Hydrol. Earth Syst. Sci. Discuss., 6, C1433–C1434, 2009
www.hydrol-earth-syst-sci-discuss.net/6/C1433/2009/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Hierarchy theory in hydropedology" *by* T. F. H. Allen et al.

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Received and published: 4 July 2009

First of all, I would like to thank the authors for their interest in hydropedology and the time and efforts they put in presenting such a stimulating topic from a very different angle. The topic of this paper is indeed important – both cutting-edge and challenging. It is indeed not easy to get it all done well the 1st attempt for non-hydropedologists to tackle one of the tough questions in hydropedology. Nonetheless, the perspectives expressed by the experts of hierarchy theory and complex system are very much appreciated. I hope one way or another and sooner or later this topic is worth of publishing. As the 3rd reviewer pointed out, there are a number of valuable points in the manuscript that could be further developed or clarified so that it would be more appealing and clearer to the readers regarding how exactly hierarchy theory could be applied to hydropedology. Like this reviewer pointed out, "getting the gist of applying hierarchy

theory to soil processes is most elusive." In its current form, the paper does strike me as too general. It would benefit from some concrete examples from hydropedology domain topics and especially hit some core issues of hydropedology, such as the link between hierarchy theory – scaling issues – heterogeneity – structure and function of soil water processes. Another beneficial thing to include is perhaps a critical review of the overall accomplishments of hierarchy theory in other disciplines (especially ecology) and highlight its place in complexity systems theory in brief but crystally clear manner.

In additional to the review comments provided by the three thoughtful reviewers, a couple of questions that I would like to further highlight are: 1) it appears the main use of hierarchy theory is central on conceptual organization of clearly-defined levels of analysis. Is this understanding correct or I missed something here? Any more quantitative means associated with this theory that could be utilized would also be desirable; and 2) the authors seemed to recommend to avoid middle number theory and suggested that the prediction is impossible with middle number theory, and yet hydropedology seemed to invite many middle number specifications. I agree that intermediate scale is often the most difficult and often neglected, and yet it is also most important from the point of view of many practical applications. So I wonder whether there might be practical solution to this dilemma?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 2931, 2009.