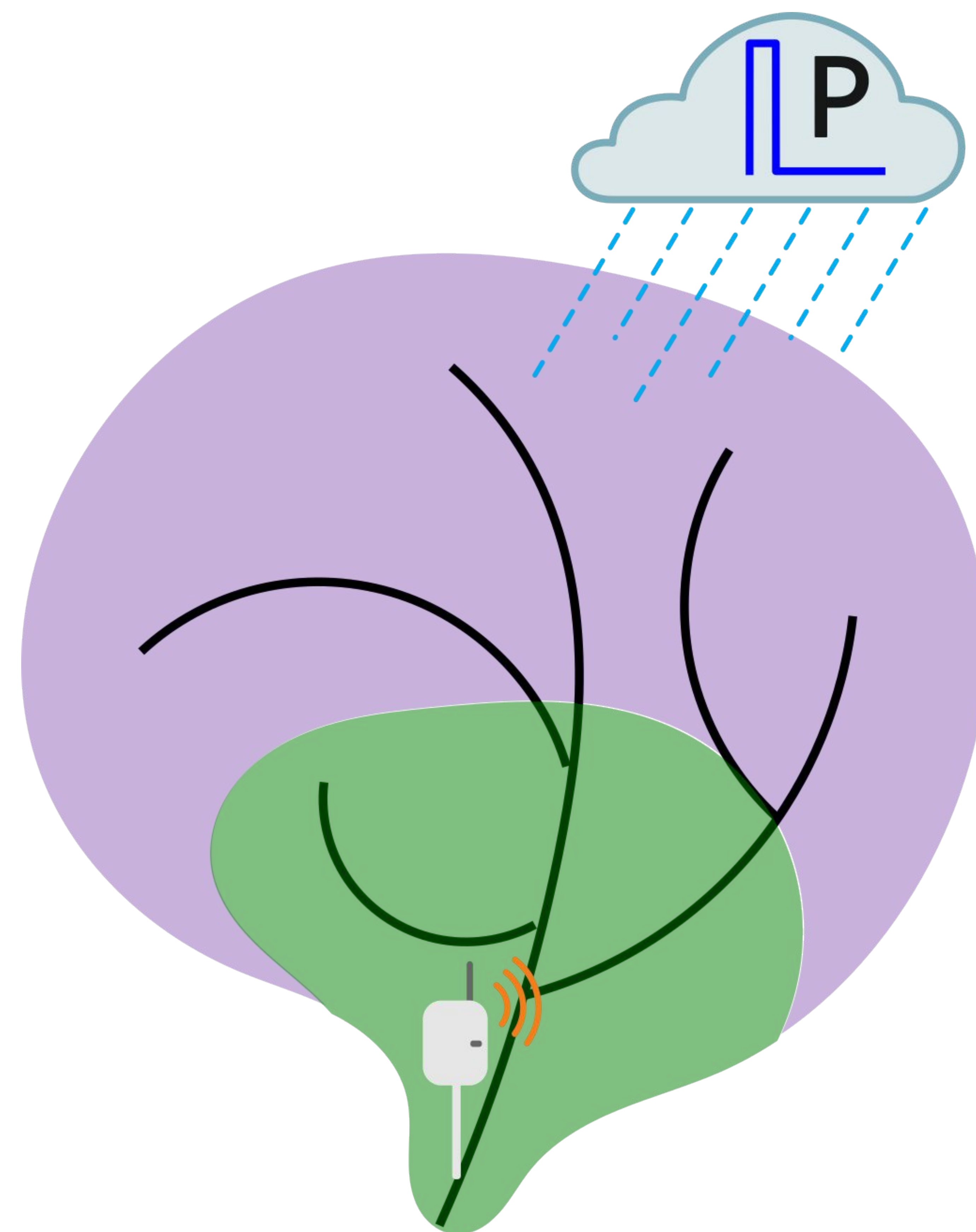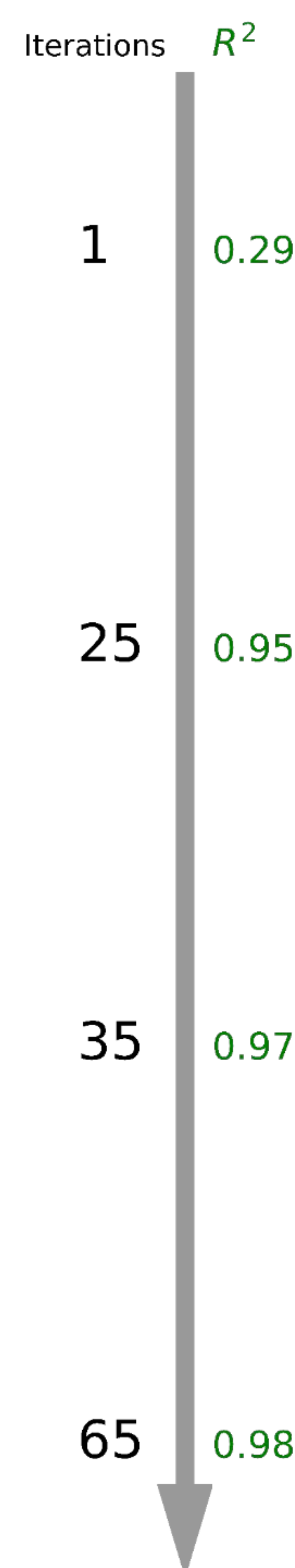# Automatically discovering interpretable rainfall-runoff models

UH1 — Approx. UH1 — UH2 — Approx. UH2 — Streamflow — Approx. Streamflow

Iterations R^2

$\frac{dQ}{dt} = -a_1 Q + b_1 P_1$ +   =   1   0.29

$\frac{dQ}{dt} = -a_1 Q + b_1 P_1$ +   =   25   0.95

$\frac{dQ}{dt} = -a_1 Q + b_1 P_1 - b_2 P_2$ +   =   35   0.97

$\frac{dQ}{dt} = -a_1 Q + b_1 P_1 + b_2 P_2$ +   =   65   0.98
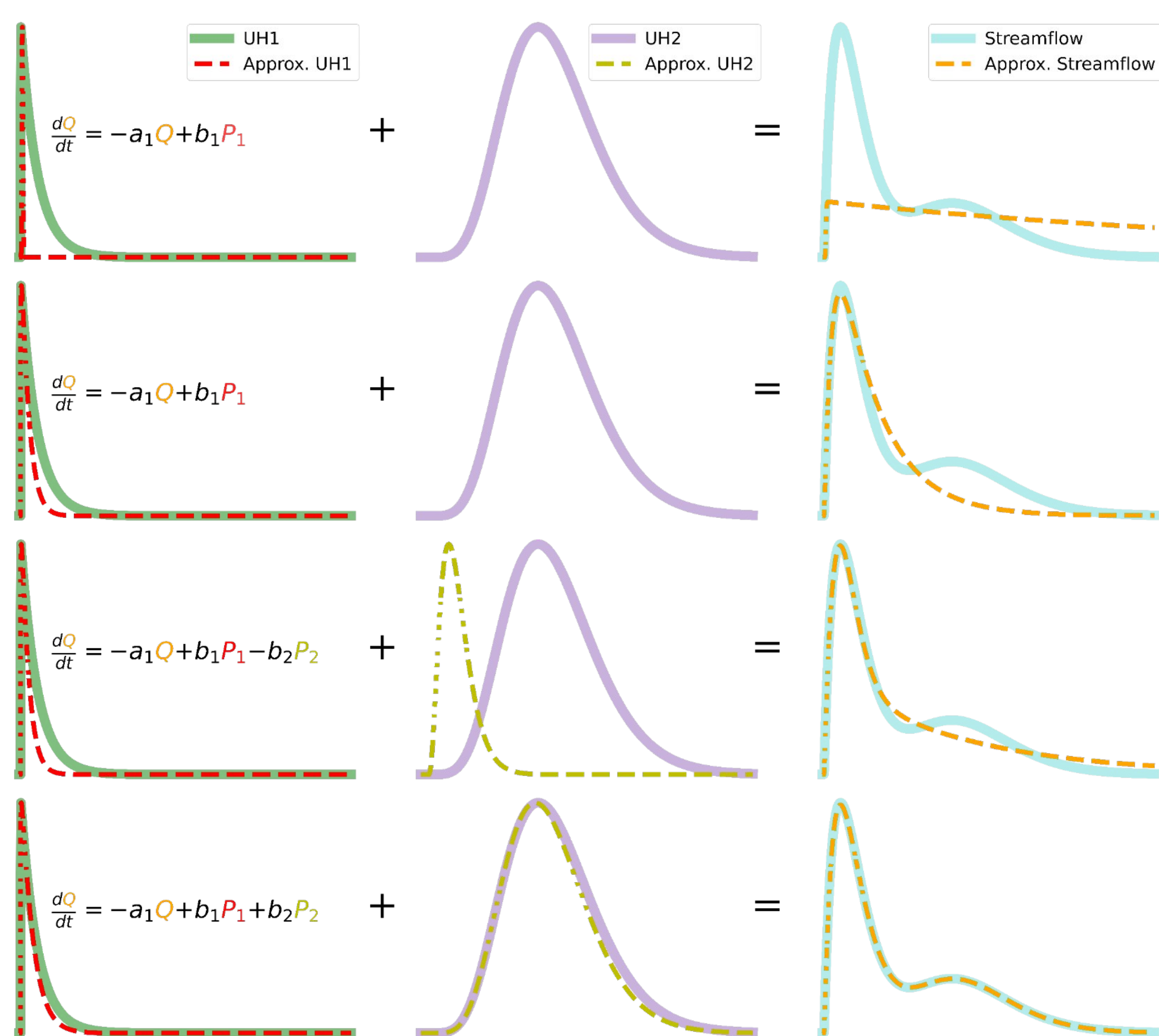
Motivation

- Expanding sensor networks generate more data every day
- Process-based models aren't designed to ingest real-time data
- Machine learning models require tons of data and are hard to interpret

Method

- Precipitation transformed to estimate the unobserved states in the watershed
- These estimates and streamflow data are used to learn a differential equation

Sewers

observed
simulated

Streams

Model Reduction
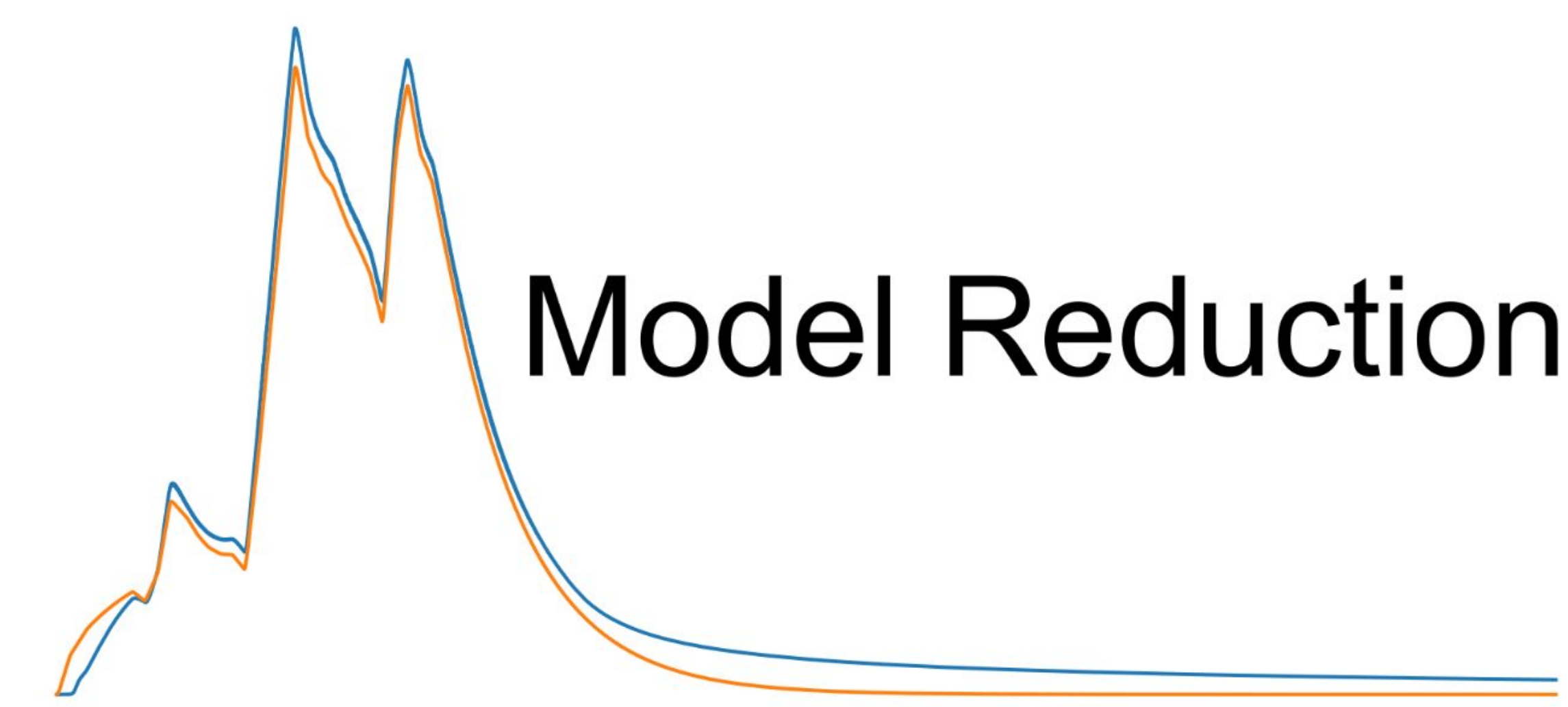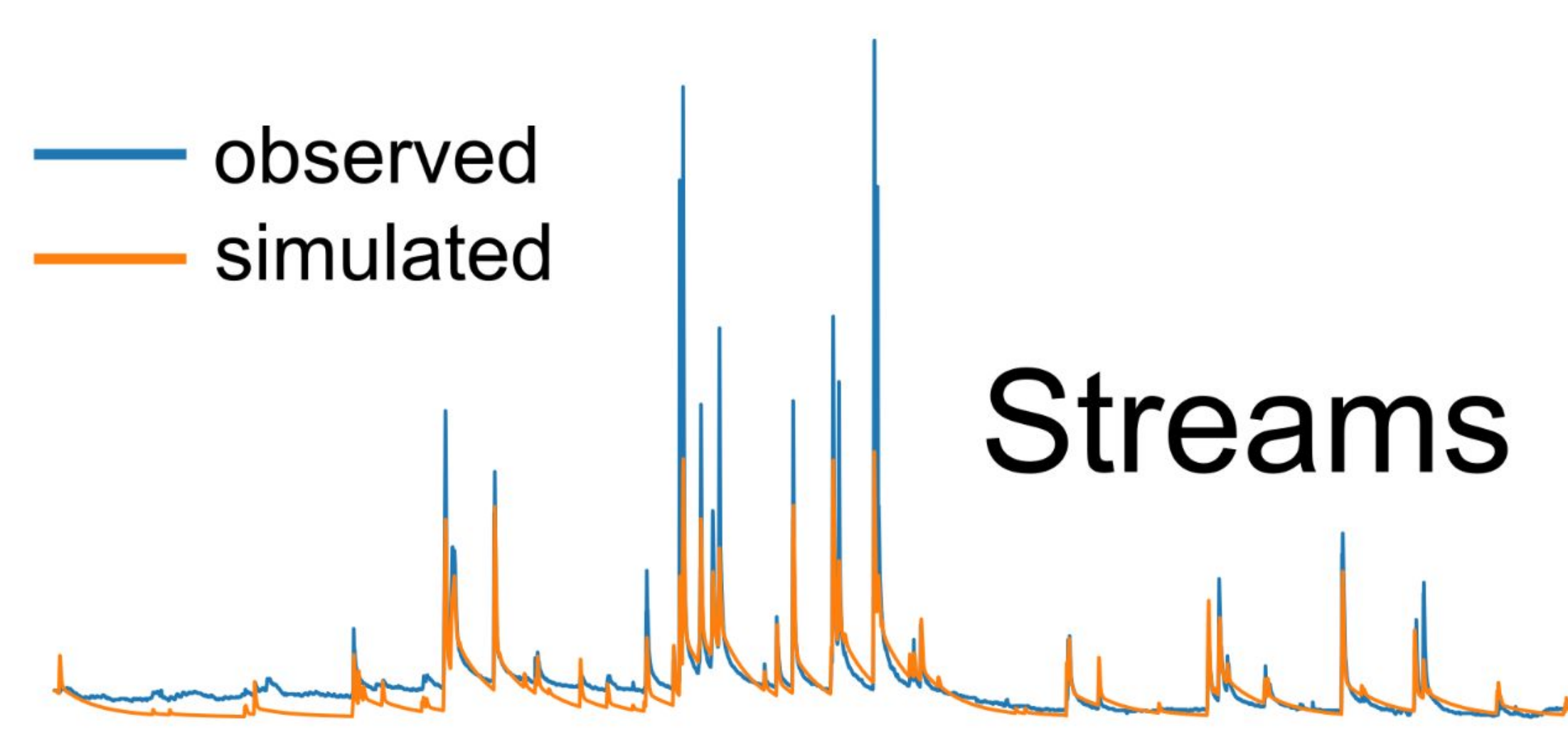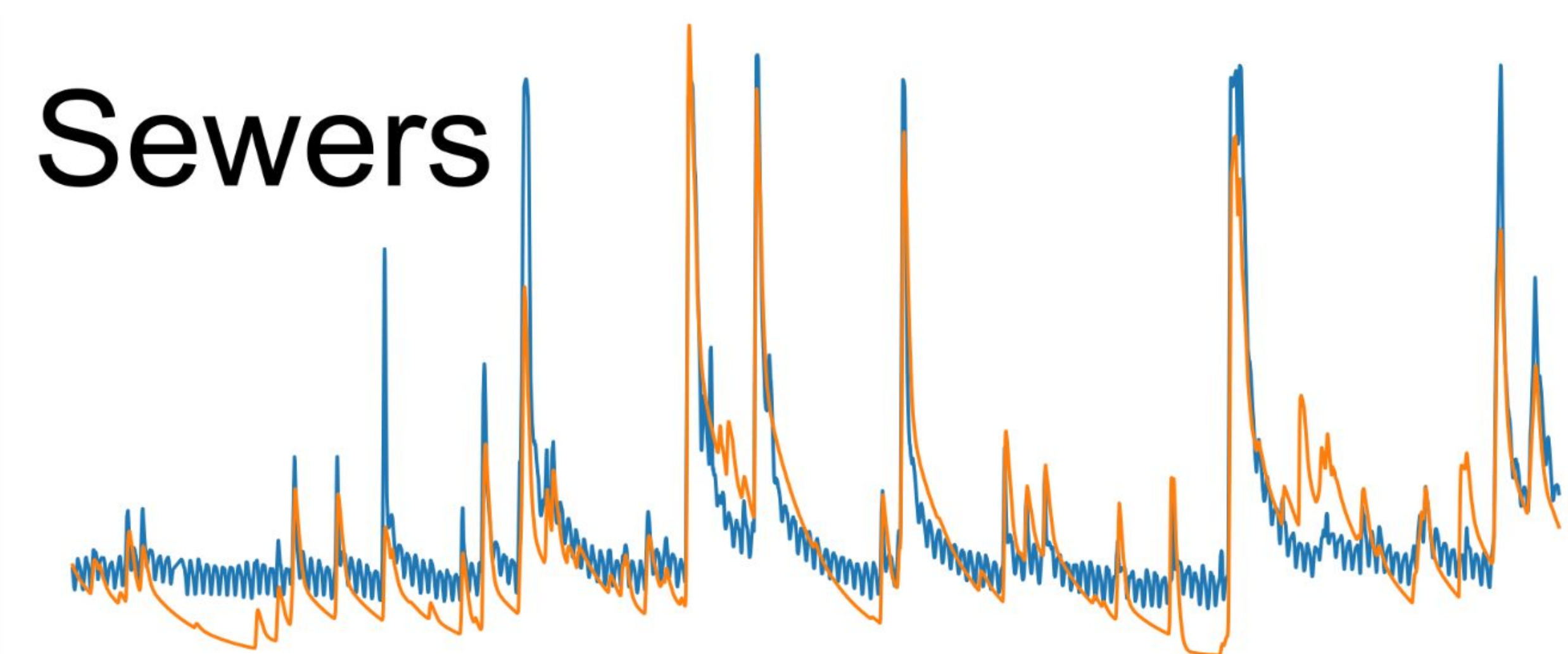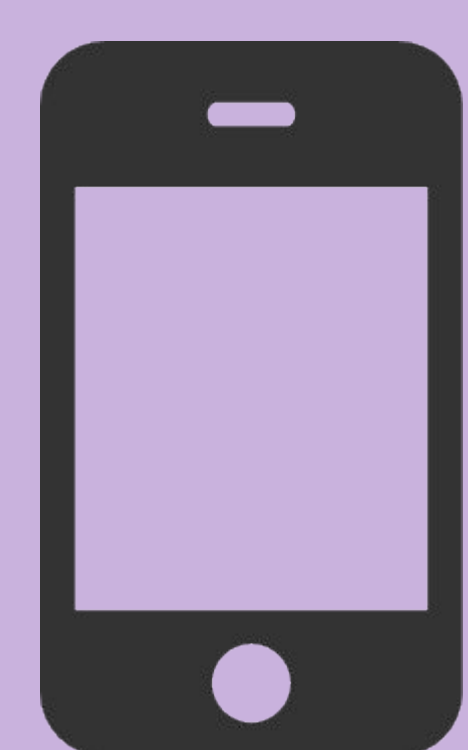
Travis Adrian Dantzer
Branko Kerkez
Digital Water Lab at UM
tinyurl.com/bkerkez
dantzert.github.io

Contact: dantzert@umich.edu

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