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# Hydration state of the incoming plate and updip fluid migration in the slab mantle

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## Résumé

Fluid production from dehydration reactions and fluid migration in the subducting slab impact various subduction processes, including intraslab and megathrust earthquakes, episodic tremor and slip, mantle wedge metasomatism, and arc-magma genesis. To better understand these processes, it is crucial to determine the migration and the resulting distribution of fluids within the slab and along the slab surface. A range of geophysical and field-based evidence have reported the plausibility of intraslab updip fluid migration, and numerical models have shown that compaction-pressure gradients induced by fluid release from dehydration reactions are a viable mechanism. Yet, the role of initial hydration in the oceanic mantle before subduction remains underexplored. Here, we use a 2-D two-phase flow model to investigate this effect under various initial slab-mantle hydration states and slab thermal conditions, both of which impact the depth extent of the stability of hydrous minerals. We focus on the lateral shift between the site of dehydration reactions and the location of fluid outflux at the top of the slab due to intraslab-updip migration. Our results indicate that major updip fluid pathways form along the antigorite and chlorite dehydration fronts sub-parallel to the slab surface. This, in turn, promotes fluid outflux at the slab surface as shallow as 30–40 km depths. This behavior is especially likely in young ( $< \sim 30$  Ma), warm slabs, where the stability zones of hydrous phases in the incoming oceanic mantle are relatively thin ( $< \sim 20$ -km thick), allowing the formation of slab-parallel dehydration fronts that promote updip flow.

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