

## Aims and Background

Identify model mechanisms best suited to represent hydrological (physical) processes in ungauged catchments.

Ingredients:

1) posterior probability of individual mechanisms given an ensemble of models and regionalized flow indices, and accounting for posterior parametric uncertainty.

2) a test statistic that defines a “dominant” mechanism = mechanism with (substantially) higher posterior probability than the sum of alternative ones.

3) a flexible model framework to generate hydrological models by combining mechanisms.

## Case study

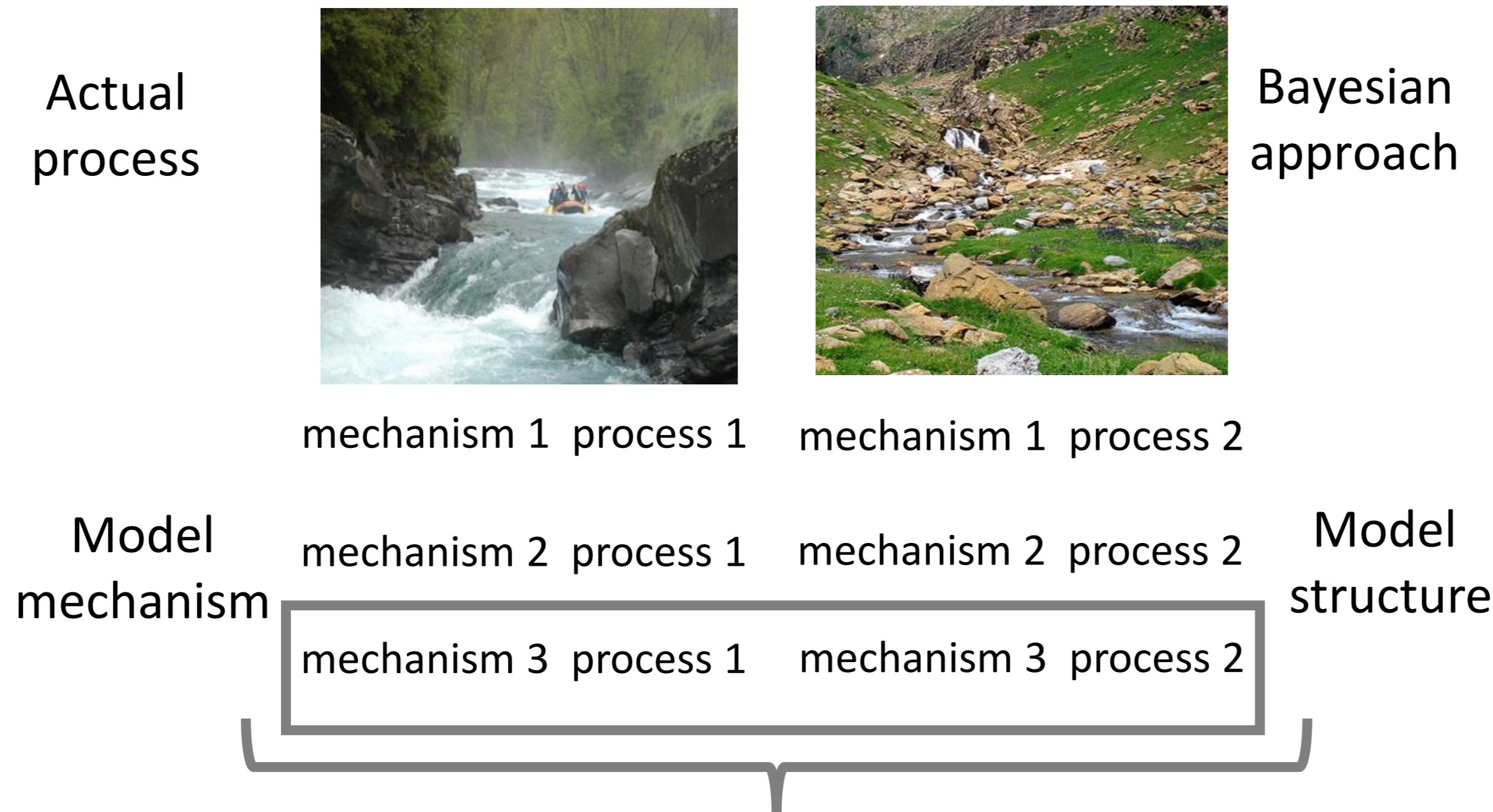
Real data and synthetic experiments.

Flexible model FUSE: 7 processes with 2-4 mechanisms per process.

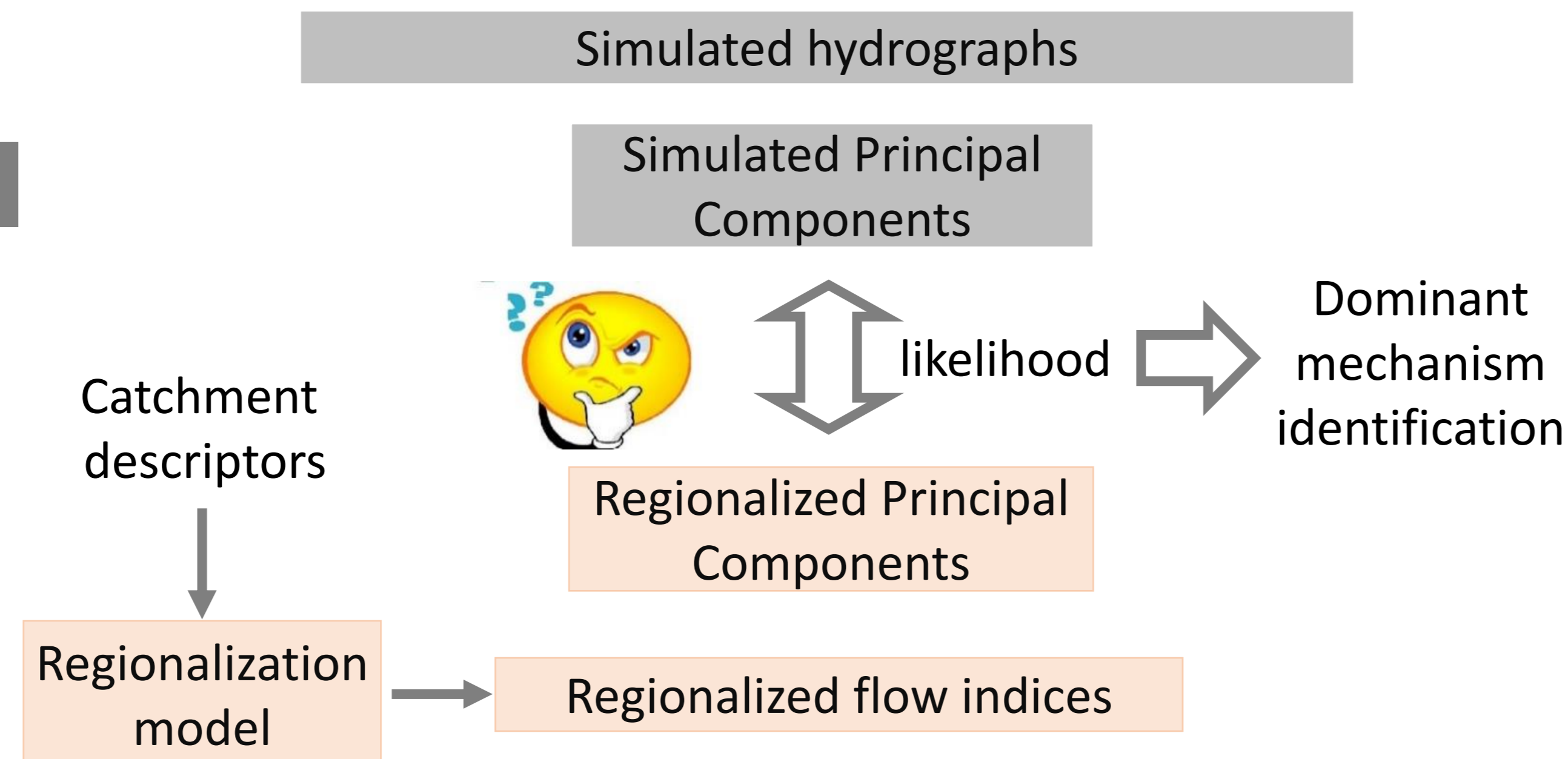
Performance metrics: Reliability and Power.

92 basins in North Spain, 16/92 are “ungauged”.

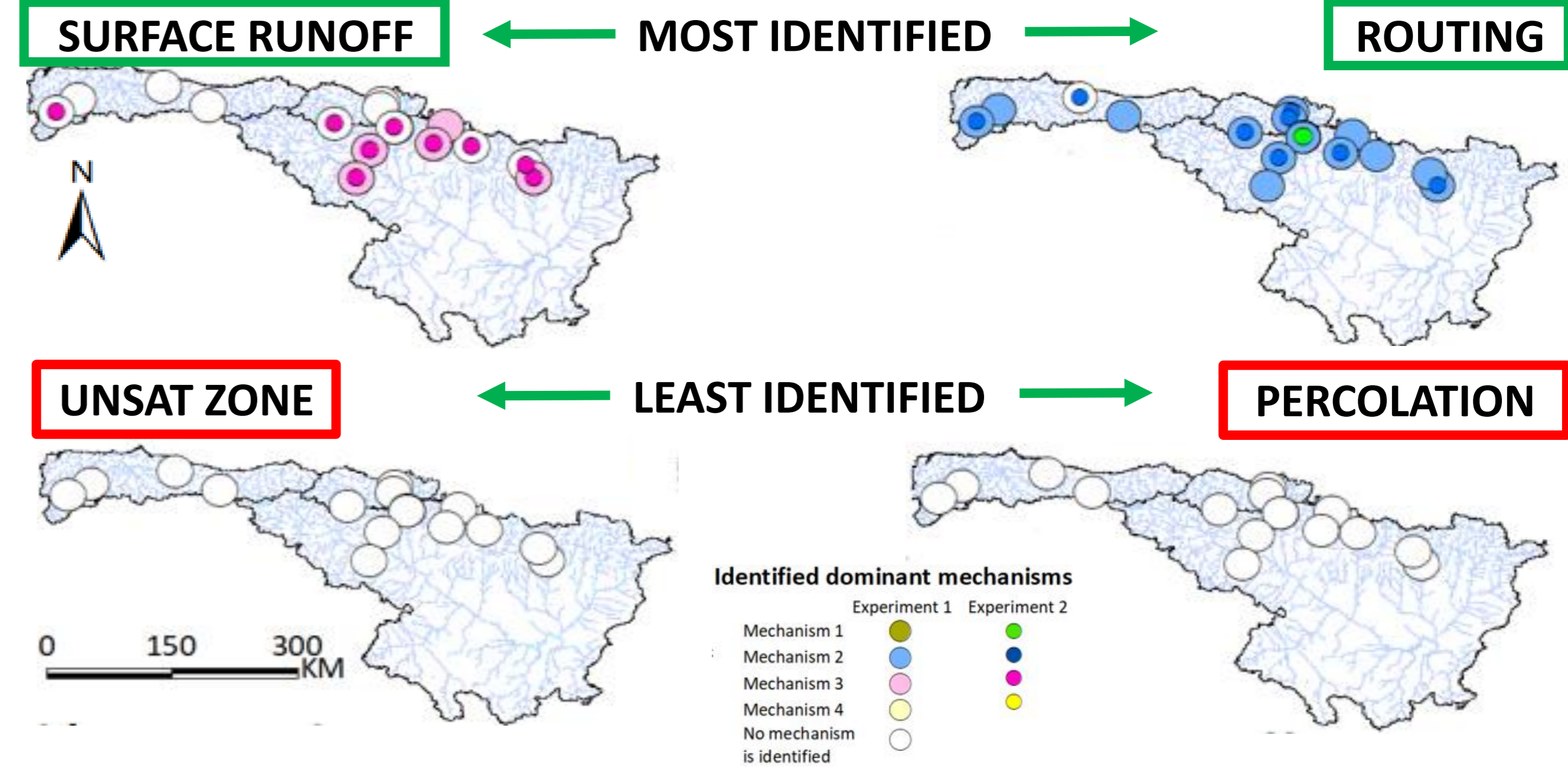
## Method



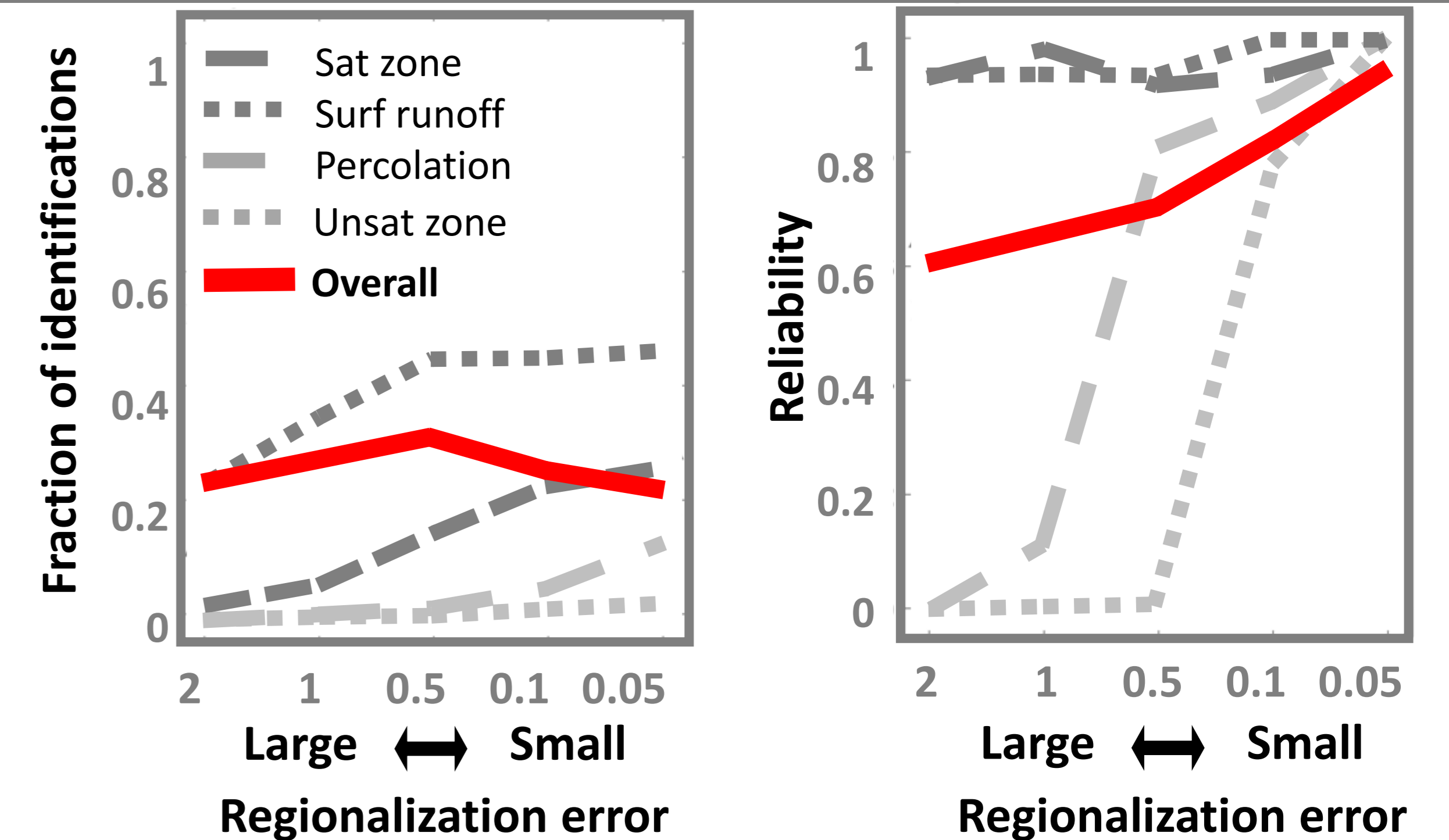
## Flexible modelling framework



## Results Real Data



## Results Synthetic Data



## Conclusions

1. Hypothesis testing to identify dominant mechanisms for hydrological process representation in ungauged catchments
2. Most identifiable processes are surface runoff & saturated zone. Least identifiable: percolation & unsaturated zone
3. As model error decreases, overall reliability increases but identifiability remains relatively constant
4. Relatively low identifiability is due to the low amount of regionalized information. Mechanisms interactions are also noted

## Reference

Prieto, C., Le Vine, N., Kavetski, D., Fenicia, F., Scheidegger, A., & Vitolo, C. (2022). An exploration of Bayesian identification of dominant hydrological mechanisms in ungauged catchments. *Water Resources Research*, 58, e2021WR030705. doi:10.1029/2021WR030705