

The origin of the small mass of Mars

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Abstract

Numerical models of the accretion process of terrestrial planets reproduce quite successfully the observed system, with one exception: the planet formed at the location of Mars is typically too massive. Hansen (2009) convincingly argued that to obtain a large Earth/Mars mass ratio, the initial distribution of the planetesimals had to be concentrated in an annulus with an outer edge at $\sim 1\text{AU}$. However, as admitted by Hansen himself, this assumption is totally ad-hoc; moreover it is unclear how it could be consistent with the presence of asteroids in the main belt (2-3.5 AU), which required a massive environment to form. In this talk we will present a new idea, dubbed the 'Grand Tack' scenario. This scenario is consistent with Hansen (2009) and reproduces reasonably well the properties of the asteroid belt in terms of orbital distribution and taxonomic-type dichotomy. This is also consistent with the most recent model of the orbital evolution of the giant planets, which provides the initial conditions to the 'Nice Model' (Morbidelli et al., 2007).

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References

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