

RESUMO N° 72

## **NEW EFFECTIVE BASIS SYSTEM FOR THE POD-SNAPSHOTS BASED REDUCTION MODELS**

**Iñigo Bidaguren**, i.bidaguren@ehu.es

*UPV/EHU, Spain*

**Lakhdar Remaki**, lremaki@bcamath.org

*BCAM, Spain*

**Jesús M. Blanco**, jesusmaria.blanco@ehu.es

*UPV/EHU, Spain*

**Keywords:** Pod, Convective Flow, Dynamical System, Gram Schmidt

The objective of this work is to improve the accuracy of the classical POD snapshots-based reduction model in the context of PDEs by coupling the POD with a new and appropriately built basis system. This will be done without contradicting the POD optimality theorem. The new basis-building criterion is discussed and mathematically expressed. This is based on the idea that the ideal scenario would be to have the snapshots already orthogonal so that the PDE solution is directly projected on the snapshots spanned space, the proposed criterion therefore aims to minimize the necessary transformation of the snapshots to turn them into orthonormal basis in a sense that will be defined. An algorithm to build such a basis is proposed. The efficiency of the proposed methods by comparison to the classical one is demonstrated on analytical solutions of steady convection equations.

[1] Berkooz, G., Holmes, P., and Lumley, J. L., 'The proper orthogonal decomposition in the analysis of turbulent flows', Annual Review of Fluid Mechanics 25, 1993, 539-575

[2] Lass, O.; Volkwein, S., 'Adaptive POD basis computation for parametrized nonlinear systems using optimal snapshot location', Computational Optimization and Applications 58, 3, 2014, 645-677

[3]Zhang, QS., Liu, YZ., Wang, SF., 'The identification of coherent structures using proper orthogonal decomposition and dynamic mode decomposition', Journal of Fluids and Structures 49, 2014, 53-72