Abstract Submitted
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On the relative contribution of inertia-gravity wave radiation to asymmetric instabilities in tropical cyclone-like vortices[1] KONSTANTINOS MENELAOU, McGill University, DAVID A. SCHECTER, NorthWest Research Associates, PETER M. K. YAU, McGill University — Intense geophysical vortices may experience various asymmetric instabilities during their life cycles. This study presents a method for evaluating the relative importance of different mechanisms that can simultaneously influence the growth of an asymmetric perturbation. The method is illustrated for vortices whose basic states are barotropic and have non-monotonic radial distributions of potential vorticity (PV). A diagnostic formula for the growth rate of the perturbation is derived from an equation expressing conservation of angular pseudomomentum. In this formula, the growth rate is decomposed into several components relevant to the most unstable modes. One component accounts for the destabilizing interaction of phase-locked counter-propagating vortex Rossby (VR) waves. Other components account for inertia-gravity (IG) wave radiation and PV stirring in one or more critical layers. The dominant instabilities are examined in a parameter regime deemed relevant to tropical cyclone perturbations. As the Froude number increases from its lower bound, the main cause of instability typically transitions from VR-VR wave interaction (or critical layer stirring) to IG wave radiation. The transition can occur gradually or abruptly at a critical point for reasons that will be explained.

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