Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Periodic mode competition in Rayleigh-Benard convections with a horizontal magnetic field YUJI TASAKA, KAZUTO IGAKI, Hokkaido University, TAKATOSHI YANAGISAWA, IFREE, JAMSTEC, SVEN ECKERT, HZDR — Recent experimental studies (Yanagisawa, *et al.*, 2011) indicated that appearance of random flow reversals in Rayleigh-Benard convection with a horizontal magnetic field. Time intervals of the flow reversals obey Poisson process and this indicates that this event is memoryless. Bi-stable nature of this system under a condition of non-dimensional parameters, Rayleigh number Ra and Chandrasekhar number Q, may induce this event with influences of external random noise. This even appears around $Ra = 10Q$ in a range, $5 \times 10^2 < Q < 10^3$, where the upper limit is determined by the maximum intensity of magnetic field. The present study investigates extrapolability of this relation in a higher range of Q up to $Q = 10^4$. The test fluid container has dimension of square of 200 mm in the horizontal plane and 40 mm in height. The container was filled with GaInSn and ultrasonic velocity profiling achieved quantitative flow pattern visualization. The visualization confirmed the extrapolability of the relation on flow reversals, but the observed flow reversals were not random but periodic. Proper orthogonal decomposition on the space-time velocity map elucidated periodic competitions between two convection modes with different wavenumbers in the periodic flow reversals.

Yuji Tasaka
Hokkaido University

Date submitted: 31 Jul 2013 Electronic form version 1.4