EGU22-5323
https://doi.org/10.5194/egusphere-egu22-5323
EGU General Assembly 2022

The Resonant Tidal Evolution of the Earth-Moon Distance

Mohammad Farhat, Pierre Auclair-Desrotour, Gwenaël Boué, and Jacques Laskar
IMCCE, CNRS, Observatoire de Paris, PSL University, Sorbonne Université, Paris, France

Due to tidal interactions in the Earth-Moon system, the spin of the Earth slows down with time and the Moon drifts away. This present recession of the Moon is now measured with great precision using Lunar Laser Ranging, but it has been realised, more than fifty years ago, that simple solid-Earth tidal models extrapolated backwards in time lead to an age of the Moon that is by far incompatible with the geochronological and geochemical evidence. Since then, in order to evade this paradox, more elaborated models have been proposed, taking into account the tidal frequency-dependent oceanic dissipation; but none so far has been able to fit both the estimated lunar age and the present rate of lunar recession. In this talk, we present a physical model that reconciles these two constraints and yields a unique solution of the tidal history. This solution fits remarkably well the available geological proxies and consolidates the cyclostratigraphic method, although such a fit was not imposed. The resulting evolution involves multiple crossings of resonances in the oceanic dissipation that are associated with significant and rapid variations in the lunar orbital distance, the Earth's length of the day, obliquity, and precession frequency.