

EGU21-12902

<https://doi.org/10.5194/egusphere-egu21-12902>

EGU General Assembly 2021

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Patterns of flood timing trend across the global river networks

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Impacts of climate change on floods have been recently suggested to be more consistently seen in flood timing (or flood seasonality) as opposed to flood magnitude and frequency. Changes in flood timing can threaten the finely tuned water resource management systems and, if poorly understood, can alter flood risks in unpredictable ways. Nevertheless, patterns of global flood timing trend remain elusive. Whether climate change has played a significant role in shifting flood timing worldwide also remains unknown.

Here we obtained an unprecedented set of discharge records from tens of thousands of global gauges and model-reconstructed naturalized discharge at ~3 million river reaches to delineate flood timing trend across the global river networks from 1980 to 2019. Hydroclimate drivers possibly causing these trends, including maximum precipitation, antecedent soil moisture, and snowmelt timing, are also investigated to disentangle climate change signals on floods. We found that the flood timing has been significantly earlier over the lower Mississippi, the Amur and the Amazon river basins, as well as large parts of the high-latitude Northern Hemisphere. Significant later floods are observed over the Yangtze and the lower Congo river basins, and the southeast Asia. However, ascribing these flood timing shifts to changing climate is not as obvious as previously suggested, implying the need for further research on this topic.