

ADVANCES IN REDUCED BASIS TECHNIQUES FOR FLOW PROBLEMS IN ANALYSIS, CONTROL AND OPTIMIZATION

G. ROZZA^{*}, S. PEROTTO[†], A. QUAINI[§] AND M. FOSSATI^{††}

^{*} SISSA International School for Advanced Studies,
Via Bonomea 265, 34136 Trieste, Italy
gianluigi.rozza@sissa.it, <http://mathlab.sissa.it>

[†] Laboratory for Modeling and Scientific Computing (MOX)
Politecnico of Milano
Piazza Leonardo da Vinci 32, I-20133 Milano, Italy
simona.perotto@polimi.it, <https://mox.polimi.it>

[§] University of Houston
4800 Calhoun Rd, Houston, TX, USA
quaini@math.uh.edu, <http://www.uh.edu/nsm/math/>

^{††} University of Strathclyde
75 Montrose Street, G1 1XJ, Glasgow, United Kingdom
marco.fossati@strath.ac.uk, <https://www.strath.ac.uk>

Key words: Reduced basis methods, Incompressible and compressible flows, Control, Optimization.

ABSTRACT

Reduced Order Models have received a lot of attention in recent years thanks to the capability of drastically reducing the computational times for parametrized problems in a many-query setting.

This minisymposium will discuss the latest advances in Reduced Order Modelling techniques devoted to the study of complex flow problems as they arise in industrial applications (including but not limited) to mechanical and aerospace, medical and applied sciences contexts.

Talks are envisioned that will deal with methodological developments in numerical analysis with emphasis on mathematical modelling as well as application in the different contexts of computational engineering. Nonlinear inverse problems, optimal flow control, shape optimization, flow characterization via principal component analysis and uncertainty quantification will be at the core of the discussion. Advanced developments in Reduced Order Modelling for Computational Fluid Dynamics will be presented for applications in multiphysics contexts, such as fluid-structure interaction problems, and more general coupled phenomena involving inviscid, viscous and thermal flows, solids and porous media, incompressible and compressible flow regimes.

The minisymposium will create the context to discuss several industrial and medical applications including aeronautical, mechanical, naval, off-shore, wind, sport, biomedical engineering and cardiovascular surgery as well, combining elements of high performance

computing and advanced reduced order modelling, real time computing, data management and visualization.

The objective of the minisymposium is to present the state of the art in the field of Reduced Order Modelling formulations and implementations while identifying the current challenges and drawing the future landscape.