# Developing width-based rating curves at river gauges using satellite imagery

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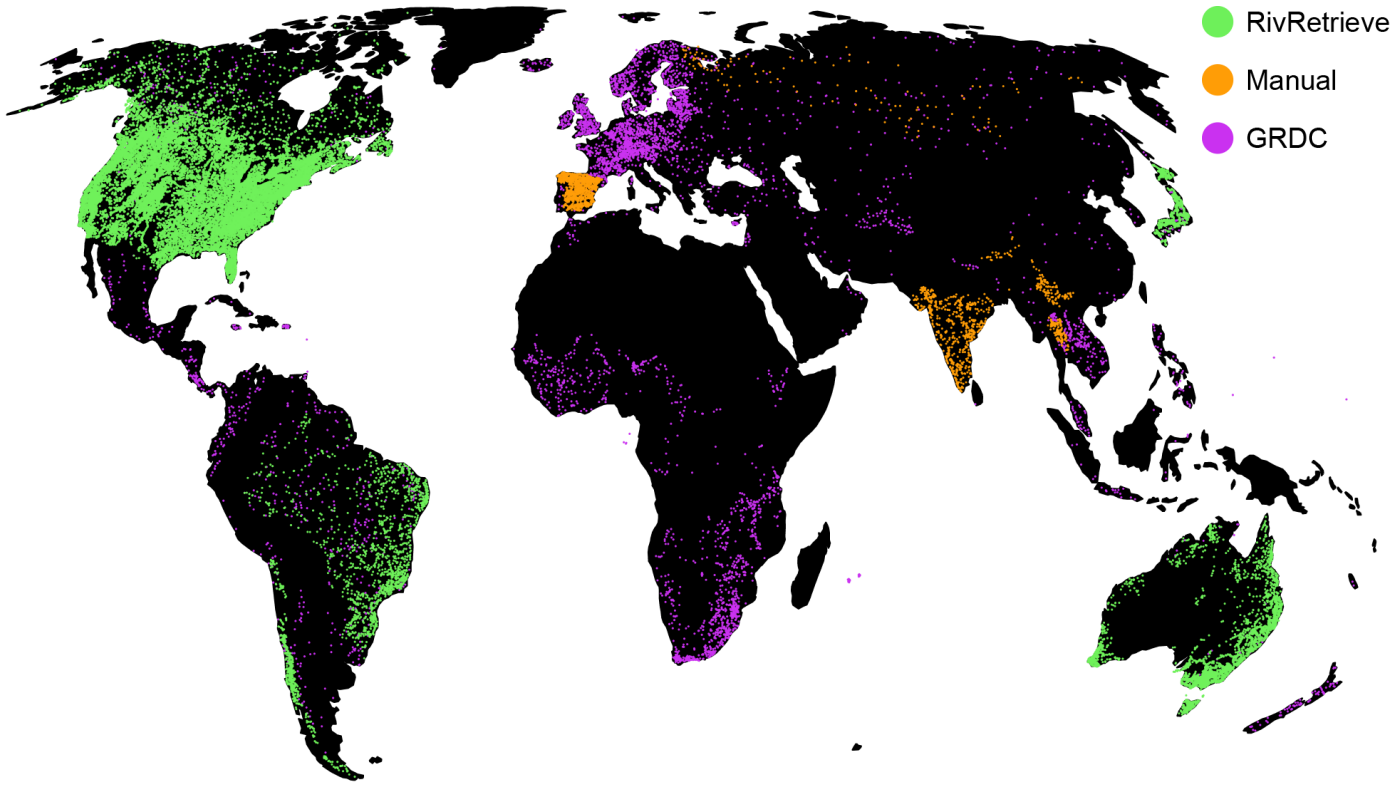
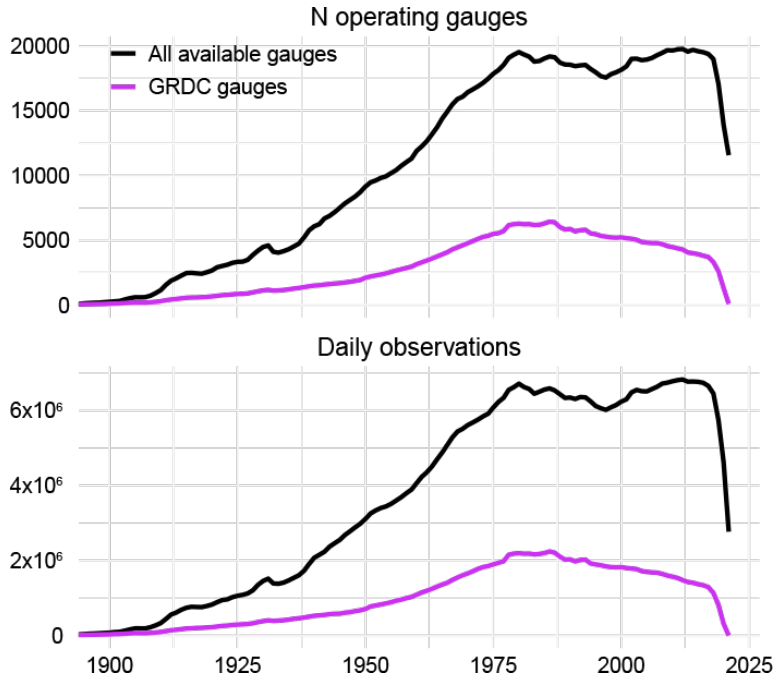
## Step 1: Get daily gauge data (N gauges=45,848)

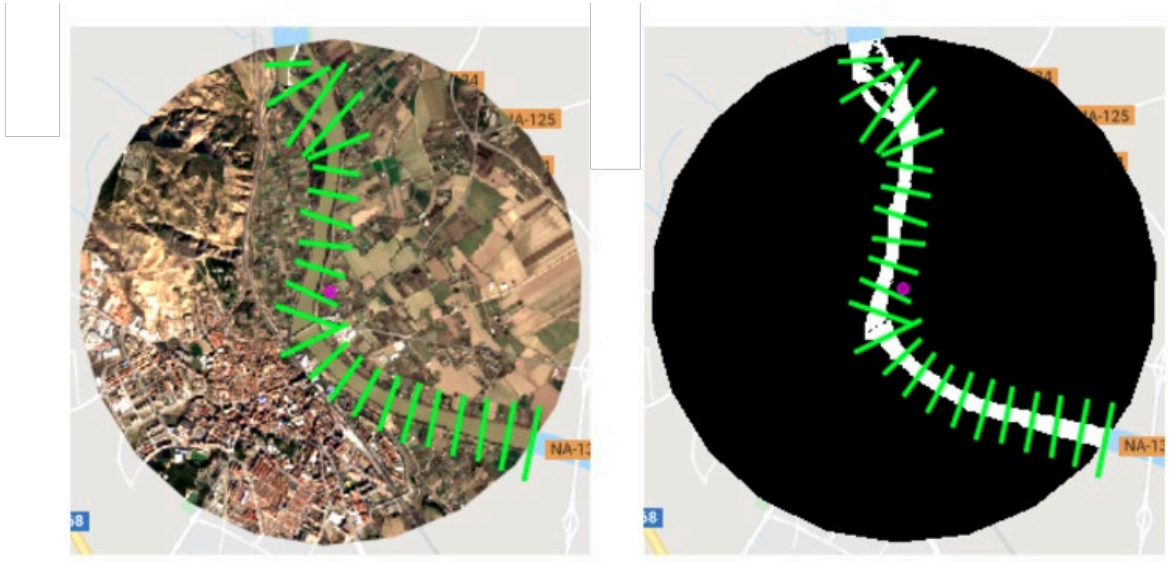



All gauges vs. GRDC

# Gauges on SWOT-observable rivers

- 3,802 gauges located on SWORD rivers:
  - For operational gauges (N=~2,383), the plan is to tie discharge data to SWOT measurements to develop rating curves
  - For all gauges on rivers wider than 120 m (N=3,247), we develop width-based rating curves using Landsat and Sentinel-2 data



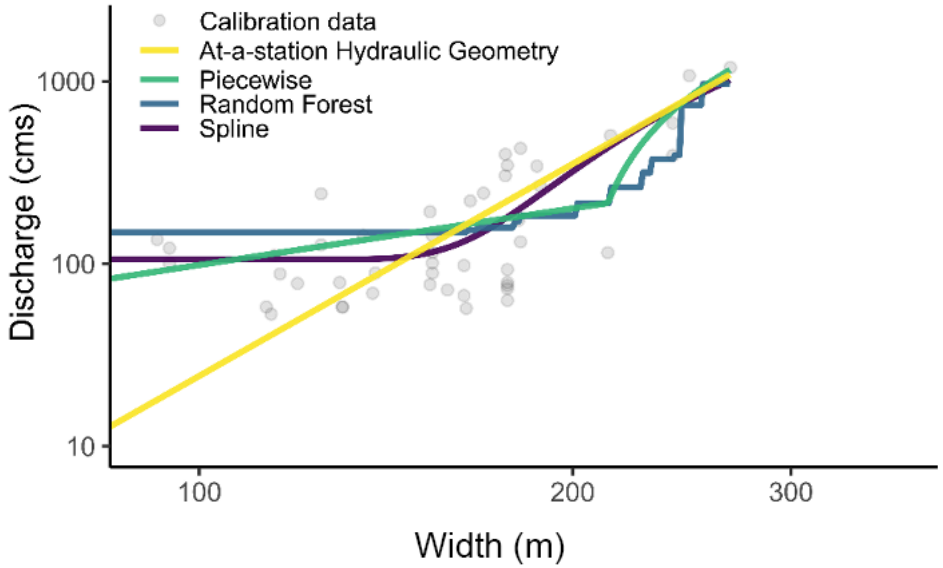
We generated rating curves on each SWORD node within 2-km of a gauge (Ebro River, Spain).

# Width-based rating curves

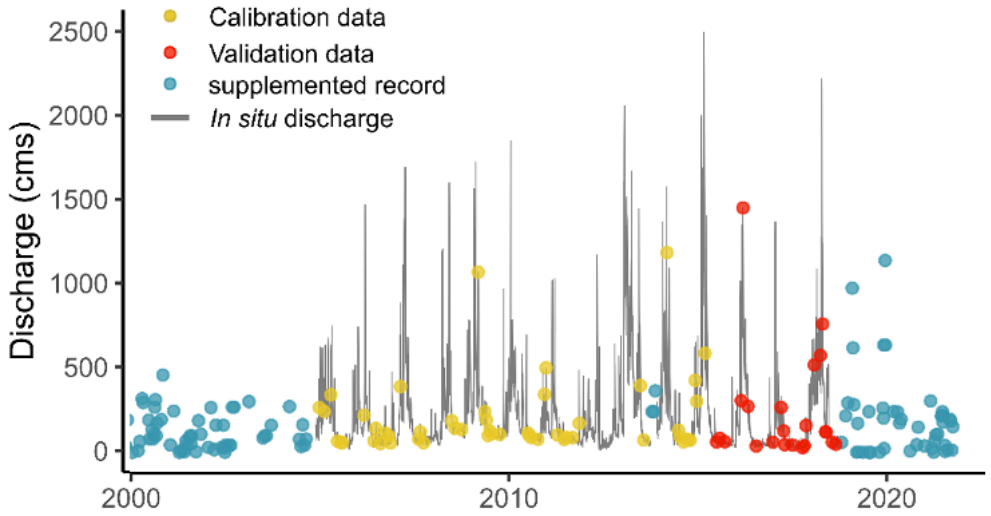
- For rivers >120 m wide, we test four types of rating curves to determine which yields the best performance:

    1. At-a-station hydraulic geometry works best on 43% of gauges
    2. Random forest = 25%
    3. Piecewise linear regression = 19%
    4. Monotonic spline = 13%

Width-based Rating curves:




Calibration/validation:

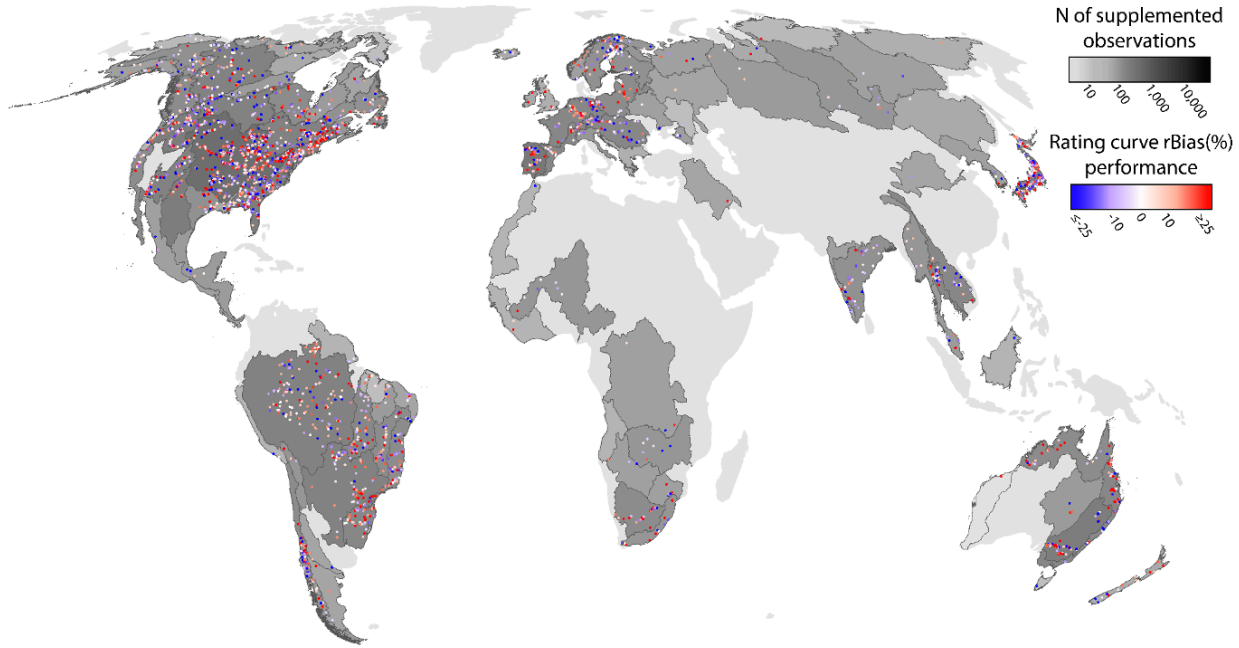


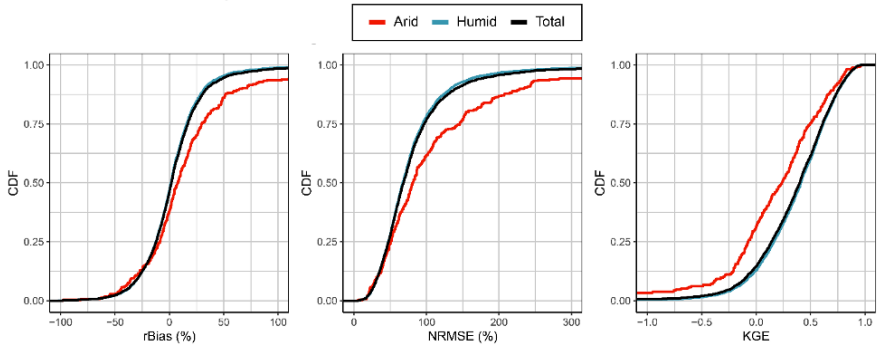
# Rating curve performance

- Median rBias = 1.81%
- Median NRMSE = 68.3%
- Median RRMSE = 95.9%
- Median KGE = 0.40

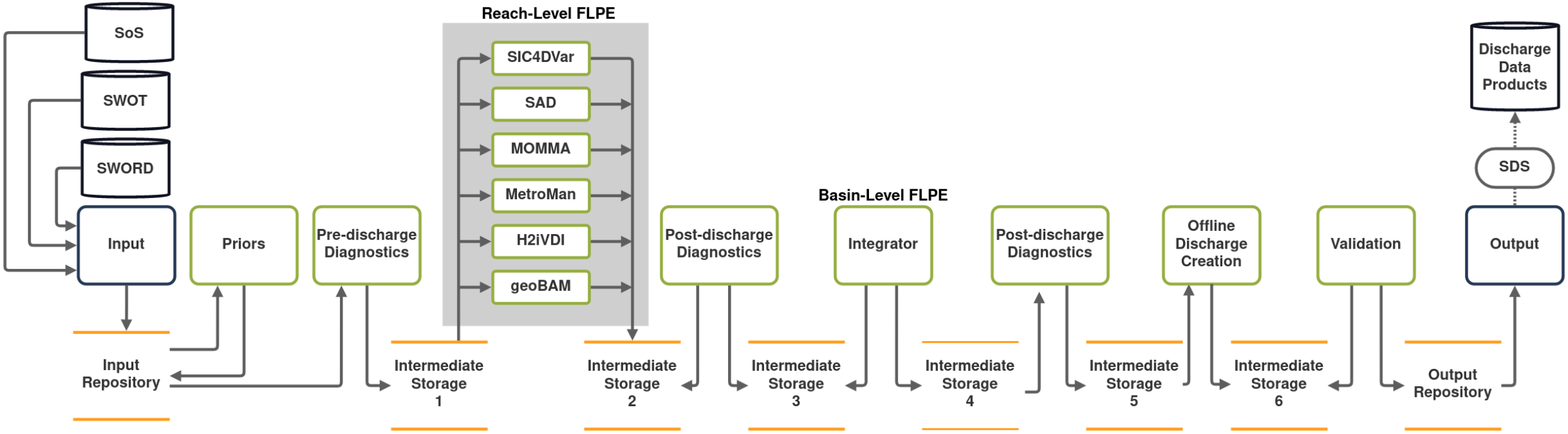
- 97% of rating curves have KGE > -0.41

- Rating curves exhibit better performance in humid climates than in arid climates



# How can gauge-based rating curves contribute to Confluence?




https://github.com/SWOT-Confluence/documentation/tree/main/documentation

# Next steps…

- Getting this information into Confluence… Useful attributes?
    (1) sword node ID
    (2) gauge ID
    (3) gauge agency
    (4) optimal equation type (AHG, piecewise, RF, spline)
    (5) equation used to convert width to discharge
    (6) uncertainty (or error)
    (7) …?

- Anything else?