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Discussions

Interactive comment on "Using open sidewalls for modelling self-consistent lithosphere subduction dynamics" *by* M. Chertova et al.

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This is very interesting and useful paper concerning detailed investigation of the use of different boundary conditions for subduction modeling. The paper is well written and can be published in SE after addressing following two issues

1) The paper insists that open boundaries are the most natural type of BC to be used in subduction modeling. This is only partly correct since without proper implementation of intraplate stresses this type of BC will always promote trench retreat and results will be different for models with different aspect ratio. The later is not surprising since models with open BC and no intraplate stresses imply unnatural plates, which are infinitely long but have finite bottom plate traction (which depends on the length of the plates actually present inside the models) and have no ridge push. Consequently, a model

with shorter aspect ratio and reduced bottom plate traction has smaller resistance to retreat and higher trench retreat rate compared to the model with longer aspect ratio. Plates are finite in nature and it is thus natural to have them finite in models. From this prospective, one should compare models CRCR with models ORORR (i.e. with a model which has two open boundaries and two ridges) and not with models OO as in the paper. Additional testing of ORORR type models would be really useful for this paper.

2) Discussion on the used BC in subduction modeling could be extended. CRCR type models are used in a number of recent papers (Duterz et al., 2011, 2012; Ueda et al., 2012). Also, models with open bottom boundary are used which allow for both trench advance and retreat by allowing mass exchange between the left and right part of the model (Gorczyk et al., 2007; Gerya and Meilick, 2011; Vogt et al., 2012). Also, one could mention recent high-resolution global scale 3D models, which allow for self-consistent (and lateral BC-free) modeling of plate tectonics with one-sided subduction (Stagler et al., 2010; Crameri et al., 2012).

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