Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Laboratory measurements of energy and temperature dissipation rates in Rayleigh-Bernard convective flow with Ra= O(10^8) to O(10^9)
SARAH WOODS, Rosenstiel School of Marine and Atmospheric Science, University of Miami, ADAM FINCHAM, Department of Aerospace and Mechanical Engineering, University of Southern California, DAREK BOGUCKI, Rosenstiel School of Marine and Atmospheric Science, University of Miami — The measurements were carried out in a Rayleigh-Bernard convective cell with dimensions 0.3 m x 0.3 m x 0.3 m. We have experimentally obtained time series of temperature collocated with velocity fields from a 2D PIV system. The length of the time series spans a few large eddy turnover times, allowing the capture of energy and temperature fluctuations. We have used PIV interrogation windows smaller than the Kolmogorov scale, permitting calculation of the energy dissipation rates. The energy dissipation rates were calculated using methodology following (Fincham et al. 1996). The temperature variance dissipation rates were calculated using collocated time series of microscale velocity and temperature fluctuations. The obtained temperature variance dissipation rates were compared to the measurements of this quantity performed using optical techniques following (Bogucki et al. 2007). The structure of the large scale velocity flow reflects the observations of (Xia et al. 2003), while we note some departure of the PDF of temperature and velocity from a Gaussian distribution.

Darek Bogucki
Rosenstiel School of Marine and Atmospheric Science, University of Miami

Date submitted: 09 Sep 2008 Electronic form version 1.4