Abstract Submitted
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The structure of shear instability at high Reynolds number W ROCKWELL GEYER, Woods Hole Oceanographic Institution — Acoustic imaging of shear instabilities in a highly stratified estuary reveals a different structure than that observed in laboratory experiments and Direct Numerical Simulation. In these field observations, the mixing is accomplished by secondary instability within the braids, while the "cores" are relatively quiescent. This contrasts most experimental and DNS results that indicate the most intense mixing in the gravitationally unstable cores. New measurements obtained with a multibeam echosounder resolve the spatial structure and temporal evolution of shear instabilities in the highly stratified estuary. They confirm the key role of the braids in mixing through the development of secondary instabilities. They also indicate that the slope of the braids is relatively low, and the primary instability never steepens enough to "roll up" and generate gravitational instability in the core. Energetic secondary instabilities downstream of the inflection point appear to be the main agents of mixing. This structure is explained by the high Reynolds number conditions of the estuarine flow (Re=500,000), which permits the development of primary shear instabilities for Ri$\geq$0.2 as well as the development of fully turbulent secondary instabilities within the braid. Comparison with high Re DNS simulations suggest that the Reynolds number has a significant influence on the structure of instabilities at least up to Re=50,000.

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