

**THE GENERATION OF OVERPRESSURES BY COUPLED DEFORMATION AND DEHYDRATION IN SUBDUCTION ZONES**

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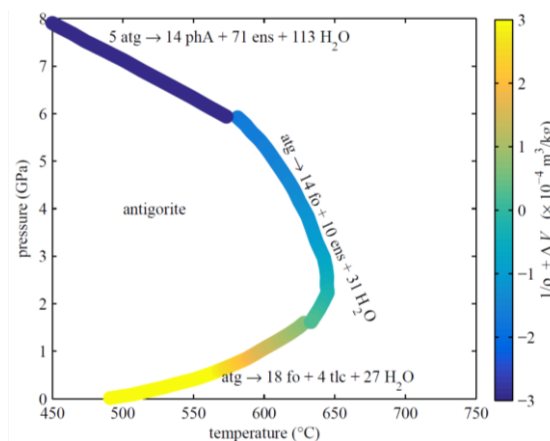
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We are here interested in the compacting behavior of dehydrating materials [1, 2]. During dehydration (for example, of serpentinites in subduction zones), a large volume of fluid is released, and a large porosity is generated. The generation of fluid induces pore pressure rises, while the generation of porosity induces a general weakening of the material. This latter aspect has been well demonstrated in experiments, which show that dehydrated and dehydrating serpentinites behave similarly to porous rocks, in the sense that they can yield in pure compaction (hydrostatic stress state). The yield caps of dehydrated serpentinites are hence “closed” at high mean stresses [3], which also implies negative friction coefficients and possibly negative dilatancy factors in the high stress regime.

How the evolution from a small porosity rock (or non-porous) to a porous one containing pressurized fluids, effects the strain localization within the material?

What is the role played by the feedbacks between reaction rate and pore fluid pressure rise?

Here we try to answer these questions by performing a stability analysis of a system composed of an initially homogeneous dehydrating rock, under nominally drained conditions. For simplicity we only consider the one dimensional case. We show that a positive feedback exists between inelastic compaction and reaction rate in the regime where the reaction produces a net decrease in total volume. This positive feedback tends to localize compaction, and generate shear instabilities, while reducing dramatically the effective pressure. This behavior is analogue to the “dehydration embrittlement” mechanism, but is shown here to occur even at very high pressure (and hence depths) in subduction zones.



**Figure 1.** Net total volume change as a function of pressure and temperature, for various reactions (atg: antigorite; fo: forsterite; tlc: talc; ens: enstatite; phA: phase A).

**References**

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