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Hydrodynamic modelling and global datasets: Flow connectivity and SRTM data, a Bangkok case study.

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The rise in the global interconnected manufacturing supply chains requires an understanding and consistent quantification of flood risk at a global scale. Flood risk is often better quantified (or at least more precisely defined) in regions where there has been an investment in comprehensive topographical data collection such as LiDAR coupled with detailed hydrodynamic modelling. Yet in regions where these data and modelling are unavailable, the implications of flooding and the knock on effects for global industries can be dramatic, as evidenced by the recent floods in Bangkok, Thailand.

There is a growing momentum in terms of global modelling initiatives to address this lack of a consistent understanding of flood risk and they will rely heavily on the application of available global datasets relevant to hydrodynamic modelling, such as Shuttle Radar Topography Mission (SRTM) data and its derivatives. These global datasets bring opportunities to apply consistent methodologies on an automated basis in all regions, while the use of coarser scale datasets also brings many challenges such as sub-grid process representation and downscaled hydrology data from global climate models. There are significant opportunities for hydrological science in helping define new, realistic and physically based methodologies that can be applied globally as well as the possibility of gaining new insights into flood risk through analysis of the many large datasets that will be derived from this work.

We use Bangkok as a case study to explore some of the issues related to using these available global datasets for hydrodynamic modelling, with particular focus on using SRTM data to represent topography. Research has shown that flow connectivity on the floodplain is an important component in the dynamics of flood flows on to and off the floodplain, and indeed within different areas of the floodplain. A lack of representation of flow connectivity, often due to data resolution limitations, means that important subgrid processes are missing from hydrodynamic models leading to poor model predictive capabilities. Specifically here, the issue of flow connectivity during flood events is explored using geostatistical techniques to quantify the change of flow connectivity on floodplains due to grid rescaling methods. We also test whether this method of assessing connectivity can be used as new tool in the quantification of flood risk that moves beyond the simple flood extent approach, encapsulating threshold changes and data limitations.