Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Heat flux in a penetrative convection experiment in water YOANN CORRE, THIERRY ALBOUSSIÈRE, STÉPHANE LABROSSE, LGL - Laboratoire de Géologie de Lyon, Université Lyon 1, ENS Lyon, PHILIPPE ODIER, SYLVAIN JOUBAUD, Phys-ENS, Laboratoire de Physique de l'ENS Lyon — In geophysical systems, stably stratified fluids adjacent to convective regions often experience thermal plume penetration from the latter. This penetrative convection occurs in stellar interiors between radiative and convective regions and possibly in liquid envelopes of planets, such as the Earth's core. We are interested in quantifying this process experimentally as it could play a crucial role in their dynamics. A volume of water initially at ambiant temperature is cooled from below at 0 degrees Celsius. Due to the maximum density of water near 4 degrees, a convective region develops and grows below a purely conductive region. A laser sheet crosses the experimental cell, lightening both neutrally buoyant particles and a thermosensitive fluorescent dye, which allows to monitor the velocity and temperature fields respectively (PIV-LIF technique), giving access to the local convective and conductive heat flux. The apparatus is placed on a rotating table to inspect the effect of the Coriolis force on the interfacial region. We find that increasing the rotation rate deepens the penetration of vortices into the conductive region, thus changing the structure of the interfacial layer and possibly eroding the stable region.

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Date submitted: 31 Jul 2015 Electronic form version 1.4