Alternative driving mechanisms for core flows and planetary dynamos

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It is a commonly accepted hypothesis that buoyancy drives planetary and stellar dynamos. Indeed, on Earth, the prevalent hypothesis is that the present magnetic field is generated by thermochemical convective motions within the conducting core driven by the crystallisation of the inner core. However, the validity of the convective dynamo model in certain planets can be questioned, as for instance in the Early Moon, in the Early Earth, in Ganymede… Besides, even in planets where the dynamo is of convective origin, the role of other driving mechanisms in the organization of fluid motions is still largely unknown. The purpose of this presentation is to participate in the rehabilitation of three processes present at the planetary scale, but often neglected when looking at their driving influence in core flows: precession, tides and libration. By combining theoretical, numerical and experimental studies from our group as well as from others, I will reestablish these alternative driving mechanisms as potential sources for planetary dynamos, as first suggested in the 70's, and I will demonstrate that on no account, planetary or stellar dynamo systematically means convection.