Accretion of the Moon from the protolunar disk: canonical Vs non-canonical

The most favored scenario for the origin of the Moon involves a giant impact onto the Earth, ejecting material into orbit and forming a disk from which the Moon accreted. While these impacts can naturally explain several properties of the Earth-Moon system, they still face important challenges. In the “canonical” case, subsequent mixing of the disk’s atmosphere with that of the Earth is required to explain the strong isotopic similarities between the Earth and the Moon, but this “equilibration” process requires >100 years, much larger than accretion timescales predicted by N-body simulations of the Moon’s accretion from the disk. In the “non-canonical” case, the disk has a composition close to that of the Earth, but the impact leaves the Earth-Moon system with an angular momentum about twice that in the current system, requiring subsequent extended capture of the Moon in the evection resonance with the Sun.

We have developed a hybrid numerical model to study the accretion of the Moon from the protolunar disk, in both cases. We will present re-evaluated accretion timescales helpful for the canonical case, and study how the dynamics of accretion may affect the likelihood of the Moon being captured into the evection resonance.