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Turbulent convective heat transfer control with plasma actuators RODRIGO CASTELLANOS, Universidad Carlos III de Madrid, THEODOROS MICHELIS, Delft University of Technology, STEFANO DISCETTI, ANDREA IANIRO, Universidad Carlos III de Madrid, MARIOS KOTSONIS, Delft University of Technology — The use of DBD plasma actuators as a technique for active heat transfer control in turbulent flows is experimentally investigated in this work. A streamwise-oriented Dielectric Barrier Discharge plasma actuator array introduces a controlled disturbance upstream of the heat flux sensor. The actuator layout aims at generating opposing plasma plumes, causing a lift-up of flow in the direction normal to the wall, which eventually leads to the formation of counter-rotating streamwise vortices. The flow is investigated with both planar and stereo-PIV in multiple parallel planes, enabling reconstruction of the three-dimensional mean flow field. IR thermography reveals plasma-induced formation of streamwise streaks on the wall surface where convective heat transfer is reduced. Each streak coincides with the spanwise position where the plasma jets lift off. The opposing plasma discharge lifts-up the boundary layer, leading to a low-velocity region that grows in the streamwise direction. In the lower region of the boundary layer, the flow induced by the actuation blocks the main flow, leading to localized low-velocity regions above the exposed electrodes. This phenomenon is a consequence of the actuator suction, extracting fluid from its surroundings

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