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Can global hydrological models reproduce large scale river flood regimes?

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River flooding remains one of the most severe natural hazards. On the one hand, major flood events pose a serious threat to human well-being, causing deaths and considerable economic damage. On the other hand, the periodic occurrence of flood pulses is crucial to maintain the functioning of riverine floodplains and wetlands, and to preserve the ecosystem services the latter provide. In many regions, river floods reveal a distinct seasonality, i.e. they occur at a particular time during the year. This seasonality is related to regionally dominant flood generating processes which can be expressed in river flood types.
While in data-rich regions (esp. Europe and North America) the analysis of flood regimes can be based on observed river discharge time series, this data is sparse or lacking in many other regions of the world. This gap of knowledge can be filled by global modeling approaches. However, to date most global modeling studies have focused on mean annual or monthly water availability and their change over time while simulating discharge extremes, both floods and droughts, still remains a challenge for large scale hydrological models.
This study will explore the ability of the global hydrological model WaterGAP3 to simulate the large scale patterns of river flood regimes, represented by seasonal pattern and the dominant flood type. WaterGAP3 simulates the global terrestrial water balance on a 5 arc minute spatial grid (excluding Greenland and Antarctica) at a daily time step. The model accounts for human interference on river flow, i.e. water abstraction for various purposes, e.g. irrigation, and flow regulation by large dams and reservoirs.
Our analysis will provide insight in the general ability of global hydrological models to reproduce river flood regimes and thus will promote the creation of a global map of river flood regimes to provide a spatially inclusive and comprehensive picture. Understanding present-day flood regimes can support both flood risk analysis and the assessment of potential regional impacts of climate change on river flooding.