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The cyclone-anticyclone asymmetry in decaying rotating turbulence FREDERIC MOISY, CYPRIEN MORIZE, MARC RABAUD, FAST, 91405 Orsay Cedex, France, JOEL SOMMERIA, Coriolis/LEGI, 38 000 Grenoble, France
— The statistics of the vorticity fluctuations in decaying rotating turbulence is experimentally investigated by means of particle image velocimetry. Two series of experiments have been carried out, one in a small-scale rotating water tank (FAST, Paris), with an aspect ratio $\sim O(1)$, and the other one in the large-scale 'Coriolis' plateform (LEGI, Grenoble), with an aspect ratio $\sim O(10)$. In both experiments, turbulence is generated by rapidly towing a grid through the fluid, providing an initial state which is approximately homogeneous and isotropic. The asymmetry between cyclones and anticyclones is characterized by the vorticity skewness $S_\omega = \langle\omega_z^3\rangle/\langle\omega_z^2\rangle^{3/2}$ (ω_z is the vorticity component along the rotation axis). During the decay, for times up to the Ekman timescale, a growth of the asymmetry towards cyclonic vorticity is observed as $S_\omega \sim (\Omega t)^{0.6\pm0.1}$. For larger times, a re-symmetrization of the vorticity fluctuations take place, due to the non-linear Ekman pumping which preferentially affects the cyclonic vorticity. While the power-law growth is generic of both experiment, the maximum value of S_ω is shown to depend on the experiment size.

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