Dipartimento di Fisica
Università di Cagliari
INFN, Sezione di Cagliari

High Energy Physics Colloquia

19 maggio 2016 · ore 15:00 · aula C

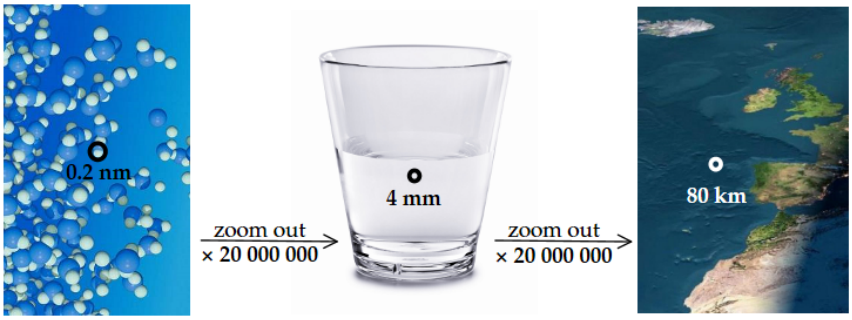
Luca Mana

Helmholtz Institute Juelich

The relation between theories on different scales: Insights from geophysical fluid dynamics

Abstract

A physical phenomenon can be described by wildly different mathematical theories, depending on the space and time scales on which it is observed. Such theories differ in the mathematics and in the physical quantities they involve. For example, to describe water we use molecular dynamics on the subnanometre scale, and the Navier-Stokes equations on the supramillimetre scale. Water has essentially different properties on those two scales. Scientists have been engaged in the quest to derive coarser-scale theories from finer-scale ones for several centuries, but are still baffled. For example, some finer theory may indicate that the coarser theory should be nonlocal; yet the coarser theory, macroscopically derived, turns out to be local instead, but with a memory dependence. Why?
This seminar shows how these intriguing features and questions appear when we try to find a theory to describe water on a geophysical, suprakilometre scale: the Navier-Stokes equations fail, and water behaves like a liquid polymer, described by a theory with memory. What are the implications of this for the finer-to-coarser quest?



Contatti:

M. Cadoni (mariano.cadoni@ca.infn.it)
Mailing list: https://lists.ca.infn.it/sympa/info/hep-colloquia