



Numerical modelling of volatiles in the deep mantle

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The transport and storage of water in the mantle significantly affects several material properties of mantle rocks and thus water plays a key role in a variety of geodynamical processes (tectonics, magmatism etc.). The processes driving transport and circulation of H₂O in subduction zones remain a debated topic. Geological and seismological observations suggest different inflow mechanisms of water e.g. slab bending, thermal cracking and serpentinization (Faccenda et al., 2009; Korenaga, 2017), followed by dehydration of the slab. On Earth both shallow and steep subduction can be observed (Li et al., 2011). However most previous models (van Keken et al., 2008; Wilson et al., 2014) did not take different dip angles and subduction velocities of slabs into account. To which extent these parameters and processes influence the inflow of water still remains unclear. We present 2D numerical models simulating the influence of the various water inflow mechanisms on the mantle with changing dip angle and subduction velocity of the slab over time. The results are used to make predictions regarding the rheological behavior of the mantle wedge, dehydration regimes and volcanism at the surface.

References:

- van Keken, P. E., et al. A community benchmark for subduction zone modeling. *Phys. Earth Planet. Int.* 171, 187-197 (2008).
- Faccenda, M., T.V. Gerya, and L. Burlini. Deep slab hydration induced by bending-related variations in tectonic pressure. *Nat. Geosci.* 2, 790-793 (2009).
- Korenaga, J. On the extent of mantle hydration caused by plate bending. *Earth Planet. Sci. Lett.* 457, 1-9 (2017).
- Wilson, C. R., et al. Fluid flow in subduction zones: The role of solid rheology and compaction pressure. *Earth Planet. Sci. Lett.* 401, 261-274 (2014).
- Li, Z. H., Z. Q. Xu, and T. V. Gerya. Flat versus steep subduction: Contrasting modes for the formation and exhumation of high- to ultrahigh-pressure rocks in continental collision zones. *Earth Planet. Sci. Lett.* 301, 65-77 (2011).