XII International Conference on Coupled Problems in Science and Engineering, COUPLED 2027
June 27-30, 2027, Palma de Mallorca, Spain

FLUID-STRUCTURE INTERACTION – ONE CHALLENGE, MANY APPROACHES

R. WÜCHNER [1], A. QUAINI [1], R. ROSSI [2], AND R. LÖHNER [3]

[1] Technical University of Munich
Arcisstraße 21, 80333 Munich, Germany
wuechner@tum.de , annalisa.quaini@tum.de

[2] Universitat Politècnica de Catalunya (UPC)/International Center for Numerical Methods in Engineering (CIMNE)
C/ Gran Capità S/N, 08034 Barcelona, Spain
riccardo.rossi@upc.edu / rrossi@cimne.upc.edu

[3] George Mason University
Fairfax, VA 22030, USA
rlohner@gmu.edu

ABSTRACT

Fluid-structure interaction (FSI) lies in the center of numerous coupled problems in science and engineering, where the mutual interplay between fluid flow and structural response gives rise to complex and often highly nonlinear phenomena. Despite decades of research, the accurate and efficient analysis of FSI systems remains challenging due to the wide range of involved physical processes, scales, and coupling mechanisms. At the same time, the diversity of modeling approaches and computational strategies has led to a rich and continuously evolving research landscape.

This invited session aims to bring together researchers working on all aspects of fluid-structure interaction, fostering the exchange of ideas across disciplines and methodological boundaries. Contributions are welcomed from a broad spectrum of approaches, including partitioned and monolithic coupling strategies, immersed and embedded methods, moving-mesh techniques, reduced-order and data-driven models, uncertainty-aware simulations, as well as emerging machine learning and hybrid computational frameworks. The session is equally open to analytical, numerical, experimental, and combined approaches that advance the understanding of coupled fluid-structure systems. Special focus can also be on the discussion of different aspects and perspectives for addressing common FSI challenges, such as strong coupling effects, interface treatment, novel discretization techniques, stability, accuracy, scalability, and computational efficiency. Applications of interest span a wide range of fields, including but not limited to aerospace, civil, environmental, infrastructure, offshore, and biomedical engineering.

By bringing together experts from diverse backgrounds and various fields of application, this session aims to explore how a common challenge (FSI) can be addressed using a variety of models and methods, thereby stimulating interdisciplinary collaboration and uncovering untapped potential in research on fluid-structure interaction.

KEY WORDS: Fluid-Structure Interaction (FSI), Multiphysics Coupling, Computational Methods, Coupling Methods, Interface Treatment, Physics-based, Data-Driven and hybrid Solution Approaches