

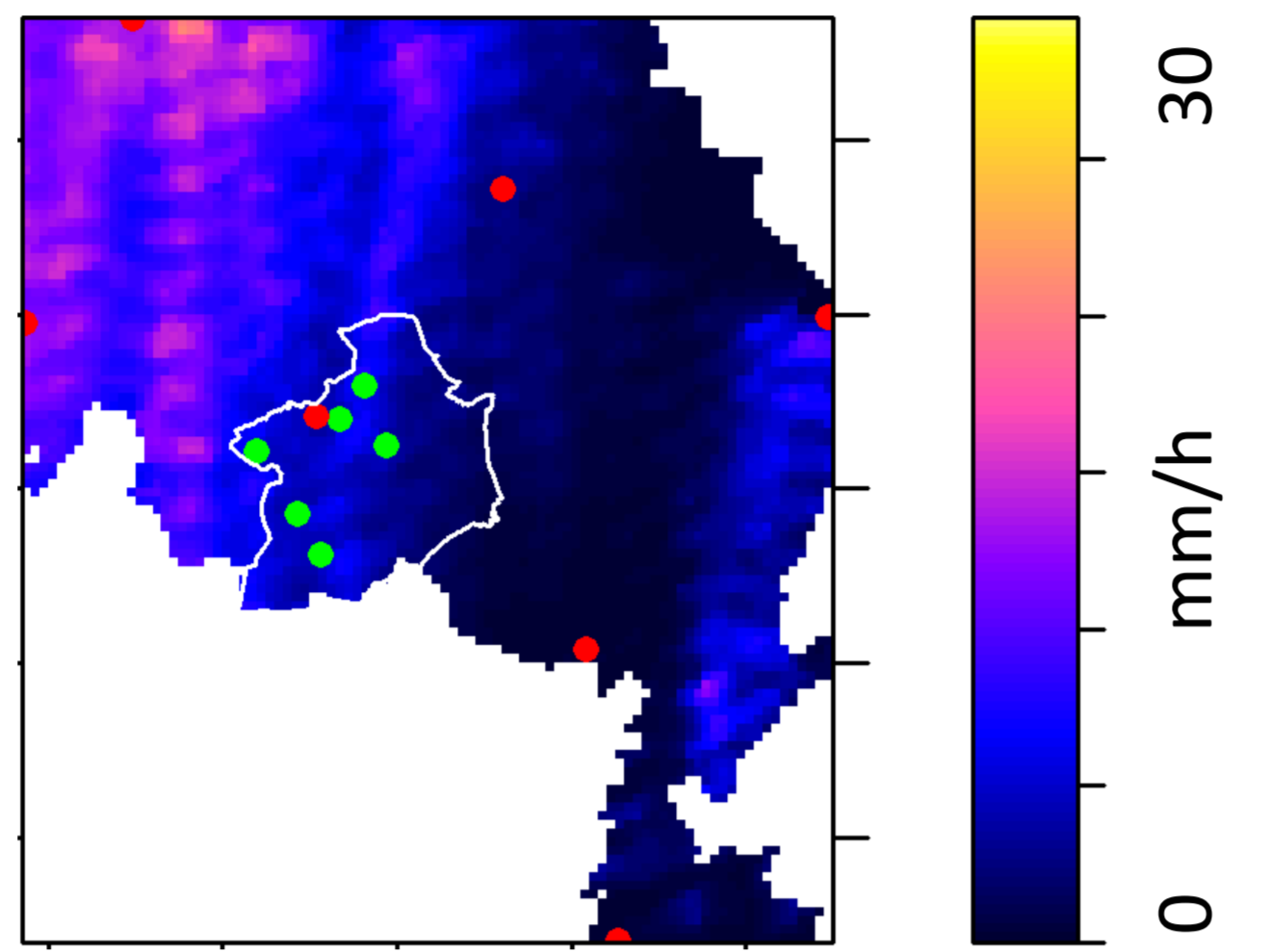
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- Many investment decisions for environmental improvement of river basins are based on models
- Rainfall is the main input in water quality and hydrological models
- There is uncertainty in the rainfall data we have and it is important to quantify and reduce it



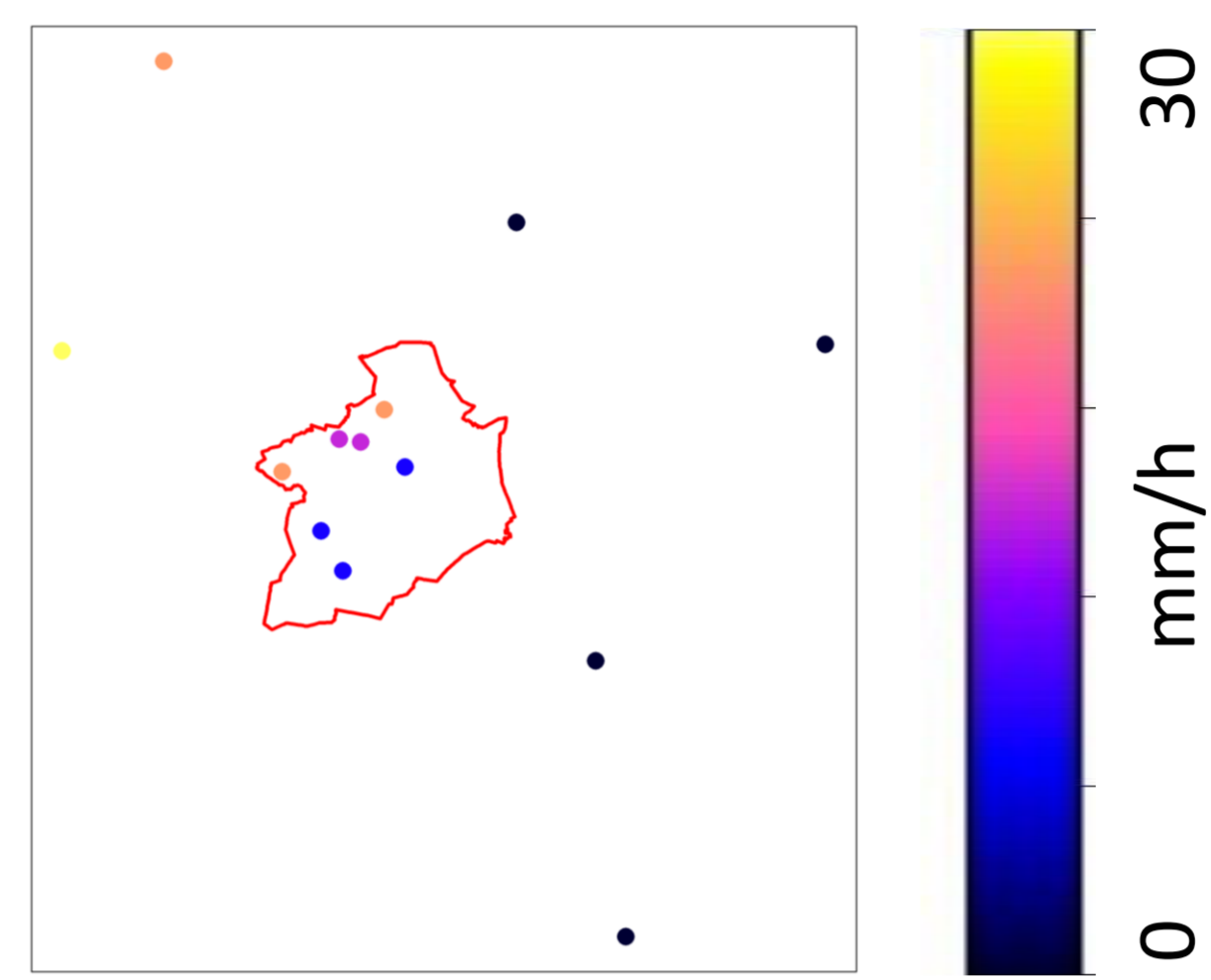
Radar

- ✓ Wide aerial coverage
- ✗ Indirect measurement
- ✗ Many errors like blocking, clutter, attenuation, evaporation, snow, hail...



Rain Gauges

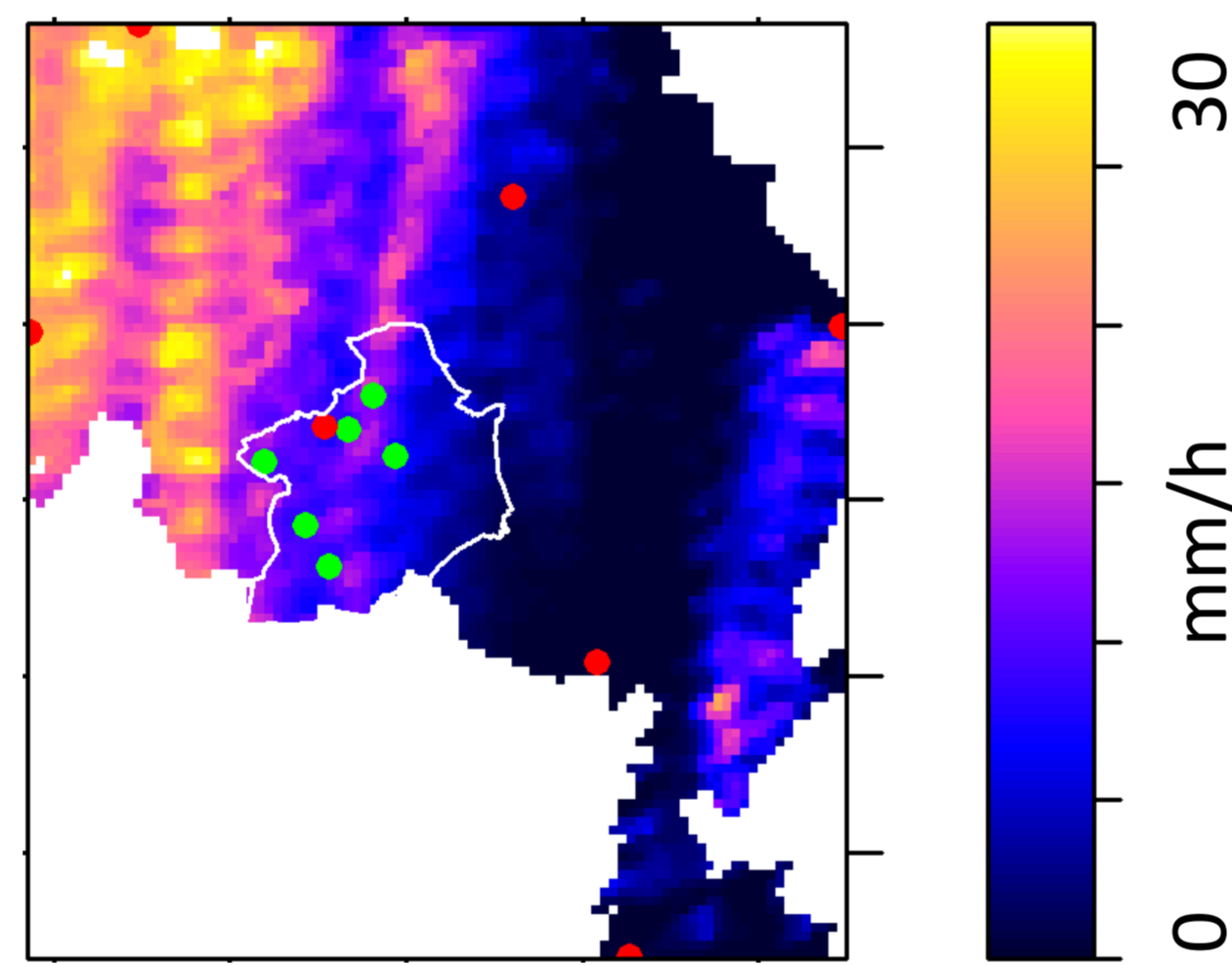
- ✓ Direct measurement
- ✓ More accurate
- ✗ Only point measurement
- ✗ Some errors like wind, blockage, calibration, shielding...



Merging

Fuse the two sources of data to get the advantages of both and limit the disadvantages

- Uncertainty is reduced, but more difficult to quantify:
- Rain gauge interpolation uncertainty
 - Rain gauge measurement errors
 - Point-to-area errors
 - Radar biases
 - Etc...



... among many methods

Kriging with external drift

- ✓ Rain gauges are interpolated
- ✓ The radar is used only for the spatial distribution of rain, but not for the values

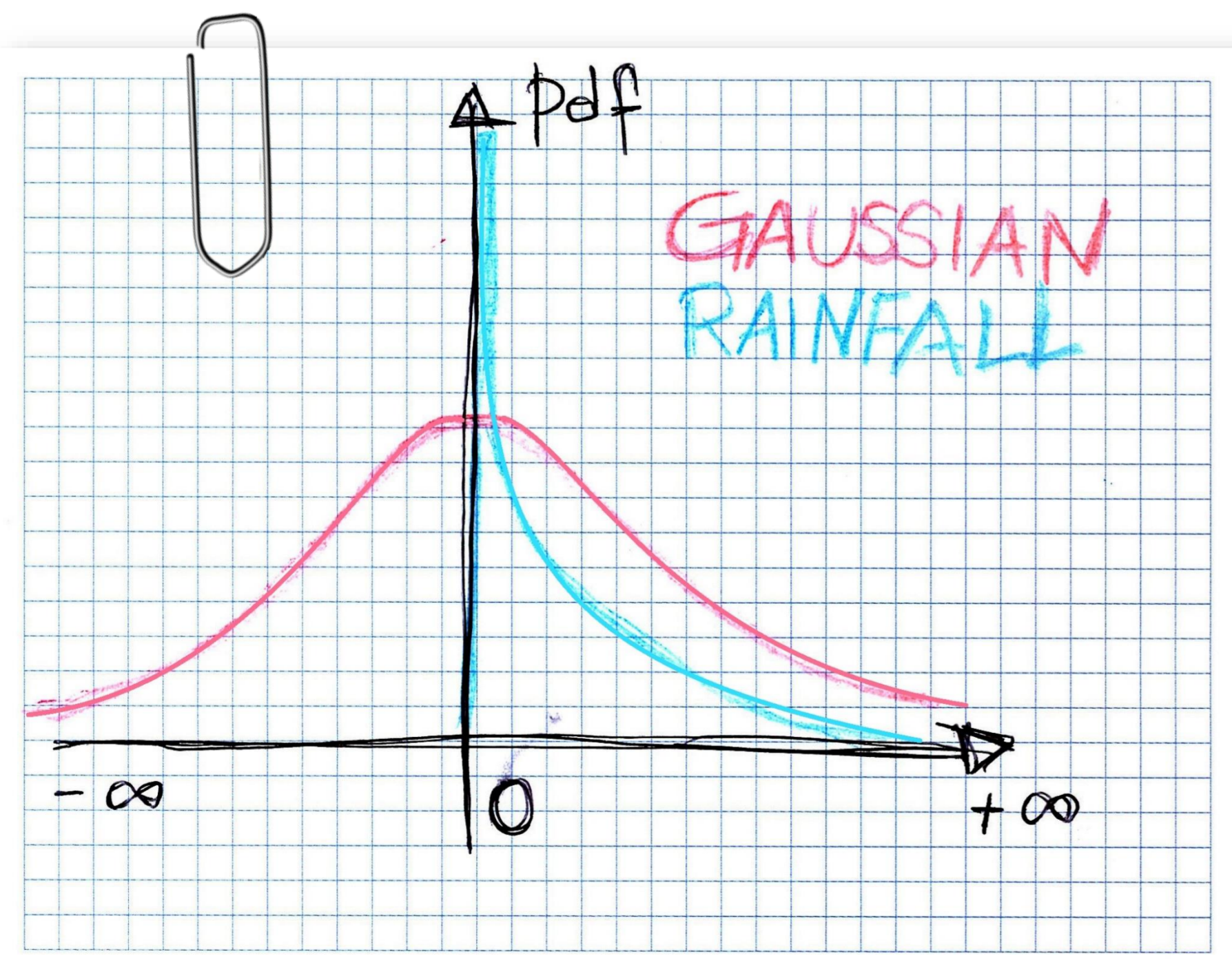
Bayesian Merging

- ✓ Rain gauges are interpolated
- ✓ Interpolated rain gauges and radar are merged, accordingly to the respective uncertainty

... they are methods based on Gaussianity assumption

But rainfall does not have a Gaussian probability distribution

Need to be corrected to reduce uncertainty



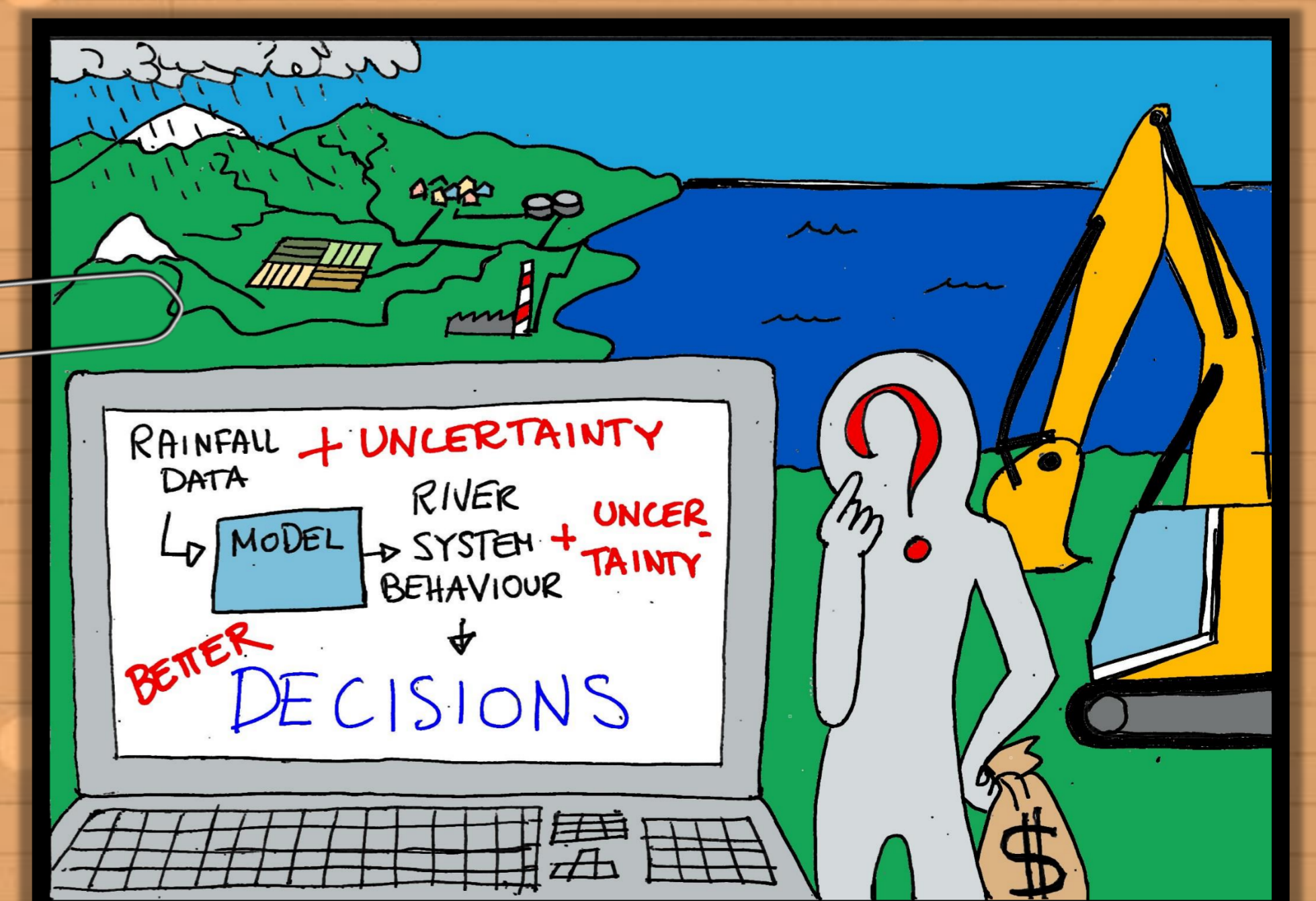
Many methods:

- Analytical anamorphoses
- Numerical anamorphoses
- Indicator kriging
- Singularity Analysis
- ...

To Conclude

Studying uncertainty in rainfall data is important to:

- ✓ Improve the quality of the data
- ✓ Provide better data and more elements for sounder model-based decisions
- ✓ Eventually, improve flood predictions, water quality, sustainability, and more



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