16th World Congress on Computational Mechanics and 4th Pan American Congress on Computational Mechanics

July 21-26, 2024, Vancouver Convention Centre, Vancouver, British Columbia, Canada

MULTI-SCALE MODELING AND UPSCALING FOR FLOW INDUCED VIBRATIONS, FROM LOCAL REFERENCE SIMULATIONS TO CERTIFIED INDUSTRIAL TOOLS

Vincent Faucher[*1] and Joris Degroote[2] and Maria-Adela Puscas[1]*

[1]CEA

[2]Ghent University

MINISYMPOSIUM

This mini-symposium is dedicated to the dynamic response of structures immersed in a flow. In the considered global system, the principal loading can be caused either by the flow itself, i.e., flow-induced vibration (FIV), or by the combination of the flow and additional loads, such as seismic events. There are no restrictions on the range of applications and industrial fields addressed, including, for example, power plant components, biological processes and offshore engineering.

The mini-symposium adds an original and specific focus on multi-scale modeling and upscaling to share knowledge and experience on the most suitable ways to provide certified computational mechanics tools to end-users in an engineering environment, with the best level of confidence and validation, relying in particular on thorough quantification and propagation of uncertainties from the small scale(s) to the industrial scale.

In agreement with the general context above, the mini-symposium will gladly welcome contributions addressing either some key aspects of the proposed multi-scale framework or the scale management and upscaling strategies themselves. For illustrative purposes, papers are encouraged to address topics such as:

- fluid-structure coupling and advanced modeling at the local scale,
- homogenized and porous modeling at an industrial scale and its link with the local scale,
- uncertainty quantification and propagation to derive confidence intervals for industrial tools,
- validation of numerical strategies at every scale of interest.

The contributions are expected to emphasize the specifics of fluid-structure interactions (FSI), with particular attention paid to stable and unstable regimes (including fluid-elastic instability, for example), the effects of added coefficients, such as mass and damping, and the impact of turbulence at various scales. Mini-symposium topics also include compressible effects and wave propagation, depending on the considered systems. Moreover, strongly non-linear behavior can be considered for the structures, including contact and impacts. The way to handle such non-linearities within multi-scale and upscaling strategies will represent a valuable source of knowledge and exchanges between the contributors.