Abstract Submitted
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Propagation and Breaking of Three-Dimensional Boussinesq Wave Packets without and with Rotation[1] ALAIN GERVAIS, Department of Mathematical and Statistical Sciences, University of Alberta, Canada, QUINLAN EDE, Department of Earth and Atmospheric Sciences, University of Alberta, Canada, GORDON SWATERS, Department of Mathematical and Statistical Sciences, University of Alberta, Canada, TON VAN DEN BREMER, Department of Engineering Science, University of Oxford, United Kingdom, BRUCE SUTHERLAND, Departments of Physics and of Earth and Atmospheric Sciences, University of Alberta, Canada — Internal gravity waves (IGWs) propagate vertically and horizontally within stably stratified fluids. As IGWs propagate vertically, nonlinear processes lead to instabilities that may cause a wave to overturn and eventually break, thus irreversibly depositing momentum to the background flow. Even before breaking, moderately large amplitude IGWs induce a mean flow that interacts nonlinearly with the waves, Doppler-shifting their frequency and altering the height at which the waves would have otherwise overturned. Here we derive explicit formulae for the induced flows of localised wavepackets influenced by Coriolis forces. Numerical simulations are initialised with quasi-monochromatic wave packets with the predicted induced flow superimposed. Simulations with small amplitude wave packets confirm that the prediction captures the induced flow. In simulations with larger amplitude waves, the nonlinear interactions between the waves and the flows they induce result in much lower overturning heights than predicted by linear theory.

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