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Heat partitioning during core formation in terrestrial planets

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Core formation is the first major differentiation event that determines the initial conditions from which the Earth and other terrestrial planets have evolved until present day. In particular, heat partitioning between core and mantle at the earliest stages has a first order impact on the subsequent long term planetary evolution.

We thus investigate dynamically the heat partitioning between metal and silicate during core formation by negative diapirism. We model numerically the sinking of iron-rich diapirs through a viscous silicate mantle, in 3D axisymmetric geometry. We carried a parameter study in which shear heating as well as several viscous rheologies were considered and systematically varied.

We then derive general scaling laws for the time evolution of heat distribution between the iron-diapirs and the silicate material. These scaling laws are subsequently used to determine the heat distribution within terrestrial planets during their growth and early differentiation.