

Heat transport at highly turbulent thermal convection

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Structure and evolution of Earth and other planetary bodies are expected to be controlled by thermal convection at high Rayleigh number. In this study, our aim is to investigate the heat flux and the flow pattern of such convection states by means of both laboratory experiments and theoretical calculations. We resolved the convective phenomenon into behaviors of the fluid elements, 'plumes'. By the analysis of the experimental measurements, the velocity and the temperature fluctuation of the plumes were estimated. Using these values, we calculated the convective heat flux by the mixing length theory, and we compared them with the measured values in the experiments.