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**Shouhong Wang\*** ([showang@indiana.edu](mailto:showang@indiana.edu)), Department of Mathematics, Bloomington, IN 47405. *Dynamic Transition Theory for Thermohaline Circulation.*

The main objective of this study is to derive a mathematical theory associated with the thermohaline circulations (THC). The results derived provides a general transition and stability theory for the Boussinesq system, governing the motion and states of the large-scale ocean circulation. First, it is shown that the first transition is either to multiple steady states or to oscillations (periodic solutions), determined by the sign of a nondimensional parameter  $K$ , depending on the geometry of the physical domain and the thermal and saline Rayleigh numbers. Second, for both the multiple equilibria and periodic solutions transitions, both Type-I (continuous) and Type-II (jump) transitions can occur, and precise criteria are derived in terms of two computable nondimensional parameters  $b_1$  and  $b_2$ . Third, a convection scale law is introduced, leading to an introduction of proper friction terms in the model in order to derive the correct circulation length scale. In particular, the dynamic transitions of the model with the derived friction terms suggest that the THC favors the continuous transitions to stable multiple equilibria. This is joint with Tian Ma (Received September 23, 2011)