

**POD-based reduced-order modelling applied to parametrized hyperbolic problems****Authors:**

- Pablo Solán-Fustero, Fluid Dynamic Technology, I3A, University of Zaragoza ([psolfus@unizar.es](mailto:psolfus@unizar.es))
- José Luis Gracia, IUMA and Department of Applied Mathematics, University of Zaragoza ([jlgracia@unizar.es](mailto:jlgracia@unizar.es))
- Adrián Navas-Montilla, Fluid Dynamic Technology, I3A, University of Zaragoza ([anavas@unizar.es](mailto:anavas@unizar.es))
- Pilar García-Navarro, Fluid Dynamic Technology, I3A, University of Zaragoza ([pigar@unizar.es](mailto:pigar@unizar.es))

**Abstract:** Reduced-order models (ROMs) based on the proper orthogonal decomposition (POD) are widely used to reduce computational costs when compared to standard numerical methods, also called full-order models (FOMs). The ROM strategy consists of two parts: the off-line part, in which the ROM is trained by applying the snapshot method (cf. [1]) to the solutions of the FOM computed up to the training time; and the on-line part, in which the ROM is solved up to the same training time. One of the most important limitations of POD-based ROMs is the prediction of solutions beyond the training set considering hyperbolic problems. It is very interesting to explore the ability of ROMs to work on parameterised problems and to see if they are able to obtain satisfactory results by modifying the value of the training parameters. In this work we study this possibility applied to hyperbolic transport problems such as the shallow water equations [2].

**References:**

- [1] L. Sirovich. Turbulence and the dynamics of coherent structures. I - Coherent structures. II - Symmetries and transformations. III - Dynamics and scaling. *Q. Appl. Math.*, 45:561–571,573–582, 583–590, 1987.
- [2] P. Solán-Fustero, J.L. Gracia, A. Navas-Montilla, P. García-Navarro. Development of POD-based Reduced Order Models applied to shallow water equations using augmented Riemann solvers. *Com. Meth. App. Mech. Eng.* **410**, 2023.