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Analysis of high-resolution observations of trans-Encke propeller structures

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Abstract

Among the great discoveries of the Cassini mission are the propeller-shaped structures created by small moonlets embedded in Saturn's dense rings. These moonlets are not massive enough to counteract the viscous ring diffusion to open and maintain circumferential gaps, distinguishing them from ring-moons like Pan and Daphnis.

We study moonlet-wake profiles and the azimuthal evolution of propeller gaps by comparing results of hydrodynamical propeller simulations [1] to high-resolution observations performed by Cassini's ISS and UVIS instruments. Furthermore, we analyze azimuthal asymmetries of moonlet wakes and propeller gaps, discuss relevant timescales for these asymmetries [2], and interpret them in the context of a simple model of a migrating moonlet (cf. [3, 4, 5]).

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