Hydrol. Earth Syst. Sci. Discuss., 10, C1433–C1435, 2013
www.hydrol-earth-syst-sci-discuss.net/10/C1433/2013/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Representation of water abstraction from a karst conduit with numerical discrete-continuum models" *by* T. Reimann et al.

Anonymous Referee #1

Received and published: 5 May 2013

The paper presents a modified version of the CFPM1 add-on package to Modflow, and an adaptation for a new BC in the coupled model. The add-on is described and its effects are shown on a very simple test model. Then a strongly simplified site model of the Cent Fonts spring catchment is used and simulation results for this case are shown. Overall, the paper is badly written and of low scientific content. The authors aim is (as stated in the conclusions section) to be able to interpret the pumping test by Marechal et al. (2008; reference as cited in manuscript) using MODFLOW with the karst add-ons CFPM1. The special setting of this pumping test makes a new lower boundary condition for the conduit system necessary, as otherwise water would be pumped into the spring. Also, a new feature of CFPM1 is developed, which is supposed to account for a fast storage mechanism. However, the model advancements are explained badly

and the model for the field test is so strongly idealized, that no meaningful results are obtained. Also, there is no significant scientific advancement compared to the paper of Marechal et al. (2008). Mayor issues: 1) The conceptual model description for the new kind of storage is incomplete and not clear at all. Where is the water? In which of the porosities? Why do the authors account for it that way? Why is storage not fast, but instantaneous? How do I get estimates of the parameters, what do they mean physically? 2) I see strong problems in 3D, as conduit storage associated with a conduit will overlap in case of multi- storey caves, thus yielding very large storage volumes by the CAD storage module, which will be unphysical to my understanding 3) The intention of solving the problem this way is not explained. What special case is the model designed for? What are the assuptions used, and what are the limitations of the model? 4) Of the test cases, only the last one is of interest, the others show just preliminary steps and wrong/incomplete results and thus should be omitted. There is no verification shown for the implementation, just the effects are displayed (and not discussed and interpreted), which should be the intention of a test case. Basically, this is not a true test case, but an even more simplified application. 5) The application is over-simplified, and there is no attempt to show the measured data or all required model results (i.e. matrix heads, origin of exchange flows with time). As this field test is the actual aim of the manuscript, this is of mayor concern. The model setup is not explained completely, and the results are only shown exemplarily, not discussed. E.g. why is the exchange parameter so strongly sensitive? It seems this parameter is dominating the results completely. There is many minor issues, which I do not list here, as they do not decide the basic issue. Thus I recommend to the authors to - make a true verification, and - conduct the field test modelling In the context of this, the model enhancements can be explained at put to use. A comparison of simulated data with measured data is required; I do not see any advancement on the Marechal paper in this work when staying just with hydraulics, so maybe including transport phenomena might bring new aspects. As a last comment to the authors: Could it be that the same effect as with CAD could be obtained using a finer discretization of the matrix close to

HESSD

10, C1433–C1435, 2013

the conduit? This should actually yield comparable results. Following from this, a grid size sensitivity analysis of the field case is certainly required.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 4463, 2013.