

### . Introduction

- The development of detailed and consistent hydrological records of past extreme events is key for better assessment of future hydrological risks and to understand the effects of climate variability and change.
- Reports of increased floods and droughts in the Amazon in recent years indicate a need for tools to better access past hydrological databases to understand how frequent or extreme the recent events have been.
- In this study, the fusion of hydrological modeling and climate reanalysis or large rainfall datasets is called Hydrological Retrospective (HR), a methodology developed to better understand past hydrological processes, in this case given focus on extreme events.

### 2. Data and methods

### 2.1. Hydrological Retrospective (HR)

- HR can be defined as a retrospective study of the evolution of hydrology in a specific region, through a combination of hydrological modeling and other available information (in-situ, remote sensing and/or climate reanalysis).
- This methodology allows an estimation of spatial and temporal fields of past hydrological variables, such as discharge, water level, soil moisture, evapotranspiration, etc.

### 2.2. The hydrological model MGB-IPH

The MGB-IPH model (Collischonn et al. 2007, Paiva et al. 2013) is a large-scale, distributed, process-based hydrological model.



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## Hydrological Retrospective of floods and droughts: Case study in the Amazon

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### **2.3. Precipitation datasets**

| Short name       | Institution | Data sources(s)              | Temporal coverage | S |
|------------------|-------------|------------------------------|-------------------|---|
| CFSR             | NCEP        | Reanalysis                   | 1979/01 - 2010/12 |   |
| CHIRPS v2.0      | CHG         | Gauge, satellite             | 1981/01 - present |   |
| ERA-Interim      | ECMWF       | Reanalysis                   | 1979/01 - present |   |
| ERA-Interim Land | ECMWF       | Gauge, satellite, reanalysis | 1979/01 - 2010/12 |   |
| ERA 20CM         | ECMWF       | Reanalysis                   | 1900/01 - 2010/12 |   |
| JRA-55           | JMA         | Reanalysis                   | 1958/01 - present |   |
| MSWEP            | JRC-EC      | Gauge, satellite, reanalysis | 1979/01 - 2014/12 |   |
|                  |             | Roopolycic                   |                   |   |

27 from data main river and its tributaries





River cross section

Water levels versus Flooded area

# Land, MSWEP and CHIRPS v2.0 HR.



variability of extreme events.



### References

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Paiva, R.C.D., Buarque, D.C., Collischonn, W., Bonnet, M.-P., Frappart, F., Calmant, S., and Bulhões Mendes, C.A., 2013. Large-scale hydrologic and hydrodynamic modeling of the Amazon River basin. Water Resources Research, 49(3), 1226–1243.

### 4. Conclusions

- events over the Amazon basin in recent decades.
- extreme events therefore cannot be identified



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• This methodology has been developed to validate, capture and evaluate trends of extreme

• Hydrological Retrospective based on precipitation datasets using satellite, climate reanalysis and in situ data (ERA-Interim Land, CHIRPS and MSWEP) yielded better results, although the temporal coverage is shorter than that of "pure" climate reanalysis.

• It is possible to use Hydrological Retrospective methodology to identify past extreme events in regions where in-situ gauge availability is sparse or nonexistent, and where

• As several authors have indicated, we found a significant trend of extreme events intensity in some regions of the Amazon basin has been increasing in recent decades. CC I