

# **The need for Professional-Amateur collaborations in studies of Jupiter and Saturn – a JBAA publication**

This work is a collective presentation of the type of contributions within the professional-amateur framework for the study of gaseous giants. In particular:

## **The need for Professional-Amateur collaborations in studies of Jupiter and Saturn**

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The observation of gaseous giant planets is of high scientific interest. Although they have been the targets of several spacecraft missions, there still remains a need for continuous ground-based observations. As their atmospheres present fast dynamic environments on various time scales, the availability of time at professional telescopes is neither uniform nor of sufficient duration to assess temporal changes. However, numerous amateurs with small telescopes (of 15-40 cm) and modern hardware and software equipment can monitor these changes daily (within the 360-900nm range). Amateurs are able to trace the structure and the evolution of atmospheric features, such as major planetary-scale disturbances, vortices, and storms. Their observations provide a continuous record and it is not uncommon to trigger professional observations in cases of important events, such as sudden onset of global changes, storms and celestial impacts. For example, the continuous amateur monitoring has led to the discovery of fireballs in Jupiter's atmosphere, providing

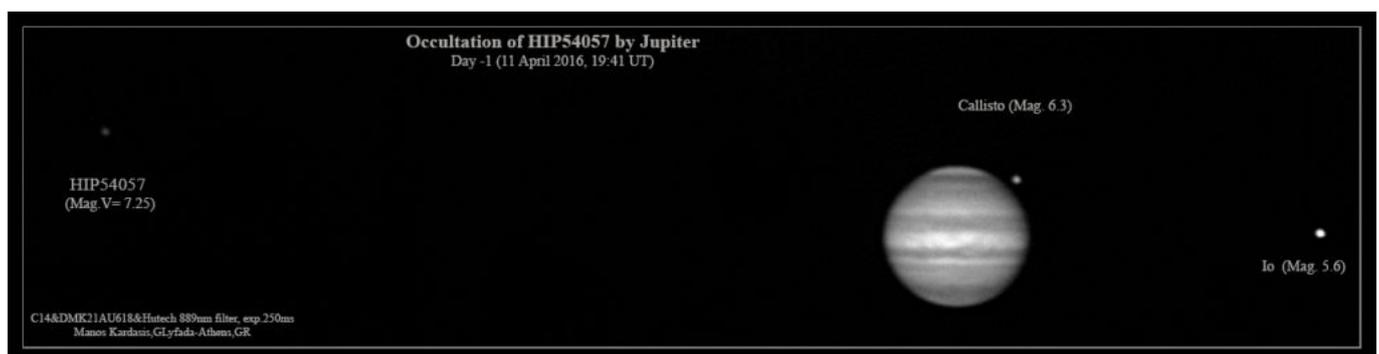
information not only on Jupiter's gravitational influence but also on the properties and populations of the impactors. Photometric monitoring of stellar occultations by the planets can reveal spatial/temporal variability in their atmospheric structure. Therefore, co-ordination and communication between professionals and amateurs is important. We present examples of such collaborations that: (i) engage systematic multi-wavelength observations and databases, (ii) examine the variability of cloud features over timescales from days to decades, (iii) provide, by ground-based professional and amateur observations, the necessary spatial and temporal resolution of features that will be studied by the interplanetary mission Juno, (iv) investigate video observations of Jupiter to identify impacts of small objects, (v) carry out stellar-occultation campaigns.

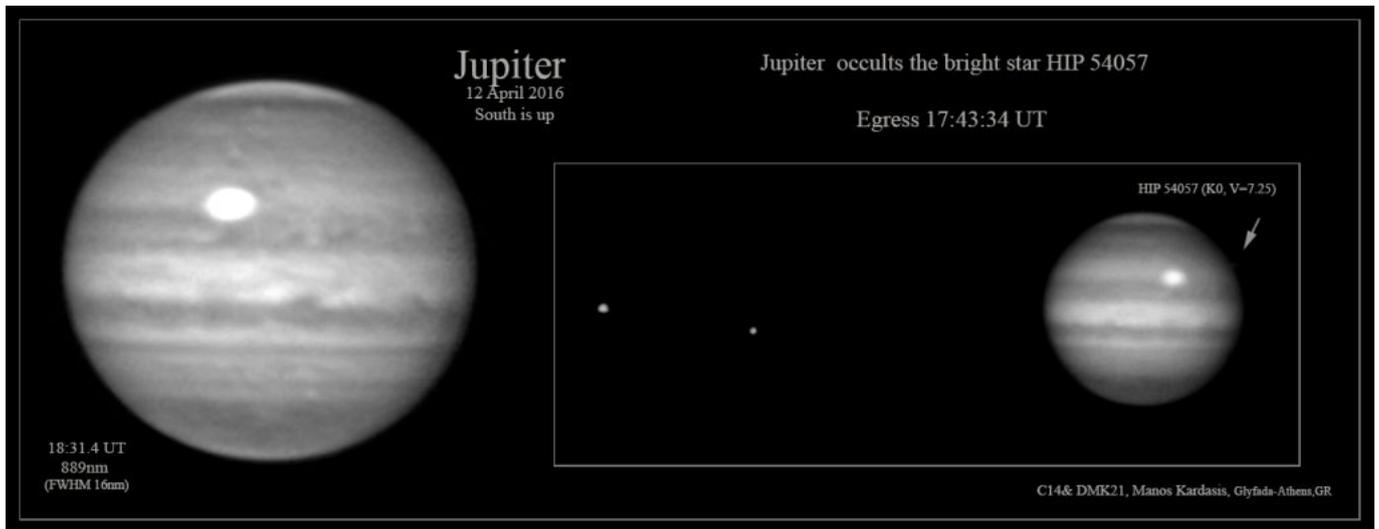
The paper is available either through [arXiv: 1503.07878](https://arxiv.org/abs/1503.07878) or directly from [JBAA \(2016, vol. 126, p. 29\)](#).

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# Stellar occultation of HIP 54057 by Jupiter and Ganymede

Results (15/04/2015):





## Announcement (13/12/2015):

The structure and variability of the upper atmospheres of the giant planets may be investigated by occultation techniques [1]. Ground-based photometric monitoring of stellar occultations measure the attenuation of starlight by the planet's intervening atmosphere due to differential refraction. This requires a sufficiently bright star to act as source and such opportunities are not frequent. A recent example was the occultation of the bright star 45 Capricornii (45 Cap) by the planet Jupiter on the night of 3-4 August, 2009.

On April 12, 2016 the planet Jupiter will occult the bright star HIP 54057 (K0, V=7.25) as viewed from areas of Europe, Africa and Asia. The occultation will sample similar planetographic latitudes at Jupiter as the 45 Cap event in 2009, allowing direct comparisons of the planet's atmospheric state between the two epochs. The event has an added significance in view of the expected arrival of the *Juno* spacecraft to the Jovian system. For European observers, ingress occurs during daytime while egress takes place at approx 1745 UT when the sun is below the horizon from E & SE Europe. Due to the star being a K dwarf (V-I=1.02), use of a broadband R or I filter (a narrowband filter may be used with large aperture instruments) is recommended to suppress the twilight sky signal and increase the contrast between the

limb of Jupiter and the star. Following this event, the star is occulted by the Galilean satellite Ganymede ( $V=5.3$ ) as viewed from certain (tbd) areas of E Asia and the Pacific at approximately 1200 UT the next day, April 13. This secondary event may be useful in refining the ephemeris of the satellite and to constrain the existence of a tenuous atmosphere around it. Dense photometric observations are requested during ingress and egress. A visual summary of the event is provided in the following image (see also ref [6]) prepared by Apostolos Christou.

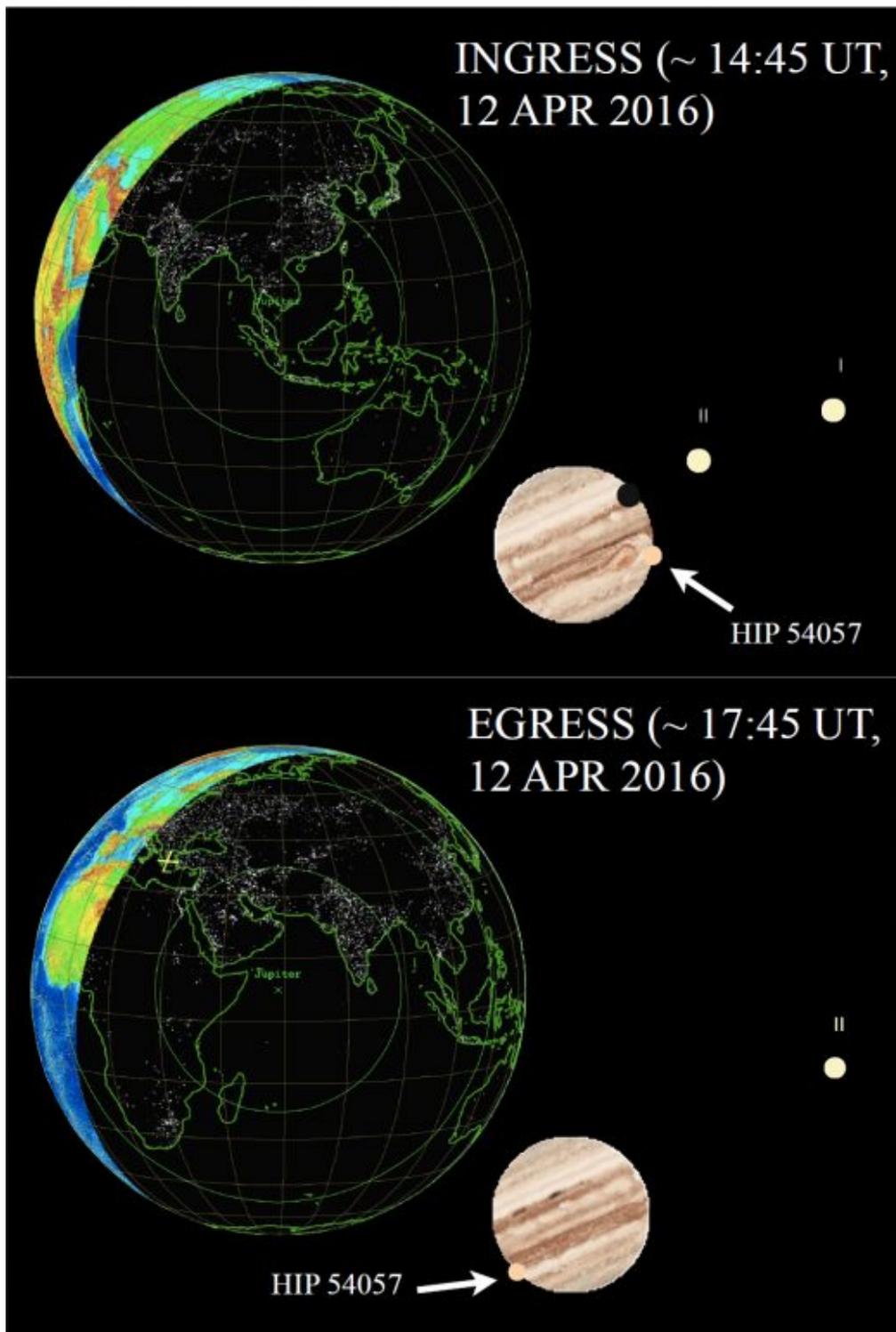
# Stellar Occultation by Jupiter (and satellites) in 2016

## **HIP 54057**

-K0, V=7.25, V-I = 1.02, K=4.9

-12 April 2016 (+ Ganymede occ. 13 April)

-visible from Asia, Oceania, E Africa & SE Europe



An optical summary of the observing conditions of the occultation of HIP 54057 by Jupiter (Credit: A. Christou).

## References:

[1] Kardasis, Emmanuel, Rogers, John H., Orton, Glenn, Delcroix, Marc, Christou, Apostolos, Foulkes, Mike, Yanamandra-Fisher, Padma, Jacquesson, Michel, Maravelias, Grigoris, *'The need for Professional-Amateur collaborations in studies of Jupiter and Saturn'*, Journal of the British Astronomical Association, vol. 126, n. 1, p. 29, (2016)  
<https://britastro.org/sites/default/files/JBAA%20126-1%20Kardasis.pdf>

[2] A. Christou et al., *'The occultation of HIP 107302 by Jupiter'*, *Astronomy & Astrophysics*, 556, A118, (2013)

[3] IOTA European Section, *'Occultation of HIP 107302 by Jupiter on the 3rd of August 2009'*  
<http://www.iota-es.de/jupiter2009/jupiteroccultation.html>

[4] Doug Mink, *Occultations of PPM stars by Jupiter 2000-2050*  
<http://tdc-www.harvard.edu/occultations/jupiter/jupiter.ppm2000.html>

[5] VizieR entry for HIP 54057  
<http://vizier.u-strasbg.fr/viz-bin/VizieR-S?HIP%2054057>

[6] A. Christou, "Stellar Occultation by Jupiter (and satellites) in 2016 – HIP 54057"  
<http://hellas-astro.gr/wp-content/uploads/2018/10/Christou-occultation-HIP54057-Jupiter.pdf>