Natural Hazards and Earth System Sciences Discussions

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Comment on nhess-2021-129

Anonymous Referee #2

Referee comment on "Evaluating integrated water management strategies to inform hydrological drought mitigation" by Doris E. Wendt et al., Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2021-129-RC3, 2021

I have found this manuscript to be well written, well structured and well presented. The topic is timely and I am very glad to see joining up of groundwater and water resources modelling, it happens far less than it should! Although the case study model is synthetic, a great deal of thought has gone into the both the model setup and parameter choices; the authors clearly have a strong working understanding of how UK water resource systems operate - and their synthetic model well reflects that. With the synthetic nature of the case study in mind, the authors are careful in their discussion and wider recommendations, making only recommendations that their sensitivity analysis supports. I have only some minor recommendations around improving clarity (primarily around presentation of the demand model) and some wider thoughts that may be addressed before the paper is published.

Minor comments

As I mention, modelling water resources with groundwater in a joined up way is surprisingly rare - the authors may wish to include a slightly expanded review (even just a paragraph in the intro) on this subject to help justify their reasonably simplistic hydrological representation.

Can water demand be written as an equation, just to make it easier to follow.

L116/133 - Perhaps either move some of the text from S3.2 here, or at least reference that this is described in more detail in the Data section. On first reading it appeared that this line was essentially the only description of water demand in the model!

I was under the impression that ecological flows are typically met by reservoir releases, rather than groundwater pumping (though I suppose this is highly regional). No need to rerun the model, but might be interesting for UK readers.

The groundwater and reservoir levels in this model are often 0 (Fig 2). This is no problem since the case study is synthetic, but the authors should note in the text that UK groundwater/reservoir systems are not this stressed (even if effort has been taken to parameterise the model in a sensible and nationally reflective manner) - perhaps expand a little in Section 5.3 (water companies might be alarmed if you give the impression that this is portrayed as a 'nationally average' model).

Can the model/modelling setup be made publicly available so that results can be reproduced - it seems that the models/data are all openly available so I don't see why not?

Figure A2. soil moisture: can the green, light blue and dark blue horizontal lines be described in the caption.

L204/Table 3: The increase in surface/ground water demand is actually an increase in water availability no? If I understand the reference to table 1, then it seems the licences are being maximised. Increasing demand as a response to drought seems confusing phrasing to me (why would a water company do that!). Maybe say +X% surface/ground water abstraction capacity? I would probably also describe this in a bit more detail in the text because it seems not trivial to conceptualise!

L207 - I guess conjunctive use is in contrast to a fixed proportion of demand met by surface water : groundwater? If so, I would state that here to make it clear.

Figure 4: There is quite a lot to unpack here! I would rename the panels slightly to help the reader navigate the figure a bit more quickly:
-High groundwater storage system groundwater level (GWL)
-High groundwater storage system baseline GWL minus scenario GWL
-Low groundwater storage system GWL
-Low groundwater storage system baseline GWL minus scenario GWL

L368: transferred, not traded!

Finally, and feel free to ignore this as I find terminology to mainly be a subjective choice,

the use of 'socio-hydrological model' in this context has left me a little confused. In terms of how sophisticated a representation of hydrological process and sociological processes - this model is very asymmetric, with a minimal social representation. The feedback between hydrological and social is only the pre-defined water company drought response to lowering groundwater/reservoir levels (which I wouldn't class as a social process). By this definition, any water resources modelling application that includes a feedback between physical state variables and water consumption (and this is surely many/most - at least from my experience in water supply modelling) may be classified as socio-hydrological (and if this is the case, then socio-hydrology is surely not an emerging field, as stated in L52!).