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Spatial Correlation in the Fluctuating Wall Pressure Field Beneath a Supersonic Turbulent Boundary Layer STEVEN BERESH, JOHN HENFLING, RUSSELL SPILLERS, BRIAN PRUETT, Sandia National Labs — Data have been acquired from a spanwise array of fluctuating wall pressure sensors beneath a wind tunnel wall boundary layer at Mach 2, then invoking Taylor's Hypothesis allows the temporal signals to be converted into a spatial map of the wall pressure field. Different frequency ranges of pressure fluctuations may be accessed by bandpass filtering the signals. This reveals signatures of coherent structures where negative pressure events are interspersed amongst positive events, with some degree of alternation in the streamwise direction. Within lower frequency ranges, streaks of instantaneously correlated pressure fluctuations elongated in the streamwise direction exhibit a spanwise meander and show apparent merging of pressure events, resembling similar structures known to exist in the velocity field. However, the pressure data lack the spanwise quasi-periodicity of positive and negative events found in velocity data, and conversely demonstrate a weak positive correlation in the spanwise direction whose extent increases at lower frequencies. The occasional passage of coherent structures spanning the entire sensor array provides an explanation for the weak spanwise correlations, a phenomenon not noted in velocity fields.

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