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Hydrology and Earth System Sciences Discussions

Interactive comment on "Large-scale groundwater modeling using global datasets: a test case for the Rhine-Meuse basin" *by* E. H. Sutanudjaja et al.

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Review comments for Title: Large-scale groundwater modeling using global datasets: A test case for the Rhine-Meuse basin Author(s): E.H. Sutanudjaja et al. MS No.: hess-2011-69 MS Type: Research Article

General Comments:

Thank you for the opportunity to review the paper, "Large-scale groundwater modeling using global datasets: A test case for the Rhine-Meuse basin." The paper is clearly written and is very relevant to scientific questions within the scope of HESS. The paper presents a regional groundwater-flow model developed using global datasets,

and demonstrates that use these datasets can produce a model capable of simulating recharge processes and regional groundwater response. The majority of the paper describes the land surface model that produces estimates of recharge for the groundwater-flow model, MODFLOW, applied to the area. The sensitivity analysis and model results are discussed well to illustrate the utility and limitations of the approach.

Specific Comments:

1. I would encourage the authors to expand the discussion on the uses and limitations of this type of modeling. In particular, because of scale it does not simulate the impact of pumping in the region. The authors could address the major uses of this type of model for data-poor areas.

2. On page 2578, the authors state that MODFLOW was run with constant kD and S_y, which will circumvent problems with dry or flooded cells. I suggest making this assumption more explicit in the discussion of the MODFLOW model at the beginning of section 2.4. Challenges to handling simulated water levels above land surface in the coupled model could also be discussed.

Minor Technical Corrections/Comments:

1. In the title and the text, the authors refer to the model as "large-scale"; but large-scale refers to detailed maps. This regional model would be "small- scale" in the terminology used in geography.

2. In bullet 7 on page 2578, the authors refer to S_y as porosity. I suggest using specific yield or storage coefficient (as used in the following paragraph).

3. I found the discussion of equations 42-44 a bit confusing. I understand that the area of the cell computed in MODFLOW by multiplying $\Delta x \times \Delta y$ is not the true area of the (30" x 30") non-rectangular cell. The equations, however, do not appear to be dimensionally consistent. Instead of (30" x 30") in the denominator, perhaps a variable for 'apparent' MODFLOW area could be used A_{MF}. With that change the equations

would look dimensionally consistent. A small sketch showing a (30” x 30”) cell and a rectangular cell also would be helpful but maybe more detailed than necessary.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 2555, 2011.