TOR VERGATA
UNIVERSITÀ DEGLI STUDI DI ROMA

Dipartimento di Fisica

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Seminar

Monday, 19 September 2022 - h. 15:00

Fisica della Materia room (Department of Physics)

Prof. Björn BIRNIR

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and Department of Mathematics
University of California, Santa Barbara CA 93106
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"Stochastic Closure in Turbulence"

Abstract

We will discuss the closure problem in turbulence and how it can be solved using basic theorems in probability and stochastic partial differential equations. The existence of stochastic processes describing turbulent solutions of the Navier-Stokes equation, will be discussed. These turbulent solutions can then be used to proof the existence of an invariant measure in dimensions one, two and three. The invariant measure characterizes the statistically stationary state of turbulence. It determines all the deterministic properties of turbulence and everything that can be computed and measured. In particular, the invariant measure determines the probability density of the turbulent velocity and velocity differences. It gives a proof of the celebrated Kolmogorov-Obukhov scaling with the She-Leveque intermittency corrections, in three dimensions. This can then be used to develop accurate sub-grid models in computations of turbulence, by-passing the problem that three-dimensional turbulence is difficult to fully resolve with current computer technology. We will discuss applications of the theory to homogeneous turbulence, boundary value problems and Lagrangian turbulence.