

L14b From Encke-like to sungrazing orbits

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It is known that an orbit such as Comet 2P/Encke's (semi-major axis $a \approx 2.21$ AU, eccentricity $e \approx 0.85$) can undergo substantial changes in e as a result of secular perturbations from Jupiter over $\sim 10^4$ yr (and also from Saturn over a slightly longer timescale); it is possible that Encke or its parent comet had an earlier phase in an orbit of very high e (sungrazing). There are many asteroids, and smaller objects (the Taurid meteoroid complex), on Encke-like orbits. These are subject to similar secular effects.

In this paper some aspects of the dynamics of such sungrazing orbits are explored, including precession rates (the longitude of perihelion ϖ precesses much more slowly when e becomes very high), the question of whether a secular resonance of ϖ can occur, and the effect of a mean motion resonance on the orbital evolution (Encke is near the 7:2 Jovian resonance at $a \approx 2.256$ AU).