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A 2016 Ganymede stellar occultation event

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On 2016 April,13th the Jovian satellite Ganymede occulted a 7th magnitude star. The predicted occultation track crossed the Northern Pacific Ocean, Japan, and South Korea. Hence, it was a very favorable event due to the star brightness and to the visibility from the large aperture telescopes at Hawaii. While no other similar event is expected for the next 10 years, only two occultation events are reported in literature in the past, from Earth in 1972 [1] and from Voyager [2], in large disagreement in respect to the atmosphere detection. However, evidence of an exosphere around Ganymede was inferred by [3], through H Lyman alpha emission detected by Galileo UVS, and by [4], through HST/GHRS detection of far-UV atomic O airglow emissions, signature of dissociated molecular oxygen ([5],[6]). Later, the HST/STIS observations by [7] provided further evidence for exospheric neutral hydrogen. Since Ganymede is known to have an intrinsic magnetic field ([8]) reconnecting with the Jovian magnetic field and (partially) shielding the surface equatorial latitudes from the electron impact, the UV emissions have been so far attributed to auroral processes ([6]). Nevertheless, the physical mechanisms governing these processes are not known with certainty (e.g. whether the emissions morphology is determined by the spatial distribution of magnetospheric electrons or by an uneven O_2 exosphere or both, see e.g.[9]).
We took advantage of this event in order to search for a signature of Ganymede's exosphere in the occultation light curve, by using facilities on Mauna Kea at Hawaii (NASA-IRTF observatory) and at Sobaeksan Optical Astronomy Observatory (SOAO) in South Korea.
At IRTF, both MORIS [10] and SpeX [11] instruments have been used, fed by the same optical entrance through a dichroic beam splitter at 0.95 micron. MORIS acquired a high-rate sequence of images about 0.25 sec apart in the visible range, while SpeX acquired a sequence of spectra at a bit lower rate, covering the 0.9-2.5 micron range. Unfortunately, a planned MORIS movie-mode sequence at higher rate failed in starting acquisition. The field of view of the instruments was not large enough to include a reference unocculted body, hence sky fluctuations are the major noise source.
At SOAO, a CCD camera in clear filter was used to obtain a shorter sequence of images at a lower rate (about 1 Hz). However, since the larger field of view allowed to observe simultaneously Ganymede and Callisto, we can use the latter as a reference unocculted body in order to cancel out telluric fluctuations. Results from the occultation light curve analysis on the three datasets will be discussed.
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