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Neptune's Wandering Hot Pole

Glenn Orton (1), Leigh Fletcher (2), Padma Yanamandra-Fisher (3), Tom Geballe (4), Heidi Hammel (5), Takuya Fujiyoshi (6), Therese Encrenaz (7), Mark Hofstadter (3), Olivier Mousis (8), and Tetsuharu Fuse (6)

(1) Jet Propulsion Laboratory, Caltech, Pasadena, California, USA (go@orton.jpl.nasa.gov, 001 818 3934619), (2) Oxford University, Oxford, United Kingdom, (3) Jet Propulsion Laboratory, Caltech, Pasadena, California, USA, (4) Gemini Observatory, Hilo, Hawaii, USA, (5) Space Science Institute, Ridgefield, Connecticut, USA, (6) Subaru Telescope, Nat'l. Optical Obs. of Japan, Hilo, Hawaii, USA, (7) Observatoire de Paris, Meudon, France, (8) Observatorie de Besancon, Besancon, France

Images of stratospheric emission from Neptune obtained in 2006 at ESO's Very Large Telescope (Orton et al., 2007, A&A 473, L5) revealed a near-polar hot spot near 70 deg. S latitude that was detectable in different filters sampling both methane (∼7-micron) and ethane (∼12-micron) emission from Neptune's stratosphere. Such a feature was not present in 2003 Keck and 2005 Gemini North observations: these showed only a general warming trend towards Neptune's pole that was longitudinally homogeneous. Because of the paucity of longitudinal sampling in the 2003, 2005 and 2006 images, it was not clear whether the failure to see this phenomenon in 2003 and 2005 was simply the result of insufficient longitudinal sampling or whether the phenomenon was truly variable in time. To unravel these two possibilities, we proposed for time on large telescopes that were capable of resolving Neptune at these wavelengths. We were granted time at Gemini South in 2007 using T-Recs, Subaru time in 2008 using the COMICS instrument and VLT time in 2008 and 2009 using VISIR. Two serendipitous T-Recs images of Neptune were also obtained in 2007 using a broad-band N (8-14 micron) filter, whose radiance is dominated by 12-micron ethane emission, and whose primary purpose was navigation of N-band spectroscopy. The feature was re-observed (i) in 2007 in the T-Recs N-band filter and (ii) in 2008 with COMICS in a 12.5-micron image. Unfortunately, none of the telescope time granted was sufficient to sample all longitudes over the 12-hour period of this latitude, and so no definitive separation of the two possibilities was obtained. However, considering the ensemble of images as a random sample of longitudes, it is likely that the phenomenon is ephemeral in time, as it was observed only twice among 9 independent observing epochs. We will continue to request observations to sample all longitudes systematically, but our current sample argues that the phenomenon is truly ephemera, because we most likely would have seen the feature closer to four times in a random sample. If this is the case, the the closest analogy in the Earth's atmosphere is the ephemeral "sudden polar warming" where a warm feature appears that is initially offset from the pole and subsequently drifts toward the pole and becomes centered on it.