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Università di Roma Tor Vergata
Dipartimento di Fisica

Seminar

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Sala Struttura della Materia (Dipartimento di Fisica)

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"The spatio-temporal spectrum of turbulent flows"

Abstract

Understanding the interplay between waves and eddies is of crucial importance in many turbulent flows, ranging from geophysical to astrophysical ones. But, identification and extraction of vortical structures and of waves in a disorganized flow is a mayor challenge. We present a study of the spatio-temporal behavior of turbulent flows in the presence of different restitutive forces. Four cases are considered: rotating turbulence, stratified turbulence, water wave turbulence, and quantum turbulence. For rotating and for stratified turbulence, the spectrum allows identification of the waves, quantification of the energy in the waves and in the turbulent eddies, and identification of physical mechanisms such as Doppler shift and wave absorption in critical layers. For water wave turbulence the spectrum shows a transition from gravity-capillary waves to bound waves as the amplitude of the forcing is increased. Finally, in quantum turbulence we are able to directly detect the much sought after Kelvin waves.

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