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Responses to time-dependent forcing in horizontal convection ROSS GRIFFITHS, GRAHAM HUGHES, JORT VAN JAARSVELD, Australian National University — We examine the adjustment of a convective overturning circulation, forced by differential heating and cooling at the surface, to changing boundary conditions. The aim is to provide a deeper understanding of the dynamics of horizontal convection. In laboratory experiments with a long box forced by heat input over one half of the forcing boundary and cooling over the other half, a small step change in forcing leads to a shift from one equilibrium state to another, where each equilibrium state has zero net heat flux through the boundary. The approach to the new state is simply exponential if the change in boundary conditions produces a net destabilizing buoyancy flux, but can involve a change from full-depth to shallow circulation if there is a period of net stabilizing buoyancy flux. Flux and temperature boundary conditions give similar results and the adjustment times tend to be reduced by effects of rotation. Oscillatory forcing is examined for the case of a central region of stabilizing surface buoyancy flux between two regions of destabilizing flux (two plumes), the latter having imposed heat fluxes that are varied sinusoidally, so that the total heat input to the box is constant and the net heat input is zero. The interior temperature and stratification are explored as a function of oscillation period and amplitude.

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