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# Gravity waves generated by sheared three-dimensional potential vorticity anomalies

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The gravity waves produced by three-dimensional potential vorticity anomalies are examined under the asumption of constant vertical shear, constant stratification and unbounded domain. As in the two-dimensional case analysed in a previous paper by the same authors, the disturbance at small vertical distance from the potential vorticity anomaly is well modelled by the quasi-geostrophic theory. This is not the case at vertical distances that are beyond the inertial layers which are located above and below the anomaly. There, the perturbation is made of vertically propagating gravity waves which vertical structure is described analytically.

On top of the sensitivity of the gravity waves emission to the background Richardson number J, already present in the 2D case, the three dimensional results shown here reveal a strong sensitivity of the emission to the orientation of the horizontal wavenumber. More specifically, there are more gravity waves emitted with phase lines making positive angles with the direction of the shear, then gravity waves making negative angles. As the QG dynamics is little sensitive to these angles, it is shown that these differences are related to the absorptive properties of the inertial layers.

These results imply that the acceleration related to the wave flow interactions that occur in the inertial layer is essentially to the left of the shear, whereas the wave effective stress vector associated with the waves propagating in the far-field is predominantly oriented to the right.