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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Why does a conceptual hydrological model fail to predict discharge changes in response to climate change?" *by* Doris Duethmann et al.

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This study (Duethmann, D., Blöschl, G., and Parajka, J.: Why does a conceptual hydrological model fail to predict discharge changes in response to climate change?, Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2019-652, in review, 2020) aims to explain the reasons why many conceptual hydrological models fail to predict non-stationary hydrologic behavior under changing climate. They examined three potential sources of errors within a HBV modeling framework: (1) observational error (or uncertainty), (2) parameter error (due to calibration), and (3) model structural error (mostly deficiency of vegetation dynamics). Using factorial design, they tried to decon-

volve each contribution in the long-term deviations between observed and simulated streamflow patterns at the 156 Austrian catchments. I totally agree to a key motivation of this study in that traditional hydrologic modeling has often ignored the importance of vegetation responses to changing climate, which can possibly provide key hydrologic non-stationary components. I write down this comment to reply to a first point raised by Dr. Liu et al. I disagree that these results cannot be applicable to other hydrological models, including both conceptual and distributed ones. Vegetation phenology, longer growing season, and subsequent vegetation growth are regarded as key and universal ecosystem responses to warming, which have great implications in carbon and water cycles. However, to my knowledge, few studies have considered these potential feedbacks between vegetation, climate, and hydrology especially in future hydrological modeling. Interactions between vegetation and hydrology can be particularly important in the watershed systems where vegetation dynamics and its water use are strongly coupled with subsequent hydrologic behavior (e.g. forested watersheds). I think that this study would provide timely information and a common ground for hydrologists why vegetation phenology and subsequent dynamics and responses should be included in future hydrological modeling under changing climate.

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