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Forced Rotational Oscillations and Tidal Evolution of Close-in Terrestrial Planets and Planetary Satellites

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Abstract

The creep tide theory [1] and the Maxwell tide model [2] show that the rotation of close-in terrestrial planets and planetary satellites are damped by tidal effects to periodic attractors nearly commensurable with the orbital period (frequency ratios 1/2, 1, 3/2, 2, 5/2, …), They also show that the final solutions are not stationary, but are forced oscillations (physical librations) around one center, even when no permanent triaxiality exists. These forced oscillations affect the evolution of the systems and the dissipation, which may depart from the solutions obtained from classical averaged models. A new model proposed by Folonier et al. [3] allows us to simultaneously calculate the tidal deformations and the body.

Aknowledgements

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References

[1] Ferraz-Mello, S. "Tidal synchronization of close-in satellites and exoplanets: II. Spin dynamics and extension to Mercury and exoplantes host stars" Celest. Mech. Dyn. Astr. 122, 359, 2015

[2] Correia, A.M., Boué, G., Laskar, J. and Rodrigues, A. “Deformation and tidal evolution of close-in planets and satellites using a Maxwell viscoelastic rheology", Astron. Astrophys. 571, A50, 2014

[3] Folonier, H.A. et al. In preparation