ID de Contribution: **31** Type: **présentation murale**

Space-time domain decomposition methods for mixed formulations of flow and transport problems in porous media

mercredi 21 janvier 2015 18:00 (1 heure)

Flow and transport problems in porous media are well-known for their high computational cost. In the simulation of an underground nuclear waste disposal site, one has to work with extremely different length and time scales, and highly variable coefficients while satisfying strict accuracy requirements. One strategy for tackling these difficulties is to apply a non-overlapping domain decomposition method which allows local adaptation in both space and time and makes possible the use of parallel algorithms. In this work we present two approaches, one using a time-dependent Steklov-Poincare operator, another using the optimized Schwarz waveform relaxation for solving a time-dependent advection-diffusion problem in a mixed formulation. We show numerical experiments for various test cases, both academic and more realistic prototypes for nuclear waste disposal simulation, to investigate and compare the behavior of the two methods.

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Classification de Session: Session Poster