# Turbulent convection in the zero Reynolds number limit and the phenomenon of flow reversals

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Turbulent thermal convection is a physical process which can be observed in many natural systems like the atmosphere, the oceans and the Earths interior. Thus, many recent efforts focused on turbulent convection, especially on enclosed fluids heated from below and cooled from above, known as Rayleigh-Bnard convection. This in- cludes experimental,theoretical and numerical studies. We discuss the special case of thermal convection in the infinite Prandtl number limit as applicable for convection in the Earths mantle, where inertia of momentum is neglected, i.e. the Reynolds number of the flow is zero. By means of a numerical two-dimensional model of Rayleigh- Bnard convection we show exemplarily for one case at a high value of the Rayleigh number of $Ra = 10^8$ that even in this zero Reynolds number limit the convective flow exhibits many features of turbulent behavior as commonly addressed to high Reynolds number convection, i.e. for flows dominated by non-linear inertial forces relative to viscous forces. Although turbulence is not a strictly defined terminus, a whole set of features is commonly attributed to the phenomenon of turbulent convec- tion. Among these features are strong irregular time-dependence, interplay between small-scale structures in form of plumes and a large-scale circulation (so-called ther- mal wind) and intermittent events, like reversals in the orientation of the large-scale circulation. Particularly, such reversals in convecting systems can also be observed in nature. Prominent examples are the reversing Geodynamo and reversals in the wind direction of the atmosphere. We will discuss the mechanism behind the phenomenon of flow reversal as an intrinsic feature of turbulent convection in form of competing states which turn out to be solutions of the fix-point equations.