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A geospatial and temporal analytics framework for flood risk mapping

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Floods have significant impact on social and economic activities, with flood frequency projected to increase in the future in many regions of the world due to climate change. Quantification of current and future flood risk at lead times of months to years are potentially of high value for planning activities in a wide range of humanitarian and business applications across multiple sectors. However, there are also many technical and methodological challenges in producing accurate, local predictions which also adequately quantify uncertainty. Multiple geospatial datasets are freely available to improve flood predictions, but their size and complexity mean they are difficult to store and combine. Generation of flood inundation risk maps requires the combination of several static geospatial data layers with potentially multiple simulation models and ensembles of climate inputs.

Here we present a geospatial climate impact modelling framework, which we apply to the challenge of flooding risk quantification. Our framework is modular, scalable cloud-based and allows for the easy deployment of different impact models and model components with a range of input datasets (different spatial and temporal scales) and model configurations.

The framework allows us to use automated tools to carry out AI-enabled parameter calibration, model validation and uncertainty quantification/propagation, with the ability to quickly run the impact models for any location where the appropriate data is available. We can additionally trial different sources of input data, pulling data from IBM PAIRS Geoscope and other sources, and we have done this with our pluvial flood models.

In this presentation, we provide pluvial flood risk assessments generated through our framework. We calibrate our flood models to accurately reproduce inundations derived from historical precipitation datasets, validated against flood maps obtained from corresponding satellite imagery, and quantify uncertainties for hydrological parameters. Probabilistic flood risk is generated through ensemble execution of such models, incorporating climate change and model parameter uncertainties.