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Colloquium of the Physics Department of ENS

Mercredi 21 Fevrier 2024, 13 :30
DPT-PHYS-ENS, ConfIV (E244) - Dépt de Physique de l'ENS - 24 rue Lhomond 75005 PARIS
Domaines : physics

Titre : *Odd Turbulence*

Orateur : **Vicenzo Vitelli**

Résumé : *Fully developed turbulence is a universal and scale-invariant chaotic state characterized by an energy cascade from large to small scales where the cascade is eventually arrested by dissipation. In this talk, we discuss how to harness these seemingly structureless turbulent cascades to generate patterns. Pattern formation entails a process of wavelength selection, which can typically be traced to the linear instability of a homogeneous state. By contrast, the mechanism we propose here is fully non-linear. It is triggered by a non-dissipative arrest of turbulent cascades : energy piles up at an intermediate scale, which is neither the system size nor the smallest scales at which energy is dissipated. Using a combination of theory and large-scale simulations, we show that the tunable wavelength of these cascade-induced patterns can be set by a non-dissipative transport coefficient called odd or gyro viscosity. This non-dissipative viscosity is ubiquitous in chiral systems ranging from plasma and bio-active media to quantum fluids. Cascade-induced patterns could also occur in natural systems including atmospheric flows, stellar plasma such as the solar wind, as well as the pulverization of objects or the coagulation of droplets where mass rather than energy cascades.*