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Targetted modal turbulent flow control via localized heating MATTHEW YAO, DUOSI FAN, KHALED YOUNES, JOSEPH MOUALLEM, JEAN-PIERRE HICKEY, University of Waterloo — Bidimensional empirical mode decomposition (BEMD) is an empirical method to decompose fluctuating signals into various intrinsic mode functions (IMF); these represent different scales of the turbulent fluctuations. The scale separation flow permits an analysis of their respective contributions towards the overall skin friction of the turbulent boundary layer. We quantify the effects of selective, localized wall heating on the formation and dynamics of turbulence structures at various scales, and consequently, the effect on the skin friction for turbulent flow control. The decomposition is applied to an unheated channel flow and is compared to a channel flow with streamwise aligned heated strips. The strip spacing is dependent on the length scale of the targeted turbulent structures. The individual contribution of the various eddy sizes to the overall skin friction is then calculated and compared to the unheated base case.

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