

EGU21-10

<https://doi.org/10.5194/egusphere-egu21-10>

EGU General Assembly 2021

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Flood and center timing in a changing world

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Climate change is expected to change the pattern of rainfall resulting in changed flood magnitude. However, in large part due to interannual variability, identifying a climate change signal in flood magnitude remains difficult. As an alternative to investigating trends in flood magnitude, it has been suggested that trends in flood timing, that is, the day of annual streamflow maxima, may be a detectable trend due climate change.

Here, using high-quality data from around the world, trends in flood and center timing are investigated. We begin by standardizing the data on a local definition of water year. We find an interesting property, that after standardization, the flood and centre timing of streamflow can be approximated by a normal distribution. Moreover, we find that without the standardization on local water year the calculated trend can reverse. We proceed by analyzing trends in centre and flood timing globally using linear regression.

Results are commensurable with large-scale climatic change. But, unlike changes in extreme rainfall, trends are not spatially consistent. Flood timing is shifting to earlier in the year in the tropics, and later in the year in the extra-tropics, consistent with changes in mean rainfall and flood magnitude. There is evidence of a reversal of trends post-drought, suggesting that the mechanisms controlling flooding at a catchment scale are changing as a result of climate change. It is concluded that trends in flood timing are related to flood generating mechanisms, and largely modulated by changing antecedent moisture conditions.