

Modelling of an Underground Waste Disposal Site by Upscaling and Simulation with Domain Decomposition Method

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Abstract: The global behavior of an underground waste disposal is studied in order to have an accurate upscaled model suitable for the computations involved in safety assessment process. We will decompose the solution to obtain more regular problems. Thanks to this regularity, we can use spectral methods to solve them. So we can get an accurate simulation of the solutions. Moreover, we will apply a multiple domain decomposition technique, here the Aitken Schwarz method, to solve these regular problems. Since spectral methods will give accurate mappings on interfaces, we can expect to be able to apply Aitken acceleration of the Schwarz method and obtain a good convergence.

We need to simulate the auxiliary variables. Their behavior is represented by a diffusive problem on a domain admitting an hole and some periodical conditions. The unit is represented by the flux through the hole. The simulation of these variables needs to be precise since they represent the oscillations at the start of the leak and will influence the rest of the simulation. In order to get an accurate simulation of these variables, we will use spectral methods. Moreover a multiple decomposition technique with mapping techniques will be realized for spectral methods to solve the auxiliary problems. Where the assumption of the repository periodical structure in the horizontal direction exists, a Fourier discretization is used. In the vertical direction, we use a Chebychev interpolation. Otherwise the problem will be treated only by Chebychev interpolation. We could compare this situation with a simulation in the domain without any hole but with an irregular second member ([4]).

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