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Solid-liquid phase changes at the boundaries between magma oceans and solid mantle: implications for mantle dynamics

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The idea of an early Earth largely molten specially due to a Moon-forming giant impact, core formation, radiogenic and tidal heating, as well as an early atmosphere, is well accepted nowadays. This silicate molten part at the surface of the Earth is known as surface magma ocean. Several studies also suggest a second magma ocean, located below the solid mantle, known as the basal magma ocean.

Understanding how these magma oceans above and/or below the solid mantle interacted with it is crucial to perceive the dynamical evolution of the mantle across time. The convection is facilitated when the critical Rayleigh number is reduced. This happens when it is considered a melting/freezing front at the horizontal boundaries between magma oceans and solid mantle, i.e. considering permeable boundaries.

With the aim of understanding how this melting/freezing interface evolve, we use dynamical evolution models with StagYY code, with the implementation of permeable boundaries between magma oceans and solid mantle. This work shows and interprets the first results obtained after this implementation.