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Improving Flood Predictions in Data-Scarce Basins

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Flood modeling methodology at Risk Management Solutions Ltd. has evolved over several years with the development of continental scale flood risk models spanning most of Europe, the United States and Japan. Pluvial (rain fed) and fluvial (river fed) flood maps represent the basis for the assessment of regional flood risk. These maps are derived by solving the 1D energy balance equation for river routing and 2D shallow water equation (SWE) for overland flow. The models are run with high performance computing and GPU based solvers as the time taken for simulation is large in such continental scale modeling. These results are validated with data from authorities and business partners, and have been used in the insurance industry for many years.

While this methodology has been proven extremely effective in regions where the quality and availability of data are high, its application is very challenging in other regions where data are scarce. This is generally the case for low and middle income countries, where simpler approaches are needed for flood risk modeling and assessment.

In this study we explore new methods to make use of modeling results obtained in data-rich contexts to improve predictive ability in data-scarce contexts. As an example, based on our modeled flood maps in data-rich countries, we identify statistical relationships between flood characteristics and topographic and climatic indicators, and test their generalization across physical domains. Moreover, we apply the Height Above Nearest Drainage (HAND)approach to estimate “probable” saturated areas for different return period flood events as functions of basin characteristics. This work falls into the well-established research field of Predictions in Ungauged Basins.