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An experimental and numerical study of cyclones produced by suction in rotating stratified flows PATRICE LE GAL, IRPHE - CNRS, PEDRAM HASSANZADEH, Berkeley University, ORIANE AUBERT, MICHAEL LE BARS, IRPHE - CNRS, PHILIP MARCUS, Berkeley University, IRPHE/BERKELEY COLLABORATION — Rotating and stratified flow motions are well-described by the gradient-wind equation, from which Hassanzadeh *et al.* (2012) and Aubert *et al.* (2012) derived a new law for the shape of the 3D vortices. The new equation was confirmed experimentally and numerically, and using the measurement data of the Atlantic Meddies and Jovian vortices. One consequence of this equation is that the interior of cyclones (anticyclones) must be more (less) stratified than the background flow. This means that to generate a cyclone (anticyclone) in nature, a process must produce both cyclonic (anticyclonic) vorticity and local-superstratification (a locally mixed patch of density). We have used laboratory experiments and 3D numerical simulations to study cyclones produced by localized suction, and we show that this process in fact produces both cyclonic vorticity and super-stratification. The physics of super-stratification and decaying cyclones in rotating stratified flows is studied. This brings a new understanding of the asymmetry between cyclones and anticyclones in nature, as it appears to be easier to locally mix some fluid to create a patch with a weaker stratification than the background as inside anticyclones, rather than to locally super-stratify it as inside cyclones.

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