

Interactive comment on “Testing the effects of the numerical implementation of water migration on models of subduction dynamics” by M. E. T. Quinquis and S. J. H. Buiter

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This study investigates the effect of different water migration schemes on the subduction dynamics. Basically, model results indicate that the style of oceanic plate subduction and extent of mantle wedge hydration are quite similar, regardless of the implemented water migration schemes, and even when there is coupling between water adsorbed and mantle viscosity. I have few comments that I would like to see addressed before publication

– page 1773, line 25: I think it is fair to add as a reference the work of Hacker et al., 2003, JGR, that has calculated phase diagrams for hydrated mafic and ultramafic

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rocks.

– page 1779, line 18: “(1) elemental and vertical”, may be you want to add “velocity”?

– page 1780, line 15: in Faccenda et al., 2008, Nature, there is no fluid flow. Fluid flow is computed in Faccenda et al., 2009, Nat. Geo., and Faccenda et al., 2012, G3, in a slightly different way than the third migration scheme of this study:

where v_f and v_s are the fluid and solid velocities, $const$ is a term function of the assigned constant hydraulic properties of the medium (permeability and porosity) and fluid viscosity, $PTOT$ is the total (lithostatic + dynamic) pressure. Hence, the fluid velocity depends on the solid flow, the constant term $const$ and the effective total pressure gradients.

– page 1781, eq. 8: please insert a citation for this empirical equation.

– Table 2: the viscosity of the dry mantle is similar to that of the cylindrical body, while the dry lithosphere viscosity is 3 orders of magnitude lower. Please correct.

– page 1789, last part: i think it would be good to check dynamic pressure differences in the two models, as slab-lifting should be induced by lower dynamic pressure (or tectonic under-pressure) above the slab

– section 4.3: among the other discussed processes not included in the modeling, I think it is worth to mention that during fluid flow compaction/dilation of the solid matrix produces additional flow divergency and pressure components that might affect the water migration patterns.

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