Linear analysis of transient growth in stably-stratified, turbulent channel flow¹ JUAN CARLOS DEL ALAMO, MAE Department, UC San Diego, CARLOS YANEZ, School of Aeronautics, Universidad Politecnica de Madrid, MANUEL GARCIA-VILLALBA, Dept. of Aerospace Engineering and Bioengineering, U Carlos III Madrid — We studied stably-stratified, fully-developed, turbulent channel flow using linear stability analysis. The analysis considered the mean velocity and density profiles extracted from DNS [1] calculations as base flow, and included a linear model to represent the energy dissipation and scalar diffusion felt at the large scales as a consequence of the small scales. The flow was found to be asymptotically stable in all cases but transient growth of initial perturbations was observed. The perturbations showing maximal transient growth corresponded well with spanwise waves in the center of the channel and with streaks in the near wall region, which were both observed in the DNS. In particular, their sizes and convection velocities were reasonably well predicted by the linear model. Component-wise analysis revealed that, while the streaks were formed by the vertical stirring of mean shear, the transient amplification of the spanwise waves was reminiscent of the Orr mechanism.


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