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The December 2010 outbreak of a major storm in Saturn's atmosphere

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On December 5, 2010, a major storm erupted in Saturn's northern hemisphere at a planetographic latitude of 41.0 deg. These phenomena are known as "Great White Spots" (GWS) and they have been observed once per Saturn year since the first case confidently reported in 1876. The last previous event occurred at Saturn's Equator in 1990 (Sánchez-Lavega et al., Nature, Vol. 353, 397.1991). A GWS differs from similar smaller-scale storms in that it generates a planetary-scale disturbance that spreads zonally spanning the whole latitude band. Studies of the 1990 case indicated that the storm produced a long-term substantial change in the cloud and haze structure around the tropopause level, and in the equatorial winds. We report on the evolution and motions of the new GWS and its associated disturbance during the months following the outbreak, based mainly on high quality images obtained in the visual range and submitted to the International Outer Planet Watch PVOL database, and with the 2.2 m telescope at Calar Alto Observatory. The high temporal coverage allows us to study the dynamics of the GWS in detail and multi-wavelength observations provide information on its cloud top structure. We also present first non-linear simulations of the evolution of a GWS generated by impulsive and localized Gaussian heat pulses, using the EPIC code with potential vorticity as a tracer.

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