



Direct stratospheric wind measurements with ALMA during Saturn's 2010-2013 Great Storm

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Great White Spot events occur every orbital period in Saturn's atmosphere (Sanchez-Lavega et al. 2018). These planetary scale storms perturb the upper tropospheric cloud deck for weeks to months. From December 2010 to June 2011, Saturn underwent its most recent Great White Spot event in its northern hemisphere (Fischer et al. 2011, Sanchez-Lavega et al. 2011, 2012). Cassini and ground-based thermal infrared observations enabled to observe the consequences of the storm above the clouds, in the stratosphere. Two hot vortices were produced above the storm, and after a few months, they merged to create a giant hot vortex that lasted for years. In this vortex, hydrocarbon abundances and temperatures were significantly altered (Fletcher et al. 2011, 2012, Hesman et al. 2012, Moses et al. 2015). Thermal wind balance calculations indicate that stratospheric circulation may have been altered too (Fletcher et al. 2012).

In this paper, we present mapping observations of CO at 230 GHz in Saturn's stratosphere, obtained with the Atacama Large Millimeter/submillimeter Array (ALMA) in January 2012, when the hot vortex was still active. From the Doppler shifts induced by the winds on the spectral lines, we have derived Saturn's stratospheric winds as a function of latitude. We present the dramatic differences found with more recent observations, including those of Benmahi et al. (2022).

References:

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