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Flow-State Estimation Using Wall Information in a Transitional Boundary Layer. AHMED NAGUIB, Michigan State University, East Lansing, MI-48824, USA, JONATHAN MORRISON, Imperial College, London, SW7 2AZ, UK — This work is motivated by the overarching goal of implementing feedback control of transient growth in boundary-layer transition. An essential step towards such implementation is the ability to estimate the flowfield through surface measurements, coupled with low-order, efficient models. In the present study, a DNS database (Zaki - Ph.D. thesis, Stanford, 2006; Zaki and Durbin - JFM, 531, 2005) of bypass transition beneath a turbulent freestream is utilized for the assessment of flow-state estimation methods based on streamwise and spanwise surface-shear-stress measurements. The main focus of the investigation is on the estimation of the wall-normal velocity due to its significance in the resonant forcing of Squire modes. The results enable examination of the accuracy of the estimation approach through comparison between the estimated and true velocity fields. Moreover, practical issues, such as the number and configuration of wall sensors required for satisfactory estimation, are also addressed.

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