Application of the LISFLOOD-FP Hydrodynamic Model for Impact-Based Forecasting over the Eastern Africa Region

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Introduction

- Impact-based forecasting (IBF) aims to support risk-oriented decisions in disaster risk management by promoting anticipatory actions that minimize damage and loss of life from natural hazards
- The floodplain inundation data is required for impact functions that demonstrate the relationship between inundation depth and displacement probability, as well as economic damage to buildings, roads, and commercial/agriculture land use categories
- Widely available hydrological models typically use streamflow rate forecasts in conjunction with historical flood hazard maps to derive inundation maps, but this method lacks specificity in capturing rainfall-induced catchment and flash flooding processes, especially in riverine and urban areas
- In this study, we tested the hydrodynamic model LISFLOOD-FP Sharifian et al. [2] for impact-based forecasting and assessed the operational IBF suitability of the parsimonious, simplified model RIM2D Apel et al. [1]

Methods

Method used for compare the LISFLOOD-FP and RIM2D operational purpose in Cloud computer.

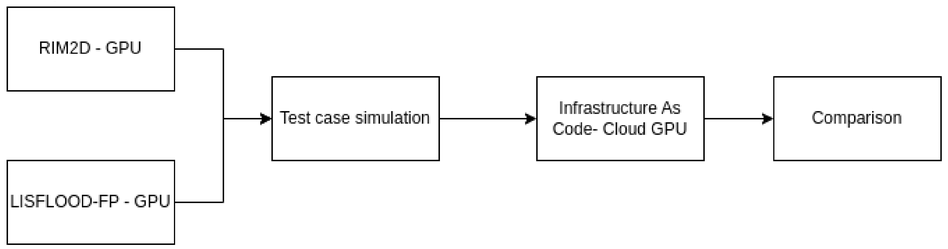

Figure 1: GPU version of the models are used in similar GPU Cloud Computing setup

Results

- Initial simulations indicate RIM2D is more efficient for operational IBF due to its parsimonious hydrological modeling approach, making it apt for IBF risk measures
- The validity of RIM2D's hydrodynamic modeling in East Africa is underway; the provided GitHub repository details the Python programs and cloud setup for the model

Reference

[1] Heiko Apel, Sergiy Vorogushyn, and Bruno Merz. Brief communication: Impact forecasting could substantially improve the emergency management of deadly floods: case study july 2021 floods in germany. *Natural Hazards and Earth System Sciences*, 22(9):3005–3014, 2022.

[2] Mohammad Kazem Sharifian, Georges Kesserwani, Alovya Ahmed Chowdhury, Jeffrey Neal, and Paul Bates. Lisflood-fp 8.1: new gpu-accelerated solvers for faster fluvial/pluvial flood simulations. *Geoscientific Model Development*, 16(9):2391–2413, 2023.

"**RIM2D**, a streamlined, **parsimonious** version of **LISFLOOD-FP** model, might be the ideal choice for **impact-based forecasting**. After all, why putting on a space suit to water the garden?"

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Github repo project
nishadhka/rim2d-ibf