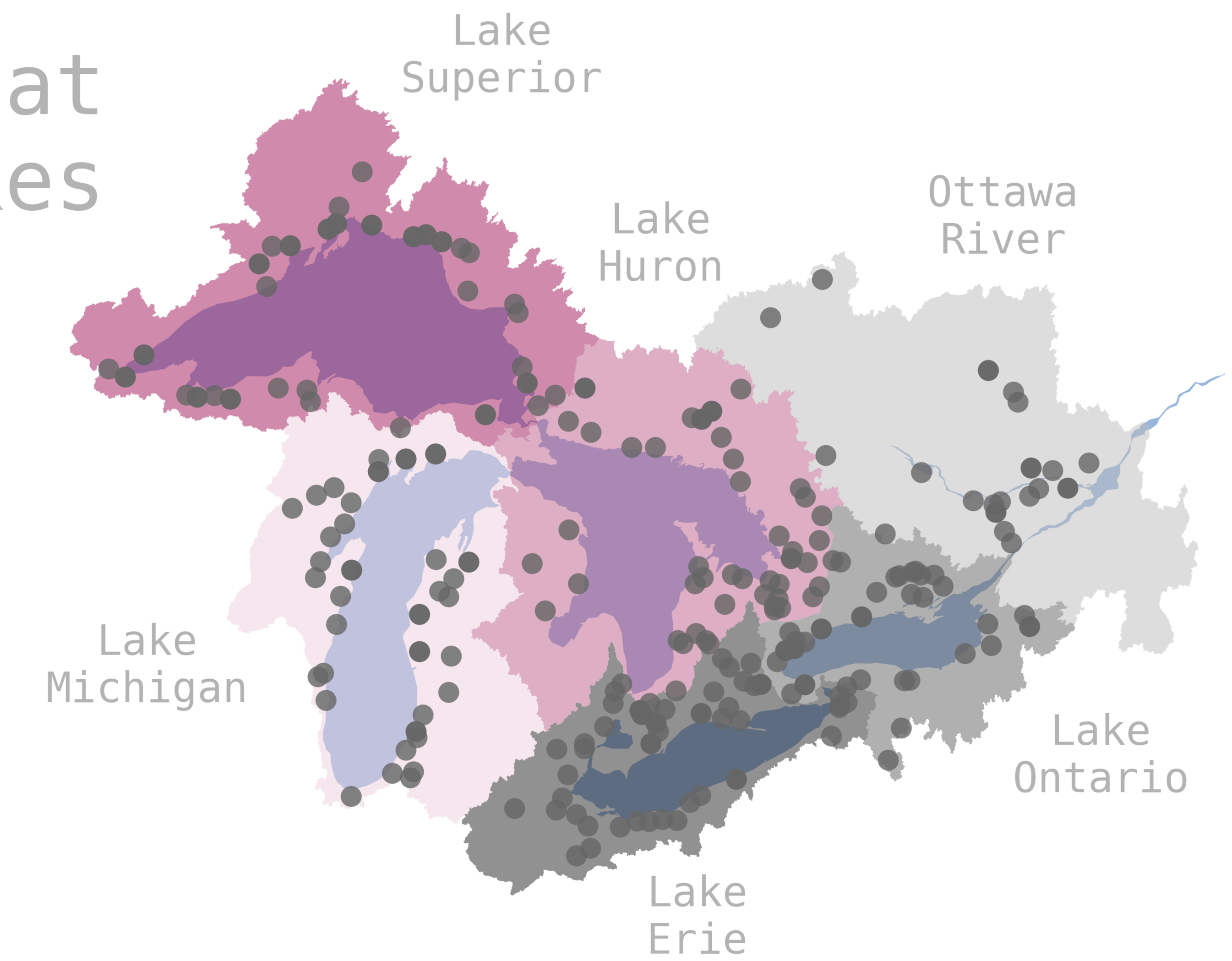
Great Lakes Runoff Intercomparison Project - Great Lakes



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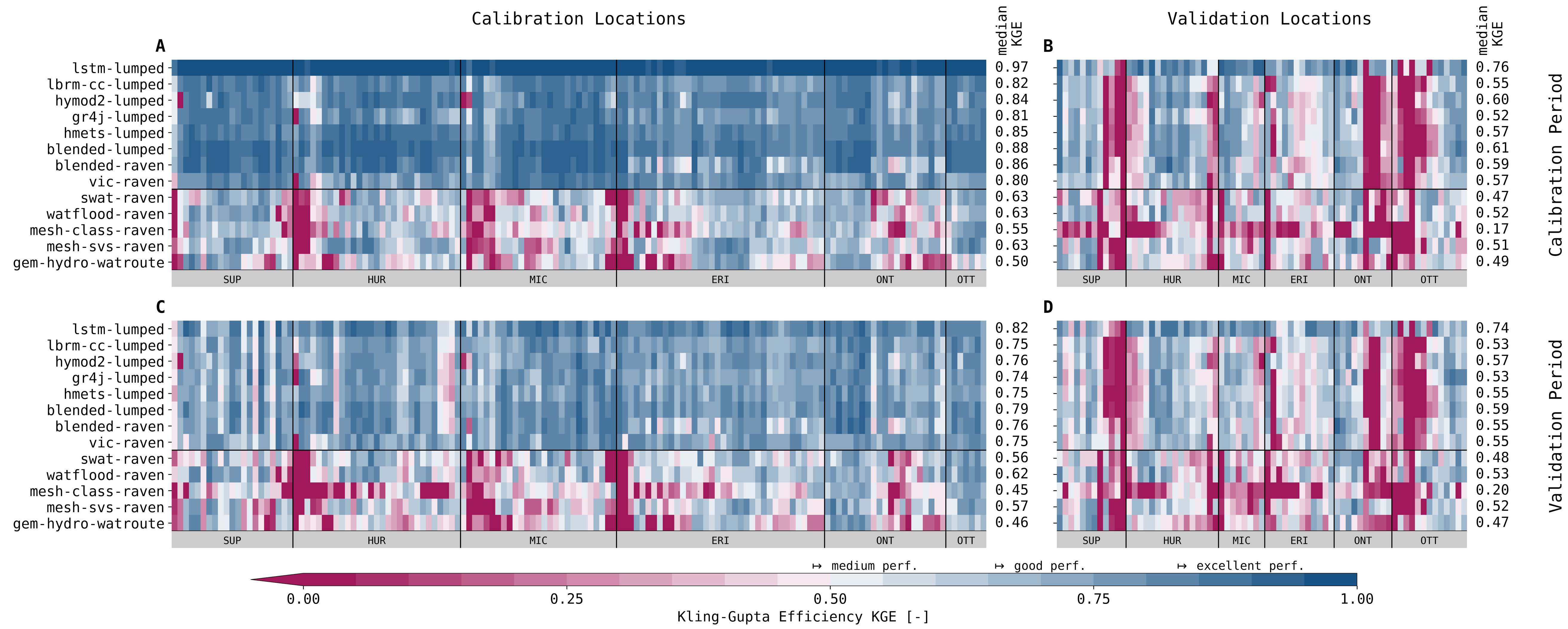
What we did and used

- Models: LSTM, LBRM, HYMOD2, GR4J, HMETS, Blended-lp, Blended-sd, VIC, SWAT, WATFLOOD, MESH-CLASS, MESH-SVS, GEM-Hydro
- Common calibration period (2001-2010) and evaluation period (2011-2017)
- Common calibration stations (141) and evaluation stations (71)
- HydroSHEDS 90 m (3") digital elevation model (DEM)
- Global Soil Dataset for Earth System Models (GSDE)
- North American Land Change Monitoring System (NALCMS)
- Regional Deterministic Reanalysis System (RDRS) v2
- Common routing product and routing approach

We found that the Machine Learning-based model outperformed any other physically-based model regarding simulation of streamflow.

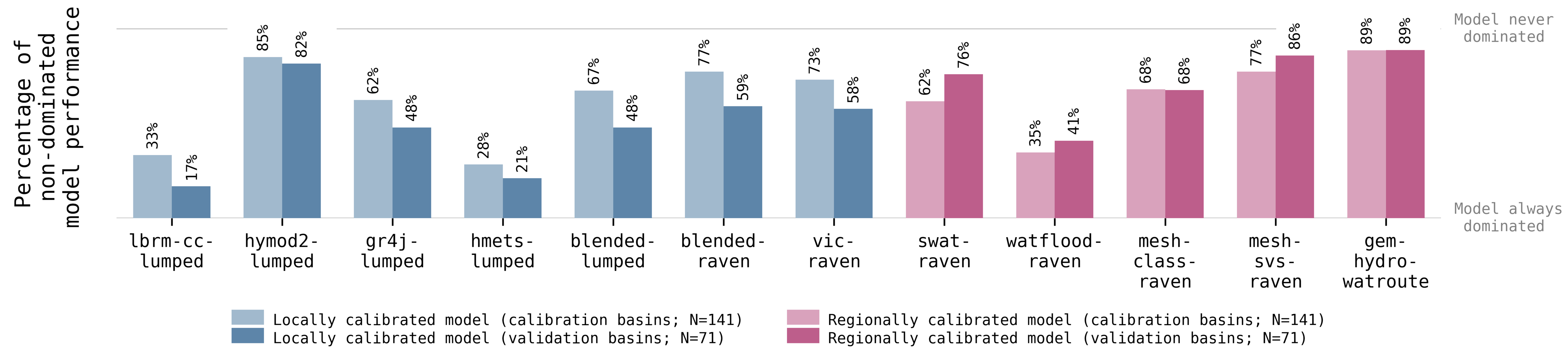
Basin-wise comparison of streamflow

reveals superior performance of machine-learning based model in calibration (A) and all validation experiments (B-D). Locally calibrated models transfer well in time (A vs C) while spatial transfer shows potential for improvement (A vs B and C vs D). On average, regionally calibrated models are the one with least performance.



Multi-objective multi-variable comparison of streamflow and additional variables

identifies overall well-performing locally calibrated models (i.e., HYMOD2-lumped) and regionally calibrated models (i.e., MESH-SVS-Raven and GEM- Hydro-Watroute) due to varying reasons. The machine- learning-based model is not included here as it is not set up to simulate the additional variables such as AET, SSM, and SWE.



This highly standardized model comparison led to a plenitude of insights on model performance regarding streamflow and beyond.

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Website