

Jun Korenaga

Yale University

'Where was the Moon? A fresh look at the tidal evolution of the early Earth-Moon system'

Monday, 5th June 2023 @ 14h

onsite: ENS Lyon, salle R117

online: <https://bigbluebutton2.ens-lyon.fr/b/mat-wa5-20g-jp8>

The early evolution of the Earth-Moon system prescribes the tidal environment of the Hadean Earth and holds the key to the formation mechanism of the Moon. Estimating its early state by backtracking from the present, however, suffers from considerable uncertainties associated with ocean tides. Tidal evolution during the solidification of Earth's magma ocean, on the other hand, has the potential to provide robust constraints on the Earth-Moon system before the appearance of a water ocean. I will show how energy dissipation in a solidifying magma ocean results in limited lunar recession and suggest that the Moon was probably still at the distance of approximately 7-9 Earth radii at the beginning of subsolidus mantle convection. With a plausible range of ocean tides, the Moon must have gained nearly half of the present-day orbital distance during the Hadean, suggesting a rapidly changing tidal environment in the early Earth. Limited lunar recession during Earth's magma ocean will also help to evaluate various hypotheses proposed for the origin of lunar inclination.