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Characterization and occurrence rate of Jupiter and Saturn analogs to assess their impact on the formation of small and terrestrial inner planets. The crucial role of Gaia-NIR

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The large exoplanet population with relatively short orbital periods (P<100 d) around solar-type stars is dominated by small (1⊠Rp⊠4 Re, Earth radii) and low-mass (1⊠Mp⊠20 Me, Earth masses) planets, i.e. super-Earths and sub-Neptunes. These planets are, however, missing in our Solar System, which has only terrestrial planets (Rp ⊠1 Re, Mp ⊠1 Me) in inner orbits, and the reason for that is unknown. Several theoretical works have tried to assess the impact of cold Jupiters (CJs, i.e. Jupiter and Saturn analogs with Mp~0.3-13 MJup and orbital separation a~1-10 au) on the formation and/or migration of small planets (SPs), and predicted either an anti-correlation or a weak or strong correlation between CJs and SPs, thus reaching somehow contradictory results. Here we report on the search, characterization, and occurrence rate of CJs in a sample of Kepler and K2 transiting systems observed with high-precision radial velocities over a decade, finding no evidence of previous claims of an excess of CJs in small-planet systems. We show how improved occurrence rates of CJs and their multiplicity around solar-type stars with Gaia-NIR can provide fundamental clues on both the formation of short-period SPs and their absence in our Solar System.

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