

Waves on Jupiter's polar regions as seen by Juno/JIRAM

Francesca Altieri (1), Maria Luisa Moriconi (1, 2), Alessandra Migliorini (1), Alessandro Mura (1), Alberto Adriani (1) and the JIRAM Team

(1) INAF/IAPS, Rome, Italy, francesca.altieri@inaf.it, (2) CNR-Istituto di Scienze dell'Atmosfera e del Clima, Italy.

Abstract

JIRAM is the InfraRed Auroral Mapper on board the Juno mission arrived at Jupiter on July 4 2016. The instrument is composed by two imager channels (IMG-L and IMG-M), and a spectrometer channel (SPE) [1]. In particular, the IMG-M channel is centered is at $4.780 \mu\text{m}$ with a 480 nm bandwidth and can sound the thermal emission from the deeper atmosphere of the planet.

The Juno mission has investigated the atmospheric dynamic on the poles for the first time with unprecedented spatial resolution. Cluster of cyclones organized in persistent polygonal array have been observed [2, 3], revealing an unexpected and unique configuration.

The planning of the mission has made possible to observe several times the polar regions. During each passage, the JIRAM IMG-M channel has collected a large number of images of the polar dynamics. The spatial resolution is of the order of 55 km/pixel .

By applying a high pass FFT filtering, it has been possible to remove the large-scale cloudy features, thus highlighting the presence of many wave patterns of different amplitude and direction, crossing each other. Figure 1 shows an example of the analysis on the southern pole cyclones. Waves with wavelength of the order of 80 to 200 km have been identified. The wave-wave interactions have the physical meaning that resonant sets of wave components are exchanging energy, as well as redistributing energy over the spectrum.

Here we present the analysis of power spectra obtained from signals traced transversally over some of the main wave packets found in the images on both the poles and discuss the preliminary results.

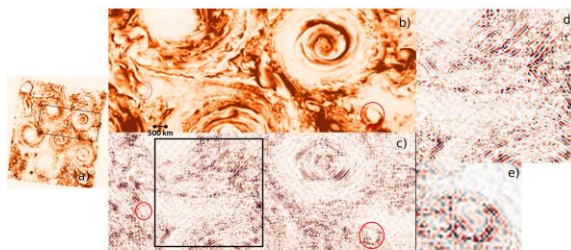


Figure 1: An example of the waves identified on the southern pole cyclones (perijove P14). a) Map of the whole cluster of cyclones. The panel b) position is highlighted (black rectangle). c) The same of panel b), but after Fourier filtering. Many wavy features result once the frequencies of the most evident patterns have been removed. The panel d) position is highlighted (black square) and the 500 km horizontal scale is reported above. Panel e) show details of the intermediate region and of a minor vortex at the right bottom corner of panel c).

Acknowledgements

The project JIRAM is funded by the Italian Space Agency, under the agreement 2016-23-H.0.

References

- [1] Adriani, A., et al.: JIRAM, the Jovian Infrared Auroral Mapper. *Space Sci. Rev.*, doi 10.1007/s11214-014-0094-y, 2014.
- [2] Adriani, A., A. Mura, G. Orton et al: Clusters of cyclones encircling Jupiter's poles, *Nature*, doi:10.1038/nature2549, 2018.
- [3] Orton, G. S., C. Hansen, M. Caplinger et al.: The first close-up images of Jupiter's polar regions: Results from the Juno mission JunoCam instrument, doi: 10.1002/2016GL072443, 2017.