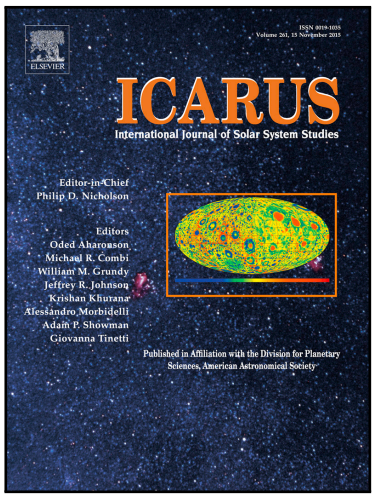

Dissipation in a tidally perturbed body librating in longitude.

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PII: S0019-1035(17)30390-1
DOI: 10.1016/j.icarus.2017.10.020
Reference: YICAR 12655

To appear in: *Icarus*

Received date: 23 May 2017
Revised date: 11 October 2017
Accepted date: 13 October 2017

Please cite this article as: Michael Efroimsky, Dissipation in a tidally perturbed body librating in longitude., *Icarus* (2017), doi: 10.1016/j.icarus.2017.10.020

Highlights

- In a tidally perturbed librating body, libration changes the spectral distribution of tidal damping across the tidal modes, as compared to the case of steady spin. This changes both the tidal heating rate and the tidal torque.
- Aside from the tidal deformation exerted by the external perturber, a librating body is subject to an alternating toroidal force. The centrifugal force, too, contains an alternating component. These forces contribute to heating and to the tidal torque. We show that in the 1:1 and 3:2 spin-orbit resonances the contribution of these effects is not very large, provided libration is weak ($\lesssim 12^\circ$).
- Forced libration in longitude provides a considerable and, in some cases, leading input in the tidal heating. This input amounts to 52% in Phobos, 33% in Mimas, 23% in Enceladus, and 96% in Epimetheus. So the additional tidal damping due to forced libration may have participated in the early heating up of some of the moons. Chipped by a collision, a moon could have acquired a higher triaxiality and, therefore, a higher forced-libration magnitude and, consequently, a higher heating rate. After the moon warmed up, its triaxiality decreased, and so did the tidal heating rate.