ICoM

Integrated Coastal Modeling

MOSART-Urban: a semi-distributed regional urban flood modeling framework

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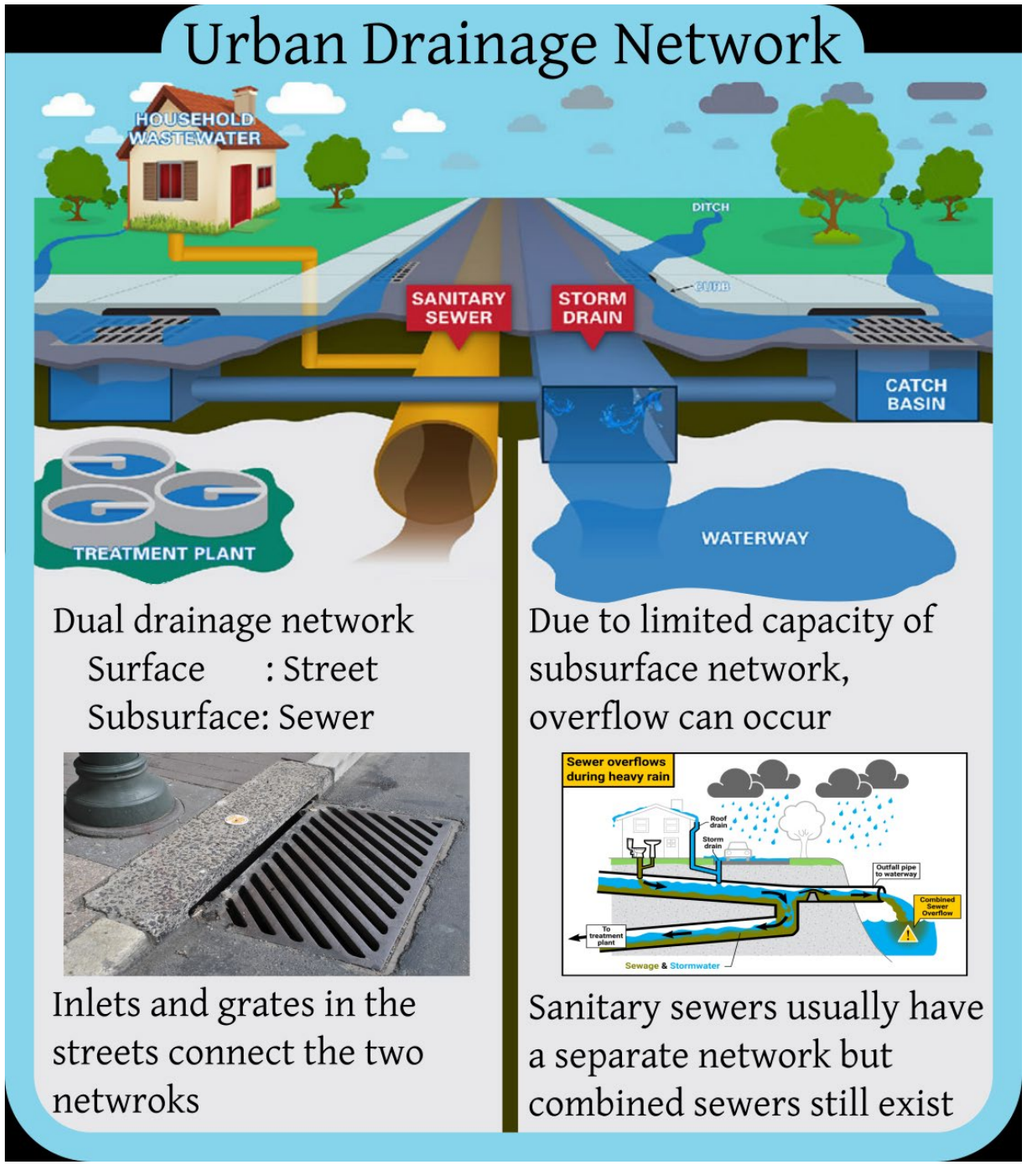
Challenges in large-scale urban hydrologic modeling

- Process complexity and heterogeneity
- Data scarcity, particularly in sewer network
- Two types of sewer networks
  - **Stormdrains** delivering excess storm water from streets to nearest rivers or lakes (**flooding**)
  - Sanitary sewer delivering polluted sewage from households to wastewater treatment plants (future extension)



https://www.gilbertaz.gov/departments/public-works/environmental-compliance/stormwater

MOSART-Urban conceptual framework

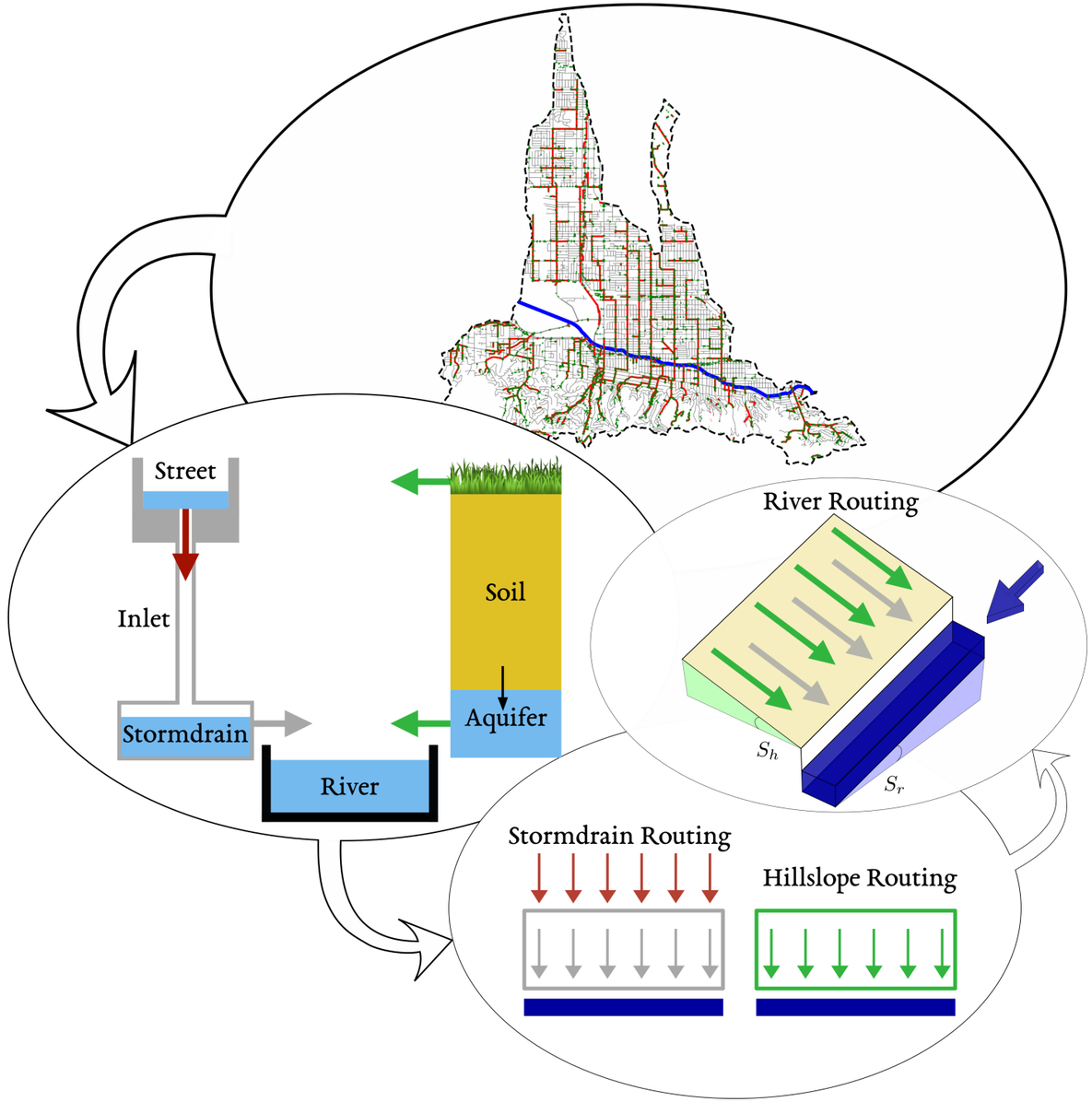
- Two **surface** areas:
  - Streets: Impervious surface
  - Soil & vegetation: Pervious surface
- Two corresponding vertical **columns**:
  - Stormdrain: Underground network
  - Soil column: unsaturated & saturated layers, aquifer
- **Pathways**:

Surface runoff to/from street form/to stormdrain through inlets

Surface and subsurface runoff from pervious area into river

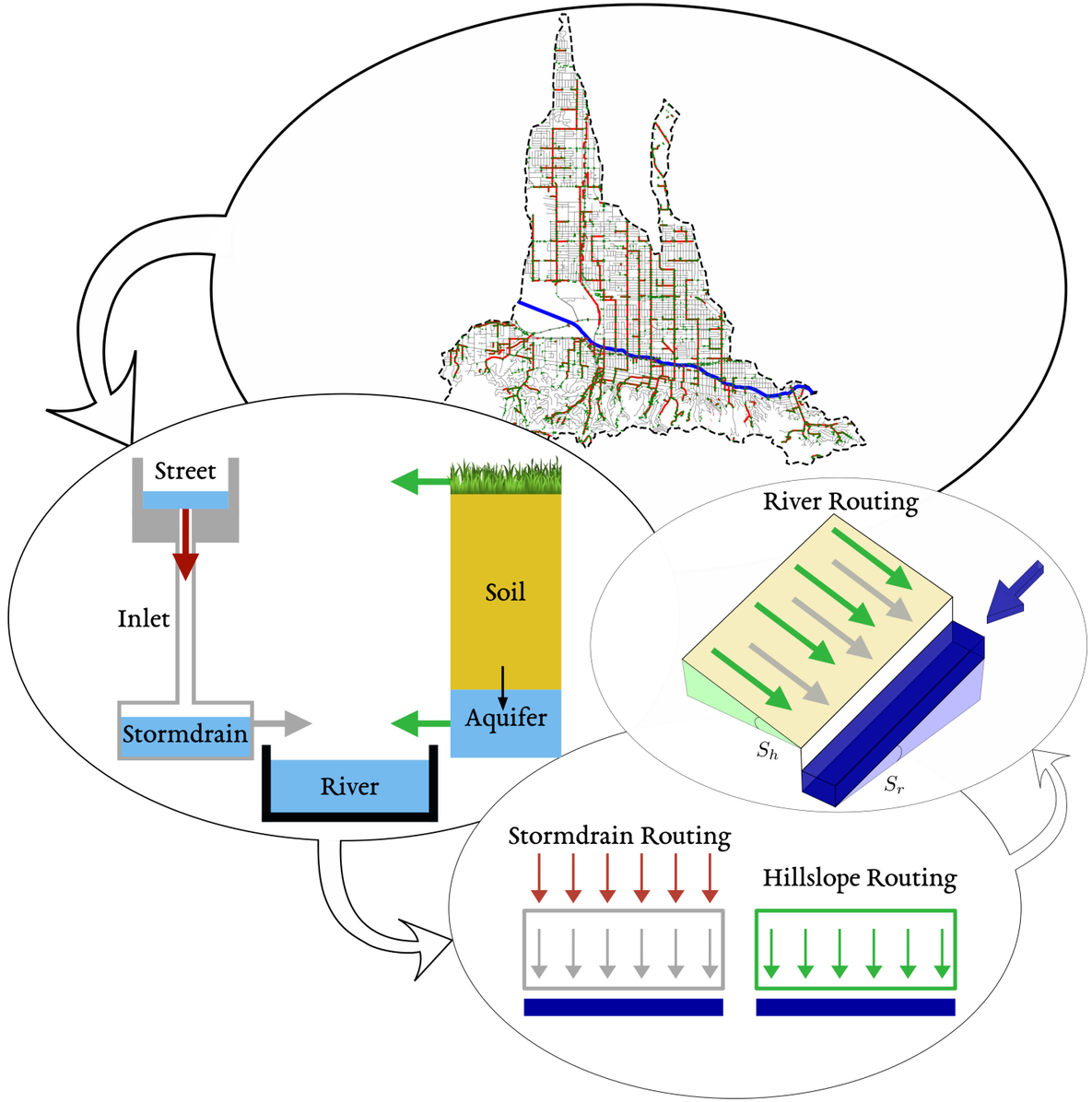
Stormdrain outflow into river through outfall

streamflow



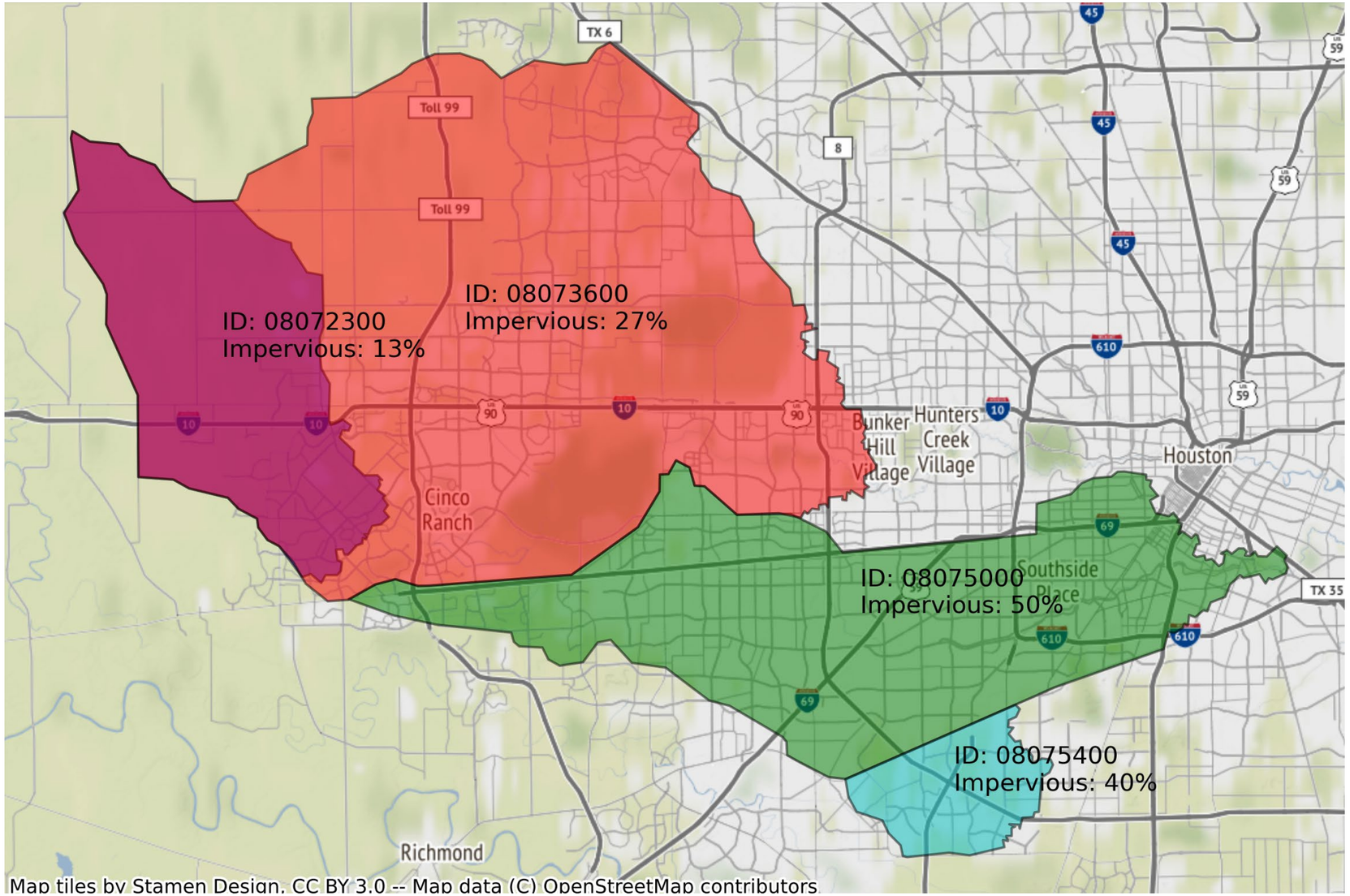
Modeling strategy

- **Kinematic Wave** (KW) method for routing across hillslopes, stormdrains and river channels.
- All the **impervious** column parameters can be estimated **a priori** using existing data
- For off-line testing, runoff generation using a lumped model with 10 (5 for the pervious column and 5 for the impervious column) calibration parameters

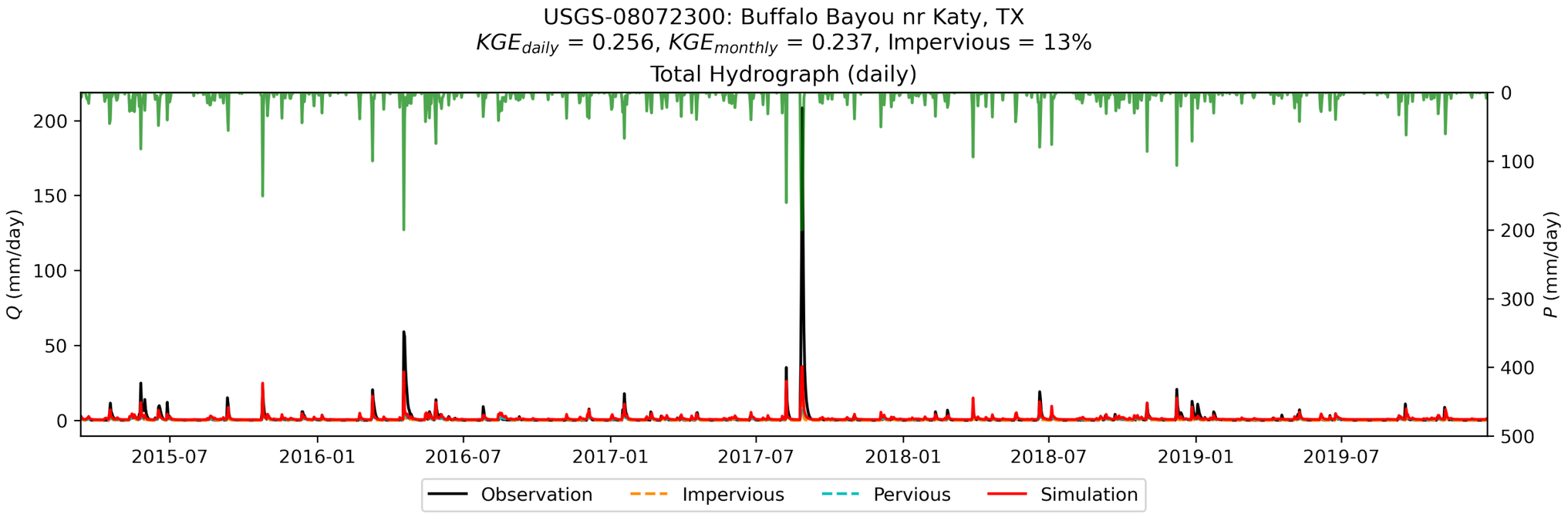


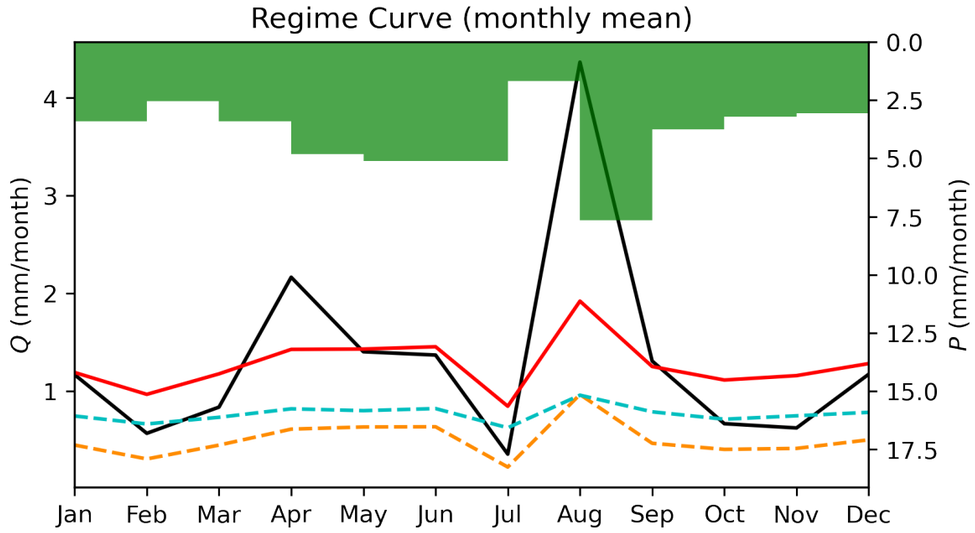
Case Study: Houston

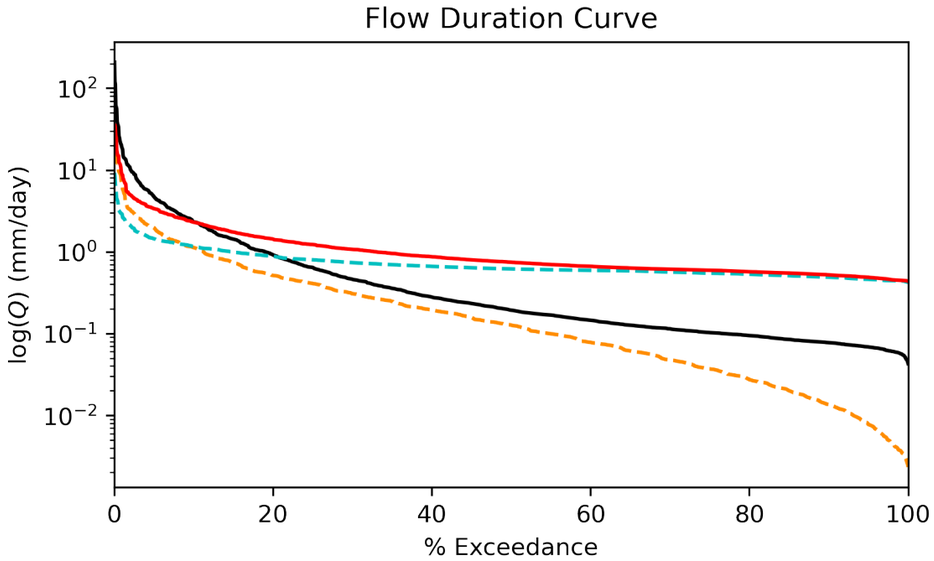
- Data period: 2003 – 2019
- Calibration with 70% of data
- Sanitary sewage not accounted for
- Subhumid (PET/P = 0.9)
- Negligible snow (Snow/Prcp = 1%)



Preliminary Results







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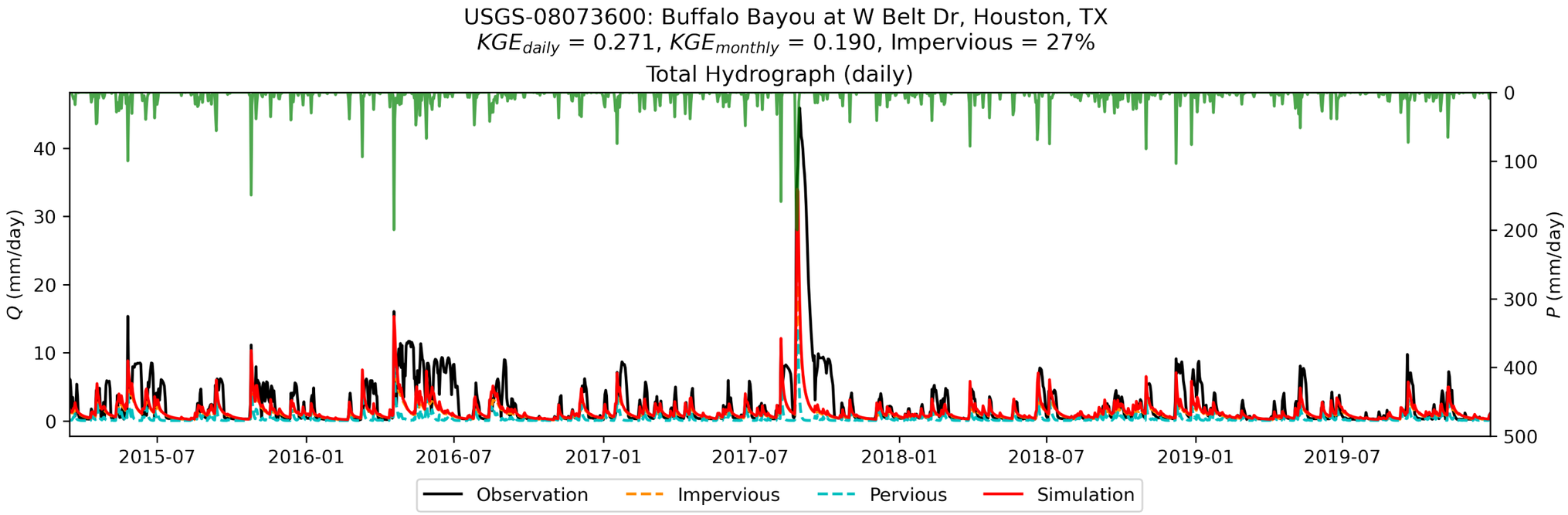

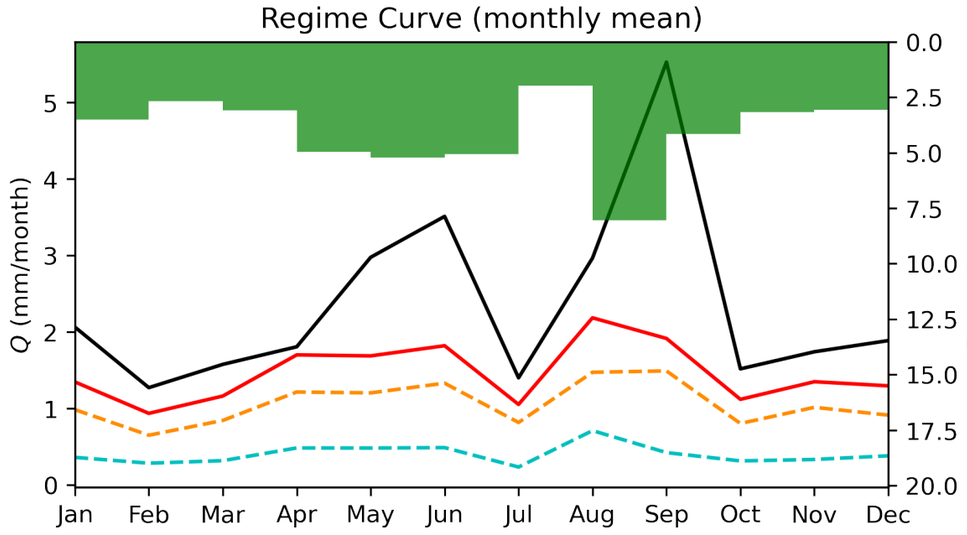

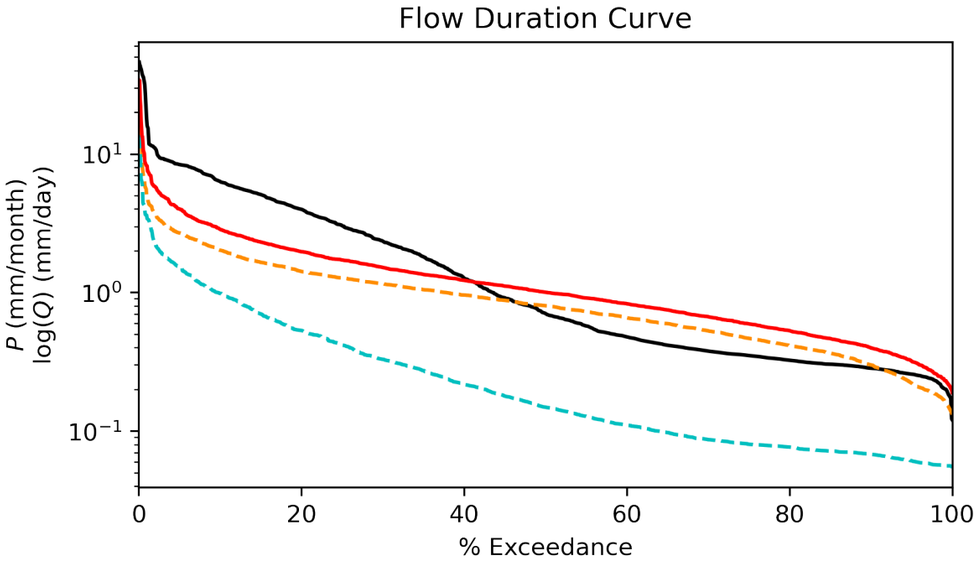

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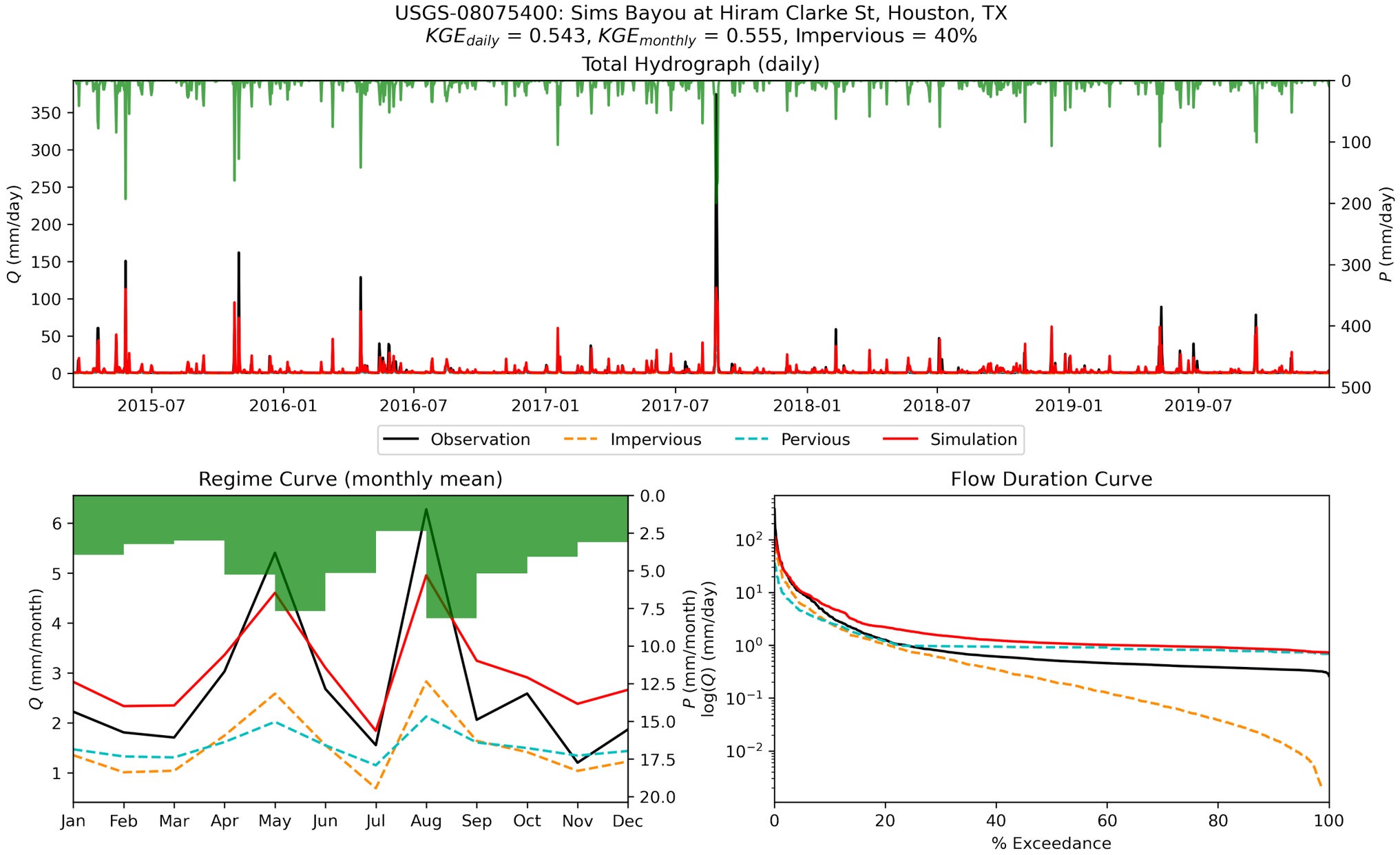

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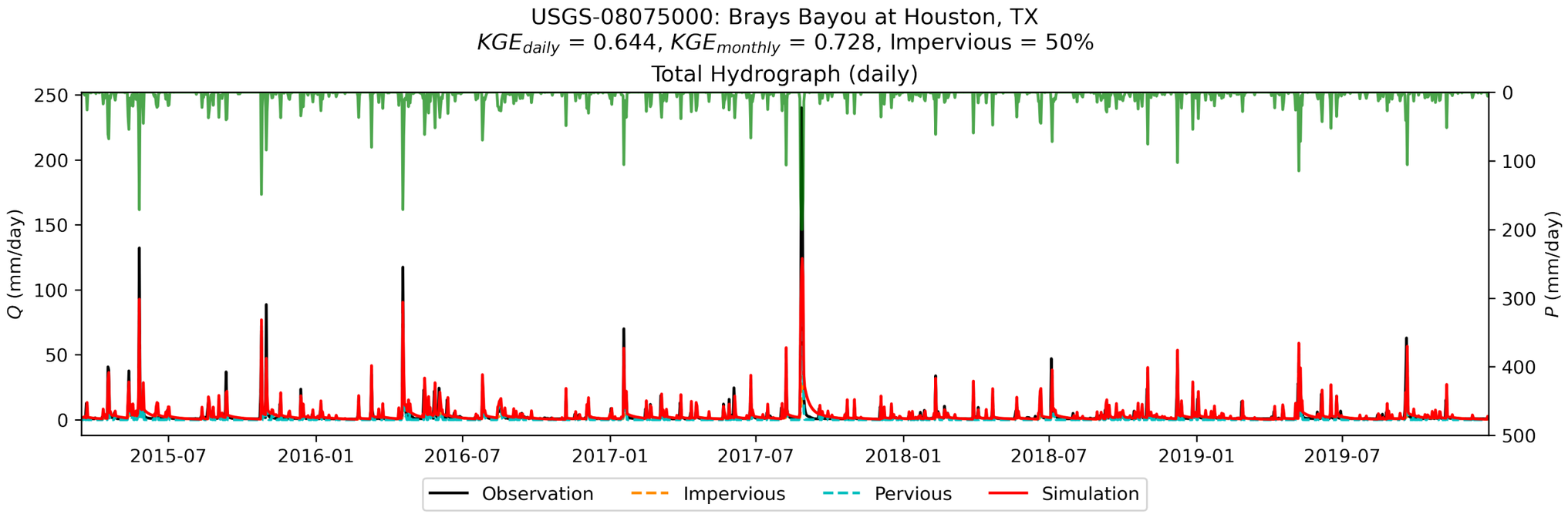

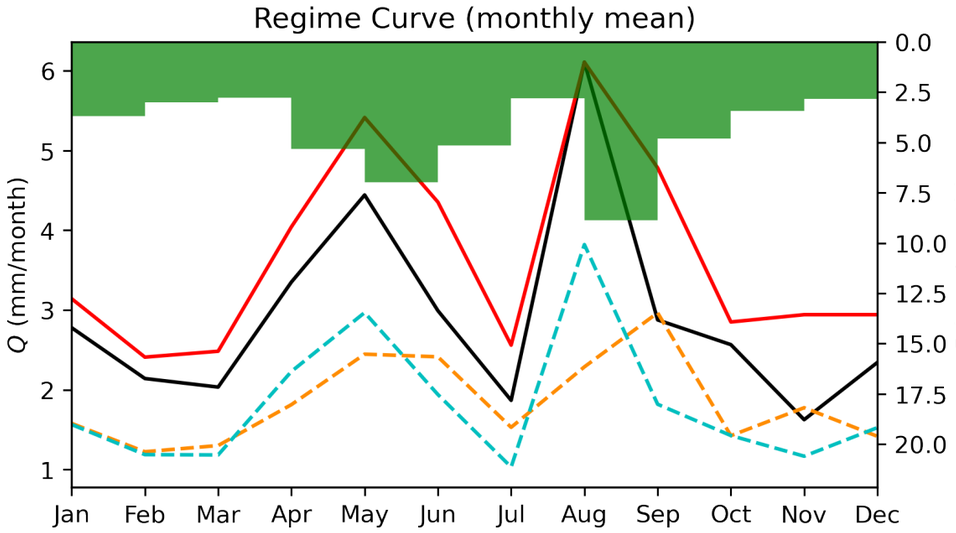

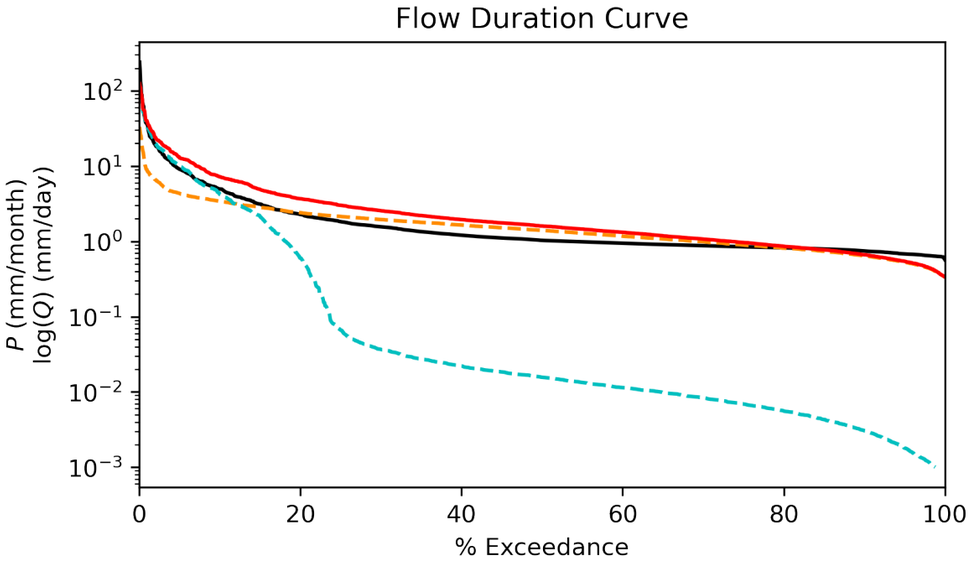

Summary & next steps

- MOSART-Urban offline version performs satisfactorily at 4 urban watersheds with varying urbanization levels
- We will compare it with the existing hydraulic urban hydrology model, Storm Water Management Model (SWMM)
- We will migrate MOSART-Urban into E3SM, and apply it over the whole contiguous U.S.

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