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Local flow control for active building facades SRIKAR KALIGOTLA, WAYNE CHEN, MARK GLAUSER, Syracuse University — Existing building facade designs are for a passive and an impermeable shell to prevent migration of outdoor air into the building and to control heat transfers between the exterior environment and the building interior. An active facade that can respond in real time to changing environmental conditions like wind speed and direction, pollutant load, temperature, humidity and light can lower energy use and maximize occupant comfort. With an increased awareness of cost and environmental effects of energy use, cross or natural ventilation has become an attractive method to lower energy use. Separated flow regions around such buildings are undesirable due to high concentration of pollutants, especially if the vents or dynamic windows for cross ventilation are situated in these regions. Outside pollutant load redistribution through vents can be regulated via flow separation control to minimize transport of pollutants into the building. Flow separation has been substantially reduced with the application of intelligent flow control tools developed at Syracuse University for flow around "silo" (turret) like structures. Similar flow control models can be introduced into buildings with cross ventilation for local external flow separation control. Initial experiments will be performed for turbulent flow over a rectangular block (scaled to be a mid-rise building) that has been configured with dynamic vents and unsteady suction actuators in a wind tunnel at various wind speeds.

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