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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Developing predictive insight into changing water systems: use-inspired hydrologic science for the Anthropocene" *by* S. E. Thompson et al.

Anonymous Referee #1

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This is a well-written, provocative paper with deep insights for the field of hydrological modeling. It calls for a fundamental reorganization of the field to focus on feedbacks in nonlinear human-natural coupled water systems, the need for co-evolutionary modeling, hydrologic reconstruction, comparative hydrology, model-data learning, and use-inspired research. It puts flesh on the bones of Sivapalan et al.'s (2011) statement in Hydrological Processes and argues for a fundamental restructuring of the field of hydrological modeling as it is practiced today. That said, I offer several comments about the paper from a social scientific perspective.

1. While the authors articulate the problem of non-stationary for making predictions

about the future, they hue to the argument that predictive insights are feasible, and it will be possible to constrain uncertainty and improve existing models for decision making. They return in the conclusions with an imperative for hydrologists to "predict the behavior of water systems over a one-hundred year timescale." They leave the challenge of deep uncertainty and non-stationarity unanswered, favoring a more evolutional approach, building on existing modeling over alternative approaches that assume it is not possible to predict the behavior of water systems. 2.While it is critical, as the authors argue, to compare water systems and look for generalization through big science, observational networks, and interdisciplinary model development, there is growing recognition in the policy literature than one-size-fits-all modeling and management frameworks have not led to effective climate adaptation in the water or other sectors. Decisions about water systems are inherently value-laden and place-based. Lessons learned from modeling and model translational activities can be shared within big-science networks, but they will probably trickle-up, not down, from place-based research. 3. If hydrological models are to rise to the challenge of Pasteur's Quadrant, they will need to be surrounded by social learning processes and other translational activities that connect modeling results to the needs of decision makers. Scientists alone do not produce use-inspired research and models. They co-produce these models with decision makers through an iterative, two-way process that acknowledges the perspectives, needs, and values of local communities. These social processes surrounding the modeling effort offer considerable opportunity for generalization about how to manage hydrological systems in the face of uncertainty.

Overall, this is an exceptionally thoughtful paper and a genuine contribution to the scientific and public discussion of modeling water systems in the face or rapid change and deep uncertainty.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 7897, 2013.