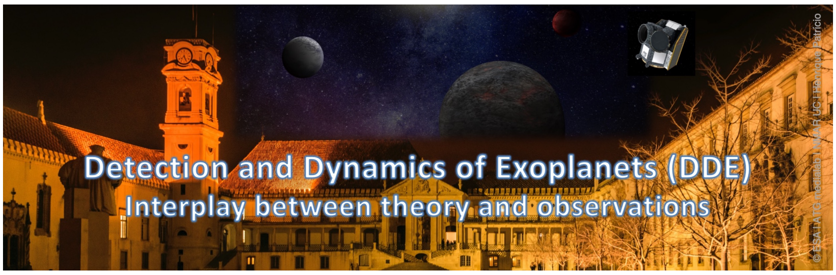

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Efficient stability constraints in RV detection limits with ARDENT

Monday 7 July 2025 11:15 (15 minutes)

Super-Earths and sub-Neptunes are the most abundant type of planets in the Galaxy, and yet, they are absent from the Solar System. A possible reason for this absence is the giant planets. Indeed, their gravitational influence could have prevented the inward migration of enough disc material needed to form super-Earths. Dedicated RV surveys investigate this hypothesis, by searching for inner small planets in systems that harbor a giant, and vice-versa. As of today, there is no consensus about a (anti-)correlation between inner super-Earths/sub-Neptunes and the presence of outer giant planets. As observational efforts continue, the computation of reliable detection limits is essential to draw rigorous conclusions. They are key to better understand the systems'architecture and to tailor specific RV follow-ups. However, those detection limits do not take into account the gravitational interactions between the known planets and the hypothetically hidden one. These interactions can lead to strong orbital instability, further discarding entire regions of the mass-period parameter space. In this presentation, I will introduce ARDENT, an open-source Python code for the fast and efficient computation of dynamical detection limits (i.e. detection limits that include the stability constraints). We combined both analytical and numerical stability criteria to balance computation time and reliability. We also optimized the parameter space exploration to further decrease execution time. I will present a few applications of ARDENT, emphasizing the improvement that stability criteria bring on the detection limits.

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Session Classification: RV-detected multiple systems