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Generation of gravity waves through inertia critical levels

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The study of the instability of a jet in a primitive equations context shows the importance of inertia critical levels for the generation of gravity waves. These levels exist where the Doppler-shifted frequency of a wave matches the Coriolis frequency: $\omega - kU = f$, with ω and k the frequency and wavenumber respectively of the wave involved, U the basic state velocity and f the Coriolis frequency. At these levels, a balanced wave transforms into a gravity wave, the amplitude of the latter relative to the former being exponentially small in Rossby number.

The case of a 1D horizontally uniform shear flow (Eady shear) having been rationalized in the past, we extend the work to the case of a 2D flow with zero Potential Vorticity. This mechanism could potentially generate strong amplitude gravity waves as the Rossby number of a turbulent flow is known to increase with the horizontal wavenumber in this context (Surface Quasi-Geostrophy). First analytical and numerical results will be shown.