

## Title: Reduced basis numerical homogenization techniques for multiscale problems

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### Abstract:

The construction of localized basis, either to recover some macroscopic parameters or to define macroscopic basis functions, is ubiquitous in many numerical strategies for multiscale problems. In this talk we discuss the combination of numerical homogenization techniques (a class of multiscale methods) with reduced order modeling techniques such as the reduced basis method for the efficient solution of partial differential equations with multiple scales. Applications to quasilinear elliptic problems and Stokes problems with multiple scales will be presented. Multiscale reduced basis methods for problems without scale separation based on local orthogonal decompositions will also be discussed.

This talk is based upon a series of joint works with various collaborators (see the references below).

### References

- [1] A. Abdulle, Y. Bai, G. Vilmart, Reduced basis finite element heterogeneous multiscale method for quasilinear elliptic homogenization problems. *Discrete Contin. Dyn. Syst.*, 8 (2015), pp. 91?118.
- [2] A. Abdulle, O. Budac, An adaptive finite element heterogeneous multiscale method for Stokes flow in porous media, *SIAM, Multiscale Model. Simul.*, 13 (2015), pp. 256?290.
- [3] A. Abdulle, O. Budac, A Petrov-Galerkin reduced basis approximation of the Stokes equation in parametrized geometries, *C. R. Math. Acad. Sci. Paris*, 353 (2015), pp. 641?645.
- [4] A. Abdulle, P. Henning, A reduced basis localized orthogonal decomposition, *J. Comput. Phys.*, 295 (2015), pp. 379?401.
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