

ON THE NUMERICAL REPRESENTATION OF FRACTURES AND DEFORMATION ZONES.

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Summary. The code DarcyTools has been used extensively by the Swedish Nuclear Fuel and Waste Management Company (SKB AB). In particular simulations of the impact of an open repository (inflow rates, draw downs etc.) have been carried out. Such simulations require that both the regional scale (say 10 km) and the details of the repository (metre scale) are handled as a coupled problem. In DarcyTools an unstructured Cartesian grid has been implemented in order to resolve several scales simultaneously. In this paper the grid technique employed by DarcyTools will be described and illustrated. In order to limit the scope the illustrations will be based on a generic situation with a single tunnel and a few fractures and deformation zones.

The unstructured Cartesian grid is easy and fast to generate and does not require a lot of RAM. The main input is objects which may be in a CAD-format. Resolution of the objects is specified by the cell size of “all cells at the boundary of the object”, “all cells inside the object” or some other criteria. A special feature of the grid generator is that cells that are not needed can be removed. As an example we can think of a cell which has zero conductivity on all cell walls; such a cell can be removed. In models of a sparsely fractured rock it is often possible to remove 70-80 % of the cells by such a criterion.

Fractures and deformations zones are generally inhomogeneous and anisotropic and this fact calls for a high resolution grid. As we can focus the grid resolution it is possible to represent also more complex features of fractures and zones. Examples will be given.