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Thermal state of the Earth after the Moon-forming impact event using numerical simulations

Güldemeister*, N., Manske, L., Wünnemann K,
* Museum für Naturkunde, Invalidenstr. 43, 10115 Berlin,
Germany, nicole.gueldemeister@mfk.berlin

The Moon-forming impact event is thought to be Earth's last giant collision event, marking the end of the main accretion phase of the Earth. This large event (re)set the conditions for the subsequent thermochemical evolution of both bodies, Earth and Moon. Large parts of proto-earth are thought to melt as a consequence of the impact. We perform 3D simulations using the iSALE shock physics code. In order to determine the thermal state of proto-earth including melt production after the giant impact event we simulate the impact of a Mars-size body onto proto-earth with an oblique angle of incidence (30 to 60°).

Our simulations show that melt production decreases with decreasing impact angle (90° impact angle corresponds to head-on collisions). The Moon-forming impact event produces a global magma ocean although complete melting of the mantle is unlikely. About 20% of proto-Earth's mantle are molten. The earth's core restricts the melt production significantly.

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