On the effect of the Coriolis force on the enstrophy cascade

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Abstract

We study the enstrophy cascade at small spatial scales in statistically stationary forced-dissipated 2D Navier-Stokes equations subjected to the Coriolis force. We provide physically reasonable sufficient conditions to prove that on small scales, in the presence of the Coriolis force, the so-called third-order structure function's asymptotics follow the third-order universal law of 2D turbulence without the Coriolis force.

Our result indicates that on small scales, the enstrophy flux from larger to smaller scales is not affected by the Coriolis force, confirming experimental and numerical observations. To the best of our knowledge, this is the first mathematically rigorous study of the above equations. We also proved well-posedness and certain regularity properties to obtain the mentioned results. This is a joint work with Yuri Cacchio (GSSI) and Gigliola Staffilani (MIT).