Dynamical simulations of the impact rate, velocities, and angles of Mars-crossing asteroids

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High-resolution spacecraft imagery has allowed us to obtain very accurate measurements of the sizes of impact craters on Mercury, the Moon, Mars, Vesta, and many of the Jovian and Saturnian satellites.

In order to achieve a better understanding of the size distribution of craters on the terrestrial planets (and other minor bodies), knowledge of the range of asteroid impact energies and geometries is required.

To begin to examine this, we used the population of Mars-crossing asteroids and ran dynamical simulations for 100 Myr forward in time. In total, ∼3,300 particles (with each particle representing a known asteroid) were integrated using the 'Hybrid' algorithm of the Mercury dynamical simulation package[1]. We report on the impact rate on the Martian surface along with a statistical estimation of the incident velocities and angles.

References: [1] Chambers, J.E. (1999). A hybrid symplectic integrator that permits close encounters between massive bodies, 304, 793–799.