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Numerical and Statistical Simulations of an Idealized Model Tachocline[1] ABIGAIL PLUMMER, Harvard University, STEVE TOBIAS, University of Leeds, BRAD MARSTON, Brown University — Solar-type stars with outer convective envelopes and stable interiors are believed to have tachoclines. As in the Sun, the tachocline is a thin shear layer thought to play an important role in the magnetic activity of these stars. We use an idealized two-dimensional model tachocline to investigate a joint instability in which the differential rotation is only stable in the absence of a magnetic field. A set of parameters are identified using Direct Numerical Simulations (DNS) that produce a cycle in which energy is transferred abruptly between kinetic and magnetic potential energy reservoirs. Elements of this cyclic behavior are replicated using Direct Statistical Simulations (DSS). Insight is thus gained into the physics prompting these sharp transitions, suggesting that they are the result of eddies interacting to form new eddies.

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