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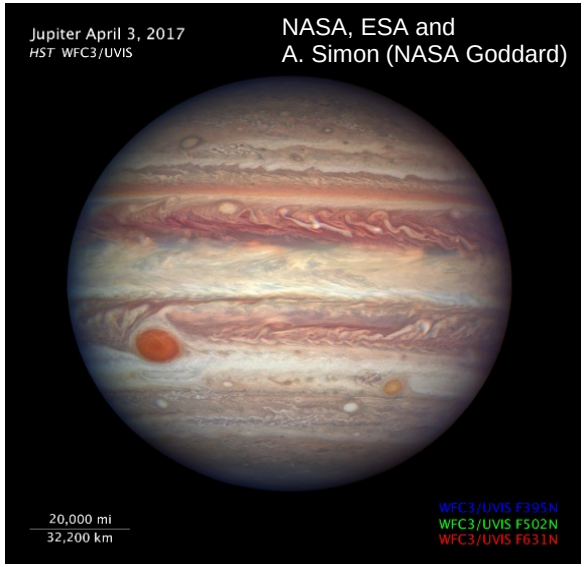
Variations in the spectral reflectivity of Jupiter's Great Red Spot



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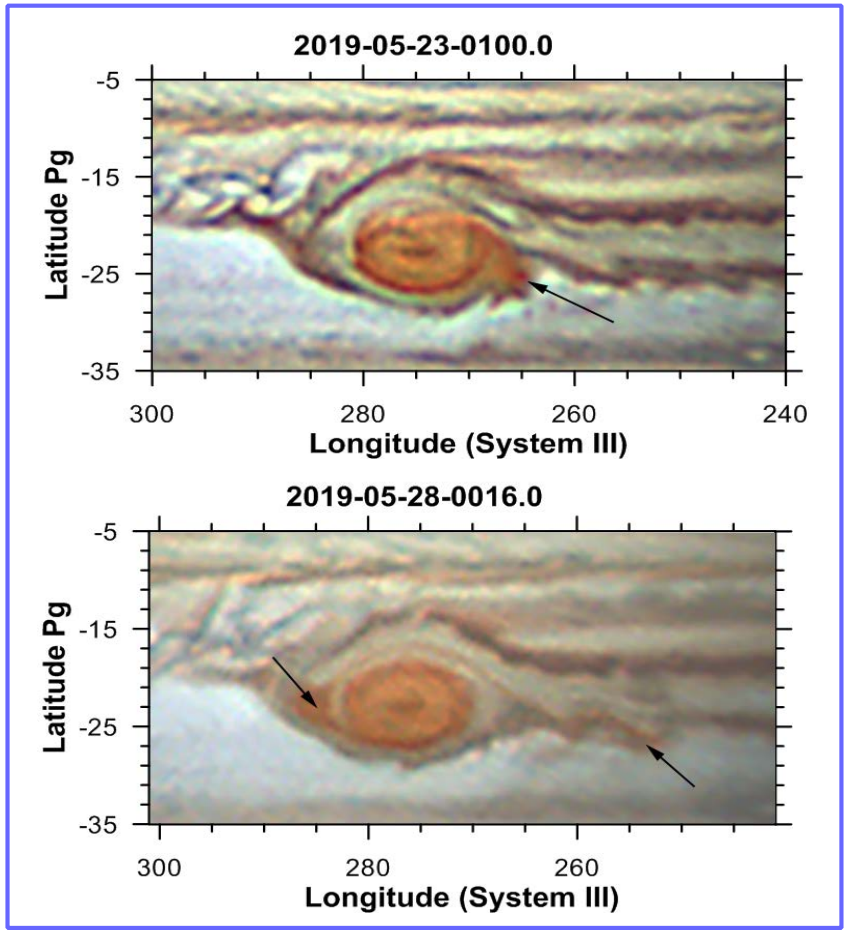
In this work we have analyzed Jupiter images provided by the Hubble Space Telescope (HST) between 2015 and 2019, with a spectral coverage from the ultraviolet to the near infrared, including some methane absorption bands of different depths. These images have been calibrated in absolute reflectivity, and from them we have obtained the spectral variations in brightness that occur in the dark central core of the Great Red Spot (GRS). For wavelengths ranging from 200 to 700 nm, the central core of the GRS seems to be getting fainter. At the same time, we present some dynamical aspects of the GRS after its interaction with other vortices during 2019.

2. Contemporary context of the GRS

- Strong interactions of the GRS with vortices producing loss of reddish material
- GRS reached minimum size since its discovery



Clyde Foster, South Africa

Current unkowns

- Unknown colorating chromophore species
- Interest in its future evolution

NASA / JPL-Caltech/ SwRI/ MSSS/ Kevin M. Gill – Reprocessed by Sánchez-Lavega

3. Ground based and HST images

Dynamical analysis: Amateur images (2019-2020)

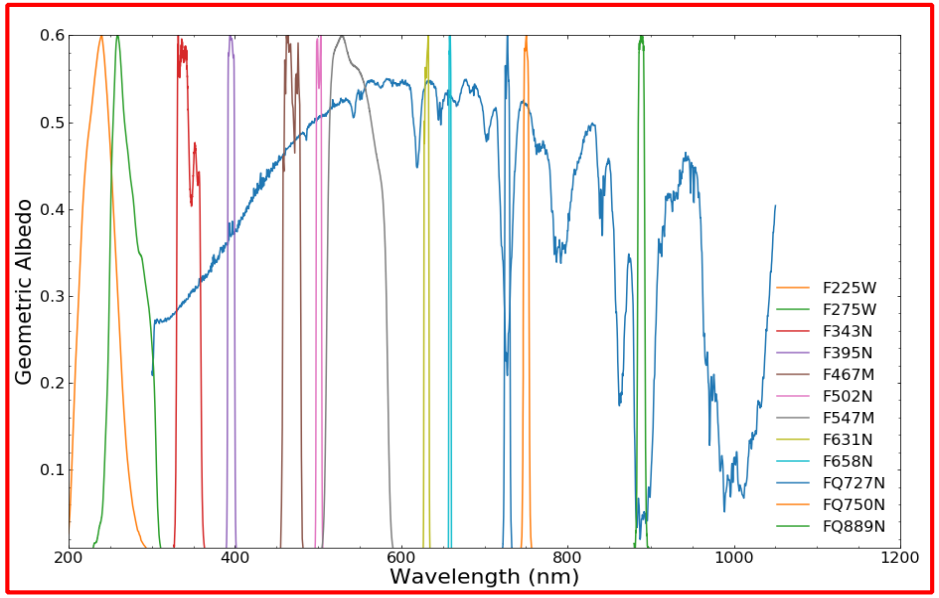
Databases:

PVOL (UPV/EHU): http://pvol2.ehu.eus/pvol2/

ALPO Japan: http://alpo-j.asahikawa-med.ac.jp/Latest/Jupiter.htm

- 54 amateur observers
- 464 images in total

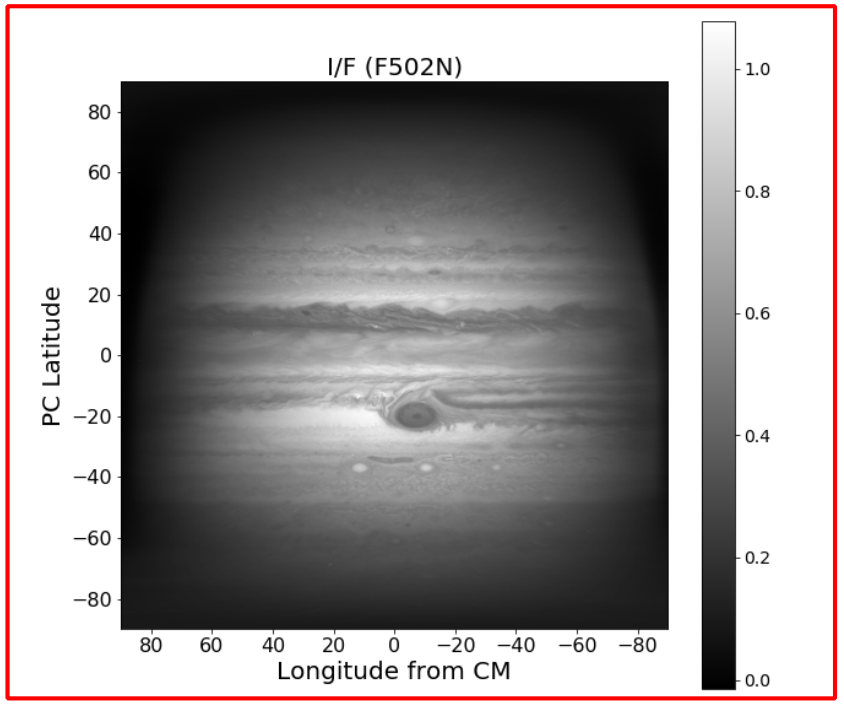
Spectral reflectivity analysis: HST images (2015-2019)



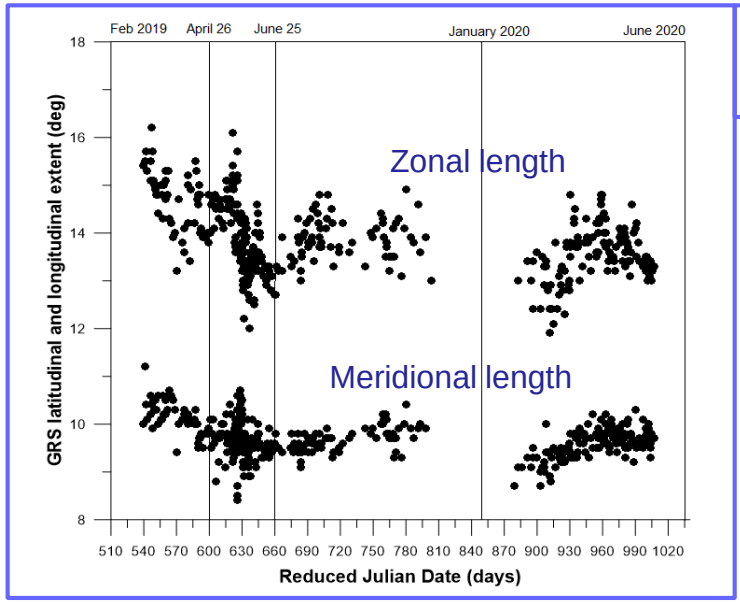
Filter transmissivity

- 15 HST visits from 2015 to 2019
- 12 filters in total, from UV to near IR
- Calibrated in absolute reflectivity

Images converted to planispheres

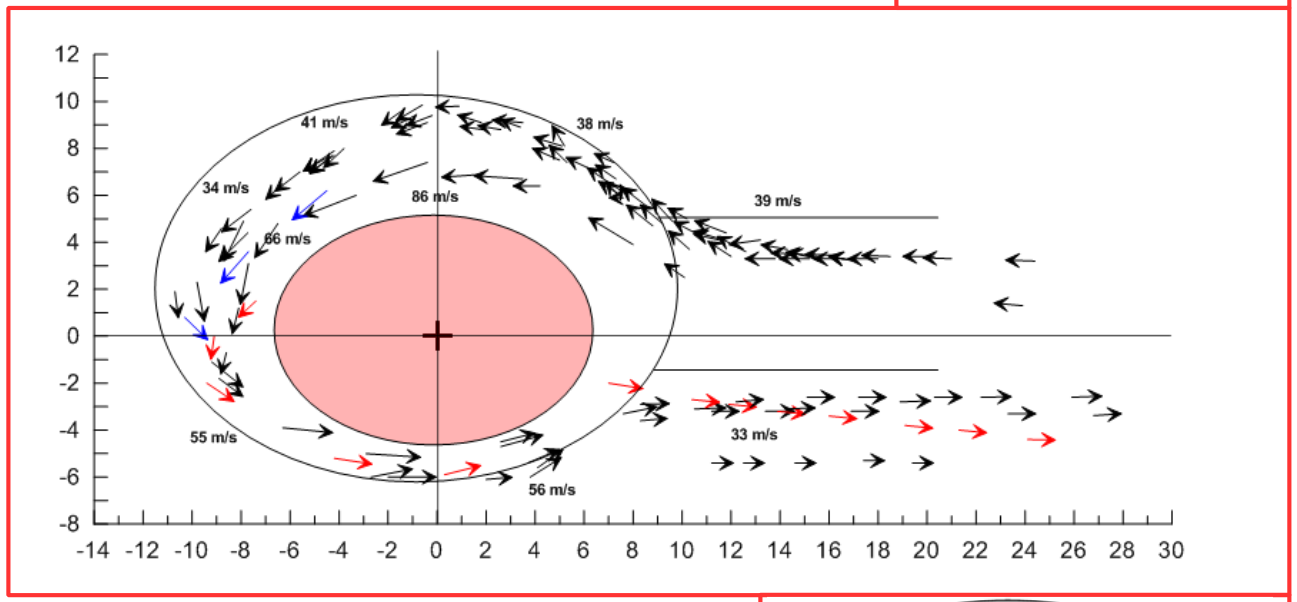


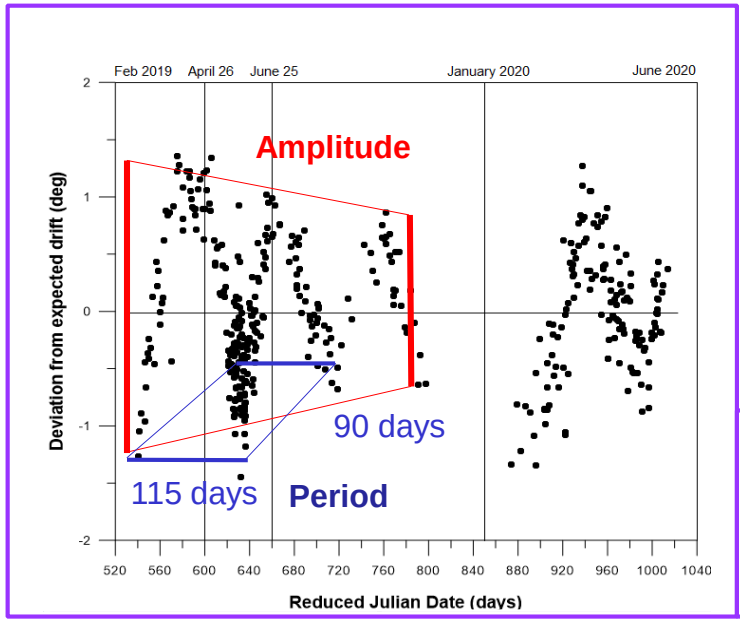
4.1. Dynamical analysis results



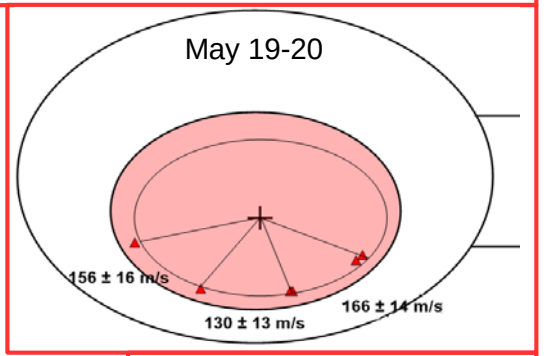
GRS size variations before, during and after interactions

Wind velocity tracking





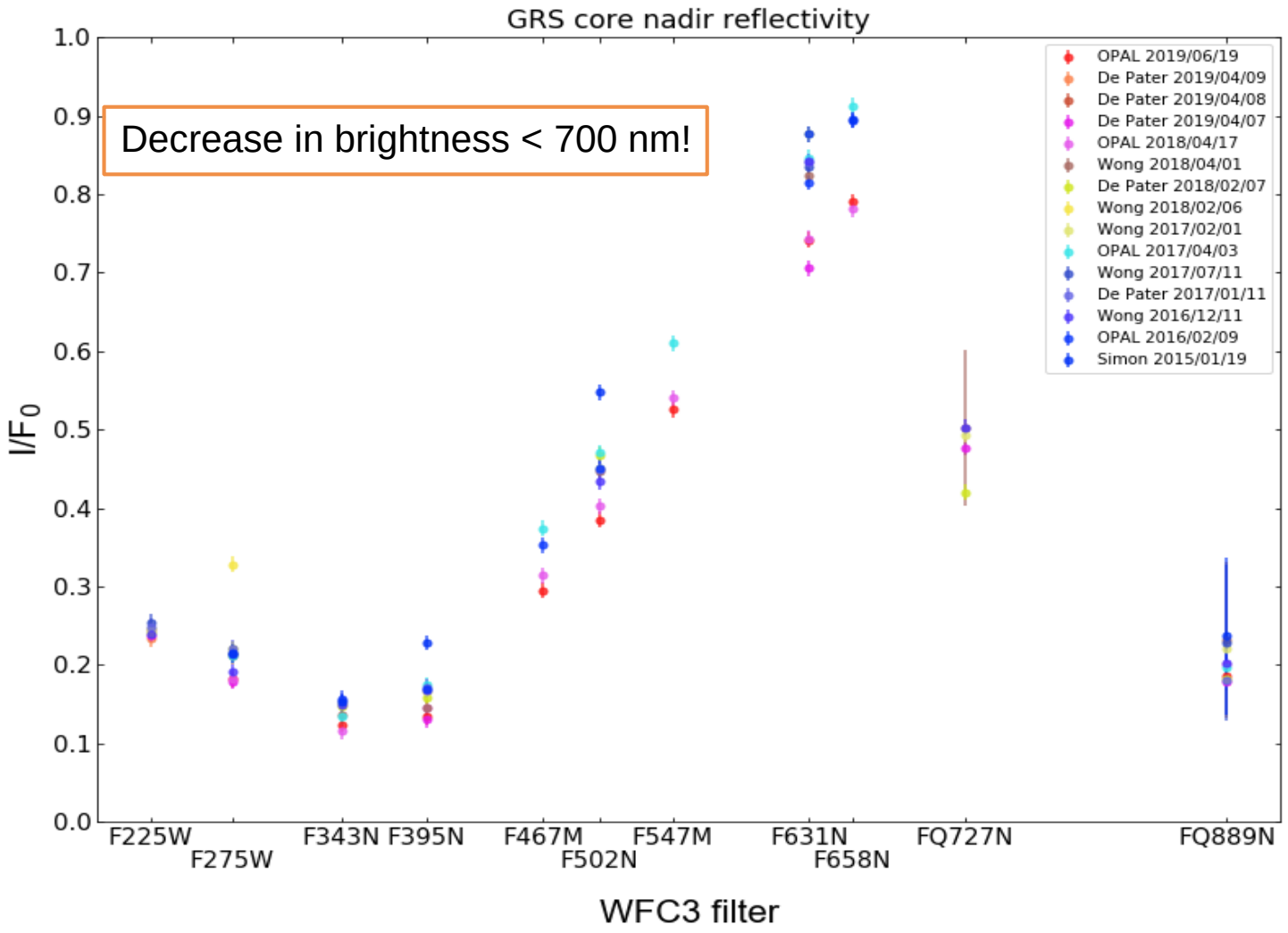
The mean zonal drift rate remained unchanged



Higher internal speeds

Change in the 90-day oscillation (period and amplitude)
Solberg et al., PSS (1969); Trigo-Rodriguez et al., PSS (2000)

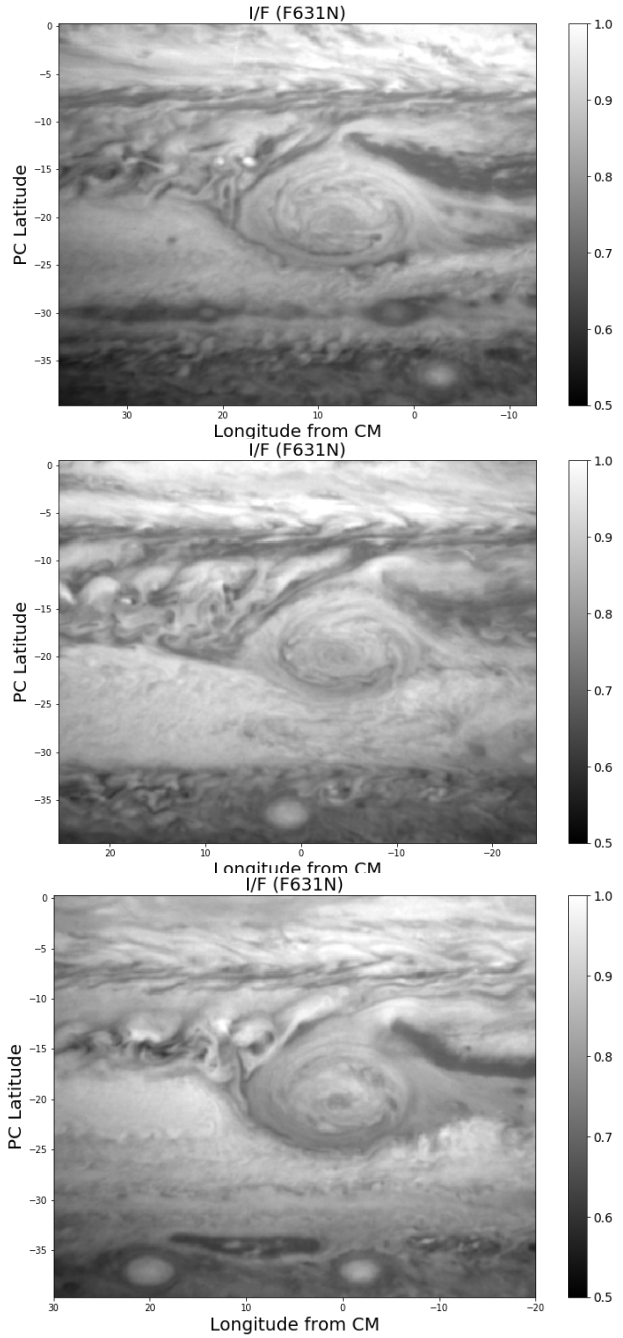
4.2. Spectral reflectivity results



2015

2017

2019



GRS core nadir view reflectivity from 2015 to 2019
Similar analysis from 1995 to 2017: A. Simon et al., AJ (2018)

5. Conclusions and prospects for the future

- The GRS has suffered important dynamical changes after its interaction with other vortices (size reduction, wind velocities, 90-day oscillation)
- Will it disappear? GRS gets recovered after interactions. This is consistent with dynamical simulations
- General decrease in brightness at GRS core
- Spectral analysis for other GRS surrounding regions will allow to generate a complete spectral map over recent years
- Future Radiative Transfer analysis will allow a general optical characterization of the clouds/hazes for pressure levels above 1 bar. GRS spectral modelling: Sromovsky et al., Icarus (2017); Baines et al., Icarus (2019)