9th European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMA2024)
June 3-7, 2024, Lisbon, Portugal

COARSE GRAINING TURBULENCE: MODELING AND DATA-DRIVEN APPROACHES AND THEIR APPLICATIONS (800)

TRACK NUMBER 800

FERNANDO F. GRINSTEIN[*], FILIPE S. PEREIRA[*], MASSIMO GERMANO[†]

[*] Los Alamos National Laboratory
Los Alamos, New Mexico, USA
grinstein@lanl.gov & fspereira@lanl.gov

[†] Duke University
Durham, North Carolina, USA
mg234@duke.edu

Key words: Coarse graining, Turbulence modeling, Prediction.

ABSTRACT

Most flows present in nature and engineering are turbulent and characterized by a wide range of flow scales whose interaction is highly non-linear and difficult to model and simulate in practical flow configurations. These features make coarse graining formulations the only effective tool to predict complex flow problems, often comprising laminar, transitional, and turbulent flow, non-equilibrium phenomena, regions of incompressible or compressible flow, multi-physics, or turbulent kinetic energy generated by multiple mechanisms. This class of turbulence models comprises all formulations capable of resolving a fraction of the turbulent field - from detached-eddy simulations (DES), partially-averaged Navier-Stokes equations (PANS), large-eddy simulation (LES), implicit LES (ILES), to high-fidelity direct numerical simulation (DNS). This mini-symposium discusses the development and/or application of these models to complex practical flows, e.g., inertial confinement fusion, flows past vehicles, oceanography, offshore flows, materials mixing, or climate change. We invite contributions addressing any areas of fluid mechanics with these mathematical models. Contributions quantifying the simulations' accuracy are highly incentivized, as well as experimental studies that can help validate and improve coarse-graining methods. The MS will also present the work to be published in the book *Coarse Graining Turbulence: Modeling and Data-Driven Approaches and their Applications* [1].

REFERENCES

[1] F.F. Grinstein, F.S. Pereira, M. Germano, “Coarse Graining Turbulence: Modelling and Data-Driven Approaches and Their Applications”, *Cambridge University Press*, (in elaboration).