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Characteristics of turbulent boundary layer flow over algal biofilm[1] ELIZABETH MURPHY, University of Virginia, JULIO BARROS, MICHAEL SCHULTZ, CECILY STEPPE, KAREN FLACK, United States Naval Academy, MATTHEW REIDENBACH, University of Virginia — Algal biofilms are an important fouling community on ship hulls, with severe economic consequences due to drag-induced increases in fuel use and cleaning costs. Here, we characterize the boundary layer flow structure in turbulent flow over diatomaceous slime, a type of biofilm. Diatomaceous slime composed of three species of diatoms commonly found on ship hulls was grown on acrylic test plates under shear stress. The slime averages 1.6 mm in thickness and has a high density of streamers, which are flexible elongated growths with a length on the order of 1- 2 mm located at the top of the biofilm that interact with the flow. Fouled acrylic plates were placed in a water tunnel facility specialized for detailed turbulent boundary layer measurements. High resolution Particle Image Velocimetry (PIV) data are analyzed for mean velocity profile as well as local turbulent stresses and turbulent kinetic energy (TKE) production, dissipation and transport. Quadrant analysis is used to characterize the impact of the instantaneous events of Reynolds shear stress (RSS) in the flow. To investigate the coherence of the large-scale motion in the flow two-point correlation analysis is employed.

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