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Numerical modeling of basin forming impacts: Implications for the heat budget of planetary interiors.

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The surfaces on most terrestrial planets, moons and asteroids are heavily cratered. Large crater basins such as Hellas on Mars with a diameter of >2000 km suggest that impacts did not only scar the surface but significantly affected the planetary interior.
We present numerical models to quantify the amount and distribution of heat deposited in the planet. We used the iSALE hydrocode to simulate vertical and oblique impacts of objects ranging from 2 km to 368 km in size into planets of different size (34.5 km-3450 km), different initial temperature, and different structural composition (crust, mantle, core). For vertical impacts the total amount of heat deposited into the target mainly depends on impactor properties (velocity and size) and only slightly on target parameters. The distribution of heat in the target body is mainly influenced by target properties (internal layering, differentiation, thermal structure and rheology). In some cases a hotspot antipodal to the point of impact is generated. With decreasing angle of impact the total amount of heat deposited inside the plant is reduced and the heat distribution is somewhat asymmetric.

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