The Effect of Tidal Force and Topography in Horizontal Convection[1] GUANG-YU DING, YU-HAO HE, Department of Physics, The Chinese University of Hong Kong, Hong Kong, China, KE-QING XIA, Department of Mechanics and Aerospace Engineering, Southern University of Science and Technology, Shenzhen, China — We present numerical study of horizontal convection system with tidal force and topography. In our study, amplitude of tidal force is fixed and simulations with a series of tidal frequency ω are conducted. Our results demonstrate that local dissipation near topography will be enhanced when tide is sufficiently strong. Such enhancement is related to the height of topography and increases as ω decreases. For smaller ω, the global dissipation becomes less sensitive to ω and asymptotically approaches to a constant. We interpret the behavior of dissipation as a result of the change of control mechanism. According to the control mechanism, this system can be divided into three regimes as ω changes, which are buoyancy-control, tide-control and viscosity-control regime respectively.We further show that mixing efficiency can be represented as a function of a single parameter, which is the ratio between tidal and potential energy injection. According to the global energy input to the ocean interior, we provide our estimation of global mixing efficiency being 0.17-0.3, which agrees with the empirical value 0.2.

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