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Atmospheric Structure of Jupiter's Vortices as retrieved by Juno/JIRAM Data

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The Jovian InfraRed Auroral Mapper (JIRAM) instrument, aboard the NASA/Juno spacecraft, is composed of an infrared imager (IMG) and a spectrometer (SPE) in the 2-5 μm range [1], sharing a common optical head. The imager is further split in two spectral channels: L-filter, centered at 3.45 μm with a 290-nm bandwidth, and M-filter, centered at 4.78 μm with a 480-nm bandwidth. In this work, we used the M-filter of the IMG for the context and the SPE for the characterization analysis.

Since the first orbits, JIRAM observed several oval vortices in Jupiter's atmosphere with the highest spatial resolution achieved so far from space-borne infrared instruments. In particular, JIRAM highlighted a line of closely spaced oval features in Jupiter's southern hemisphere, between 30°S and 45°S [2], as well as other persistent vortices in the northern hemisphere. Moreover, the radiance map at 2.57 μm identifies three vortex structures at stationary positions [3].

We retrieved maps of column densities and altitudes for an NH3 cloud and a photochemical haze using a Bayesian data inversion approach in the range 2.4-3 μm, which is sensitive to changes in high tropospheric clouds and stratospheric hazes, as well as to gaseous ammonia. The deep well-mixed volume mixing ratio and the relative humidity for gaseous ammonia were also retrieved. Moreover, the synergistic use of the aforementioned spectral range with the one between 4 and 5 μm can be used to better constrain the cloudy atmospheric structure. Our results suggest different vortex activities for the studied ovals. Vertical atmospheric dynamics together with considerations about the ammonia condensation could explain our maps providing evidence of cyclonic and anticyclonic structures as well as of different atmospheric conditions inside them.

References

[1] Adriani, A., et al. (2014). Space Sci. Rev., DOI 10.1007/s11214-014-0094-y.
[2] Sindoni, G., et al., (2017). Geophys. Res. Lett., 44, doi:10.1002/2017GL072940.
[3] Filacchione, G., et al. (2017). EPSC Abstracts Vol. 11, EPSC2017-773.