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



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Mutually-aligned orbits revealed by a Rossiter-McLaughlin analysis of the planetary system GJ 9827

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The GJ 9827 system hosts three planets in near-resonant orbits, smaller than two Earth radii. The two inner planets have an Earth-like composition, while the outer companion is a mini-Neptune with a volatile envelope. These features raise questions about the roles of in-situ formation and inward migration in shaping the system, which can be addressed by measuring the orbital architectures of the planets. GJ 9827 offers a rare opportunity to derive and compare the 3D spin-orbit angle of three small planets transiting the same star. We obtained transit observations of each planet as part of the ESPRESSO GTO and used a novel workflow, ANTARESS, to reduce the data homogenously and perform a joint Rossiter-McLaughlin "Revolutions" analysis of the three transits. We present our findings for the system's architecture, aiming to enhance our understanding of planetary system dynamics and composition. We find the three planets to be mutually aligned and orbiting within the stellar equatorial plane, favouring a scenario where the star and protoplanetary disk remained aligned, and the three planets migrated early on within the disk.

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