Moving towards a Global Flood Model Validation Framework

Jannis M. Hoch and Mark Trigg

The WHY
Global Flood Models (GFMs) are powerful tools to detect flood risk hotspots, provide early warning, and inform policy. Yet, there are several major shortcomings:

1. Each GFM follows its own approach (Fig. 1);
2. GFMs employ different numerical schemes, data;
3. Validation is done for different basins using varying data and metrics (Tab. 1).

As a result, models can differ locally (Fig. 2). We need to test several elements of GFMs. To do so, we also foresee several challenges to be met.

Testing elements:
- Inundation extent & depth
- Discharge hydrograph
- Input forcing/data
- Regionality

Testing challenges:
- Test location
- Common forcing data
- Observed discharge, extent, and depth

And THEN?
- Make it cloud-based and open
- Evolve into plug-and-play tool for model component coupling (Fig. 4)
- Open up model code and make it accessible

We must understand better why Global Flood Models can differ locally.

The WHAT
By establishing a GFM validation and benchmarking framework (Fig. 3) it becomes possible to disentangle the underlying drivers of the deviations through:

- providing standard forcing data
- validating & benchmarking model results
- storing & indexing reference output

The HOW
The WHY

By providing 

Fig 1: Overview of different GFM modelling approaches and their modelling steps

Fig 2: Agreement between GFMs of 1/100 years flood extent for the lower Niger

Tab. 1: Summary of meta-study analysing the different river basins, time periods, and data sets used for GFM validation

Climate cascade model type
- Climate reanalysis data
- Land surface model
- Continuous river flow routing
- Flood frequency analysis
- Flood flow magnitude
- Downscaling or calculating flood extents and depths

GFMs
- Global gauged flow data
- Regional flow frequency analysis
- Flood flow routing, rivers and floodplains
- Calculate flood extents and depth

Fig 3: Conceptual design of the proposed GFM validation & benchmarking Framework

Fig 4: Conceptualization of a GFM plug-and-play tool combining components (“Comp”) from different GFMs

References: