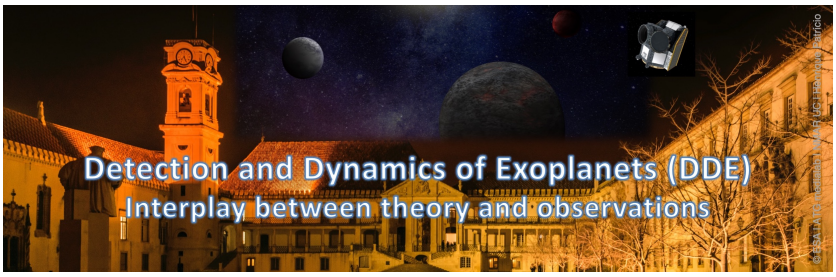

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Stability and dynamics of the compact planetary system K2-72

Friday 11 July 2025 15:00 (15 minutes)

We consider the dynamic evolution of the compact four-planetary system K2-72. Star K2-72 is an M-type dwarf. The system contains three Earth-like planets and one super-Earth. We searched for low-order resonances within the uncertainty of determining the periods of the planets. We considered a few scenarios for the evolution of the K2-72 system over 100 Myr using the Posidonius software, which considers tidal interactions. Furthermore, we showed that the compact planetary system K2-72 is likely to evolve beyond low-order resonances. A significant change in the large semi-major axes of the orbits of the K2-72 b and K2-72 d planets leads to the moving of the adjacent planets b–d and d–c out of the 7/5 and 8/5 resonance regions, respectively. The adjacent planets K2-72 d and K2-72 c are located far from the 2/1 resonance, which excludes the possibility of forming chains of mean motion resonances and, hence, 3-planet mean motion resonances. If the orbital eccentricities do not exceed 0.03, the evolution of the compact planetary system K2-72 over 100 Myr remains stable even in the presence of tidal perturbations. In case the initial eccentricities of the orbits of the three planets are equal to 0.04, the eccentricities of the orbits of one of the planets K2-72 d or K2-72 e should not exceed 0.03 to ensure the stability of the system. The study was supported by the Russian Ministry of Science and Higher Education via the State Assignment Project FEUZ-2020-0038.

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