Building the Flood Early Warning System in Guyana at the National scale, with real-time forecast of inundated areas for selected flood prone communities

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1. *CIMA Research Foundation*
2. *UNITAR Operational Satellite Applications Programme (UNOSAT)*
3. *Hydromet Service Guyana*

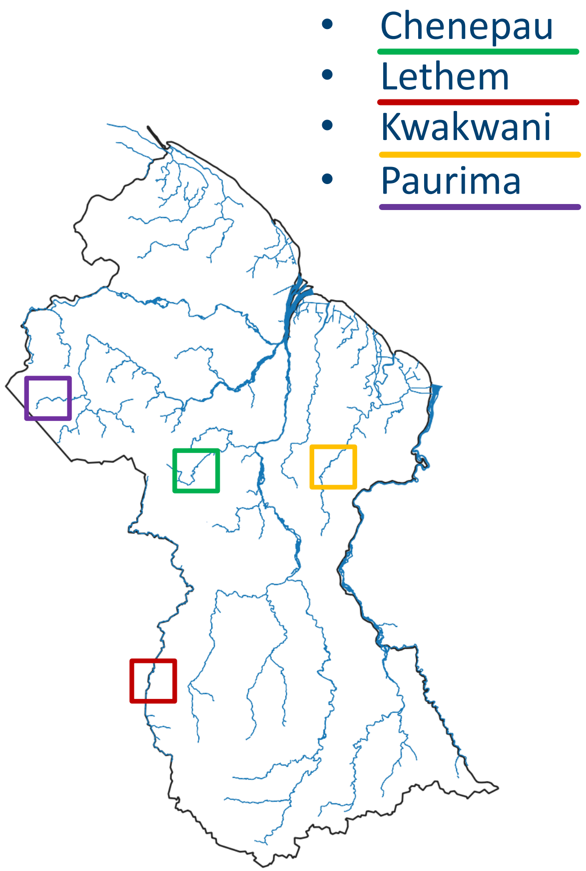
EGU General Assembly 2020
6 May 2020

SCIENCE AWARENESS BEHAVIOURS

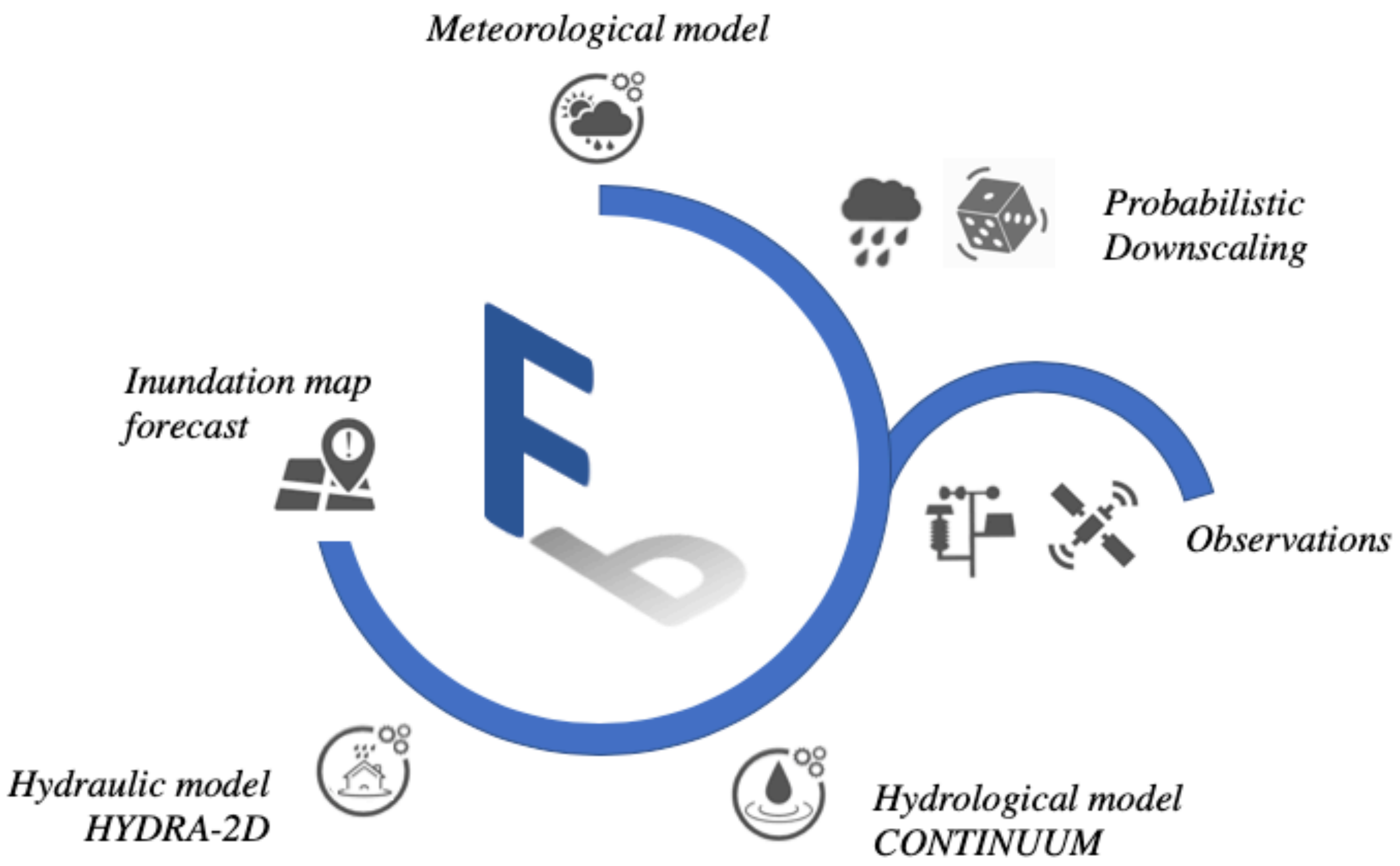
FRAMEWORK AND OBJECTIVES

«*Strengthening Disaster Management Capacity of Women in Guyana and Dominica*» Project, founded by JICA, implemented by UNDP Guyana together with UNOSAT and CIMA:

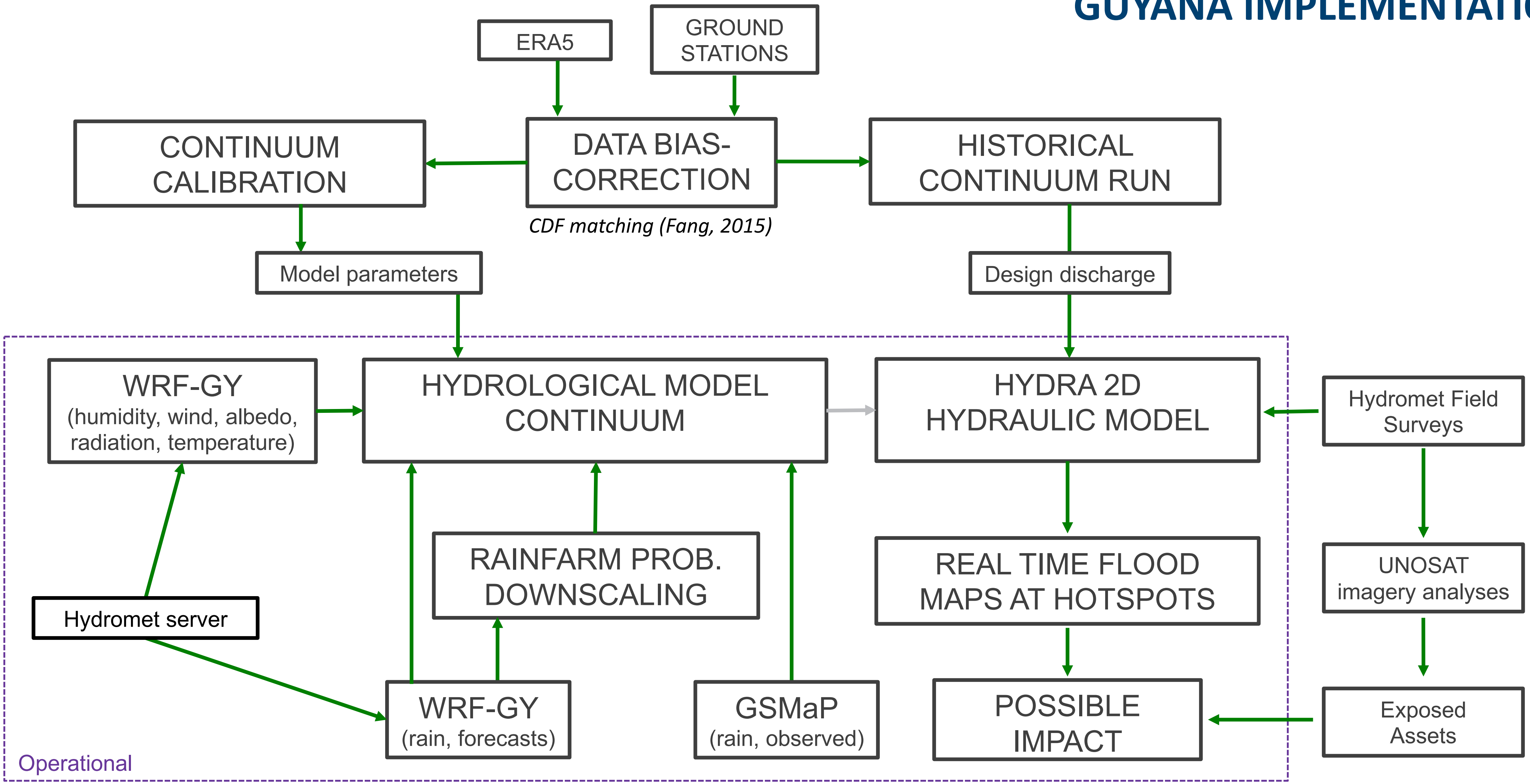
- technical component aimed at implementing an operational flood forecasting modelling chain;
- provide daily forecasts of extreme flood events 1 to seven 7 days in advance, covering the whole Guyana;
- provide inundation forecasts at selected locations;
- river gauge records at few locations.



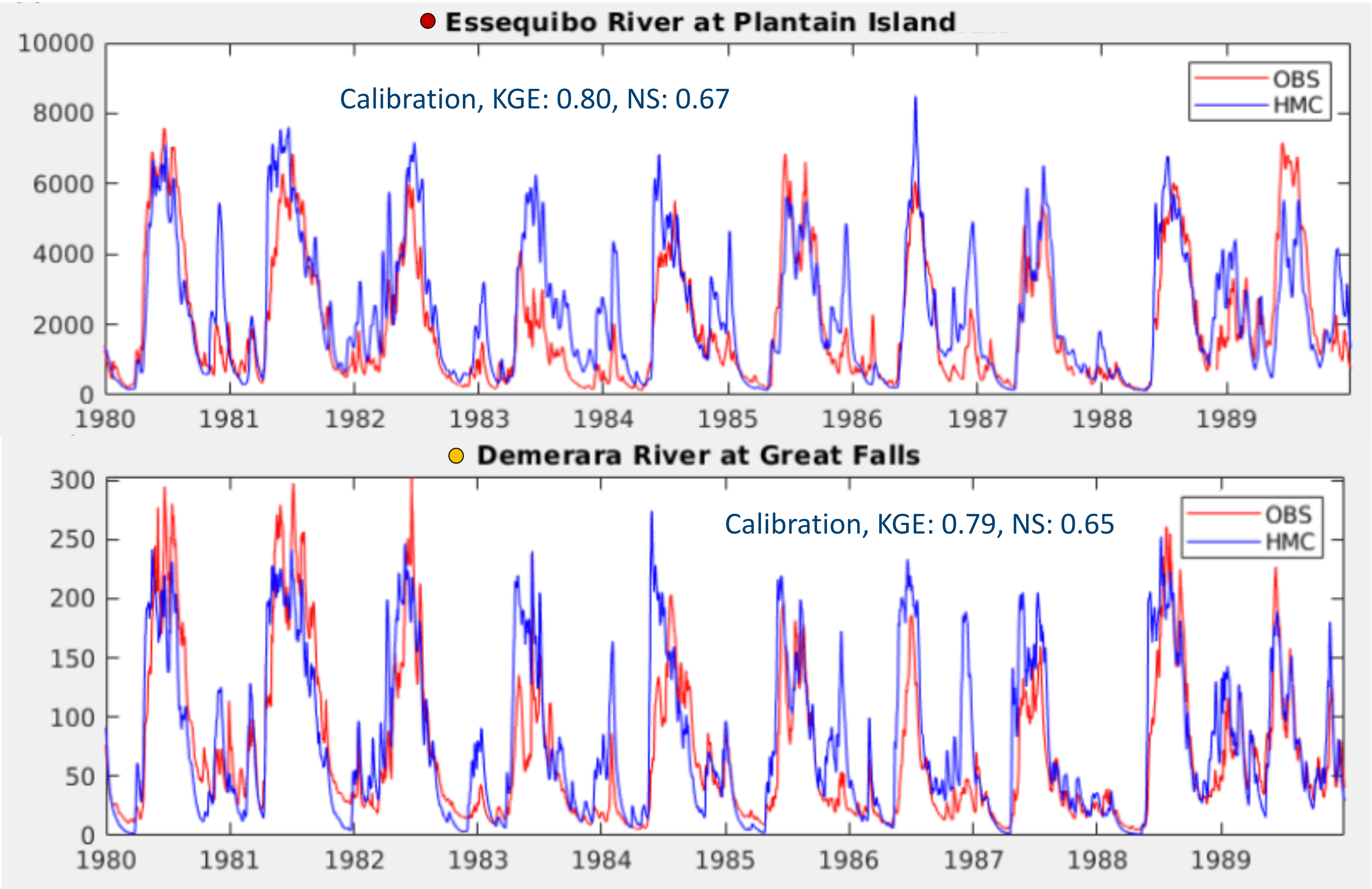
FLOODPROOFS, Flood Forecasting Chain

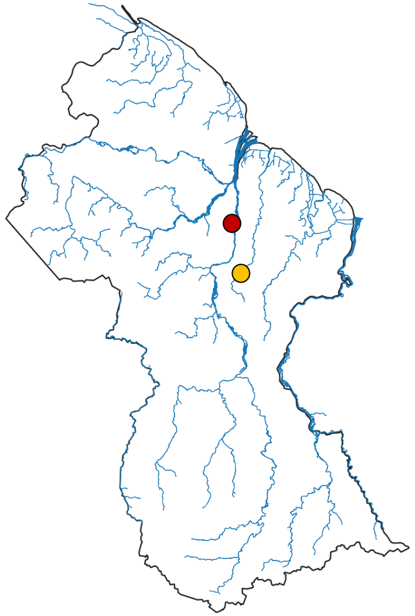


GUYANA IMPLEMENTATION



CONTINUUM, Hydrological Results



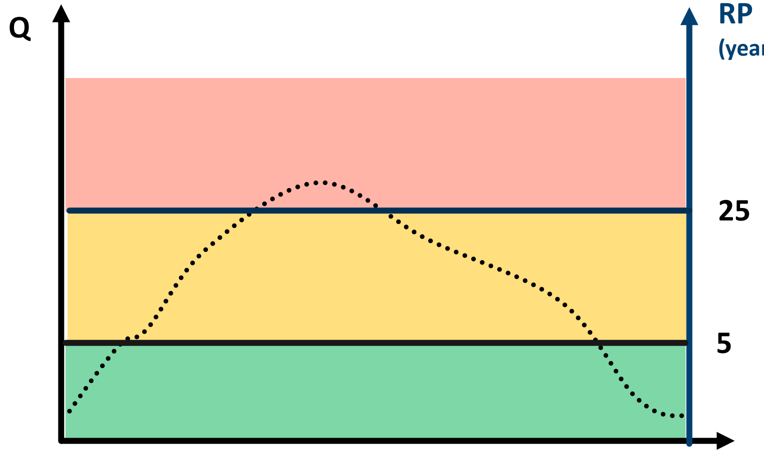


Continuum (Silvestro et al. 2013, 2015): distributed hydrological model, solving both mass and energy balances. Routing in channels with possible overflow according to width and depth (*Andreadis et al., 2015*)

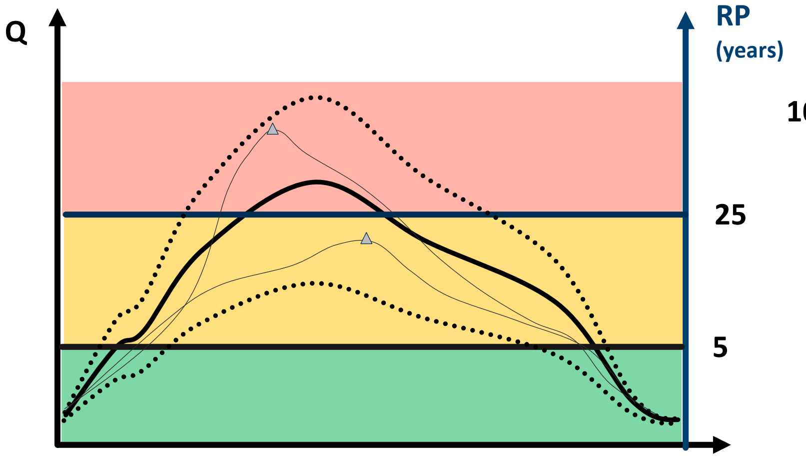
PROBABILISTIC Hydrological Forecasts

RAINFARM Downscaling (*Rebora et al., 2006*) – several equiprobable rainfall fields

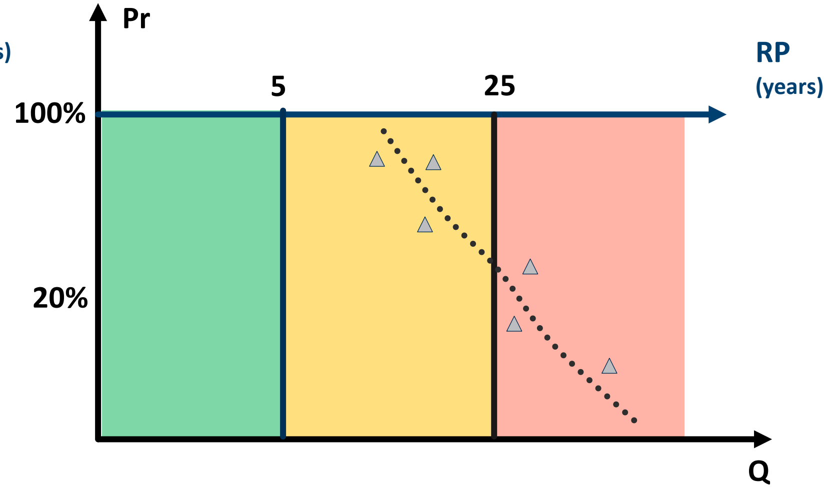
Single hydrograph

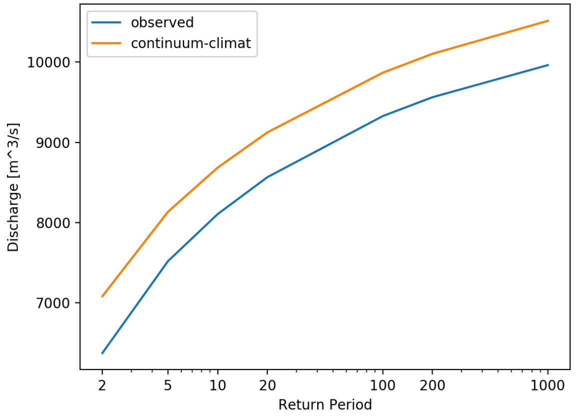


Spaghetti plot



Probabilistic plot

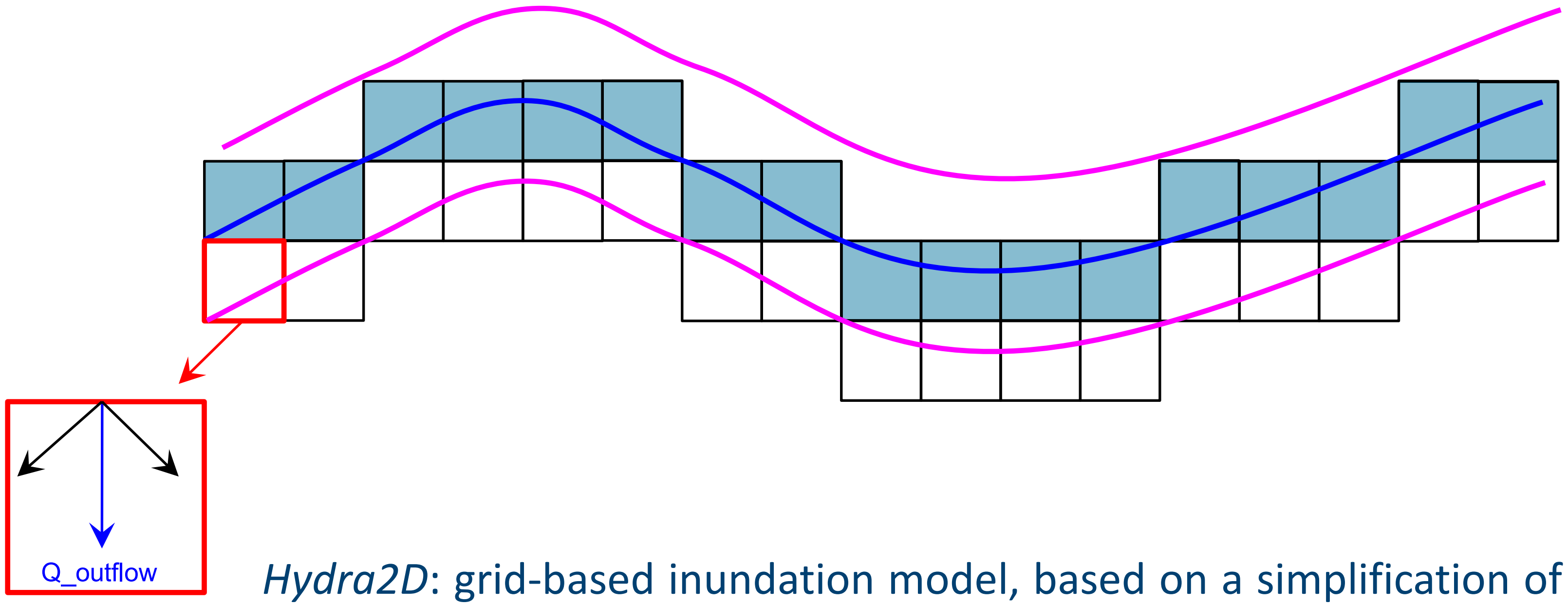




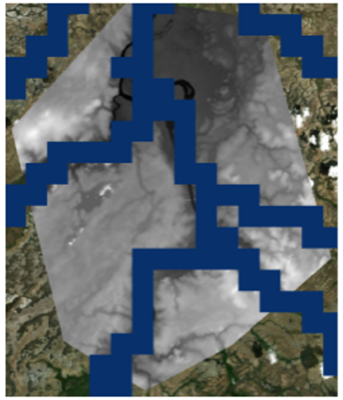
Model estimate of flood discharges occurrence frequency at each location. Hence, operational forecasts can be compared with relevant model statistics to assess predicted event severity.

COUPLING Hydro-Hydra models

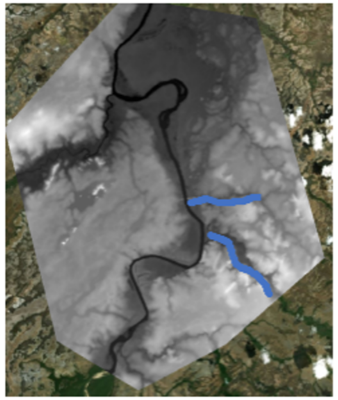
The right and left outflows (Continuum) generate linear inputs for the bidimensional flood propagation model (Hydra2D). In each cell the $Q_{outflow}$ is divided in 2 components inputs of the hydro-dynamic model: q_x and q_y



Hydra2D: grid-based inundation model, based on a simplification of shallow water equations (local inertial approximation).



Hydrological scale (1.5 km, MERIT-DEM, Yamazaki 2017 et al.)



Hydraulic scale (12m, TANDEM-X)

PROBABILISTIC inundation maps

RAINFARM Downscaling – several equiprobable rainfall fields

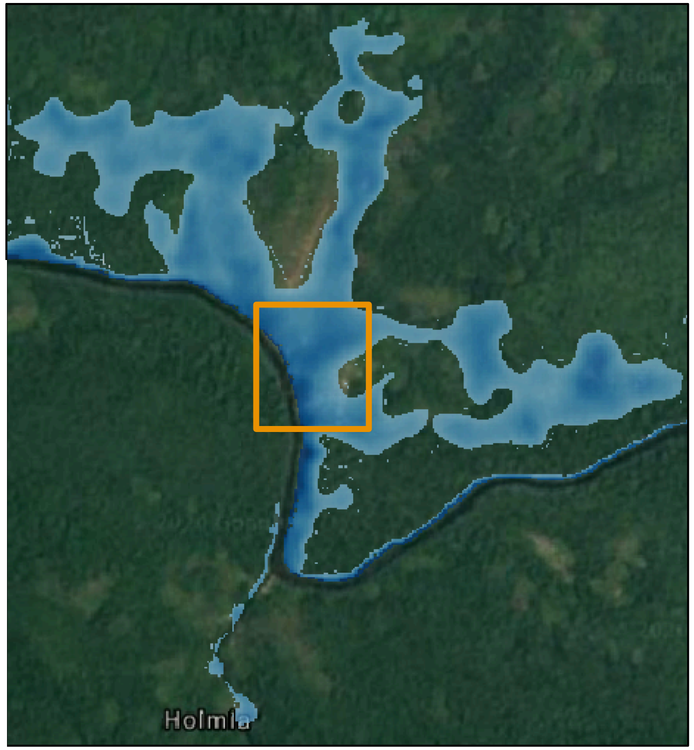
Chenepau

RP 50 years

Water Depth [cm]

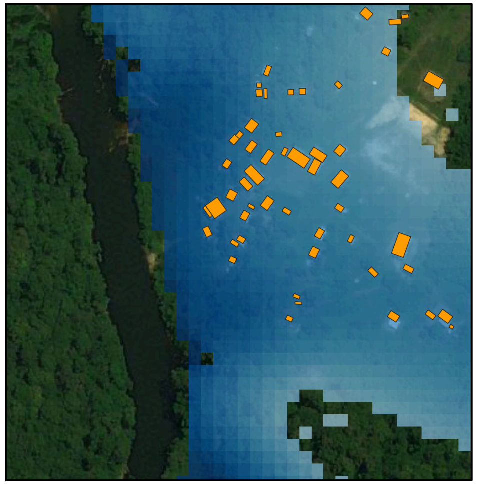
- 0
- 5
- 10
- 20
- 30
- 50
- 70
- 100
- 120

Single inundation maps

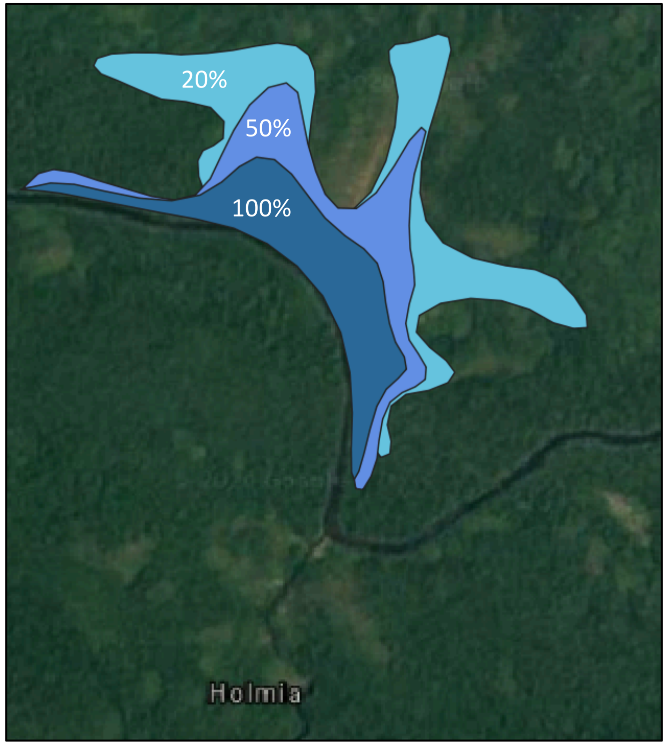


Exposed assets

(buildings)



Probabilistic inundation maps



Water depth

above 50 cm

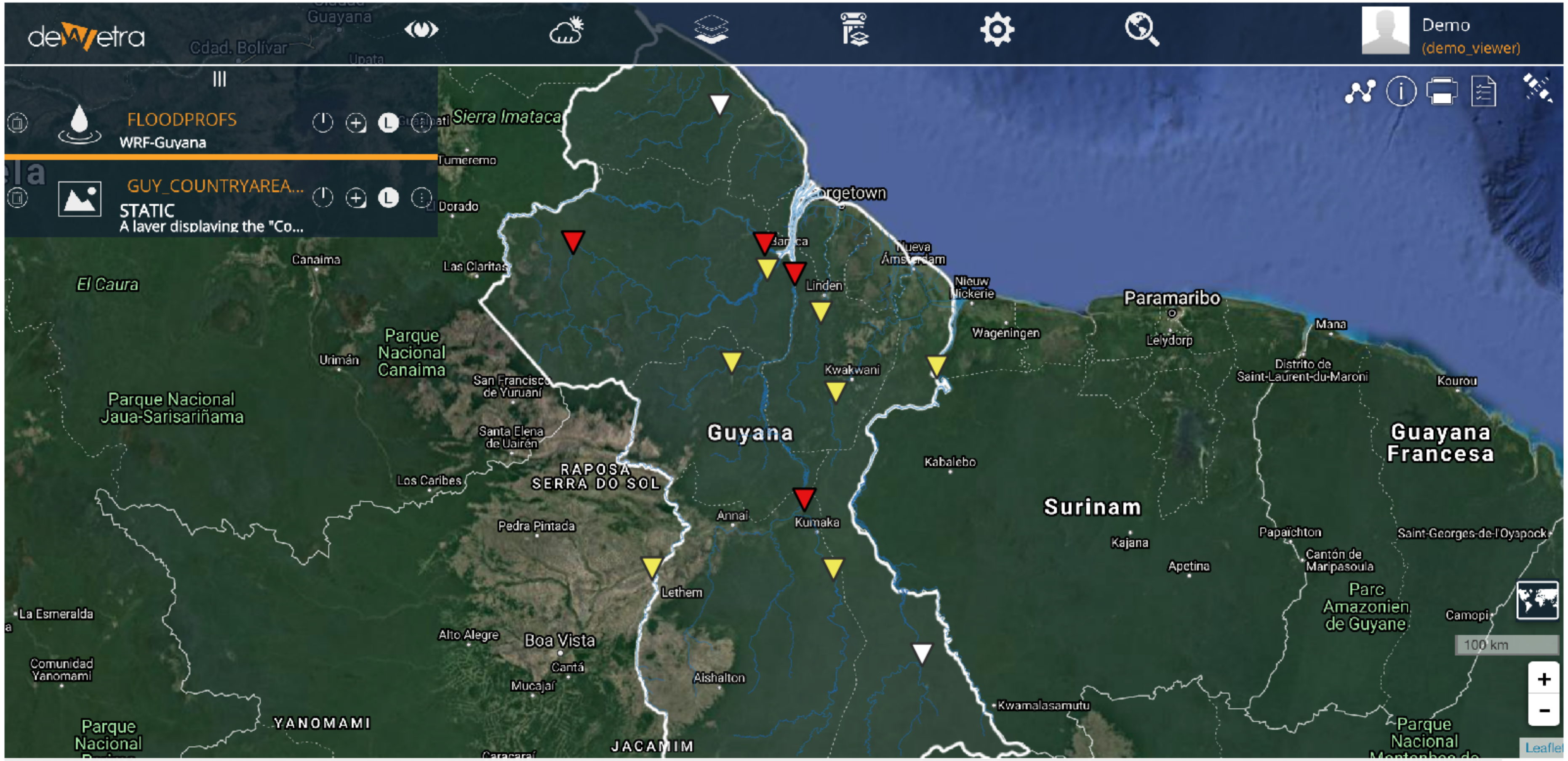
Multiple hydra2D

simulations (fast)

Severe water depth identified according to local knowledge, damage to buildings/crops

Early Warning Platform

Dewetra Platform of the *Caribbean Institute for Meteorology and Hydrology* (CIMH)



Direct and rapid access to last forecast and monitoring data

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Flood-PROOFS codes are freely available and users can get them from the GitHub repository [https://github.com/c-hydro].

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