

Primordial sculpting of the region of semimajor axes smaller than 2 AU

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We carried out a series of numerical simulations of the dynamical evolution of test particles in the region between $a=1.5$ AU and $a=1.9$ AU, during the early phase of planetary formation in the Solar System. We explored two different scenarios: 1) only Jupiter and Saturn are present, including a case simulating the accretion of these planets and 2) including also Mars and the Earth. We found that only those asteroids from well defined narrow regions in semimajor axis, associated to the V16 secular resonance and the 5:1 mean motion commensurability with Jupiter, can reach Mars crossing orbits in time scales comparable to the time scale of formation of the inner planets. This implies that only a small fraction of objects in this region could have been contributors to the accretion of the inner planets. Secular resonances with the inner planets and mean motion commensurabilities with both the inner and the outer planets play a key role in the primordial sculpting of this region. We also computed the intrinsic probability of collision with Mars, concluding that primordial asteroids from this region did not contribute in a significant way to the early strong bombardment of Mars' surface.