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Boundary zonal flows in rotating Rayleigh-Benard convection and other turbulent convective superstructures[1]

OLGA SHISHKINA, Max Planck Institute for Dynamics and Self-Organization

Olga Shishkina, Max Planck Institute for Dynamics and Self-Organization, Goettingen, Germany (MPIDS), and Robert E. Ecke, Center for Nonlinear Studies, Los Alamos National Laboratory, New Mexico, USA, Eberhard Bodenschatz, Marcel Wedi, Stephan Weiss, Xuan Zhang, Lukas Zwirner, MPIDS ——- Experiments and simulations reveal that in rapidly rotating containers, the classical large-scale circulation (LSC) in turbulent Rayleigh-Benard convection (RBC) is replaced by a boundary zonal flow (BZF) which is located near the vertical side wall, where a prograde fluid motion and retrograde thermal traveling wave are observed (Zhang et. al. PRL 124 (2020) 084505). Both turbulent convective superstructures (LSC and BZF) play key roles in the global heat transport in the system. In this talk, we will analyze the robustness of the BZF in rapidly rotating RBC and discuss, what determines the size of the LSC rolls in classical RBC in slender (Zwirner et. al. PRL 125 (2020) 054502) and wide containers (Wang et. al. PRL (2020), in print).

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