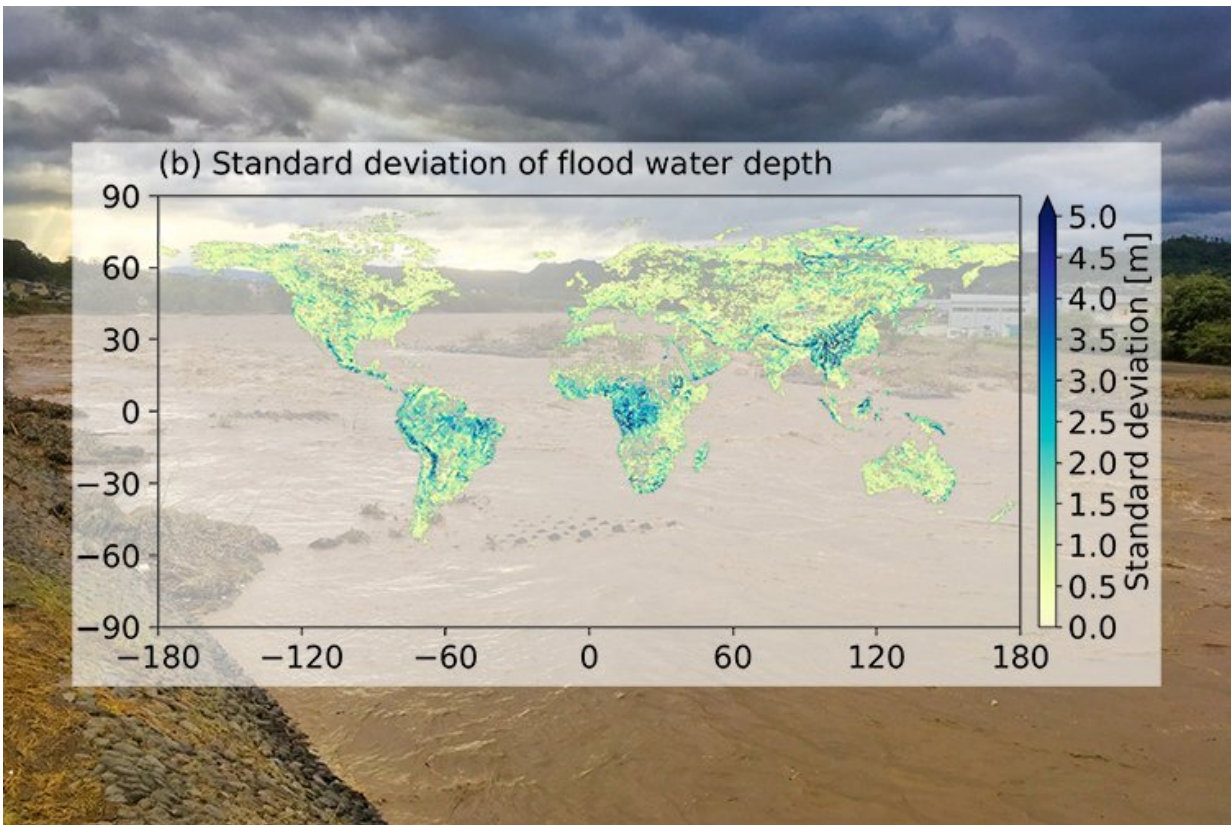


Flood risk uncertainties assessed at the global scale

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Credit: University of Tokyo

A research team from the Institute of Industrial Science, The University of Tokyo has conducted a detailed analysis of the uncertainties associated with flood risk modeling at the global scale. They found large

uncertainties were mainly associated with runoff data. Flood magnitude is large in wet regions, but uncertainties in flood depth is larger in dry and mountainous regions affected by rare, extreme floods. The results of the study can be used to identify the key areas for improvement in hydrological modeling and improve future predictions of flood risk.

Assessment of the risk of rare and extreme floods is essential for disaster management and recovery planning at international, national, and regional levels. However, the accurate assessment of [flood risk](#) is limited by the number of observations possible, and relies on hydrological modeling which has limited performance. Theoretical [flood](#) hazard maps, which are relied on by governments, regional planners, insurance services, and other stakeholders, are an important part of understanding the potential extent of flood risk. However, they are subject to high levels of uncertainty, especially at the large scale.

"The main problem is that the creation of accurate flood hazard maps relies on excellent flood frequency analysis," explains study co-author Dr. Wenchao Ma, "and the main limitation of that is its reliance on assumptions about the underlying distribution of flood events, which is hugely variable among different regions of the world. There is no single solution that can be applied everywhere."

The research team found that uncertainties in runoff inputs contributed more than 80% of the total uncertainty. Overall uncertainties were highest in Africa, but exposure risk was greatest in Asia. "We found that land susceptible to rare floods—called 1-in-100-year floods—accounts for 9.1% of the global area, excluding Antarctica," says study lead author Dr. Xudong Zhou. "In addition, the numbers show 13.4% of the population may be exposed to such a flood event, with a potential economic impact of up to 14.9 trillion US dollars to global GDP."

More adjustments are needed to flood hazard maps to ensure their

accuracy. Further data are needed to take into account the efforts made by flood defenses and dam regulations and to improve inputs for areas with large uncertainties, such as Africa. Such improvements would reduce these uncertainties and improve these resources for use under future climatic conditions.

More information: Xudong Zhou et al. The uncertainty of flood frequency analyses in hydrodynamic model simulations, *Natural Hazards and Earth System Sciences* (2021). [DOI: 10.5194/nhess-21-1071-2021](https://doi.org/10.5194/nhess-21-1071-2021)

Provided by University of Tokyo

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