

Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Turbulence Structure near the Hot Plate in Turbulent Natural Convection VIPIN KOOTHUR, BABURAJ PUTHENVEETIL, Indian Institute of Technology Madras — We obtain the velocity field in a plane parallel to the hot plate in turbulent natural convection for $10^6 \leq Ra_w \leq 10^9$ using Stereo PIV. The plane of measurement is inside the velocity boundary layer, estimated from natural convection boundary layer equations as well as inside the velocity boundary layer due to the large scale flow. We extract the line plumes from these velocity field and study the nature of boundary layer and the velocity statistics of these line plumes. We study the turbulent statistics from these velocity fields and show that at higher wavenumber the energy spectrum shows a Bolgiano-Obukhov $k^{-11/5}$ scaling at all Ra_w considered. At lower wavenumbers, the energy spectrum scales approximately as $k^{-1.35}$ for $10^6 \leq Ra_w \leq 10^8$ and k^{-1} at $Ra_w = 10^9$. The crossover lengthscale obeys the same power law dependence as the mean plume spacing on the near wall lengthscale, Z_w .¹

¹Puthenveetil et al, **J. Fluid Mech.** 685: 335-364.

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Date submitted: 01 Aug 2014

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