



Superstructures and exact coherent states in the asymptotic boundary layer

The aim of this project is to study the relation between exact coherent structures and turbulent superstructures for the case of the asymptotic suction boundary layer. This flow is part of a family of flows that mediates between parallel shear flows and spatially developing boundary layers, and thus provides a flexible model for superstructures in several shear flows. The range of exact coherent structures has been extended from that of large scale ones that reach across the entire domain to also include a cascade of smaller structures that reach all the way down to the Kolmogorov scale. This should enable us to cover all scales from the ones close to the wall to the superstructures near the free stream region. The aim is to determine solutions and to subsequently investigate the corresponding bifurcations and stability properties, leading to a further understanding of the persistence and eventual breakdown of large-scale structures that are detached from the bottom plate. In a joint interest with the groups working on Lagrangian aspects of flows, we focus on the characterisation of uniform momentum zones as prominent large scale structures in shear flows. The collaborations in the network will enable us to compare the results for the asymptotic suction boundary layer with other shear flows.