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Impact-induced melting in giant collision events.

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The amount of melt that is generated in an impact event can be estimated by the volume of rocks that experience a shock pressure above some critical thresohold value (P_{crit} > ~60 GPa) [e.g. 1]. For large collision events these estimates may be inaccurate as they do not account for parameters such as initial temperature, pressure and the structure of the planet's interior. We carried out a series of impact simulations with the iSALE shock physics code to quantify the effect of these parameters.

In our models the critical shock pressure is a function of the initial temperature. We also account for the dependency of the solidus and liquidus as a function of lithostatic pressure, which enables us to account for decompression melting as a consequence of structural uplift of matter. For different terrestrial planets we consider different initial conditions regarding gravity, composition, pressure and temperature distributions. In our models we vary impactor diameter L and velocity v_i. The melt production in our models is in agreement with previous estimates for smaller impacts, but deviates significantly for large collision events.

[1] Pierazzo et al. (1997) Icarus 127, 408-423.

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