Abstract Submitted
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Double-diffusive staircases in gas giant planets[1] PASCALE GARAUD, Applied Mathematics, UC Santa Cruz, RYAN MOLL, Department of Oceanography, Naval Postgraduate School, Monterey, CHRIS MANKOVICH, JONATHAN FORTNEY, Astronomy and Astrophysics, UC Santa Cruz — We present Direct Numerical Simulations of the transport of heat and heavy elements across a double-diffusive interface or a double-diffusive staircase, in conditions that are close to those one may expect to find near the boundary between the heavy-element rich core and the hydrogen-helium envelope of giant planets such as Jupiter. We find that the non-dimensional ratio of the buoyancy flux associated with heavy element transport to the buoyancy flux associated with heat transport lies roughly between 0.5 and 1, which is much larger than previous estimates derived by analogy with geophysical double-diffusive convection. We also find that the structure of double-diffusive interfaces at low Prandtl number differs significantly from those observed at high Prandtl number. Using these results, we find that the entire core of Jupiter would be eroded within less than 1Myr assuming that the core-envelope boundary is composed of a single interface, but could be entirely preserved in the presence of a staircase. This is particularly pertinent in the context of present and anticipated results from the Juno mission.

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