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Università di Roma Tor Vergata
Dipartimento di Fisica



Seminar

Tuesday, 18 November 2014 - h. 14:30

Sala Paoluzi (Dipartimento di Fisica)

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“Can we quantify the effect of waves in turbulence?”

Abstract

Turbulence is ubiquitous in a large variety of flows, from geophysical and astrophysical to industrial flows. Given their complexity, turbulent flows must be studied combining numerical, experimental and theoretical approaches. One of the building blocks when describing turbulence is the concept of the eddy, a swirling flow loosely associated with vortical structures. However, in flows in the atmosphere, the oceans, and in space, restitutive forces (Coriolis force associated with rotation, buoyancy forces associated with stratification, gravity and capillary forces in free surfaces, and the Lorentz force in ionized media) allow the system to also sustain waves, which in turn interact with vortical structures in the flow thus changing the fluid dynamics and the turbulent transport. The nonlinear interaction between waves, as well as the interaction between waves and eddies, are poorly understood. In this talk I will present numerical simulations of rotating and of stratified flows, with a focus on the helical nature of the waves, and on the amount of energy contained in these waves. I will show how net helicity can sometimes be spontaneously generated in such flows at large scales, and the impact of helicity in the turbulent scaling laws followed by the flow. Finally, I will present spectra resolved in time and space to extract the waves from the turbulent flow, and to precisely quantify their relevance in the overall dynamics of the system.

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