The dynamics of impactors on a synchronous planetary satellite

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We have applied the extension of Opik's theory of close encounters by Valsecchi et al. (2003) to the case of a satellite in a circular orbit about a planet that, in turn, is in a circular orbit about the Sun, with the further assumption that the plane of the planetocentric orbit of the satellite is the same as that of the heliocentric orbit of the planet.

The goal is to understand the effects on the satellite surface of the cratering caused by impacts due to a population of small bodies on planet-crossing, inclined orbits.

With this setup, we have already computed analytically the velocity and the elongation from the apex of the bodies impacting the satellite, as simple functions of the heliocentric orbital elements of the impactor and of the longitude of the satellite at impact.

In the present work, we delve deeper into the dynamics of the impactors, taking into account also trajectories leading to impacts on the satellite just after a close encounter with the Earth.

References: Valsecchi, G. B., Milani, A., Gronchi, G. F., Chesley, S. R.: Resonant returns to close approaches: Analytical theory. Astron. Astrophys. 408, 1179–1196 (2003).