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Linear modeling of turbulent skin-friction reduction due to spanwise wall motion CARLOS DUQUE-DAZA[1], MIRZA BAIG, DUNCAN LOCKERBY, School of Engineering, University of Warwick, Coventry CV4 7AL, UK, SERGEI CHERNYSHENKO, Department of Aeronautics, Imperial College, London SW7 2AZ, UK, CHRISTOPHER DAVIES, School of Mathematics, Cardiff University, Cardiff CF24 4AG, UK, UNIVERSITY OF WARWICK TEAM, IMPERIAL COLLEGE TEAM, CARDIFF UNIVERSITY TEAM — We present a study on the effect of streamwise-travelling waves of spanwise wall velocity on the growth of near-wall turbulent streaks using a linearized formulation of the Navier-Stokes equations. The changes in streak amplification due to the travelling waves induced by the wall velocity are compared to published results of direct numerical simulation (DNS) predictions of the turbulent skin-friction reduction over a range of parameters; a clear correlation between these two sets of results is observed. Additional linearized simulations but at a much higher Reynolds numbers, more relevant to aerospace applications, produce results that show no marked differences to those obtained at low Reynolds number. It is also observed that a close correlation exists between DNS data of drag reduction and a very simple characteristic of the "generalized" Stokes layer generated by the streamwise-travelling waves.

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