Abstract Submitted
for the FWS20 Meeting of
The American Physical Society

Analysis of Turbulence Production and Dissipation in a Strongly Stable Stratified Boundary Layer. AMIR ATOUFI, K.ANDREA SCOTT, MICHAEL L. WAITE, University of Waterloo — In this study, high-resolution direct numerical simulation is employed to analyze the production and dissipation of turbulent kinetic energy for an open-channel flow subjected to strongly stable stratification. To do so, dominant length scales in production and dissipation of kinetic energy for a stably stratified open-channel flow is identified first. Then, production and dissipation are directly related to the vorticity field. Turbulence production by mean-flow shear is reformulated in terms of dominant interactions between velocity and vorticity fluctuations using divergence of the Lamb vector and the Bernoulli function. It is shown that stratification interrupts the self-sustaining process of near-wall turbulence through interfering with the regeneration of streamwise vortices. The effect of stratification on the regeneration cycle of these streamwise vortices is further studied by analyzing the transient growth of streaky structures in streamwise velocity fluctuations beneath the logarithmic layer.

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Date submitted: 24 Sep 2020 Electronic form version 1.4