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Development and propagation of a subduction plate interface: insight from hydro-thermo-mechanical models

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The deformation mechanisms of the subduction zone plate interface varies along its length, from seismic brittle deformation near the surface to aseismic viscous deformation further at depth. However, the initiation of a subduction interface, as well as the interplay between viscous and brittle deformation is still incompletely understood. Furthermore, in the shallower portions of the subduction zone, in particular in the accretion prism, water might play an important role in the localization of the decollement (i.e. shallower part of the subduction interface).
In this study we model the development of a subduction plate interface from subduction initiation to prism development. We employ a numerical algorithm that solves the fully coupled hydro-thermo-mechanical using the staggered grid finite difference/marker-in-cell method. We first performed a parameter study varying the thermal age of the plate, shortening speed, sediment thickness and initial porosity distribution. In a second step numerical results are compared with geophysical data and samples from the Japan trench and the Nankai trough. Early results and numerical implementation will be presented.