Detection and Dynamics of Exoplanets (DDE): Interplay between theory and observations



Contribution ID: 26

Type: not specified

Extreme Exomoons: Unlocking the secrets of ringed and volcanic satellites

Tuesday 8 July 2025 10:15 (15 minutes)

Since the advent of space telescopes such as Kepler and TESS, the discovery of exomoons has been anticipated to follow the plethora of exoplanet detections. Despite more than a decade of observations, exomoons remain elusive, with only a few candidates, such as those around Kepler-1625b and Kepler-1708b, proposed. Their physical and orbital properties challenge current theories of satellite formation and dynamics, leaving their existence under debate. This work explores the state of exomoon and exoring science, intertwining their orbital dynamics and observational characteristics to unravel the key processes shaping their evolution. We investigate phenomena such as tidal detachment leading to the formation of "ploonets" (moons transitioning into independent planets), the existence of "cronomoons" —moons with rings that could be mistaken for giant satellites —and the potential for exo-Io analogs in highly dynamic environments. A notable case is WASP-49b, which orbits its host star every 2.8 days, offering a unique testbed to study orbital stability, tidal interactions, and atmospheric signatures linked to volcanic activity. Furthermore, the search for circumplanetary rings and their potential association with massive moons provides critical insights into the mechanisms shaping these exotic systems. By combining theoretical models and observational strategies, this study aims to bridge the gaps in our understanding of exomoons and their role in the broader context of planetary system evolution.

Presenter: SUCERQUIA, Mario (Université Grenoble Alpes)

Session Classification: Exomoons, exorings, and trojan systems