

# ILAMB for watershed scale models

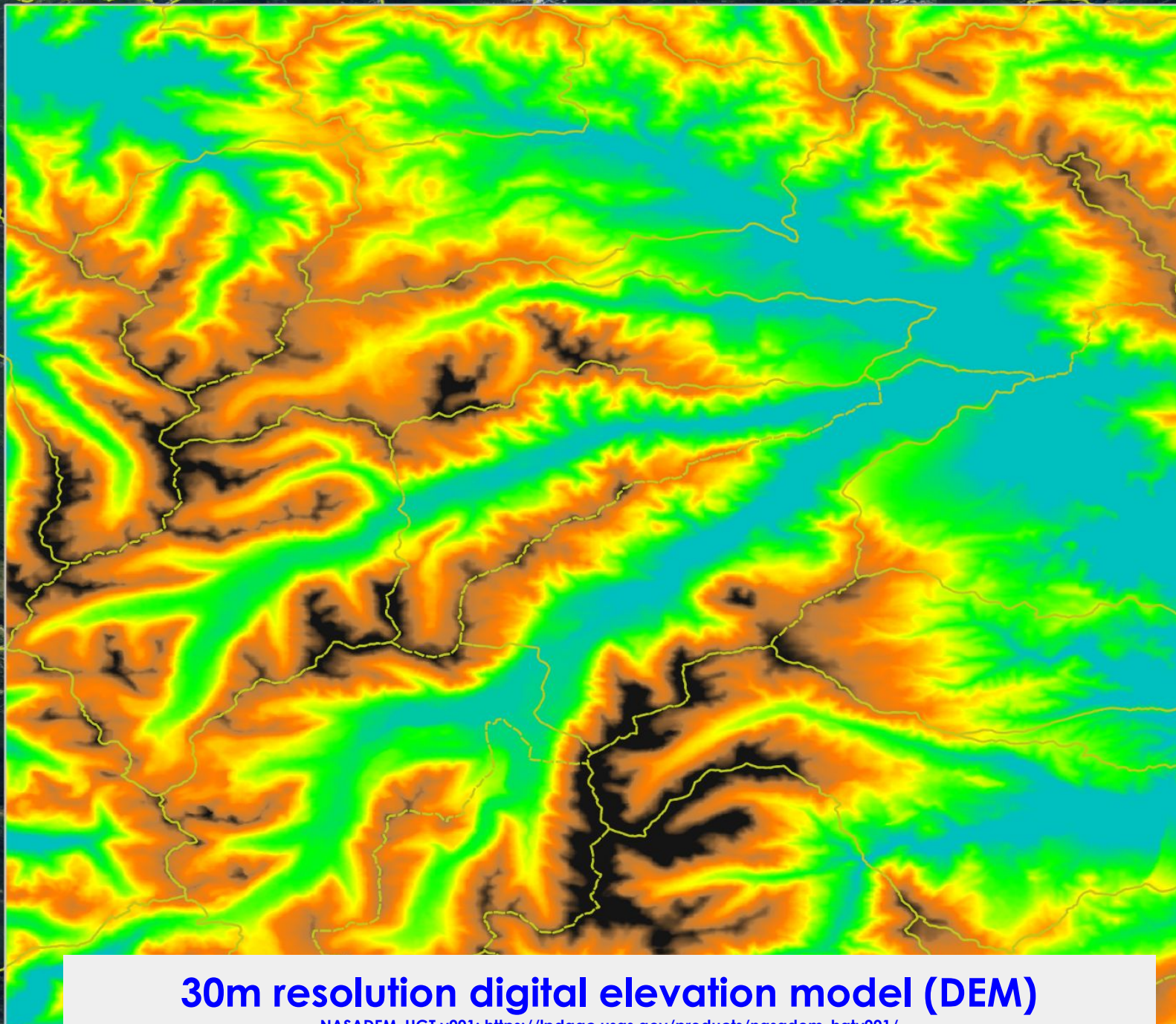
- ILAMB provides capabilities to benchmark and evaluate watershed scale models
- Use high resolution gridded datasets, as well as point based observations (such as from USGS gages, flux towers etc.) for evaluation
- Hydrological models can be routed vs unrouted models and are treated differently within ILAMB
  - routed model: use routed time series from model at gage locations
  - unrouted model: aggregate gridded flows over the contributing basin
- ILAMB has model specific readers to read native model outputs files without need of any pre-processing
- Currently supported model: Advanced Terrestrial Simulator (ATS), Soil Water Assessment Tool (SWAT), National Water Model (NWM) [using outputs at gage locations]



A satellite map showing a mountainous region with numerous watersheds outlined in yellow. The terrain is rugged with green forested areas and some snow patches. A white rectangular box highlights a central portion of the map.

## HUC 12 Watersheds

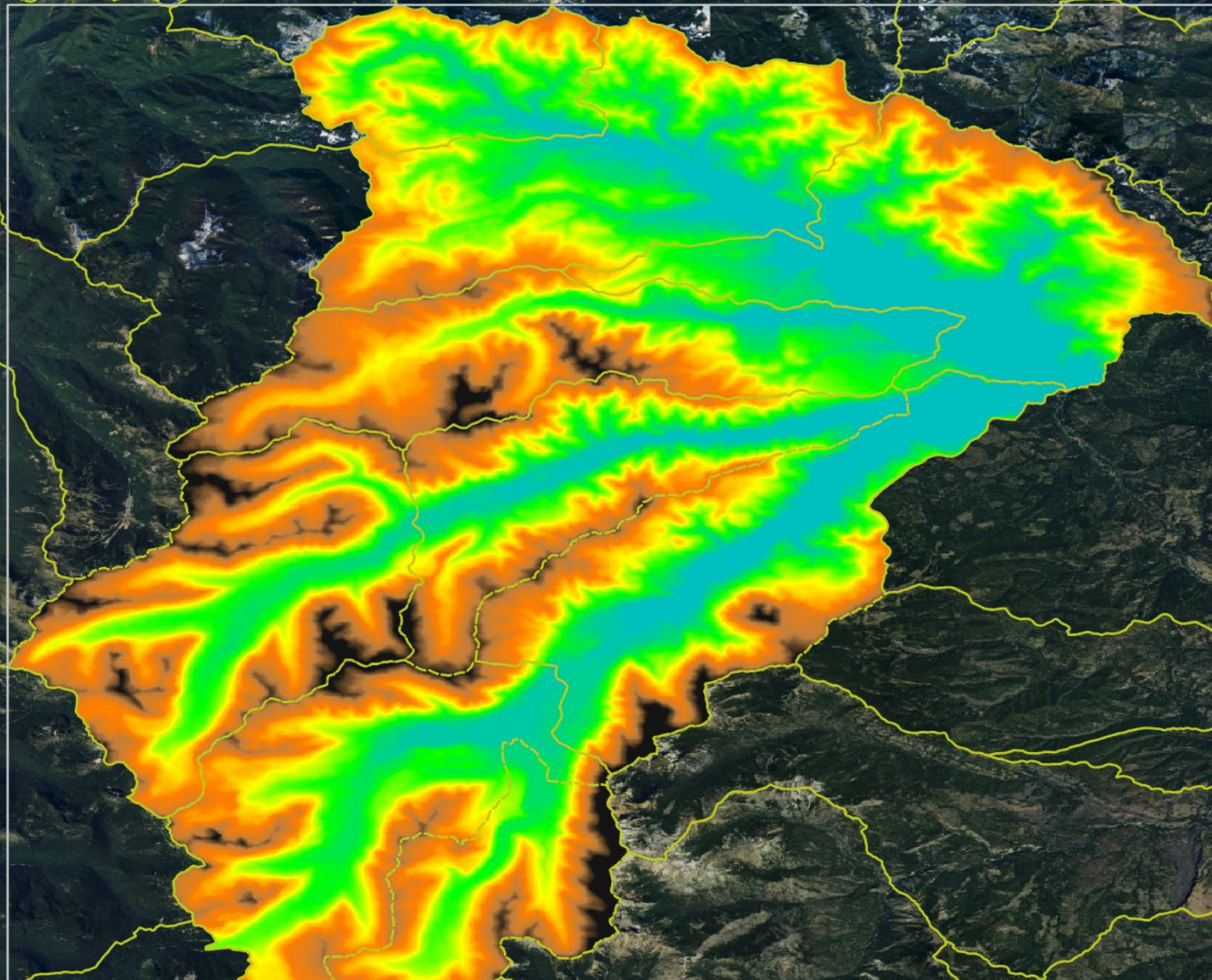




## 30m resolution digital elevation model (DEM)

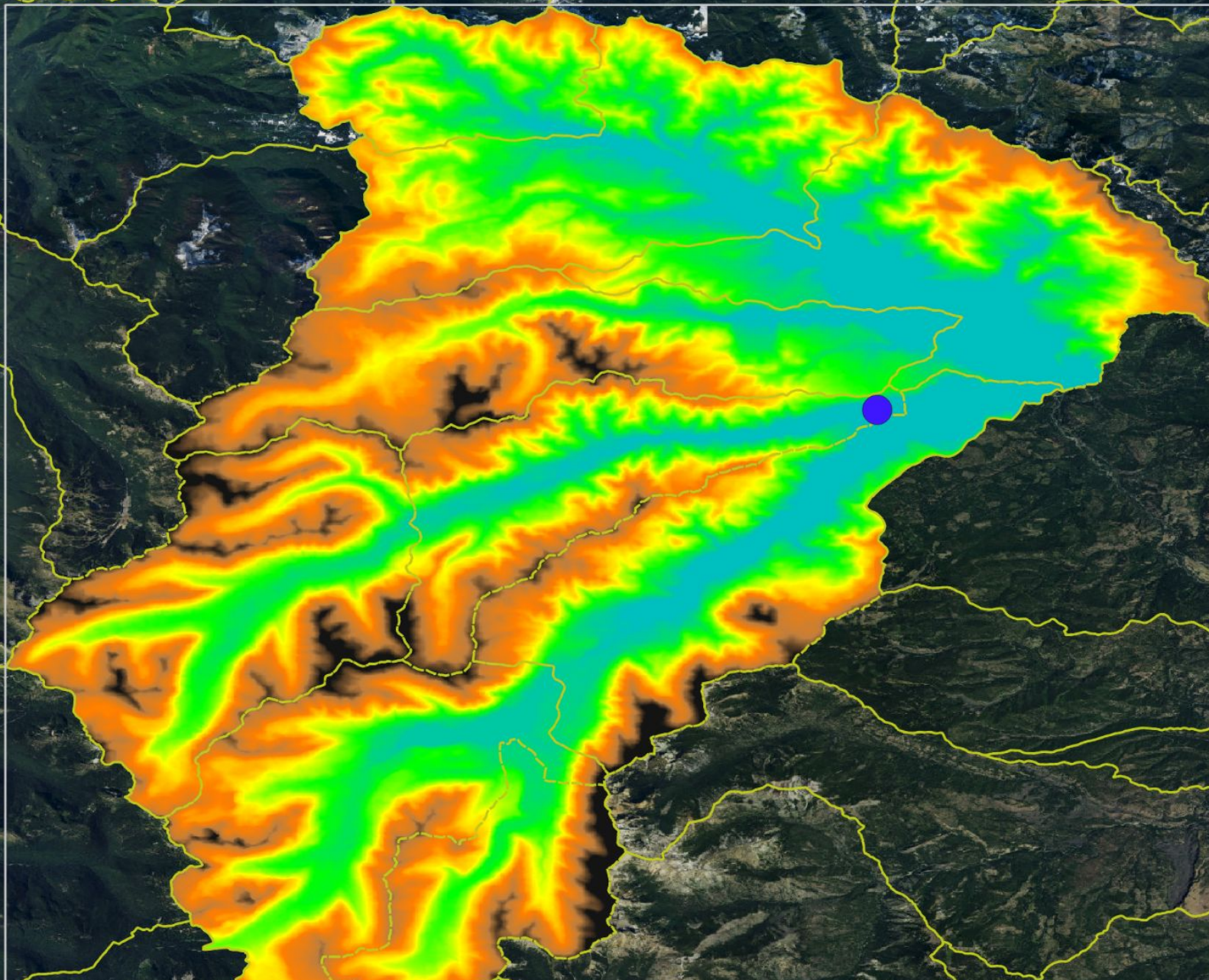
NASADEM\_HGT v001: [https://lpdaac.usgs.gov/products/nasadem\\_hgtv001/](https://lpdaac.usgs.gov/products/nasadem_hgtv001/)





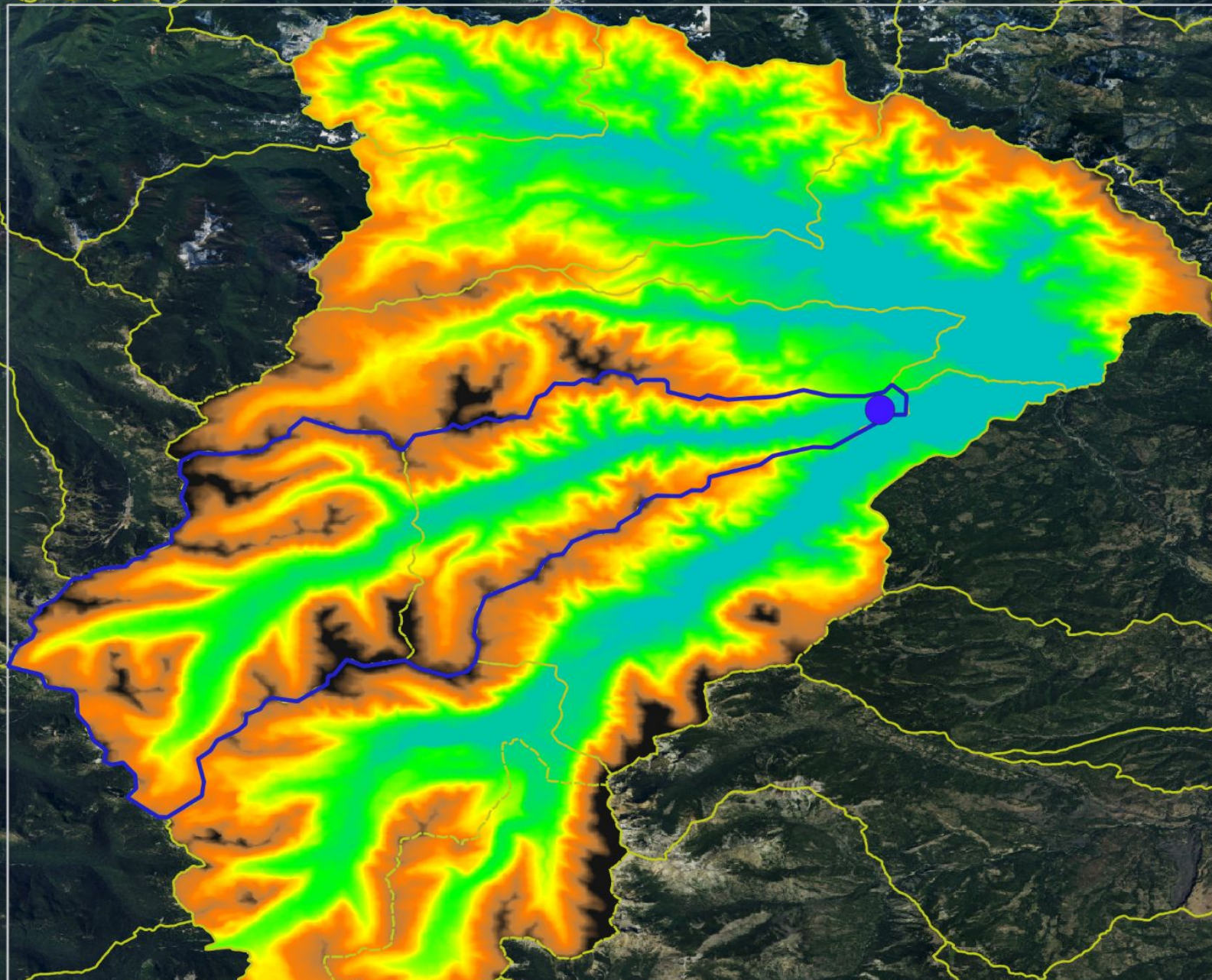
**Model simulations were conducted on a HUC10 watershed**





One USGS gage present at “American River Near Nile, WA - 12488500”





Upstream basin for the USGS gage is composed of two HUC12 basins



# Evaluation datasets

- Discharge data from USGS gage stations (fully automated via USGS APIs); watershed vectors from NHD;
- 500 m resolution GPP, LAI, and ET from NASA MODIS -- we have developed scripts to automate the download data for watersheds of interest via NASA AppEEARS REST PI (requires EarthData Auth)

# Metrics for hydrological flow evaluation

- ILAMB-Watersheds includes all standard benchmarking metrics supported by ILAMB
- ILAMB-Watersheds also calculates Nash–Sutcliffe Efficiency (NSE); Kling Gupta Efficiency (KGE); and metrics/plots to assess low/high/peak flow magnitude and timing;



# What's next

- Additional metrics/statistics for hydrological flow properties (high/low flow quantity and timing etc.); seasonal biases; etc.
- Ecohydrological functional metrics: ex. precip vs flow vs ET
- Read gridded model (ATS/SWAT/NWM) outputs for evaluation
- Quantify uncertainties: model -- observation scale mismatch
- Regional/national scale meta-analysis and evaluation metrics for simulations across many watersheds

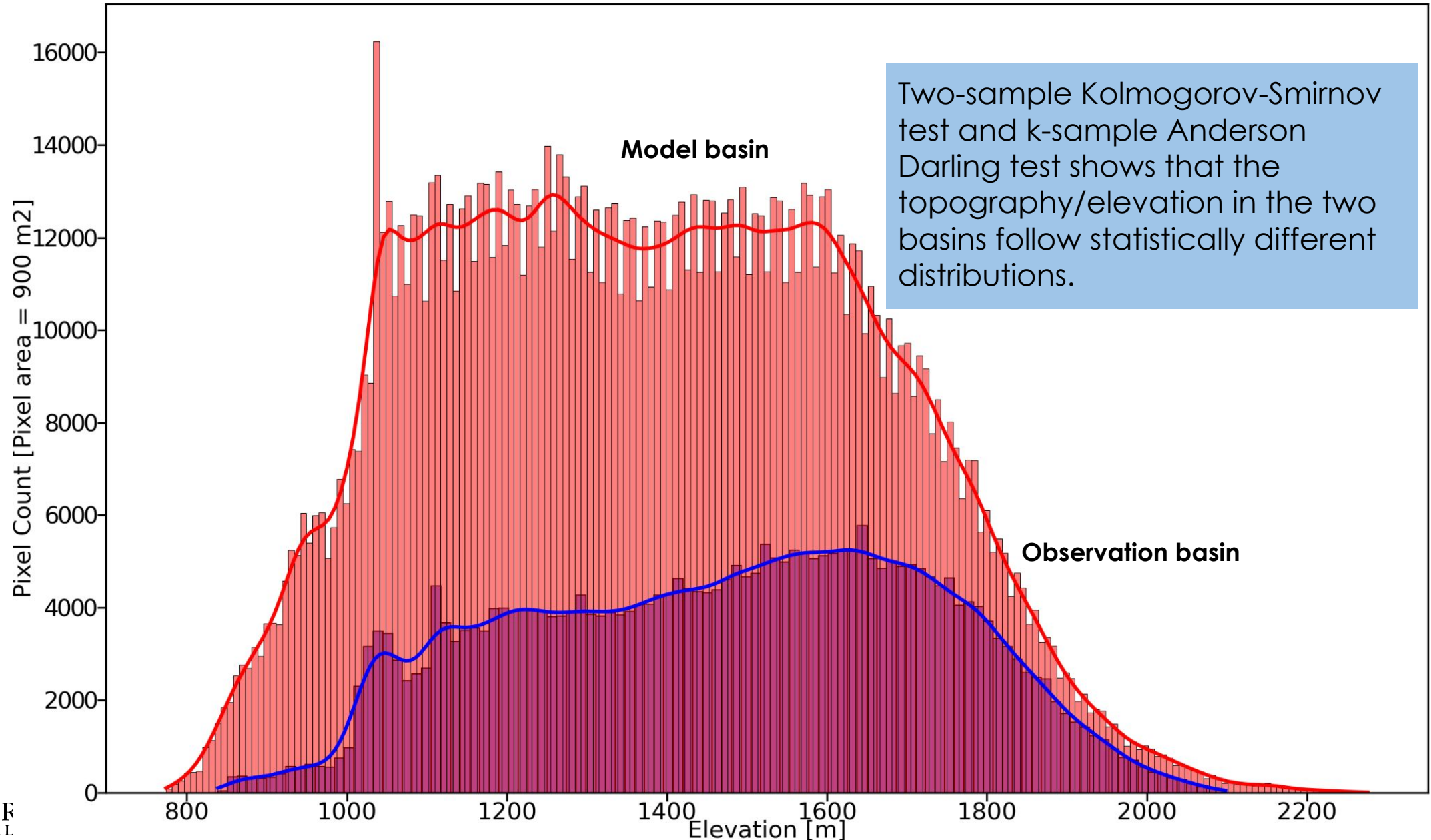


# Mismatch between models and observations

- Contributing areas for model vs gage station (observations) are not the same
- Quantifying potential mismatches would be important for fair comparison and interpretation of the evaluation metrics
-

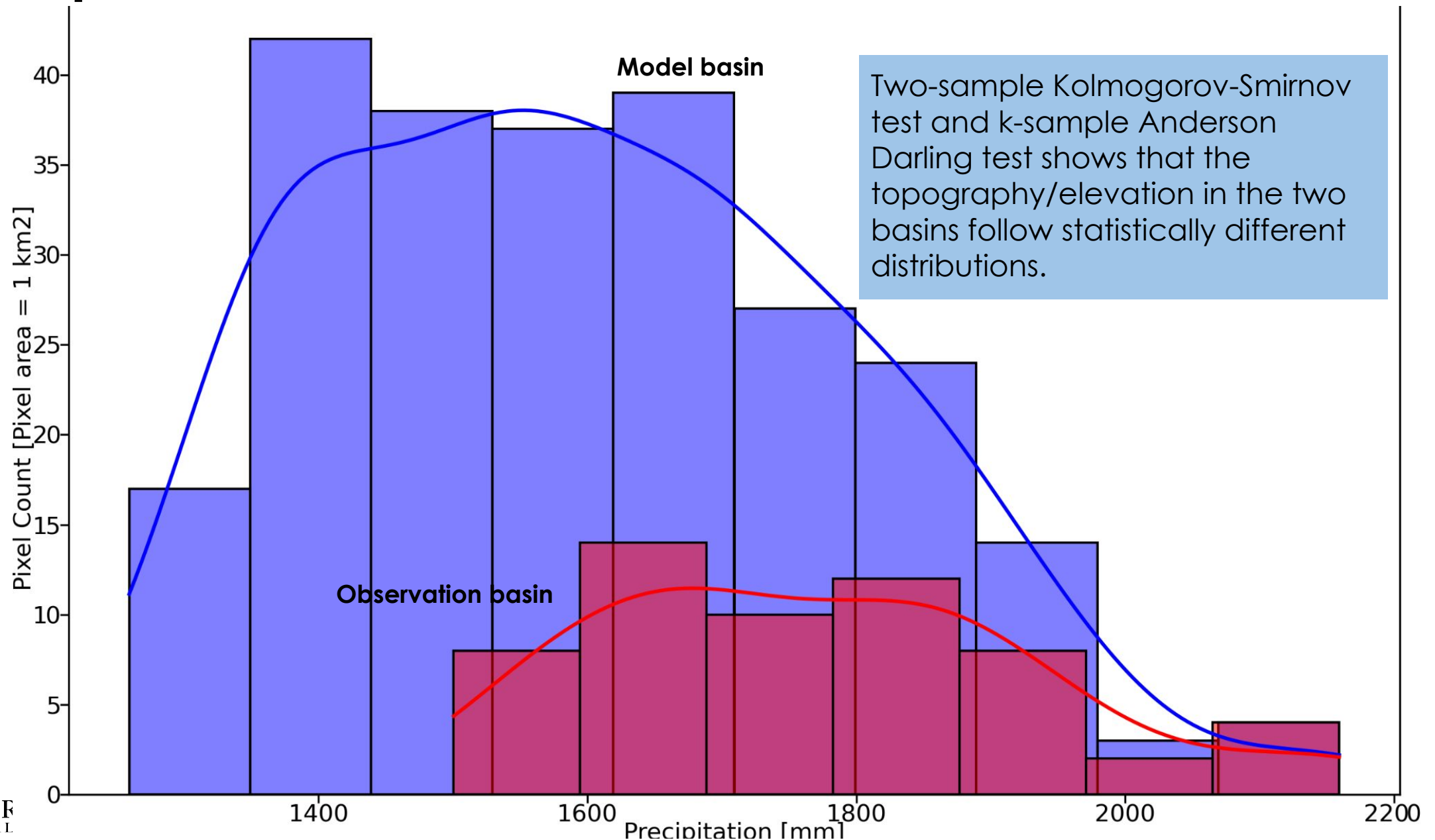


# Topographic characteristics of the watershed





# Precipitation distribution in the watershed





# Help us improve ILAMB-Watersheds

- Send us your questions/comments/PRs and ideas for
  - new features
  - evaluation metrics
  - benchmark datasets
- Share your model results (whether at a point, watershed, regional or global scale) -- they would help us develop new use cases and model specific functions/metrics;
- We would like to work with the model developers to improve model outputs and ILAMB configuration;