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An experimental study on columnar vortex structures in rotating Rayleigh-Benard convection YUJI TASAKA, KODAI FUJITA, YUICHI MURAI, Hokkaido Univ., TAKATOSHI YANAGISAWA, JAMSTEC — A scanning PIV system was developed to investigate columnar vortex structures in rotating Rayleigh-Benard convection in a range of Taylor number, $6.0\times10^6 \leq Ta \leq 1.0\times10^8$, at constant Rayleigh number, $Ra = 1.0 \times 10^7$. Horizontal vortex advection that is much slower than the vertical scanning motion by a motor driven stage of a laser light sheet allows capturing quasi-instantaneous 3D vortex structures. Vortex distributions at each scanning plane were represented by contour of stream function calculated from a planner velocity vector field measured by PIV with assuming quasi-two dimensional flow field at the planes. 3D structure at each Ta number was visualized by iso-surface of the stream function and the vertical velocity component was estimated from the planner velocity fields via equation of continuity for incompressible fluids. These results suggested that the flow transportation is emphasized by straightening of the columnar vortices with increasing Ta. This may correspond to improvement of Nusselt number with background rotation at the present range of Ta.

Yuji Tasaka
Hokkaido Univ

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