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Mixed insulating and conducting boundary conditions in Rayleigh-Bénard convection DENNIS BAKHUIS, RODOLFO OSTILLA MÓNICO, ERWIN VAN DER POEL, Univ of Twente, ROBERTO VERZICCO, Univ of Rome Tor Vergata, DETLEF LOHSE, Univ of Twente — We report the results of 3D direct numerical simulations of a rectangular doubly periodic Rayleigh-Bénard system. These results are an extension of earlier 2D work by Ripesi et al. (Journal of Fluid Mechanics 742, 636, 2014). The Rayleigh number is between 10^7 and 10^9 and the Prandtl number is set to unity. The bottom plate is homogeneously heated and the cold top plate of this setup has been split into conducting and insulating regions. While keeping both areas equal the pattern has been varied and multiple characteristics like the Nusselt number and bulk temperature have been recorded. When the top plate was divided into one conducting and insulating halves, we see that the Nusselt number is about two thirds of the fully conducting case. However, when we now increase the number of divisions, the Nusselt number slowly approaches that of the fully conducting case. This is a surprising result, as even though only half of the effective area can conduct heat, the same heat transport as a fully conducting cold plate is achieved.

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