Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Azimuthal Decomposition of Wide Aspect-Ratio, Turbulent Rayleigh-Benard Convection in a Cylindrical Cell PHILIP SAKIEVICH, YULIA PEET, RONALD ADRIAN, Arizona State Univeristy — Turbulent Rayleigh-Benard convection (RBC) is considered an ideal problem for studying the thermal convection that occurs in nature, and it is typically studied in finite cylindrical or rectangular domains. Cylindrical domains have an advantage because they prevent geometric effects from defining preferential horizontal directions in the flow. This allows the large scale patterns to drift azimuthally and mimic the dynamics of convection in applications where geometric constraints are minimal. The large scale pattern for RBC in small aspect-ratio (Γ) domains is a single roll-cell that spans the entire domain, and the azimuthal drift for this pattern can be fairly energetic. As Γ is increased the single-roll cell breaks into a multi-roll cell pattern, and the time scale for azimuthal motion increases substantially. In this presentation we investigate azimuthal properties of the velocity and temperature fields in a 6.3 Γ cell with a Rayleigh number of 1×10^8 and a Prandtl number of 6.7. Statistical independence in the azimuthal direction is investigated for each field, and a detailed decomposition of the multi-roll cell pattern is presented. These analysis' are performed through temporal and spatial averaging techniques and Fourier decomposition.

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Date submitted: 01 Aug 2015 Electronic form version 1.4