

Abstract Submitted
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Assessment of fluctuating pressure gradient using acceleration spectra in near wall flows DANIEL CADEL, K. TODD LOWE, Virginia Tech — Separation of contributions to the fluctuating acceleration from pressure gradient fluctuations and viscous shear fluctuations in the frequency domain is examined in a turbulent boundary layer. Past work leveraging turbulent accelerations for pressure gradient measurements has neglected the viscous shear term from the momentum equation—an invalid assumption in the case of near wall flows. The present study seeks to account for the influence of the viscous shear term and spectrally reject its contribution, which is thought to be concentrated at higher frequencies. Spectra of velocity and acceleration fluctuations in a flat plate, zero pressure gradient turbulent boundary layer at a momentum thickness Reynolds number of 7500 are measured using a spatially resolving three-component laser Doppler velocimeter. This canonical case data is applied for validation of the spectral approach for future application in more complex aerodynamic flows.

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