

## ***Interactive comment on “Improved representation of groundwater at a regional scale – coupling of mesocale Hydrologic Model (mHM) with OpeneGeoSys (OGS)” by Miao Jing et al.***

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I have read the paper with great interest and find this kind of developments within SW-GW coupling very relevant and necessary. I generally find the paper very interesting and a good step in the right direction. I especially encourage the efforts related to variable time stepping and grid resolutions between compartments. I would however encourage the authors to be more specific about the coupling and limitations hereof. As I read it there is no feedback from OGS to mHM, meaning that mHM is merely used to calculate a distributed boundary condition of groundwater recharge to OGS, which could have been done using separate models? Or am I wrong? There is currently

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no coupling between groundwater and soil moisture/evapotranspiration or baseflow? I find the discussion part interesting when it comes to actual full coupling. This would make the potential for model application far greater since it would enable simulations of the impact of horizontal GW flow on surface water and the impact of groundwater levels on GW-SW interactions. This again would make the model useful for evaluating the effect of GW pumping on surface water flow. One could ask, what is the purpose of a regional scale ground water model from a water resources perspective if it does not include the interaction with surface water? I suggest that the authors: â€” Make it very clear from the beginning of the manuscript which kind of “coupling” is performed â€” Provide more details on the OGS code, is it a fully integrated 3D variably saturated code or a pure saturated GW code? â€” That the discussion section about full coupling is expanded by reflecting more on what that would require (e.g. regarding flexible time stepping and grid resolution etc.) and what sort of application that could benefit from such a development. Also referencing other fully coupled codes. â€” Discuss what kind of water resources issues this kind of regional scale model (mHM#OGS) could help solve.

Thanks for an interesting contribution, that I hope to see in GMD and hopefully also a follow-up paper including a full GW-SW coupling which would really excel the potential of such a model system.

Minor comment: Figure 8 need to include specifications of a) and b) and the figure caption needs to explain what the blue and red plots represent. Also I think you should avoid adding the  $R_{cor}$  values for groundwater heads, since they are meaningless in a topographically varying catchment. Stick to the RMSE.

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