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A POD analysis of rough surface pressure and temperature fluctuations in a spatially developing turbulent boundary layer LUCIANO CASTILLO, JENSEN NEWMAN, Texas Tech University, RONALD ADRIAN, Arizona State University, YI CHEN, Rensselaer Polytechnic Institute — It is desired to gain a better understanding of how the presence of surface roughness in a turbulent boundary layer affects phenomena such as heat transfer and aeroacoustic noise generation. With this in mind, it is expected that by examining the most dominant features of these scalar fields in flows with and without surface roughness progress could be made towards this end. Hence, a Proper Orthogonal Decomposition (POD) was performed on the surface temperature and pressure fluctuations of a DNS simulation with a smooth wall, and one with a rough wall. The rough topography corresponded to an actual rough topography measured from 24 grit sand paper. Reynolds numbers based on momentum thickness ranges for the simulations were 1922-2269 for the smooth and 2077-2439 for the rough. The low order POD modes correspond to the dominant features of interest in these scalar fields. By comparing the smooth and rough cases, important qualitative differences in the dominant features were observed.

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