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Surface-Pressure Fluctuations due to Coherent Microscale Processes in the Atmospheric Boundary Layer[1] GREGORY LYONS, NATHAN MURRAY, University of Mississippi - NCPA — Recent work has found evidence for microscale coherent turbulence in the atmospheric boundary layer due to the breakdown of Kelvin-Helmholtz billows. It is hypothesized that these structures, which advect with the mean flow, may be identified by transient fluctuations they cause in the boundary wall pressure. Surface-pressure fluctuations beneath the turbulent atmospheric boundary layer were measured at Reese Technology Center, located in the Llano Estacado mesa region of West Texas. Two multi-element arrays of piezoelectric bimorph infrasound sensors, selected for their sensitivity to frequencies as low as 0.1 Hz, were used to measure the pressure fluctuations. The boundary layer was simultaneously profiled up to 200 meters in elevation by an on-site meteorological instrument tower. All measurements were taken continuously for 44 hours. To study coherent propagating events, methods of beamforming and model reduction were applied to the surface-pressure fluctuations. Through dynamic mode decomposition, wavelike eigenfunctions of the pressure dynamics are identified that propagate with either advective or acoustic speeds.

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