# Direct and inverse cascades in rotating stably-stratified turbulence

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The concept of interscale energy cascade is well used in turbulence, but is often very superficially supported by rationale. What is the cause for the direction of this cascade, direct (towards smallest scales), inverse or other (e.g. transverse, by Horton et al. in homogeneous shear flows) ? I propose to discuss two important points, the number of invariants and the anisotropic structure. For instance, it is well known that conservation of both energy and enstrophy is a prerequisite for the inverse cascade in 2D unbounded turbulence, but such inverse cascade is not found in a strongly stratified fluid, in which both energy and potential vorticity (or toroidal mode) are (quasi) invariant: The strong and typical anisotropy of the toroidal cascade gives an explanation. In addition to a review of the problem in my team for rotating stratified turbulence, I will discuss new recent DNS results from Marino, Pouquet and Minnini on the occurrence of a remarkable inverse cascade when the Coriolis parameter f is close to the stratification frequency N. The case f = N merits particular attention, because strict 3D isotropy is permitted by dynamical equations, allowing a simplified analysis.