Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Azimuthal Motion of the Mean Wind in Turbulent Thermal Convection[1] HENG-DONG XI, QUAN ZHOU, KE-QING XIA, The Chinese University of Hong Kong — We report an experimental study of the azimuthal motion of the circulation plane of the mean wind in turbulent Rayleigh-Bé nard convection in water. Measurements were made in both aspect ratio $\Gamma = 1$ and 0.5 cylindrical cells. The results show that for $\Gamma = 1$ the orientation of the wind fluctuates over an azimuthal angular range of $\sim \pm 100$ degrees about a preferred direction for over 90% of the time. In contrast, for $\Gamma = 0.5$ the orientation of the wind shows no preferred direction. For $\Gamma = 1$ the observed azimuthal motion of the wind is a superposition of a periodic oscillation in short timescale and chaotic fluctuation in longtime scale. For both $\Gamma = 1$ and 0.5 the apparently stochastic azimuthal motion of the wind generates a net-rotation on average, with the $\Gamma = 0.5$ cell having a much larger net-rotation rate. Measurements with varying values of the Rayleigh number Ra is made for the $\Gamma = 0.5$ case, and it is found that the net rotation rate diminishes with increasing Ra, reaching a vanishing value around $Ra = 1 \times 10^{11}$.

[1]Work supported by the Research Grants Council of Hong Kong (Project No. CUHK403003).

Ke-Qing Xia
The Chinese University of Hong Kong

Date submitted: 03 Aug 2005 Electronic form version 1.4