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Título: A possible water ice cloud in Jupiter's stratosphere

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Resumen:

Jupiter's atmosphere has been sounded in transmission from UV to IR, as if it were a transiting exoplanet by observing Ganymede while passing through Jupiter's shadow during a solar eclipse. An eclipse of Ganymede was first observed on 06/10/2012 using LIRIS at WHT in La Palma Observatory, Spain and repeated later on 18/11/2012 by observing a second eclipse with XSHOOTER at VLT in Paranal Observatory. A first analysis of the observations has been reported by Montañés-Rodríguez et al. (ApJL, 2015). Here we focus on a more detailed analysis of the VIS and near-IR spectral regions with particular emphasis on the signatures of water ice. With this technique we obtain limb transmission spectra of Jupiter's atmosphere. During the eclipse, the spectral features of the Jovian atmosphere are imprinted in the sunlight that, after passing through Jupiter's planetary limb, is reflected from Ganymede toward the Earth. The ratio spectrum of Ganymede before and during the eclipse removes the spectral features of the Sun, of the local telluric atmosphere on top of the telescopes, and the spectral albedo of Ganymede. The spectra show strong extinction due to the presence of aerosols and haze in the atmosphere and strong absorption features from CH₄. In addition, the spectra show two broad features near 1.5 and 2.0 μm that we tentatively attribute to a layer of H₂O ice in Jupiter's stratosphere. While the spectral signatures seem to be unequivocally attributed to crystalline water ice, to explain the strong absorption features requires a large amount of water ice. This poses a major problem for reconciling the low water vapour abundance's in Jupiter stratosphere as measured by HERSCHEL (Cavalie et al.,2013) and the large concentrations of water ice very small particles (~0.01 μm) required to explain our spectra.