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TOI-201: Unveiling spectacular dynamics in a young multi-planet system

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The TOI-201 system, featuring a young F-type star approximately 870 million years old, has emerged as one of the most intriguing planetary laboratories discovered so far. Our recent studies have unveiled a remarkable planetary architecture, including the detection of TOI-201 c - an additional massive gas giant with a 7.7-year orbital period. This discovery was facilitated by the analysis of transit timing variations (TTVs) in previously known gas giant TOI-201 b. Observations acquired with the space-born Transiting Exoplanet Survey Satellite confirmed the transit of TOI-201 c, revealing its orbital eccentricity of 0.64 and a mass of 14 Jupiter masses, cyclically diving into the system's habitable zone. Numerical simulations indicate that the system is dynamically stable over gigayear timescales, with TOI-201 b's transits expected to cease within a few thousand years. This evolving configuration provides a unique opportunity to investigate the long-term dynamical interactions and secular evolution within multi-planet systems. The TOI-201 system's youth and the presence of multiple giant planets make it an invaluable case study for testing theories of planet formation, migration, and dynamical evolution. In this talk, I will highlight how TTVs led to the discovery of TOI-201 c, explore the system's dramatic orbital architecture, and discuss what it tells us about the formation and dynamical evolution of giant planets.

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