Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Heat Flux measurements under strongly Non-Oberbeck Boussinesq conditions STEPHAN WEISS, Max Planck Institut f. Dynamics and Self-Organisation, VALENTINA VALORI, TU Delft, LUCIA WESENBERG, Georg August University, Goettingen, EBERHARD BODENSCHATZ, Max Planck Institut f. Dynamics and Self-Organisation — We use sulfur-hexafluoride (SF_6) in a Rayleigh-Bénard convection cell to investigate how deviations from the Oberbeck-Boussinesq approximations influence the heat flux. The pressure (P) and temperature (T) of the working fluid are above their critical values, where fluid properties are very sensitive to changes in T and P. We make measurements at various (T,P) that are chosen, such that the Rayleigh- and Prandtl numbers are kept constant, while the variations of the fluid properties across the cell ($X_{NOB} = X_t/X_b - 1$, with $X = \varrho, \kappa, \nu, \alpha, \lambda$) change. In this way, we can directly measure how changes in X_{NOB} affect the heat flux. Our preliminary results suggest the existence of different regimes, where the heat flux is either increased or decreased for increasing X_{NOB}. These regimes are separated by lines of maximal and minimal X in the T-P parameter space. Our results also contribute to a better understanding of RBC under OB conditions, since one can tune to some extend the conditions at the boundary layers and see the effect of such changes onto the heat transport.

Stephan Weiss
Max Planck Institut f. Dynamics and Self-Organisation

Date submitted: 18 Jul 2017 Electronic form version 1.4