Utrecht University

4 May 2020

How model selection can determine flood risk estimates - A case study in the Ganges basin using the GLOFRIM framework

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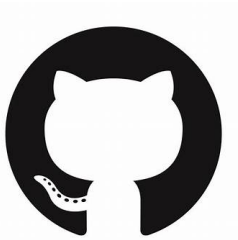
Before we start...

This is the official #shareEGU20 display.

But we also prepared a Code Ocean capsule where you can reproduce all numbers and plots found here
Check here.

All code can also be found on GitHub.
Check here.



On model selection

- Often due to legacy use
- Depends on personal preferences or affiliation
- There is not one model to rule them all…

SO, DO WE REALLY KNOW WHICH MODEL PERFORMS BEST IN A GIVEN AREA?

AND WHAT DOES THIS MEAN FOR FLOOD RISK MANAGEMENT PRACTICES?

Study design

1) Align all boundary conditions
2) Run various models
3) Align flood map resolution, e.g. by post-processing/downscaling
4) Validate results with contingency analysis
5) Overlay flood maps with population data

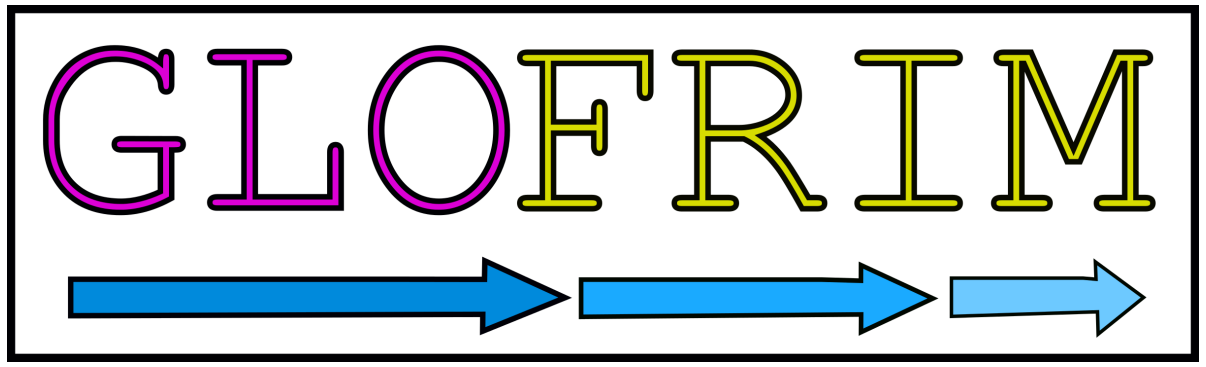
But how?

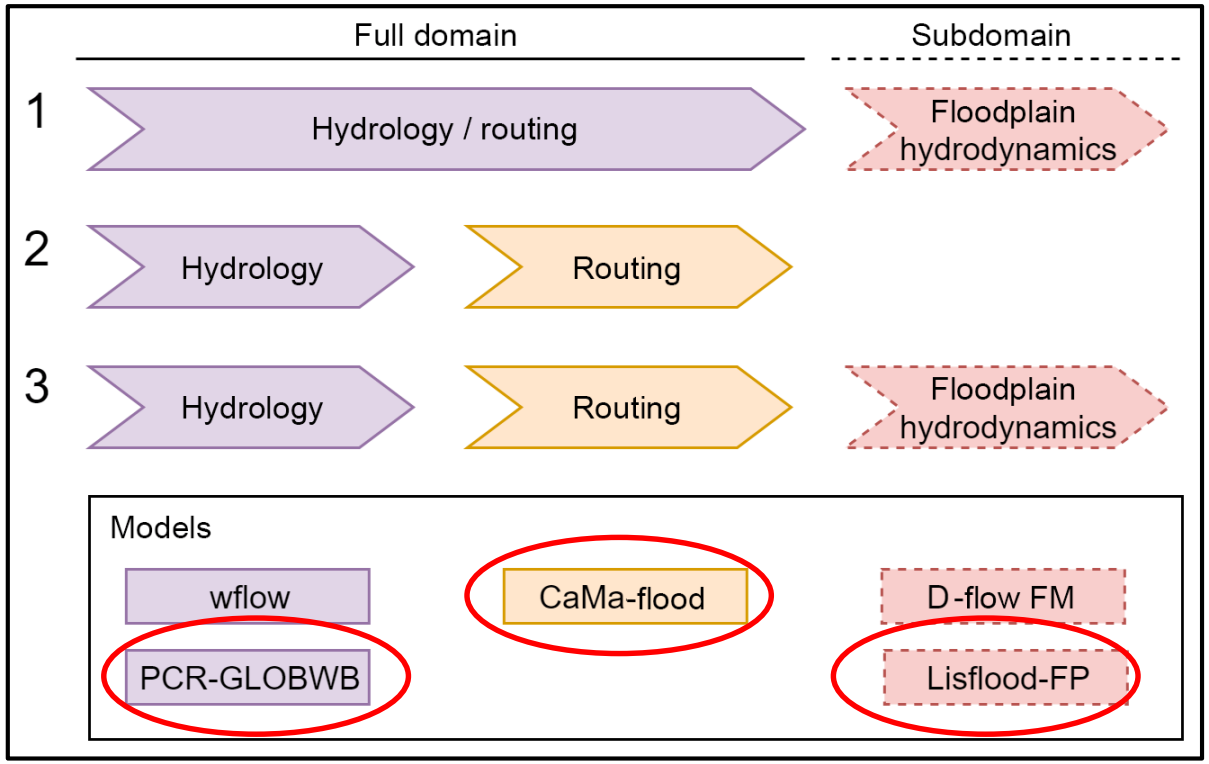
GLOFRIM allows for online coupling and nesting of various flood models

→ Aligns boundary conditions

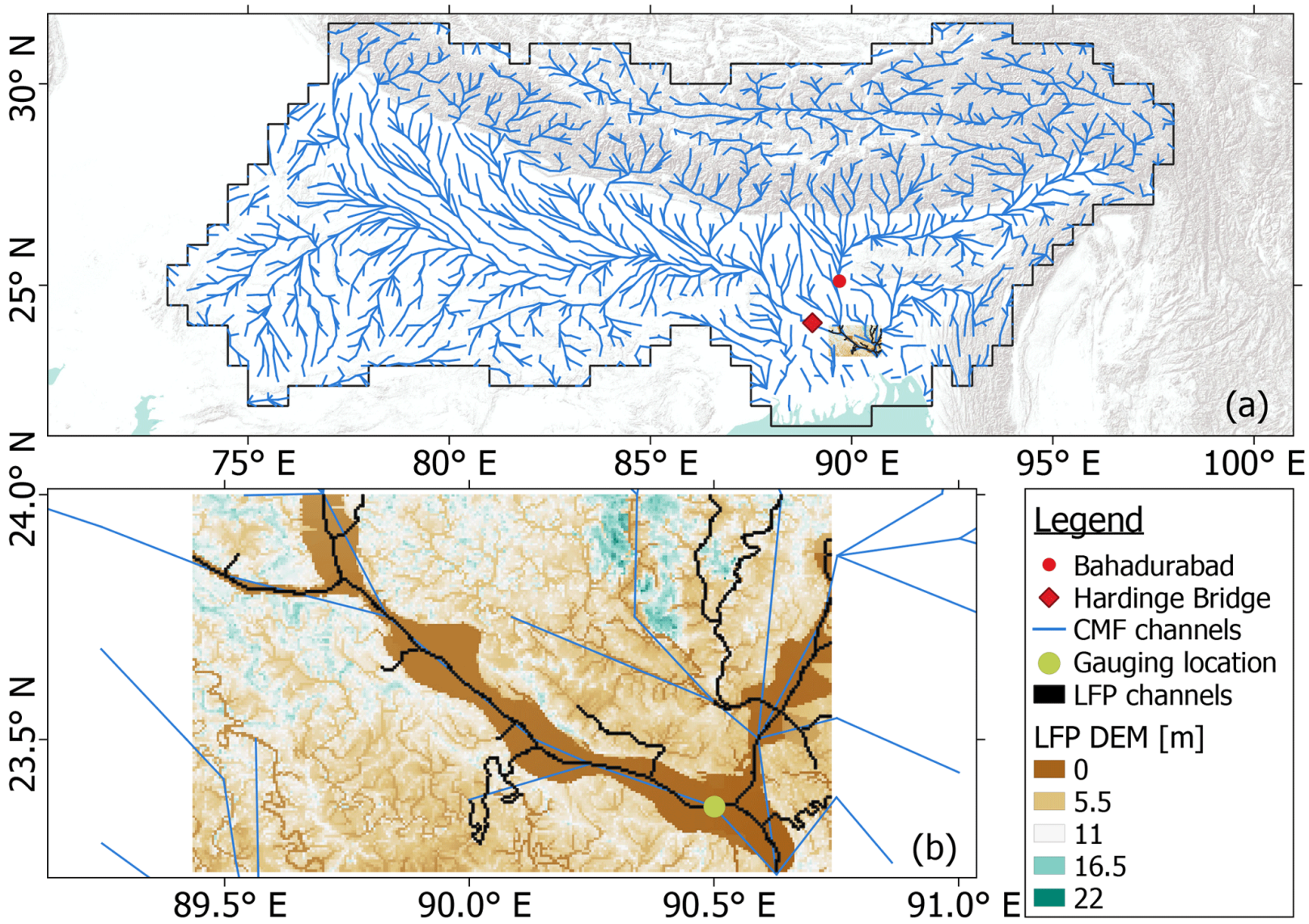
→ Simultaneous model runs

→ Facilitates benchmarking

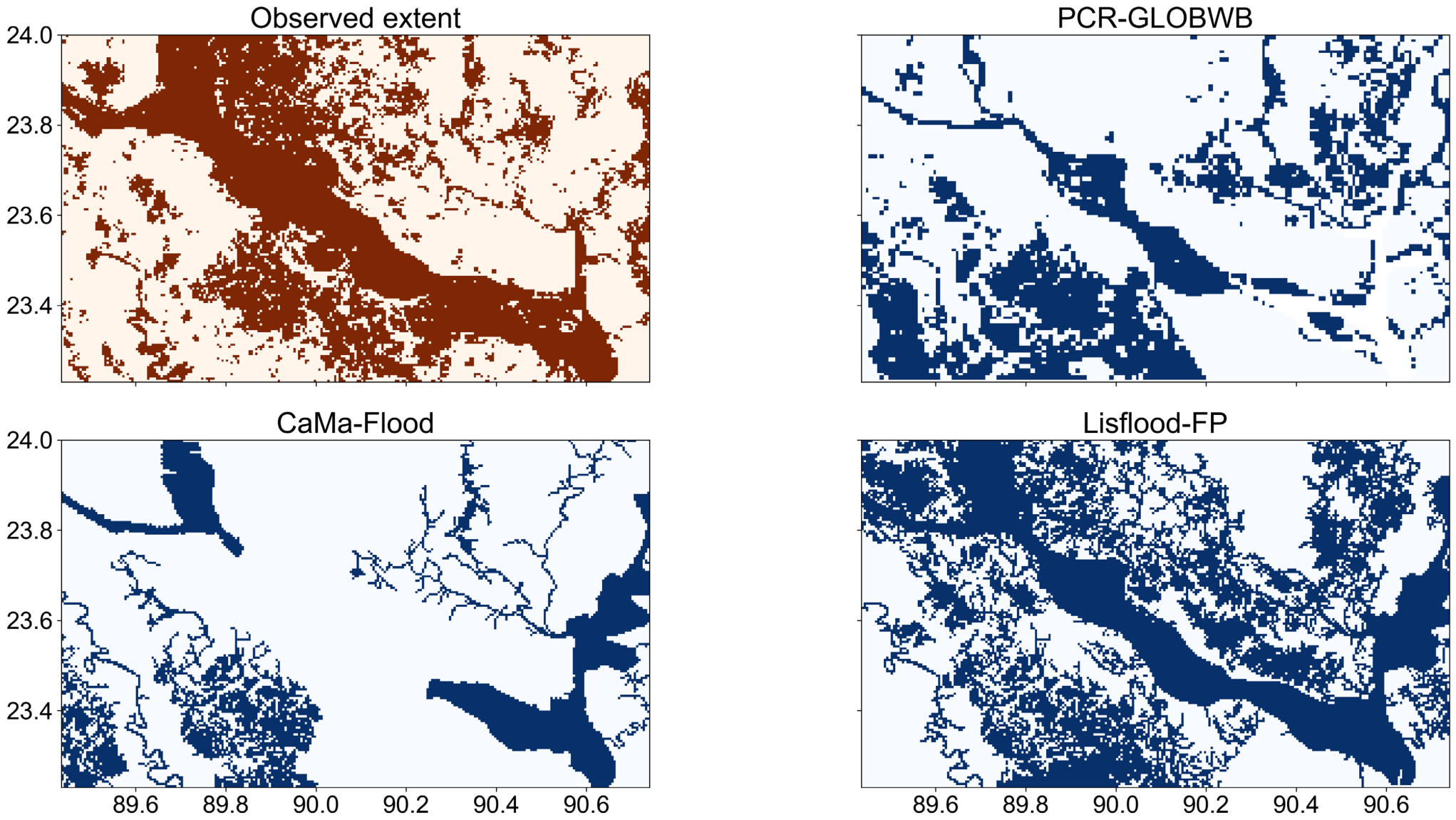




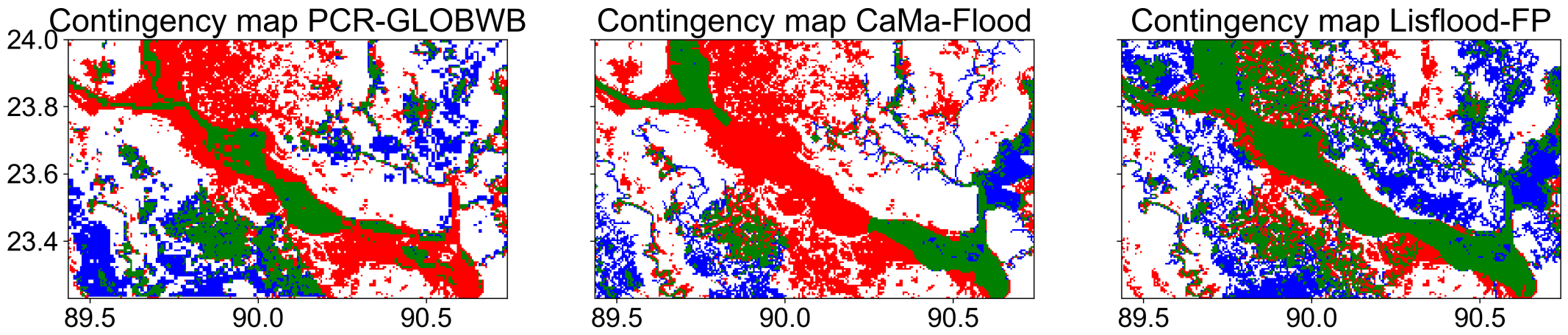
Hoch, J. M., Eilander, D., Ikeuchi, H., Baart, F., and Winsemius, H. C.: Evaluating the impact of model complexity on flood wave propagation and inundation extent with a hydrologic–hydrodynamic model coupling framework, Nat. Hazards Earth Syst. Sci., 19, 1723–1735, https://doi.org/10.5194/nhess-19-1723-2019, 2019.



Case study: 2007 flood in the Ganges delta

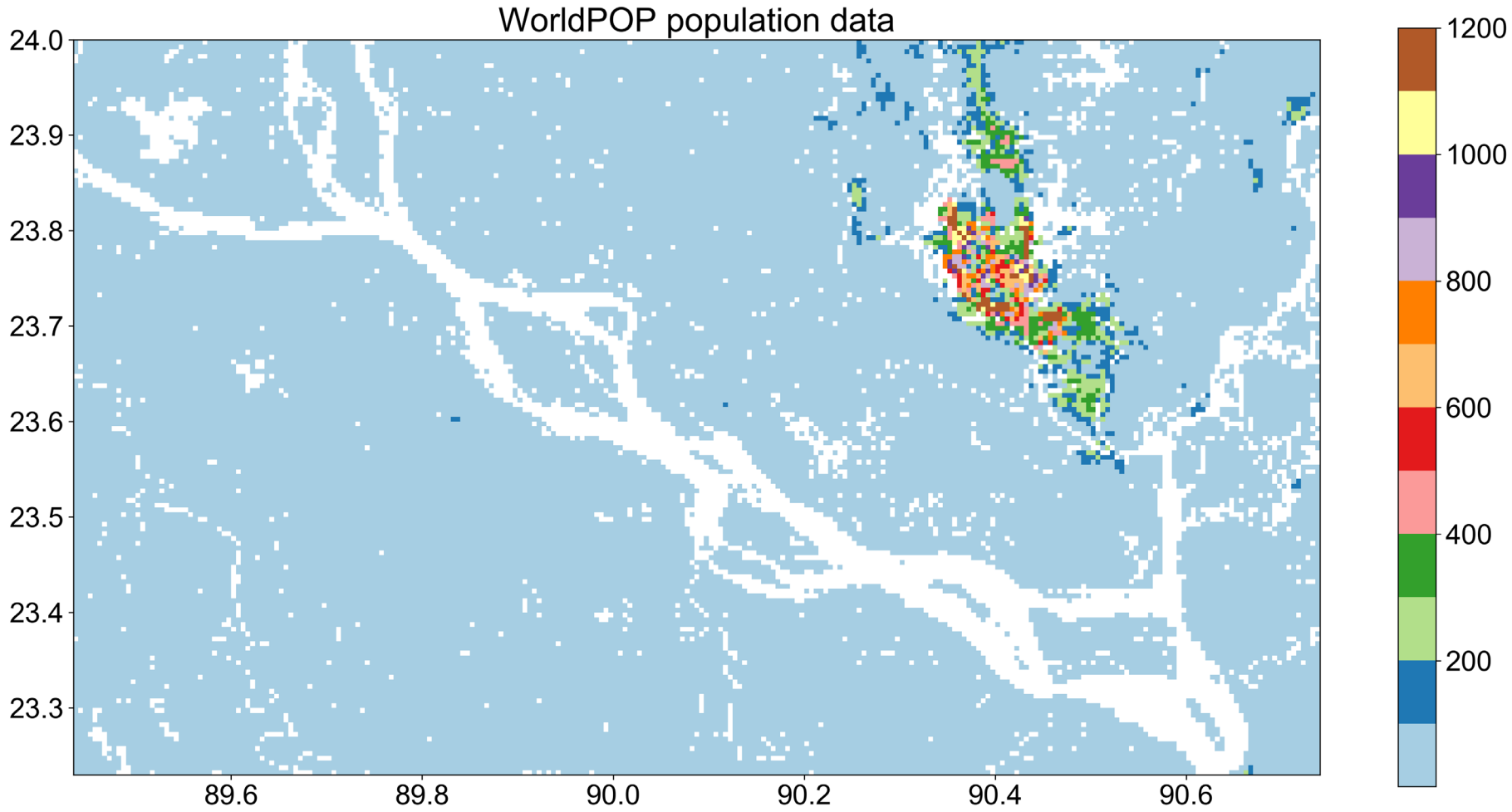


Results: simulated and observed flood extents



	PCR	PCR → CMF	PCR → CMF → LFP
Hit rate	0.38	0.30	0.70
False alarm ratio	0.44	0.40	0.42
Critical success index	0.30	0.25	0.46

Contingency maps: assessing the accuracy of simulated extent



WorldPOP data

Impact on number of people exposed

By simple overlay, the following number of people affected is computed:

- Observed extent: 173,291 (benchmark)
- PCR-GLOBWB: 165,277 (-5 %)
- CaMa-Flood: 75,136 (-57 %)
- Lisflood-FP : 233,572 (+34 %)

INTERESTINGLY, THE MODEL WITH THE BEST CSI DOES NOT MATCH BEST!

WELL, WHAT DOES THIS MEAN FOR FLOOD RISK MODELLING ???

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