



## On the role of crustal deflection in the hydraulic-mechanical simulation of sedimentary basins during glacial cycles

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While guidelines for the location and licensing of a deep geological repository (DGR) for high-level radioactive waste depend both on national government policies and international regulations, it is mandatory to select a site where the hydrogeological setting provides sufficiently safe natural conditions for long-term waste isolation from groundwater flow. Therefore, safety assessments of a suitable location of a DGR require the evaluation of future external events and processes that may affect its long-term evolution.

Here, glaciation cycles are of special importance: Ice sheets evoke crustal deflections (including deformation), and impose pronounced hydraulic heads, both of which change the large-scale hydrogeological conditions. To properly assess the present and future conditions of a DGR site, its evolution in the past should be understood. For this, a sedimentary basin [3] is considered here as a large-scale hydrogeological benchmark. The evolution during one glacial cycle is simulated using the open-source multi-field finite element code OpenGeoSys. The hydraulic-mechanical impact of the glacial loading is taken into account using appropriate time-dependent boundary conditions. For comparison with a previously published study [3], the same (heuristic) displacement field is prescribed and the groundwater evolution is regarded. Then, a more realistic displacement field obtained from large-scale GIA simulations [1,2] is prescribed. Using a one-sided mechanical-hydraulic coupling with a staggered solution scheme it is possible to consider not only the hydraulic head from the glacier and the crustal deflection but also the crustal compression. Especially in regions at the margin of the glacier this could have an impact on the hydraulic behavior at the depth of a DGR.

### References & Funding

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