



Interactive comment on “Numerical models of trench migration in continental collision zones” by V. Magni et al.

S. Buitter (Editor)

susanne.buitter@ngu.no

Received and published: 30 May 2012

Dear authors,

Thank you for your constructive response to the reviews. Based on your replies, I would now like to invite you to submit your revised manuscript. I do want to ask you to have another look at two of the suggestions by the reviewers, not because of any major issues, but rather because I think some additional clarification may further benefit the manuscript:

Suggestion 6 by Clint Conrad: The reviewer raises the point that the trench advance observed in the models may depend on the length of the subducted oceanic slab prior to collision. You note that the behaviour of trench migration in your models did not

C216

change with a longer slab. The point here is that in nature very long slabs may be anchored in the lower mantle and will not so easily steepen. Your models do not include a lower mantle and therefore test a different scenario of subduction of a long slab. Also, short slabs (that do not reach the 660 km discontinuity) may occur when small ocean basins close, and though short slabs can change their dip angle more easily, they may perhaps indeed not steepen, not leading to trench advance. I am not suggesting that additional models should be run, but would just like to see some discussion of these points in the manuscript.

The first comment by Russ Pysklywec: The reviewer observes that in your models the amount of trench advance seems to be the same as the previous amount of trench retreat. I am fine with not using the term 'recovery', but the observation still holds and some discussion would be nice.

In addition, I have a few minor questions that should be easy to address:

Your models have a free-slip upper surface. Subduction can occur because the weak zone between the subducting and overriding plates is prescribed and allows the subducting slab to decouple from the surface. A low yield strength at the surface (such as in the models with $\tau_0 = 40$ MPa and $\tau_{\max} = 400$ MPa) also allows easier decoupling from the surface and better mimics a free surface. I am wondering if models with a low yield strength are somehow more appropriate and if effects of the surface boundary condition (especially higher yield strength near the surface) could propagate into model evolution? I guess I am just trying to convince myself that the difference in behaviour between the Von Mises (high yield strength at the surface) and depth-dependent (low yield strength at the surface) models is related to slab strength and not boundary conditions. Could you discuss this?

Could you give the absolute densities of your materials in Table 1 (not only the density difference)?

Why does the trench retreat velocity in phase 1 (before the slab reaches the base of

C217

the model domain) decrease?

Thank you for submitting your work to Solid Earth and i am looking forward to your revised manuscript! Susanne Buiter

Interactive comment on Solid Earth Discuss., 4, 429, 2012.