
Hunting exomoons with VLTI/GRAVITY+ and future facilities

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Abstract

With the publication of Gaia DR4, astrometry will mature from a future prospect to a highly prosperous and efficient method of exoplanet detection. Monitoring the slight orbital wobbles that potential host stars show over long periods of time will reveal the presence of thousands such planets. It is now the time to prepare for taking the astrometric detection method to the next level: for the first time, the novel possibilities offered by the emergent field of NIR interferometry, more precisely the unprecedented astrometric accuracy and precision of VLTI/GRAVITY+, allow us to directly monitor the orbital movement of exoplanets with sufficient accuracy to detect the perturbing presence of exomoons.

Here we present early results of an ongoing study into the exomoon detection capabilities of different present and future instruments. We will outline our injection and blind-retrieval approach, simulating astrometric time series data resulting from different star-planet-moon configurations and attempting to identify such parameter spaces where detection is especially favourable. Additionally, we will show the first exomoon sensitivity estimates achievable with a future kilometeric baseline facility.

The first bona fide exomoon detections are imminent. Their frequency will impact planet formation scenarios, the search for habitability as well as the eventual interpretation of prospective biosignatures. Assessing these capabilities today will strengthen the case for leveraging NIR and optical interferometry to astrometrically detect exomoons in the future.

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