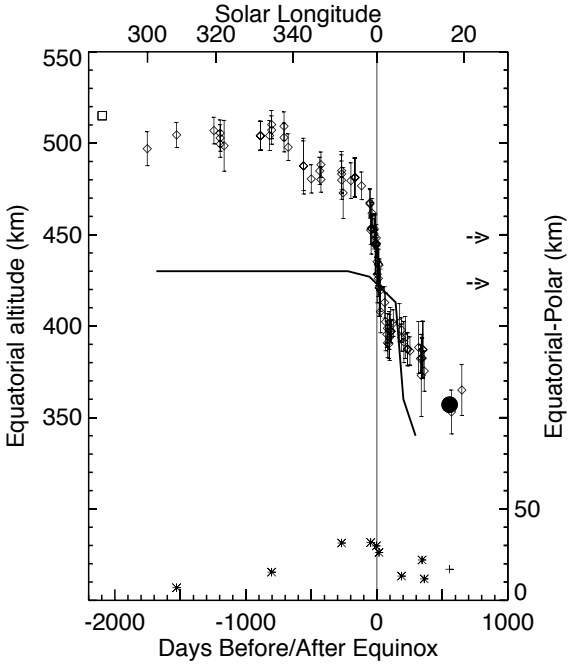
TITAN'S DETACHED HAZE AND POLAR VORTEX: LARGE-AMPLITUDE SEASONAL VARIATIONS. R. A. West[1], A. Ovanessian[1], E.P. Turtle[2], T.L. Ray[1], J. Balloch[1], Philip Dumont[1], Panayotis Lavvas[3], R. D. Lorenz[2], and P. Rannou[3,4]. [1]Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California, USA, [2]Johns Hopkins University Applied Physics Laboratory, Laurel, Maryland, USA, [3]GSMA, UMR 6089, CNRS, Université de Reims Champagne Ardenne, Reims, France, [4]LATMOS, UMR 8190, CNRS, Université de Versailles St Quentin, Verrières-le-Buisson, France.

Introduction: Observations of the Titan haze continue to accumulate over longer time scales. These observations have become increasingly important input to models of the Titan circulation and haze formation mechanisms. Cassini Imaging Science Subsystem (ISS) observations from 2005 to the present revealed a large-amplitude (150 km) drop in altitude of the Titan's detached haze, most rapidly at equinox in 2009, and returning to the same altitude as was observed using Voyager images one Titan year earlier [1,2].

Previous Work: Titan's detached haze was first observed by cameras on the Voyager spacecraft. Rages and Pollack [2] reported the altitude of the detached haze to be 360 km at the equator and 280 km at the south pole. Those measurements were obtained from images taken by the Voyager 2 camera in August, 1981, approximately 500 terrestrial days after northern spring equinox. West et al. [1] measured the altitude of the detached haze over the period 2005 to early 2010, ending about 350 days after equinox. During that time the haze altitude dropped from near 500 km to about 375 km, trending toward the Voyager measurement. During that time the detached haze remained a continuous structure at all latitudes south of the northern polar vortex boundary (near latitude 55 N), in particular, it was continuous across the south pole. West et al. [1] noted that two models had been previously proposed to explain the existence of the detached haze [3,4], and these new data expose deficiencies in both.

Recent work: We have continued to monitor the altitude of the detached haze. As of early 2011 the seasonal phase returned to that of the earlier Voyager observations, and the altitude of the haze returned to the Voyager value, within the uncertainty (several km). These new measurements, along with the older measurements, are shown in Fig. 1. In Fig. 1 the Cassini measurements are shown with error bars (one pixel), the Rages and Pollack measurement [2] is shown as a large filled circle. Altitude differences (equator – south pole) are shown in the bottom portion of the figure (the + symbol is from [2]) with the scale on the right. Also shown is a model result from Rannou et al. [3]. Continued monitoring will provide important information on the potential breakup of the detached haze as the meridional stratospheric circulation reverses in response to seasonal forcing, and the breakup of the northern polar vortex and formation of the southern polar vortex. These data will form the basis of new and improved models seasonal change and the responsible dynamical and haze microphysical processes.



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