Fluvial and pluvial flood hazard assessment in Lagos, Nigeria, using a hydrological-hydrodynamic model cascade

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Ogun basin, Nigeria

- 22,500 km², rural, two strategic reservoirs
- Monsoon climate with distinct rainy season
- Frequent pluvial and fluvial floods in the city of Lagos
  - No warning system
  - Poor management (blocked channels, illegal settlement, etc.)
  - Limited data availability and quality

Objective: Quantification of pluvial and fluvial flood hazard and impacts by climate change.

Data

Rainfall observations

- 5 minute resolution
- Limited data availability
- Data pooling: 96 stations along coast of West Africa, about 20 million data points (186 years)

Climate projections: ISIMIP3b

- 10 CMIP6 GCMs, bias-corrected, common resolution
- 30-year periods: 1985-2014, 2071-2100
- 2 scenarios: SSP126, SSP585
- Data pooling: 46 grid cells covering TAHMO stations

Historical climate data

- W5E5: reanalysis and observed data
- 1979-2019

Hydrological data

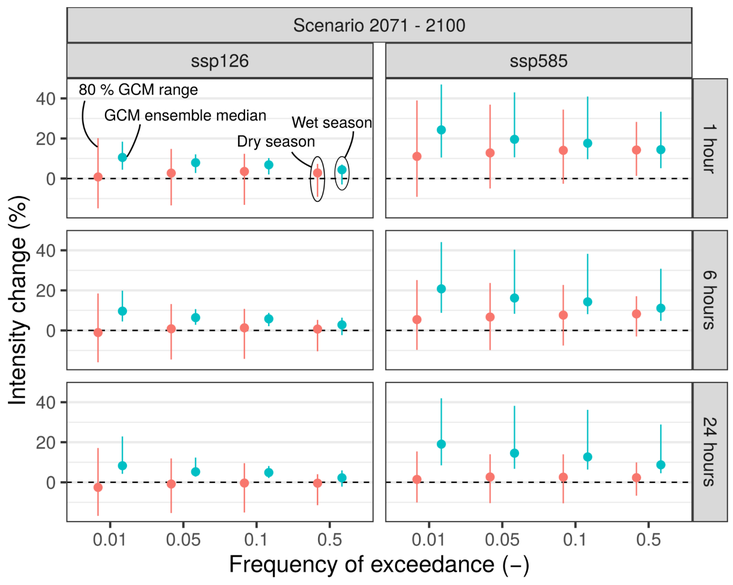
- DEM
- Soil
- Land cover
- River discharge observations
- Reservoir information

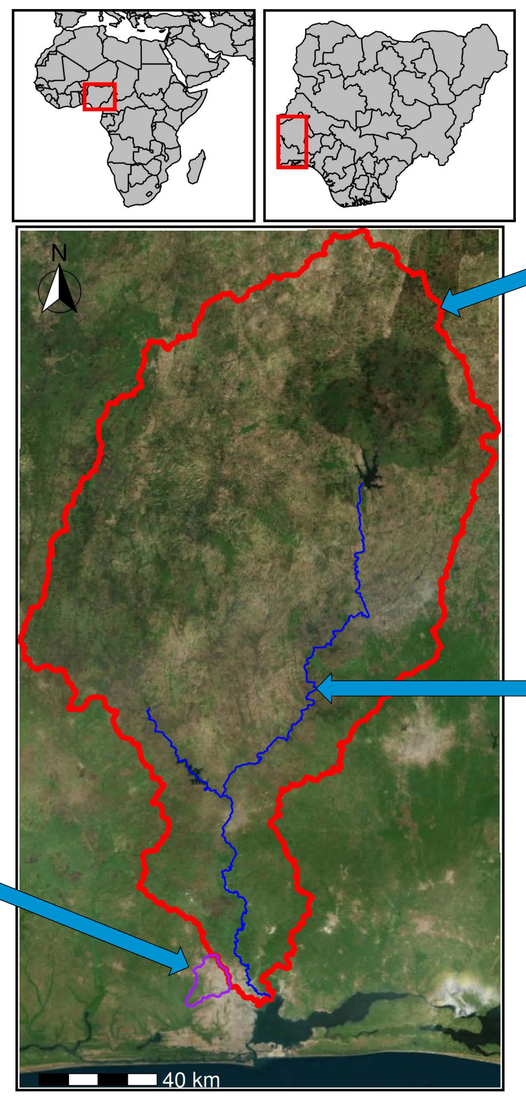
Processing and extreme value analysis

- Disaggregation to 5 minute resolution using Olsson's Random Cascade Model
- Derivation of Intensity-duration-frequency relation

Future projection of extreme rainfall

- Delta change: projected change added to observation
- 2071-2100 vs. 1985-2014





SWIM
Soil and Water Integrated Model

Eco-hydrological model for

- Runoff generation
- Reservoir operation

CaMa Flood model

Simplified hydrodynamic model for large-scale simulation of

- River flow
- Overland flow

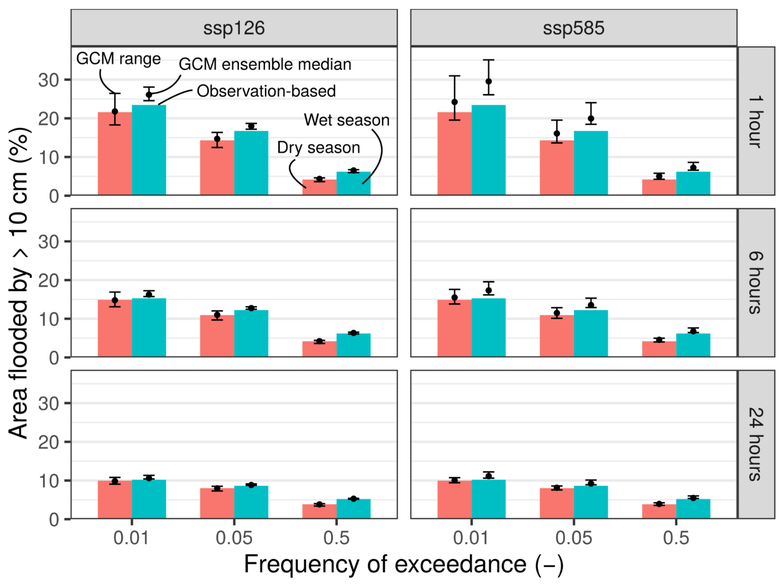
Fluvial flood hazard

Work in progress

TELEMAC-2d model

Fully 2-D hydrodynamic model for small-scale simulation of flooding using observed and projected design storms.

Pluvial flood hazard: current state and future projections



Effect of compound events?

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