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# Double-diffusive inner core translation

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The hemispherical asymmetry of the inner core has recently been interpreted as resulting form a high-viscosity mode of inner core convection, consisting in a translation of the inner core. With melting on one hemisphere and crystallization on the other one, inner core translation would impose a strongly asymmetric buoyancy flux at the bottom of the outer core, with likely strong implications for the dynamics of the outer core and the geodynamo. The main requirement for convective instability in the inner core is an adverse radial density gradient. While older estimates of the inner core thermal conductivity favored a superadiabatic temperature gradient and the existence of thermal convection, the much higher values recently proposed make thermal convection unlikely. Compositional convection might be a viable alternative to thermal convection: an unstable compositional gradient may arise in the inner core either because the light elements present in the core are predicted to become increasingly incompatible as the inner core grows (Gubbins et al. 2013), or because of a possibly positive feedback of the development of the F-layer on inner core convection. Though the magnitude of the destabilizing effect of the compositional field is predicted to be similar to or smaller than the stabilizing effect of the thermal field, the huge difference between thermal and chemical diffusivities implies that double-diffusive instabilities may still arise even if the net density decreases upward. We propose here a theoretical (linear stability analysis) and numerical study of double diffusive convection in the inner core, focusing on the translation mode, and discuss in what conditions inner core translation can develop.