Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Strong Subcritical Dynamics in the Thermal Asymptotic Suction Boundary Layer JEFFREY OISHI, Bates College, JARED WHITEHEAD, BYU — The thermal asymptotic suction boundary layer problem occurs when a heated plate drives thermal convection in a fluid subject to a uniform suction perpendicular to the plate itself. The background state is semi-infinite in z with uniform suction velocity $V_z < 0$ and a temperature profile that relaxes to T_∞. This setup becomes linearly unstable at a Rayleigh number $\simeq 20$; it is also known to have a subcritical bifurcation with steady states traced to Rayleigh numbers of ~ 8 (Zammert, Fischer, Eckhardt 2016). In this work, we show that even in the weakly unstable regime, this system is highly chaotic owing to the free energy in the suction flow as well as that of the unstable temperature gradient. Using direct numerical simulations in the infinite half-plane, we follow the subcritical instability below the threshold for linear stability and show that it has highly complex dynamics. We comment on the role played by exact coherent states in unconstrained simulations and the projection of our solutions onto low-dimensional subspaces.

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Date submitted: 06 Aug 2020 Electronic form version 1.4