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Librating Propeller Moonlets in Saturn's A-Ring

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Abstract

More than 150 moonlets have been found orbiting in Saturn's A-Ring [1,2] based on their gravitational interaction with the ring material forming s-shaped structures in their vicinity- propellers [3, 4]. An analysis of the orbital motion of the largest propeller moonlet, Bleriot, revealed a sinosodial, long-term deviation from the suspected Keplerian orbit. In order to explain this deviation, we consider a resonant perturbation of the propeller moon, induced by another more massive satellite (such as Pan, Prometheus and Pandora).

We model these perturbations with an adapted pendulum model [5, 6]. With our analytical model we can predict the amplitude and period for the libration or circulation for defined resonances. The 14:13 CER of Pandora, the 136:134 OVR of Pan and the 42:40 IVR of Prometheus are the three most promising candidates to explain Bleriot's observed libration period and amplitude of 3.6 years and 0.13°, respectively. Furthermore, we will present predictions for other trans-Encke moonlets (e.g. Earhart, Sikorksy, Santos Dumont and Kingsford Smith).

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