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Flood Inundation Modelling in Data Sparse Deltas

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An estimated 7% of global population currently live in deltas, and this number is increasing over time. This has resulted in numerous human induced impacts on deltas ranging from subsidence, upstream sediment trapping and coastal erosion amongst others. These threats have already impacted on flood dynamics in deltas and could intensify in line with human activities. However, the myriad of threats creates a large number of potential scenarios that need to be evaluated. Therefore, to assess the impacts of these scenarios, a pre-requisite is a flood inundation model that is both computationally efficient and flexible in its setup so it can be applied in data-sparse settings. An intermediate scale, which compromises between the computational speed of a global model and the detail of a case specific bespoke model, was chosen to achieve this. To this end, we have developed an intermediate scale flood inundation model at a resolution of 540m of the Mekong Delta, built with freely available data, using the LISFLOOD-FP hydrodynamic model. The purpose of this is to answer the following questions: 1) How much detail is required to accurately simulate flooding in the Mekong Delta? , 2) What characteristics of deltas are most important to include in flood inundation models?

Models were run using a vegetation removed SRTM DEM and a hind-casting of tidal heights as a down-stream boundary. Results indicate the importance of vegetation removal in the DEM for inundation extent and the sensitivity of water level to roughness coefficients. The propagation of the tidal signal was found to be sensitive to bathymetry, both within the river channel and offshore, yet data availability for this is poor, meaning the modeller has to be careful in his or her choice of bathymetry interpolation Supplementing global river channel data with more localised data demonstrated minor improvements in results suggesting detailed channel information is not always needed to produce good results.

It is envisaged that this work will lead to current and future flood risk analysis of not only the Mekong Delta, but also other data sparse deltas owing to the model's utilisation of freely available data that has a global coverage. This will ultimately aid in the much-needed estimation of flood risk in deltaic settings.