Fingering convection in geophysical and astrophysical contexts

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Fingering convection can occur in stably stratified fluids provided the density depends on two components, which diffuse at different rates. A common example is that of salt water, where both salinity and temperature contribute to the density of the fluid, and where heat diffuses about 100 times faster than salt. In astrophysics, fingering convection can occur in the stably stratified interior of stars and planets when the local chemical composition changes as a result of accretion or nuclear reactions.

In addition to increasing turbulent transport of heat and chemical species, fingering convection has a tendency to drive the emergence of large-scale fluid motion and large-scale structures such as gravity waves and layers. These are observed in the ocean, and are presumed to occur in the astrophysical context as well.

In this talk, I will present some of the latest numerical and analytical result of our group in quantifying the transport processes induced by fingering convection in different environments, and understanding its relationship with larger-scale dynamics. I will discuss the relevance of our findings for two cases, that of thermohaline staircases in the ocean, and of the apparent chemical abundances of planet-hosting stars.