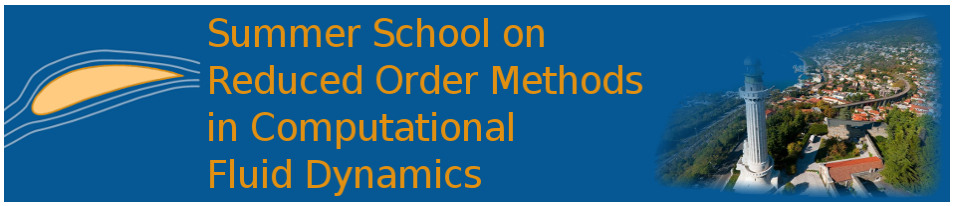

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Reduced basis methods for parametric bifurcation problems in nonlinear PDEs

Wednesday, July 10, 2019 4:09 PM (3 minutes)

The aim of this work is to show the applicability of the reduced basis model reduction in non-linear systems undergoing bifurcations. Bifurcation analysis, i.e., following the different bifurcating branches, as well as determining the bifurcation points themselves, is a complex computational task [1, 4]. Reduced Order Models (ROM) can potentially reduce the computational burden by several orders of magnitude.
Models describing bifurcating phenomena arising in several fields with interesting applications, from continuum to quantum mechanics passing through fluid dynamics.
We first focus on non-linear structural mechanics [3], and we show applications of ROM to Von Kármán plate equations and to an hyperelastic 3D beam.
Then we consider the incompressible Navier-Stokes equations in a channel [1] discretized with the spectral element method, which undergoes bifurcations with increasing Reynolds.
Finally, we show some recent results of the bifurcating phenomena in Bose-Einstein condensates (BEC) varying the chemical parameter [2].
Some of these studies are carried out in collaboration with A.T. Patera at MIT, A. Quaini at University of Houston and F. Ballarin, M. Hess at SISSA.

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