

Discharge and Floods Projected to Increase More Than Precipitation Extremes

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Abstract

Floods claim a high toll in fatalities and economic impacts. Despite their societal relevance, there is much more to learn about the projected changes in discharge and flooding. Here we force an operational hydrologic model over the state of Iowa with high-resolution convection-permitting climate-model precipitation to evaluate the response of 140 watersheds to climate change. At the end of the century, under the most aggressive scenario in terms of fossil fuel use, we show that the transition from snow to rainfall and a ~30% increase in extreme precipitation rates lead to a doubling of maximum discharge during the spring and extended the flood season into the fall. Total discharge volumes are also expected to increase. Our results suggest that flood projections based on extreme precipitation increases alone substantially underestimate future risk due to the nonlinearity of the hydrologic response explained by long-term soil moisture memory and its feedbacks with precipitation.

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