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Coherent structures in the asymptotic suction boundary layer over a heated plate STEFAN ZAMMERT, TU Delft, BRUNO ECKHARDT, Philipps-Universitt Marburg — The asymptotic suction boundary layer over a heated plate [S. Zammert et al. arXiv:1605.06956] is a good point of entry to study the dynamics of thermal boundary layers by means of dynamical systems theory. We analyze the stability of this flow in dependence on the Reynolds, Rayleigh and Prandtl numbers and identify the bifurcating secondary solutions. It turns out that in contrast to the Rayleigh-Bénard problem the base flow becomes unstable in a subcritical bifurcation. In the subcritcal range the secondary solutions are the starting point for a bifurcation cascade that creates a chaotic attractor. As in other subcritical flow, a boundary crisis bifurcation turns this attractor into a chaotic saddle causing transient chaotic motion in the subcritical range. We also calculate mean turbulent profiles and their scaling with the Rayleigh and Prandtl number. It turned out that the turbulent flow in the system is characterized by large-scale coherent structures which extend surprisingly far above the plate.

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