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REDUCED ORDER MODELS FOR ENVIRONMENTAL APPLICATIONS IN OCEAN AND ATMOSPHERE

JEFFREY C. HARRIS[*], KONSTANTIN KUZNETSOV[†]

[*] LHSV, Ecole des Ponts, EDF R&D
Chatou, France
jeffrey.harris@enpc.fr and https://sites.google.com/view/wavecfd/

[†] GRASP Earth
3 avenue Louis Neel, 59260 Lezennes, France
konstantin.kuznetsov@grasp-earth.com and https://www.grasp-earth.com/

ABSTRACT

This minisymposium focuses on the development and application of Reduced Order Models (ROMs) for complex environmental systems, with particular emphasis on oceanic and atmospheric processes (e.g., circulation, waves, interaction with structures). ROMs offer efficient alternatives to high-fidelity simulations by simplifying large-scale models while preserving critical system dynamics, making them highly valuable for real-time prediction and analysis.

Oceanic and atmospheric flows often have significant societal impacts but often due to the physical scales involved provide computational challenges to real-time models useful for digital twins. Machine learning or data-driven models, applying such techniques (but not limited to) dynamic mode decomposition (DMD) and variants, physics-informed neural networks (PINNs), even generative AI approaches, are able to bridge this gap under certain circumstances.

The minisymposium invites researchers and practitioners from diverse fields to discuss advancements in creating Reduced Order Models (ROMs) for complex physical processes in the ocean and atmosphere, which traditionally require significant computational resources when using classical numerical modeling techniques.

Participants are encouraged to contribute to the ongoing dialogue on advantages and disadvantages of different approaches to build a reduced order models for complex physical processes in the ocean or atmosphere.