Early results from LakeFlow: an algorithm to integrate lakes into river discharge estimates

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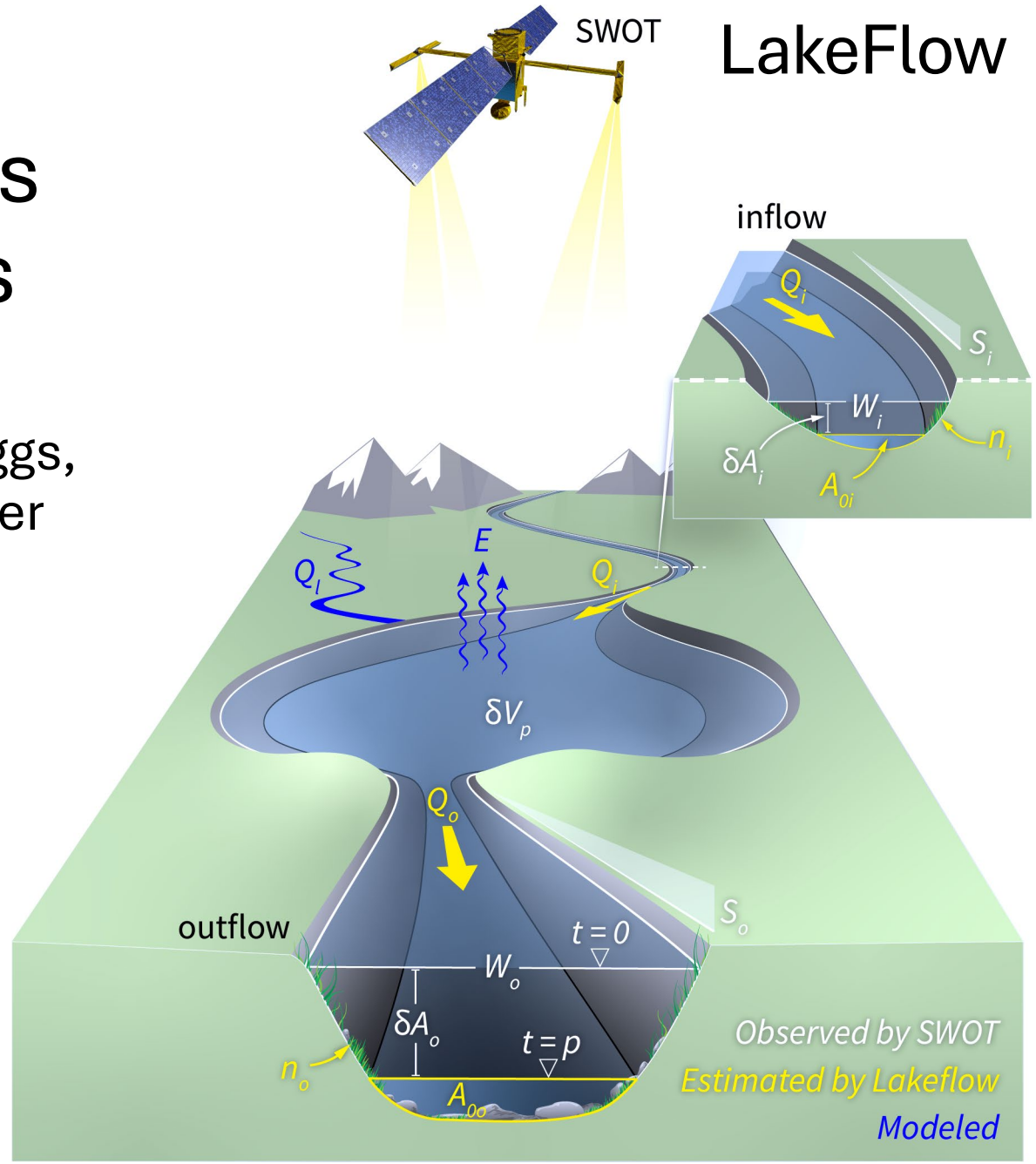
LakeFlow uses river-lake mass conservation to estimate river inflows and outflows of lakes

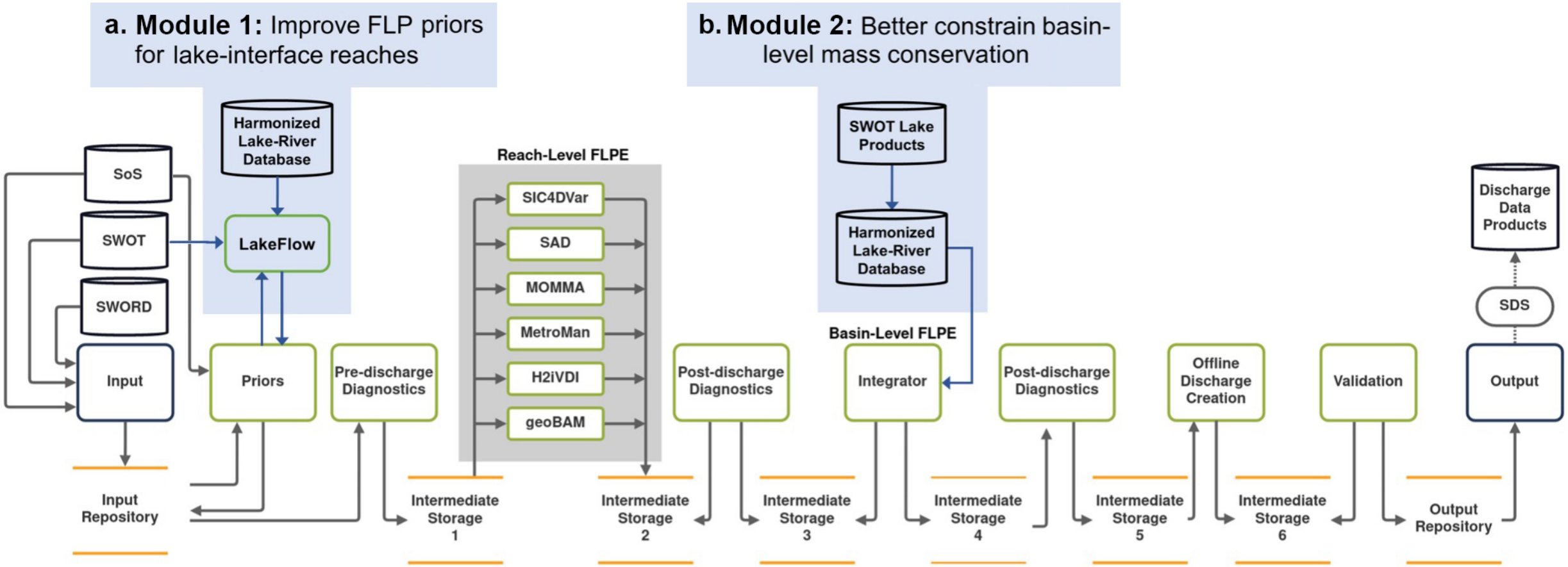
$$\delta V = Q_{in} - Q_{out} + Q_l - E$$

δV	change in lake volume
Q_{in}	lake inflow
Q_{out}	lake outflow
Q_l	lake lateral inflow (modeled)
E	evaporation (modeled)

Q	River discharge
V	Lake storage
i	Lake inflow
o	Lake outflow
n	Manning's hydraulic roughness
A_0	Unobserved cross-section area
W	River width (wetted)
S	Hydraulic slope
E	Lake evaporation
l	Lake lateral inflow



Riggs et al. (2023) *Geophys. Res. Lett.*



Modified from Durand et al. (2023) *Wat. Resour. Res.*

Testing LakeFlow using 1-day orbit SWOT data

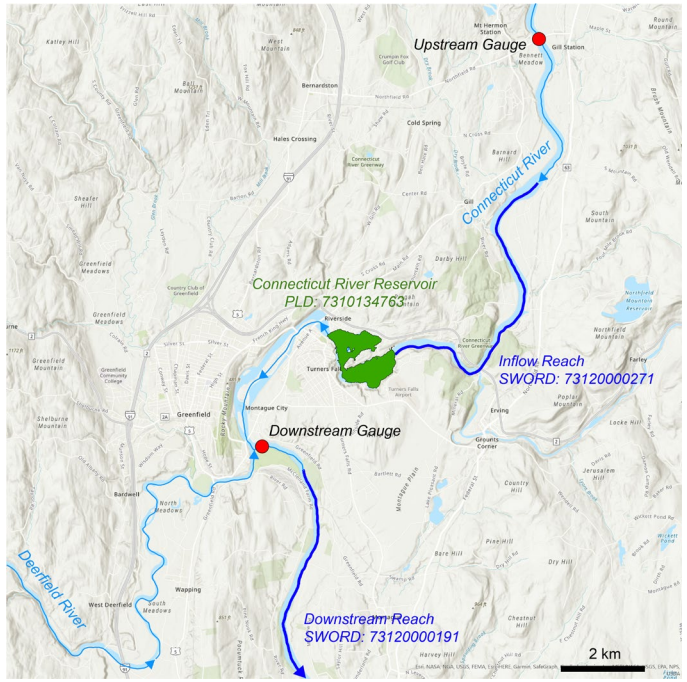
- First results on the Connecticut River Reservoir, MA during April 2023

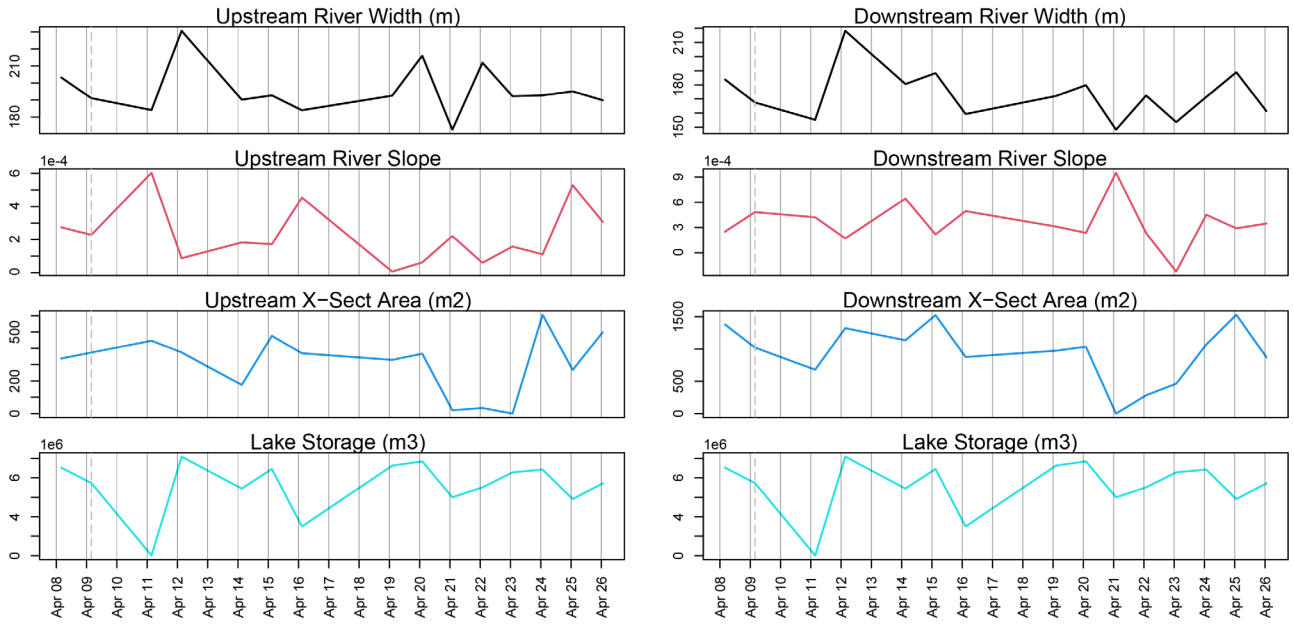
- SWOT input:
  - Rivers (lake inflows & outflows): slope, width, wse, d_x_sec_area
    - **pulled from geochron**
  - Lakes: wse, area, d_storage
    - **downloaded manually**

- Other inputs:
  - Lake evaporation (DLEM, Zhao et al., 2024)
  - Lateral inflow (GEOGLOWS, Sanchez et al. 2021)
  - SWORD priors: *n*, median *Q*

- LakeFlow outputs:
  - Inflows
  - Outflows

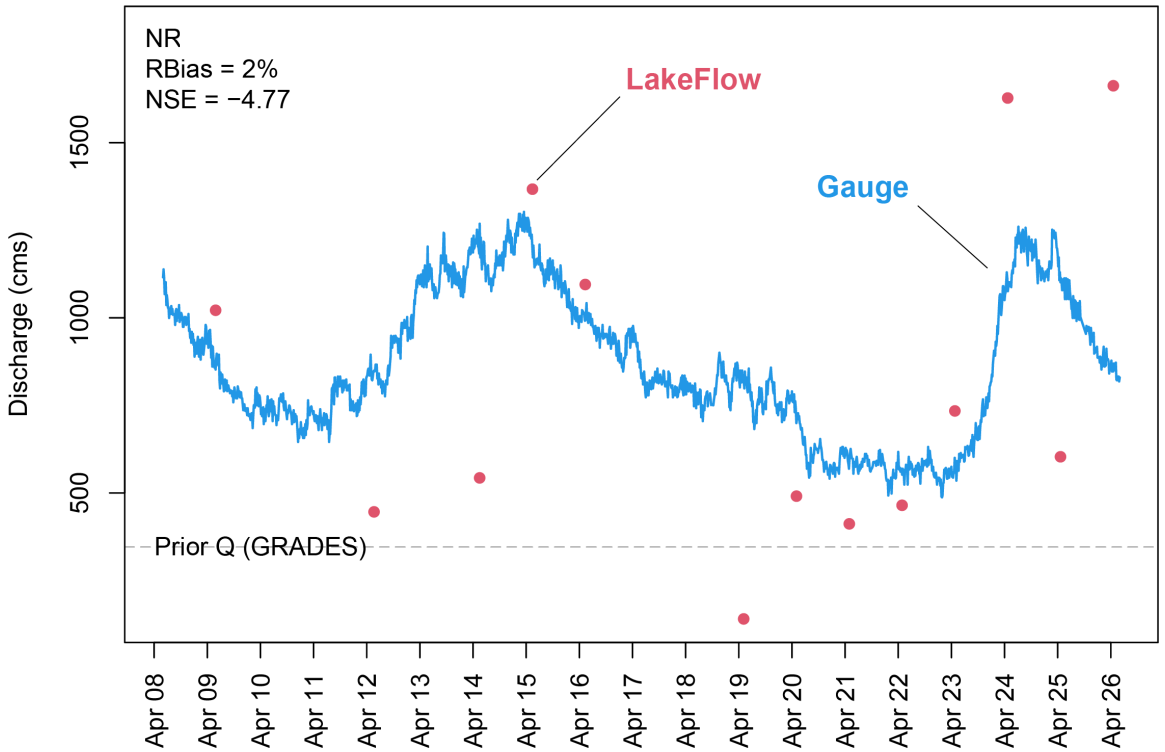
Connecticut River Reservoir, MA



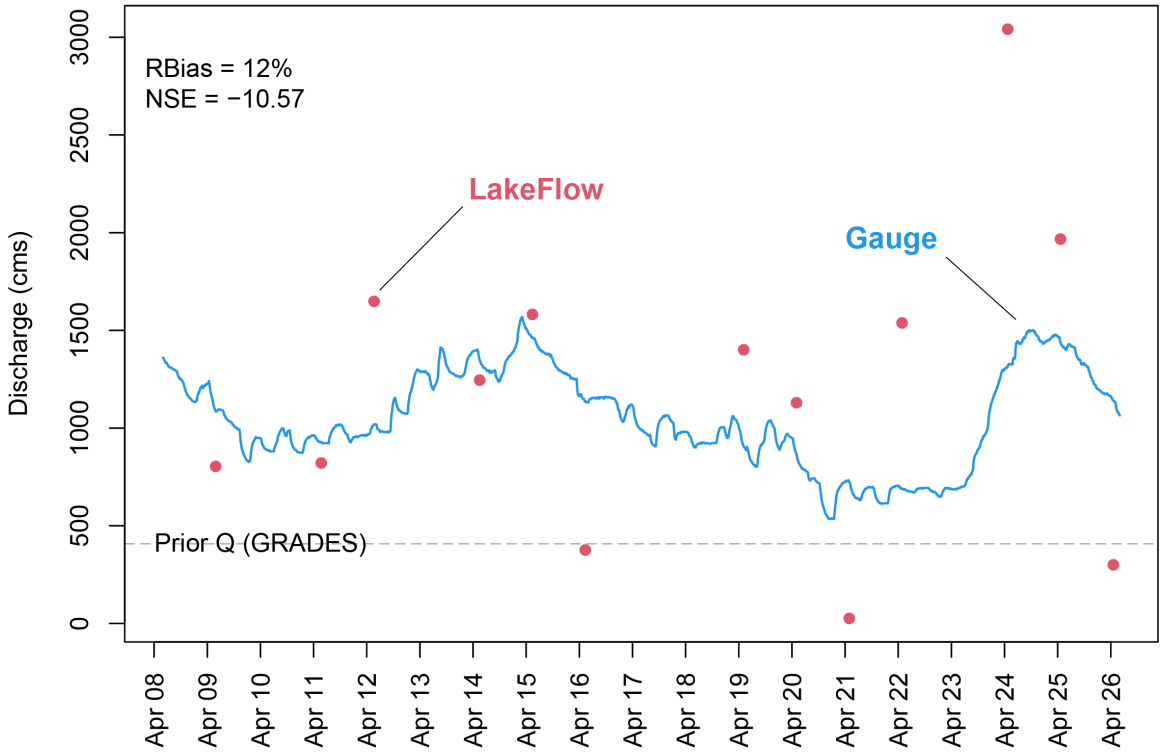


Testing LakeFlow using 1-day orbit SWOT data

Inflow



Outflow



Testing LakeFlow using 21-day SWOT orbit data