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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Thermal damping and retardation in karst conduits" *by* A. J. Luhmann et al.

Anonymous Referee #1

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The authors present analytical and numerical solutions for relating conduit geometry with thermal damping and retardation. The manuscript is overall well written and the topic interesting. Moreover, the findings are of interest of the scientific community and may be useful to give some light in inferring karst conduit properties. I have not reviewed the mathematical development for analytical solutions. It seems to be correct but I leave this task to another referee.

Although I consider that the manuscript is acceptable for publication at Hess in its current format, I propose some minor issues that, in my opinion, could improve this manuscript: - Section 5 page 9602; Hydraulic boundary conditions are not clear. The authors impose velocity just at the conduit or fracture inlet? Is there flow across the matrix? The authors say that the calculation of f does not affect to the results. Is the

model insensitive to this parameter or is it a consequence of the imposed boundary conditions? What if you impose head instead of velocity? The authors explain the number of elements within the grid but it would be more useful an explanation of the model sensitivity to this grid (it seem they have some numerical dispersion that could be produced because of a grid effect). What about the time stepping? - Section 6.3.2, page 9610; Regarding the variable velocity setting I miss a figure showing the fitting between analytical solutions and numerical simulations and an explanation about why the authors chose that range of velocities. As it is the most interesting case, I would pay more attention to this topic. The modeling work seems to be correct, crossing a wide range of different assumptions. I have noticed some limitations of the model while reading the manuscript, however, they are well discussed on section 8.2 so nothing to say. - Section 7, page 9616; As for the field study, the authors chose as a section title "An example field study to test the theory". I do not see the testing, I can see a good application to estimate the geometry of conduits applying their solutions but I cannot see how the authors check that the estimation of conduit diameter is correct. Explain better or change the title to something like "Theory application to a field study". The authors claim within the abstract too that they have confirmed their relationships with a tracer experiment. They should change that affirmation if they do not explain better within section 7. Some technical corrections: - Page 9616, line 3: explict would be explicit - Page 9612, line 10: simlations would be simulations - Table 6: when the authors explain what Θ means they say advection and conduction time ratio. I would say conduction and advection time ratio, it may lead to errors while reading.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 9589, 2014.