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Discussions

Interactive comment on "Why is the Arkavathy River drying? A multiple hypothesis approach in a data scarce region" *by* V. Srinivasan et al.

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The referee has provided a number of valuable points on the framing of the argument. Overall, we agree and will attempt to modify or nuance the paper's thrust suitably. Additionally, the referee has suggested a number of minor edits which will be addressed in the revised version.

Referee comment 1: This is an interesting and well-presented paper of which I will be happy to suggest minor revisions. I am fully sympathetic to the fact that the authors advocate a "best practices" approach to attributing recent hydrological change in a complex regions such as the Arkavathy river basin, and that they try to generate information that is useful for policy making. I am also inclined to agree that there exist many

documented attempts that focus too strongly on modelling, and that those attempts are very prone to neglect processes that are not represented in the model, thus leading to some form of "modeller myopia".

Author Response: Thank you.

Referee comment 2: My main comment, which I realise is subjective, has to do with the style in which the argumentation is set up. The authors pose the issue too black and white, contrasting "developed world models" to "developing world data scarcity", or, as I interpret it, an approach based on a-hydrological-model-that-happens-to-be-available, versus a conscious identification of the issues at hand and the appropriate complexity of analysis as a function of available data. As such, I see the paper not so much as a first step towards a new scientific approach, but rather an excellent example of "best practice" of bottom-up hydrological problem solving. Many developed regions are problematic in modelling their hydrology while many developing regions are starting to get better and better data. What makes a study region like Arkavathy challenging is the big discrepancy between the urgency of decision making v. the low data availability and complexity of the hydrology. This is of course a situation more likely to occur in developing regions, but surely not their monopoly.

Author Response: We agree with this and will reframe the introduction to the paper. We will also spell out the specific conditions that make the study region challenging.

Referee comment 3: Another reason that I am a bit uncomfortable with the "us v. them" tendency of the problem statement, is that rejecting the use of complex models also has implications for the analysis.

Author Response: We agree. We don't intend to reject complex modelling at all. The first step we refer to in the paper is not a first step towards a new hydrology but rather a first step to engaging in hydrologic research at a specific study site.

We see this paper as a starting point to inform for more complex modelling. We are in

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fact already engaged in a significant amount of primary data collection and instrumentation of the watershed and hydrological process modelling. But our research questions, hypotheses and therefore instrumentation design were informed by this initial analysis.

This will be clarified in the paper.

Referee comment 4: In particular, it makes it impossible to look at interactions between each of the hypotheses. For instance it is not unlikely that an increase of evapotranspiration from Eucalyptus may have reduced groundwater recharge, thus further aggravating the impact of extraction. The authors discuss this to some extent in section 5 and emphasize the need for further research, but give little explanation about how this can be done without the use of the models against which they argue in the introduction of the paper.

Author Response: This is a valid point and we think this point needs to be explained better in the paper. First, to clarify, the third hypothesis is not groundwater depletion but groundwater extraction. In other words, we deliberately split up the blue and green water components of human activity – although mechanistically both deplete groundwater and reduce baseflows.

Likewise, obstructions along the stream channel (in the Million Puddle Theory) convert surface water to groundwater and in fact these enable groundwater extraction to persist at the observed levels. However, we deliberately only looked at the "pure evaporation" component when evaluating the impacts of check dams – to avoid double counting. However, as the referee has pointed out this is unclear and should be clarified upfront when introducing the five hypotheses.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 25, 2015.