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Rompimiento de un Paquete de Ondas de Vorticidad en un Torbellino en Gran Rotatión

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This study considers the interaction between a free vorticity wave packet and a rapidly
rotating vortex in the slowly-evolving regime, a long time after the initial, unsteady, and strong interaction. The interaction starts when the amplitude modulated neutral mode enters resonance with the vortex on a spiralling critical surface, where the phase angular speed is equal to the rotation frequency. The singularity in the modal equation on this asymmetric surface strongly modifies the flow in its neighbourhood, the three-dimensional helical critical layer, the region where the wave/vortex interaction occurs. This interaction generates a vertically sheared 3D mean flow of higher amplitude than the wave packet. The chosen envelope regime assumes the formation of a mean radial velocity of the same order as the wave packet amplitude, deviating the streamlines in a spiral way with respect to the rotational wind [2]. This spiral motion is frequently observed inside tropical cyclones as spiral rainbands [1]. Through matched asymptotic expansions, we find an analytical solution of the leading-order motion equations inside the 3D critical layer. The system of the coupled evolution equations of the wave amplitude and the low-order critical layer-induced mean flow on the critical radius has been derived in the quasi-steady
regime. The main outcome of the first-order mean flow truncated system resolution is that
the wave packet/vortex interaction leads to a fast vorticity wave breaking. The vertical wind shear has the highest effect on the wave/mean flow interaction. When the shear is moderate, it enhances intensification but when it is very large, it prohibits it in both the unsteady and slowly evolving stages [3].

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