

Abstract Submitted
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An experimental study of bottom heating effects in horizontal convection¹ FEI WANG, SHI-DI HUANG, Department of Physics, The Chinese University of Hong Kong, Shatin, Hong Kong, China, SHENG-QI ZHOU, State Key Laboratory of Tropical Oceanography, South China Sea Institute of Oceanology, Chinese Academy of Sciences, Guangzhou 510301, China, KE-QING XIA, Department of Physics, The Chinese University of Hong Kong, Shatin, Hong Kong, China — We report an experimental study of bottom heating effects in horizontal convection. The horizontal convection is driven by a surface heat flux Q_s and a small amount of heat flux Q_b is applied at the bottom boundary as a perturbation. It is found that while the bottom heating has negligible effect on the thermal properties at the top surface, its influences on the interior temperature and the strength of the downwelling flow are remarkable and such influences are more significant for stronger bottom heating and larger Rayleigh number Ra . Most importantly, direct velocity measurements at Ra around 5×10^9 reveal that the overturning rate, characterized by the maximum stream function, is increased by up to 111% and 256% for $\eta = Q_b/Q_s = 2\%$ and 6.8% cases, respectively, which is consistent with previous numerical studies. These results might be helpful to understand how geothermal heating will affect the oceanic circulation.

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