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Spontaneous emergence of helicity in rotating stratified turbulence

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Under the assumption of stationarity, weak non-linearities, no dissipation and no forcing, one obtains large-scale geostrophic balance linking pressure gradient, gravity and Coriolis force. The role of helicity has not received as much attention as geostrophic balance. However, it is measured routinely in the atmosphere, for example in order to gauge the likelihood of supercell convective storms to strengthen, then it may be a factor to consider in the formation of hurricanes. We perform numerical simulations of decaying rotating stratified turbulence and show, in the Boussinesq framework, that helicity is spontaneously created due to geostrophic balance. Helicity emerges from the joint action of eddies and of inertia-gravity waves (with inertia and gravity with respective associated frequencies f and N), and it occurs when the waves are sufficiently strong. We show that for $N/f < 3$ the amount of helicity produced is correctly predicted by a linear balance equation.