

Interactive comment on “Coupled modeling of hydrologic and geochemical fluxes for prediction of solid phase evolution in the Biosphere 2 hillslope experiment” by K. Dontsova et al.

Anonymous Referee #1

Received and published: 30 July 2009

General Comments

This study presents modeling experiments that attempt to predict the rate and extent of weathering (i.e., the evolution of soils) from an initial granular basalt material for a series of upcoming hillslope-scale experiments taking place in the Biosphere 2 (B2). While the assumptions made in developing these computer models (HYDRUS, CrunchFlow2007, and Rosetta) are limiting in some respects, this study does a good job (along with the companion paper) of covering the first approach towards the goal of a fully-coupled modeling environment capable of adapting and developing in parallel

C1684

with the actual B2 experiments. While the paper is well written, a few concerns should be addressed by the authors.

Specific Comments

The authors could more clearly demonstrate how all the modeling pieces fit together. This could be done by including a simple schematic figure. It is confusing as to how everything fits together.

Additionally, one aspect that was not clear to me (and perhaps needs better justification) is the influence of dimensions and configuration in one-dimension column experiment. Would the orientation of the column in the one-dimensional modeling influence the transformation? Also, the dimensions of the soil column are selected to simulate the ‘longest’ flow paths in the hillslope. What about shorter flow paths (i.e., columns of different dimensions)? In addition, some additional discussion should be included to highlight why each of the models used in this study was selected.

Another general comment is on the use of laboratory values (as opposed to field values) for the parameters of the basalt material. The authors give sound justification for this; however, since this is a modeling study, some effort should be put into demonstrating the influence of a range of assumed parameterization for the initial basalt material. Simply put, what would happen if you adopted field values? It makes sense rather than to speculate on the possible outcomes to just run through a few key modeling scenarios to demonstrate the influence. Are the one-dimensional and the two-dimensional experiments influenced in the same way?

The title of the manuscript may be considered a bit of an overstatement since the three models feed into each other, but it is debatable to what extent that can be considered ‘coupled’. From the concluding sentences of the manuscript, it sounds as if future models will indeed be fully-coupled and allow for feedbacks and complexities to emerge in the hillslope developments. The current study takes one model result and uses it to drive another model. The authors should consider changing the title to reflect this.

C1685

Technical Corrections

P4450, L22: Clarify if these will be first-order or zero-order watershed.

P4454, L8-10: Here and elsewhere, verify that all digits are significant.

Figures: The color scales do not print well in black and white. If possible, consider this in the selection of color bars.

Figure 7: Change 'finction' to 'function' and 'a nd' to 'and'.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 4449, 2009.