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Poroelastic aspects in geothermics

Bianca Kretz[1], Willi Freeden[2], and Volker Michel[1]
[1]Geomathematics Group, University of Siegen, Germany
[2]University of Kaiserslautern, Germany

The aspect of poroelasticity is anywhere interesting where a solid material and a fluid come into play and have an effect on each other. This is the case in many applications and we want to focus on geothermics. It is useful to consider this aspect since the replacement of the water in the reservoir below the Earth's surface has an effect on the sorrounding material and vice versa. The underlying physical processes can be described by partial differential equations, called the quasistatic equations of poroelasticity (QEP). From a mathematical point of view, we have a set of three (for two space and one time dimension) partial differential equations with the unknowns u (displacement) and p (pore pressure) depending on the space and the time.

Our aim is to do a decomposition of the data given for u and p in order that we can see underlying structures in the different decomposition scales that cannot be seen in the whole data.
For this process, we need the fundamental solution tensor of the QEP (cf. [1],[5]).
That means we assume that we have given data for u and p (they can be obtained for example by a method of fundamental solutions, cf. [1]) and want to investigate a post-processing method to these data. Here we follow the basic approaches for the Laplace-, Helmholtz- and d'Alembert equation (cf. [2],[4],[6]) and the Cauchy-Navier equation as a tensor-valued ansatz (cf. [3]). That means we want to modify our elements of the fundamental solution tensor in such a way that we smooth the singularity concerning a parameter set $\tau=(\tau_x,\tau_t)$.
With the help of these modified functions, we construct scaling functions which have to fulfil the properties of an approximate identity.
They are convolved with the given data to extract more details of u and p.

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