P314a　木星・土星のカオス励起による地球型惑星と小惑星帯の形成：太陽系内部の包括的な力学モデル

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The terrestrial planets formed by accretion of small bodies within the inner solar system’s protoplanetary disk. Previous works studying this process with numerical simulations have found that forming a small-mass Mars requires the disk to contain little or no mass beyond 1.5 au. Several scenarios may produce such a narrow disk. However, the simultaneous replication of the four terrestrial planets’ orbits/masses, the asteroid belt’s main properties, and other inner solar system constraints remains elusive. Here, our extensive simulations revealed that chaotic excitation of disk objects generated by a near-resonant configuration of Jupiter-Saturn could create a narrow disk, allowing the formation of the terrestrial planets and the asteroid belt. This mechanism could typically deplete a massive disk beyond 1.5 au within 10 Myr. After 100 Myr timescales, the resulting terrestrial systems reproduced the current orbits and masses of Venus, Earth and Mars. Considering an inner region disk component also boosted the formation of Mercury in those systems. Thus, several of our terrestrial systems simultaneously formed analogs of the four terrestrial planets. In addition, these systems often satisfied additional constraints: Moon-forming giant impacts occurring within 60 Myr, terrestrial planets’ bombardment of late impactors represented by disk objects formed within 2 au, and bulk water acquired during the first 10 – 20 Myr of Earth’s formation. Finally, our model asteroid belt explained the asteroid belt’s orbital structure, small mass and taxonomy (S-, C- and D/P-types).