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Main Modes of Heat Transport in Rayleigh-Bénard Convection Analyzed by a POD approach JOHANNES LUELFF, WWU Muenster — Rayleigh-Bénard convection, i.e. the buoyancy-induced movement of a fluid enclosed between two horizontal plates, is the definite setup to study thermal convection. We are interested in the heat transport of the main modes that are found in the convection cell. To this end, we apply the technique of proper orthogonal decomposition (POD) to obtain a set of empirical basis modes from simulation data. Usually the POD method results in modes that are optimal in describing the generalized energy, i.e. kinetic energy plus temperature variance. We extend the technique so that instead it gives the optimal modes with respect to the heat transport, measured in terms of the Nusselt number. We then demonstrate at numerical simulations of different RB setups and geometries that the proposed ansatz performs consistently better than the standard approach in describing the heat transport. Furthermore, the coherent structures that are connected to the biggest heat transport are examined.

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