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Data-driven dynamics description of a transitional boundary layer[1] FIROOZEH FOROOZAN, VANESA GUERRERO, ANDREA IANIRO, STEFANO DISCETTI, Universidad Carlos III de Madrid — Cluster analysis is applied to a DNS dataset of a transitional boundary layer (BL) developing over a flat plate. The streamwise-spanwise plane at a wall normal distance y=0.25 half-plate thickness L is sampled at several time instants and discretized into small sub-regionswith a size of 20Lx20L, which are the observations analysed in this work. Using k-medoids clustering algorithm, a partition of the observations is sought such that the medoids in each cluster represent the main local states. The clustering has been carried out on a two-dimensional reduced-order feature space, constructed with the multi-dimensional scaling technique. The clustered feature space provides a partitioning which consists of five different regions, each one being represented by the cluster medoid. The observations are automatically classified as laminar, turbulent spots, amplification of disturbances, or fully-developed turbulence. The lagrangian evolution of the regions and the state transitions are described in terms of transition probability matrix and transition trajectory graph to determine the transition dynamics between the different states.

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