# Advancing Visualization-Based Methods for the Evaluation of Large Scale Operational Hydrologic Forecasts following Significant Flood Events

OWP | OFFICE OF WATER PREDICTION


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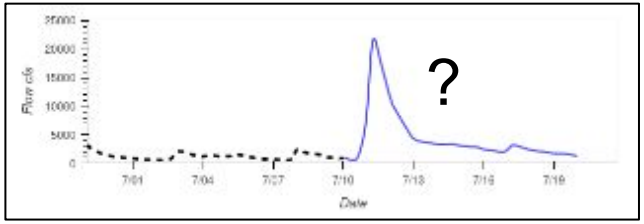
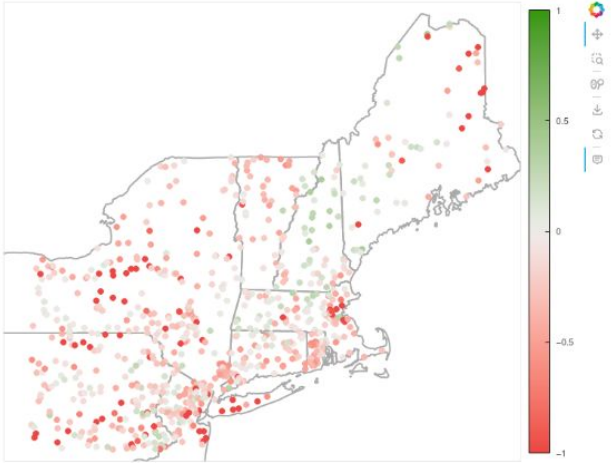
# Motivation

“How did we do?”



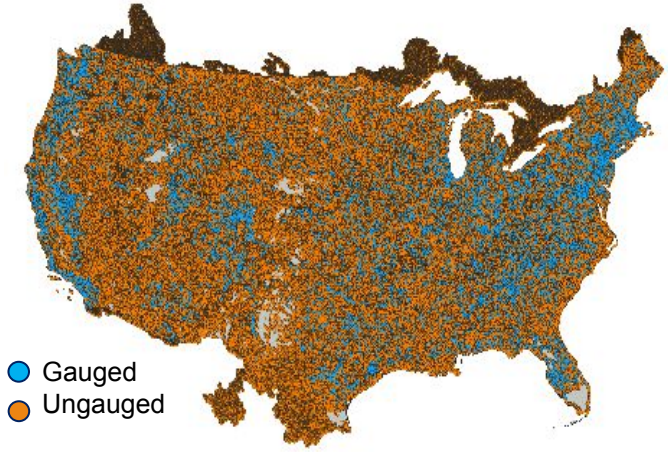

- Were high flows forecast in the right place?
- Were they roughly the right magnitudes, or too high or too low?
- Was the peak at the right time, or too early or too late?
- How far in advance of the event were high flow signals showing up in the forecasts?
- How consistently were high flow signals showing up in the forecasts?

# Motivation



Kling Gupta Efficiency (KGE) for all NWM medium range forecasts issued July 4-11)

Statistics mask the story




~3M+ forecast points

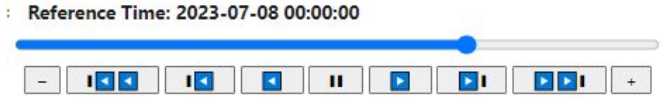
Single location evaluations tell only a very small part of the story

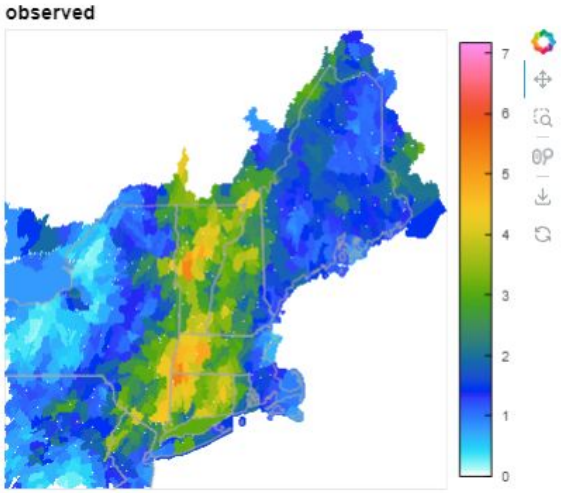
# The Goal

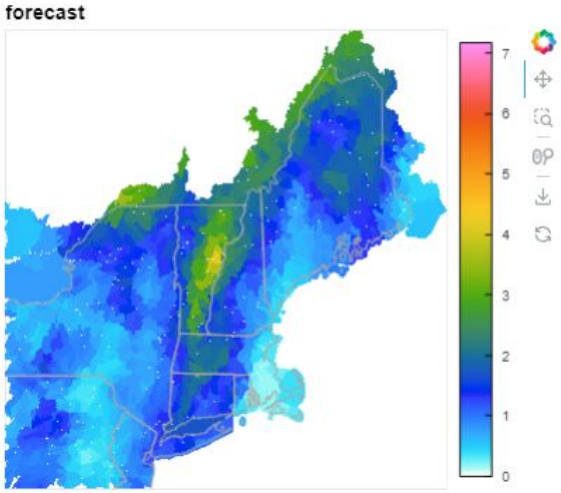
- Build tools to **interactively visualize and explore the forecast data** in different ways across a region of interest to help us uncover and communicate the forecast performance story

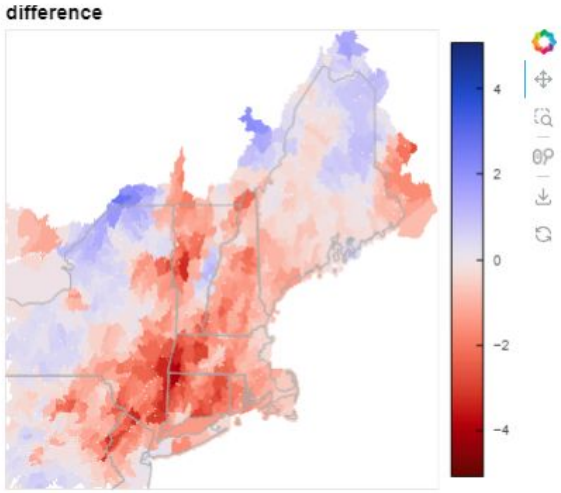
  - Leverage CIROH TEEHR and other modern open source tools and platforms
  - Build prototype dashboards in Jupyter Notebooks, then deploy as external dashboards and/or migrate to web apps for broader use

# Examples: Total precipitation, forecast by forecast

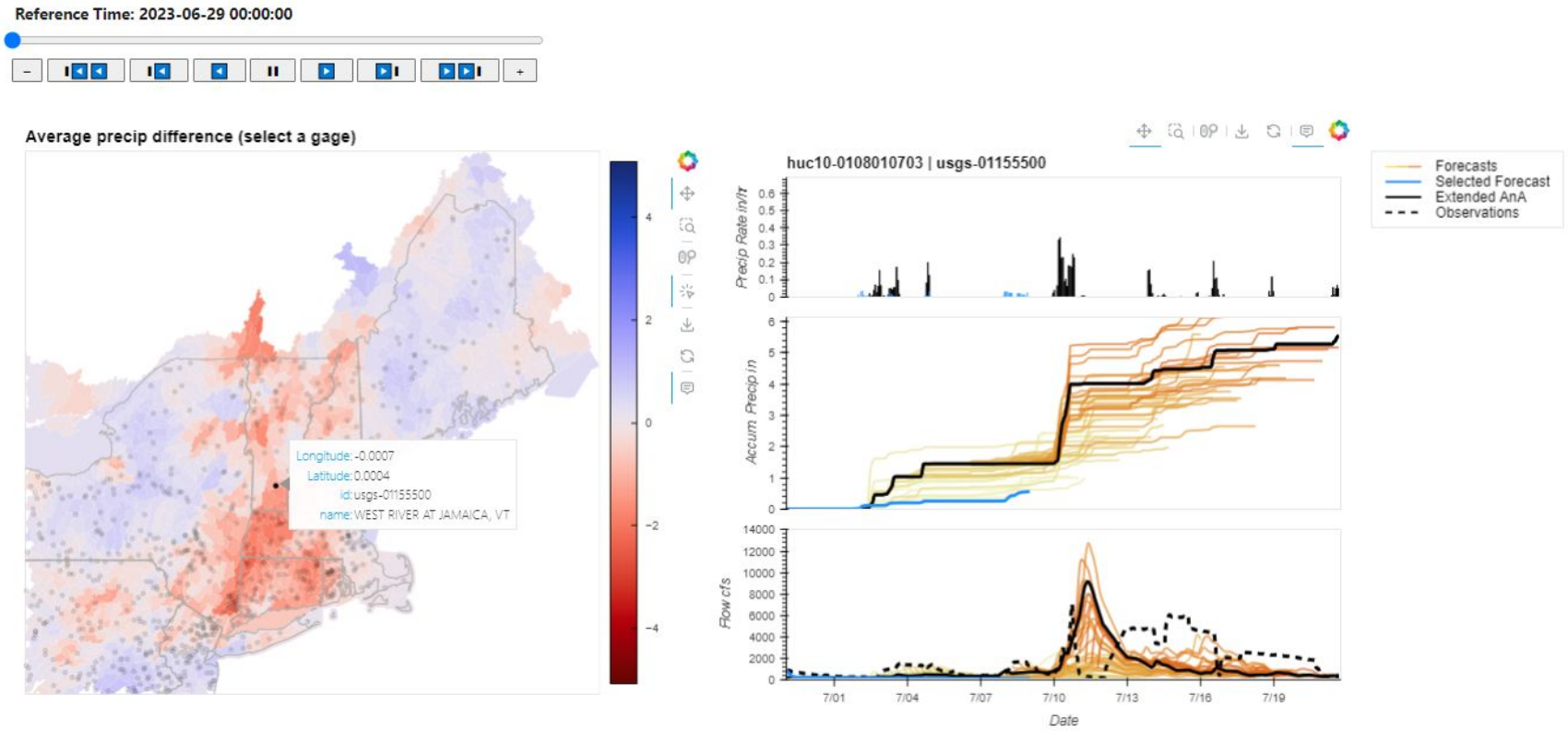


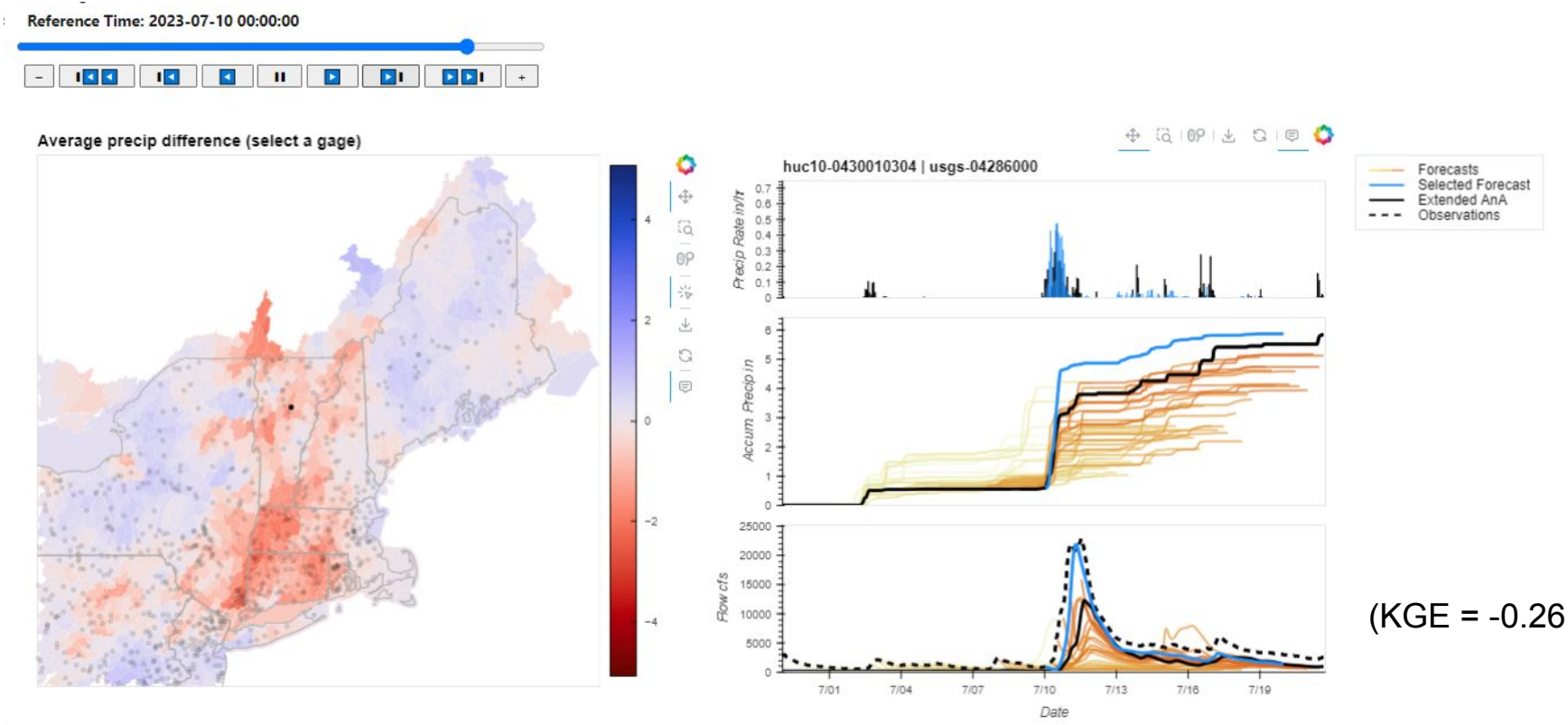



# Forecast spaghetti by location



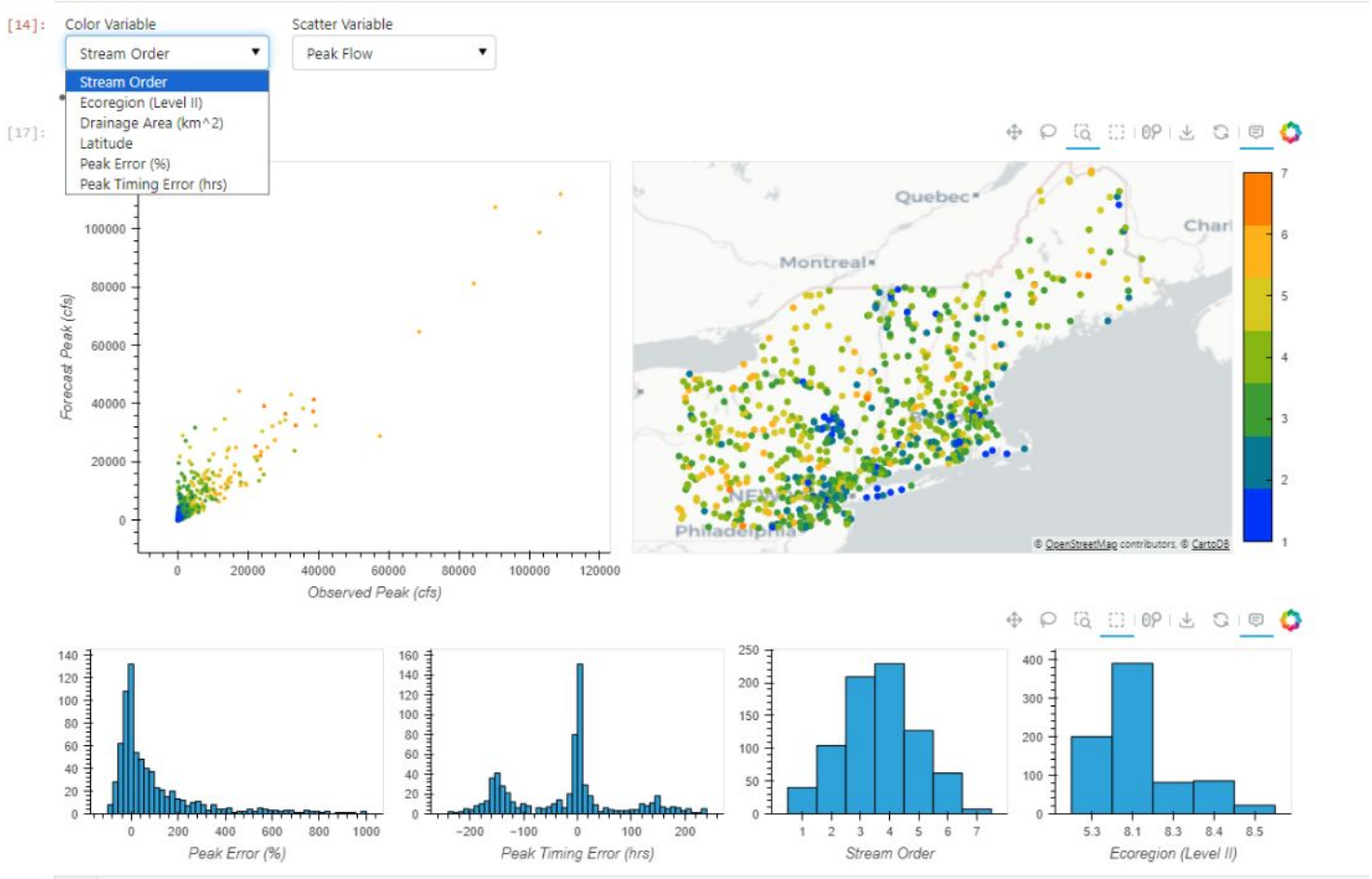
# Forecast spaghetti by reference/issue time



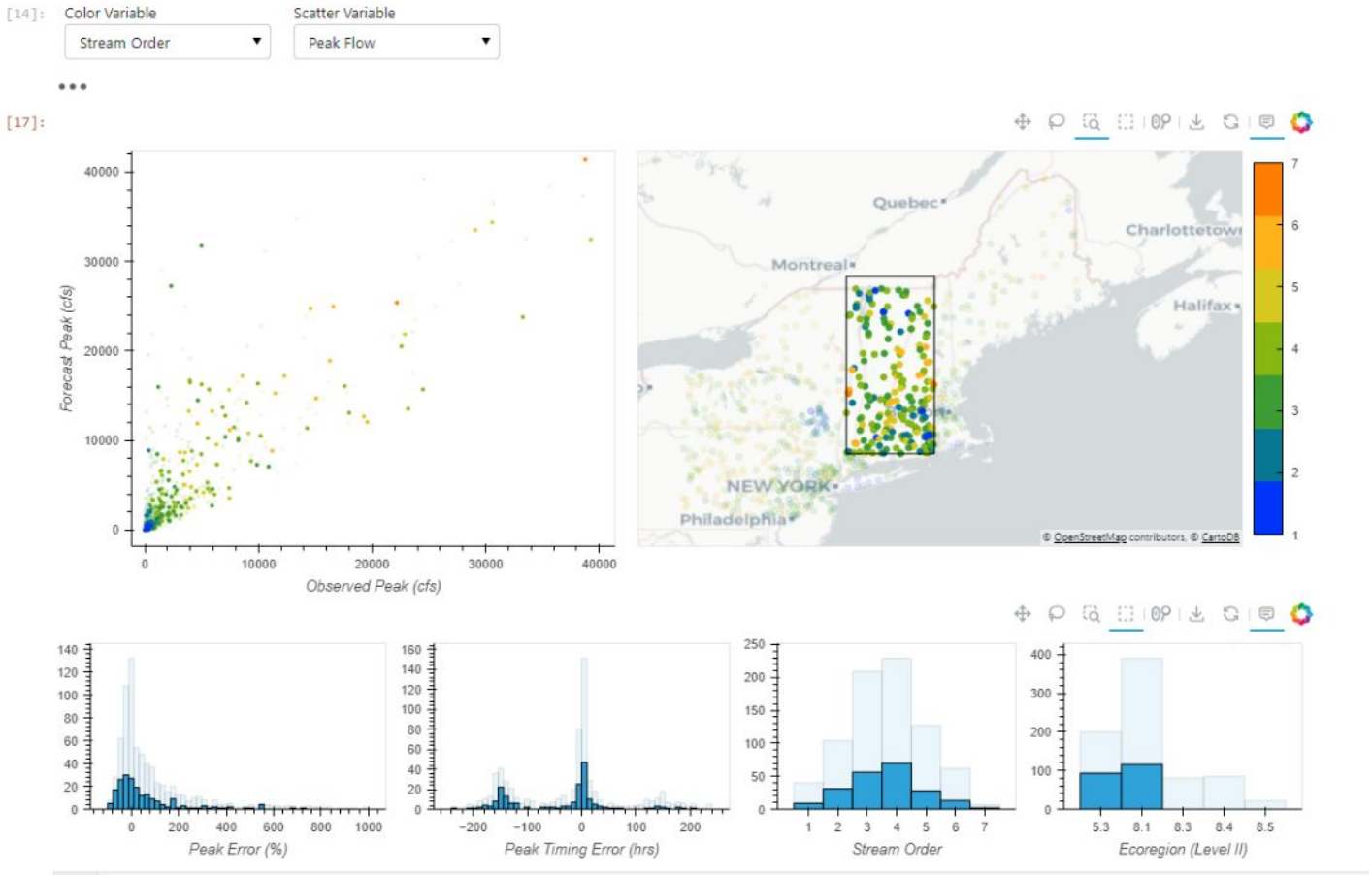

(KGE = -0.261)

(to be GIF)

# Linked scatter, map and distributions



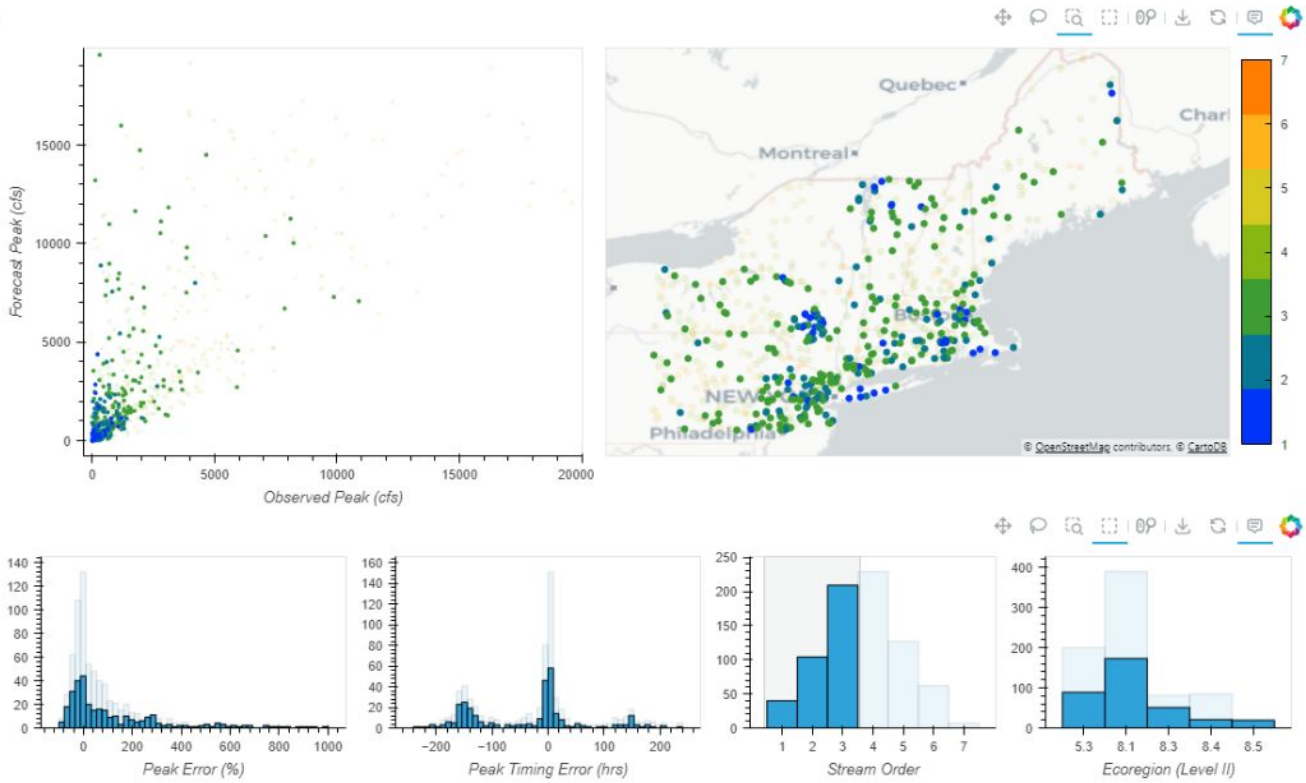
# Linked scatter, map and distributions –region subset



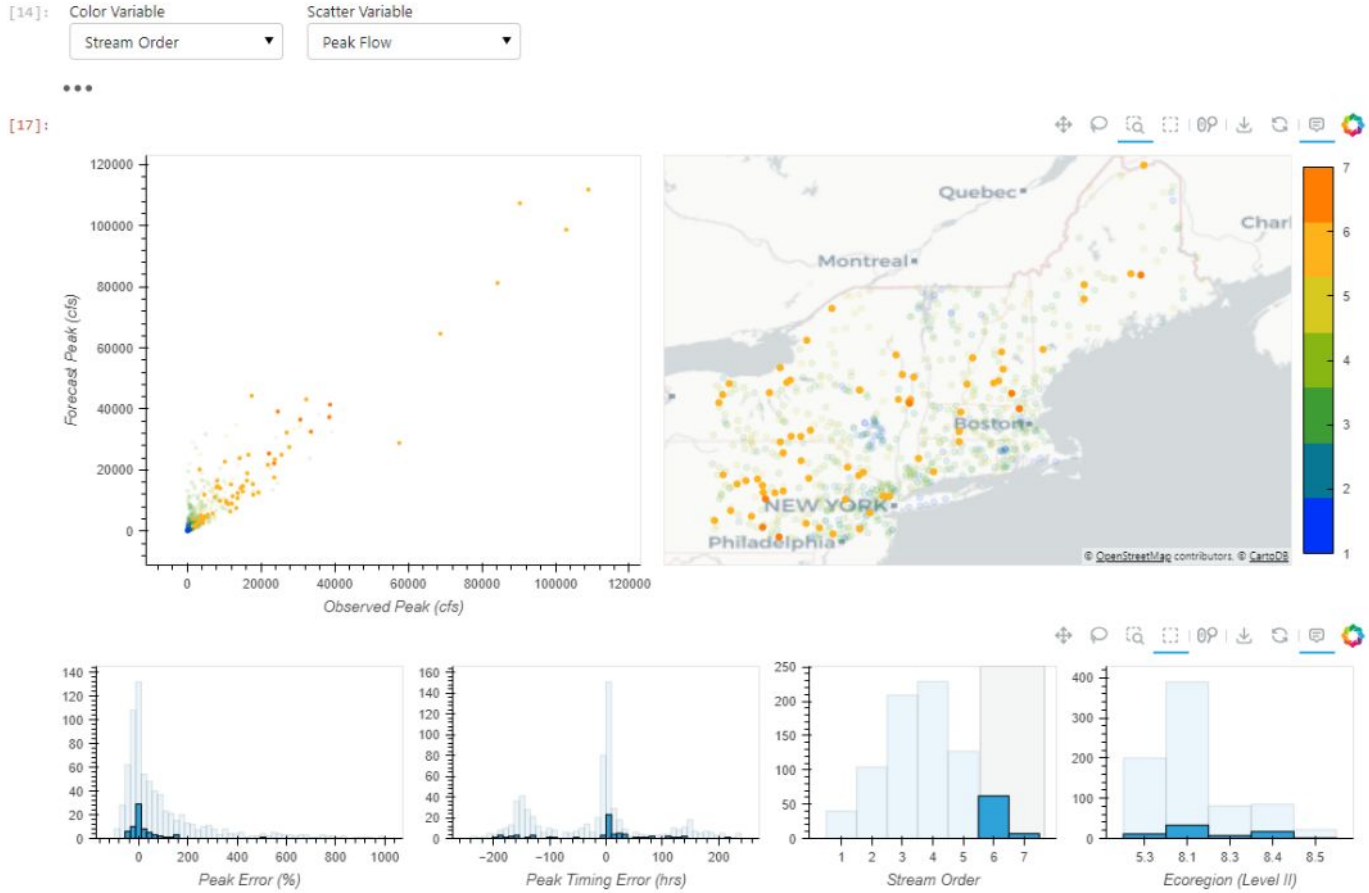
# Linked scatter, map and distributions – small streams

[14]: Color Variable: Stream Order | Scatter Variable: Peak Flow

[17]:



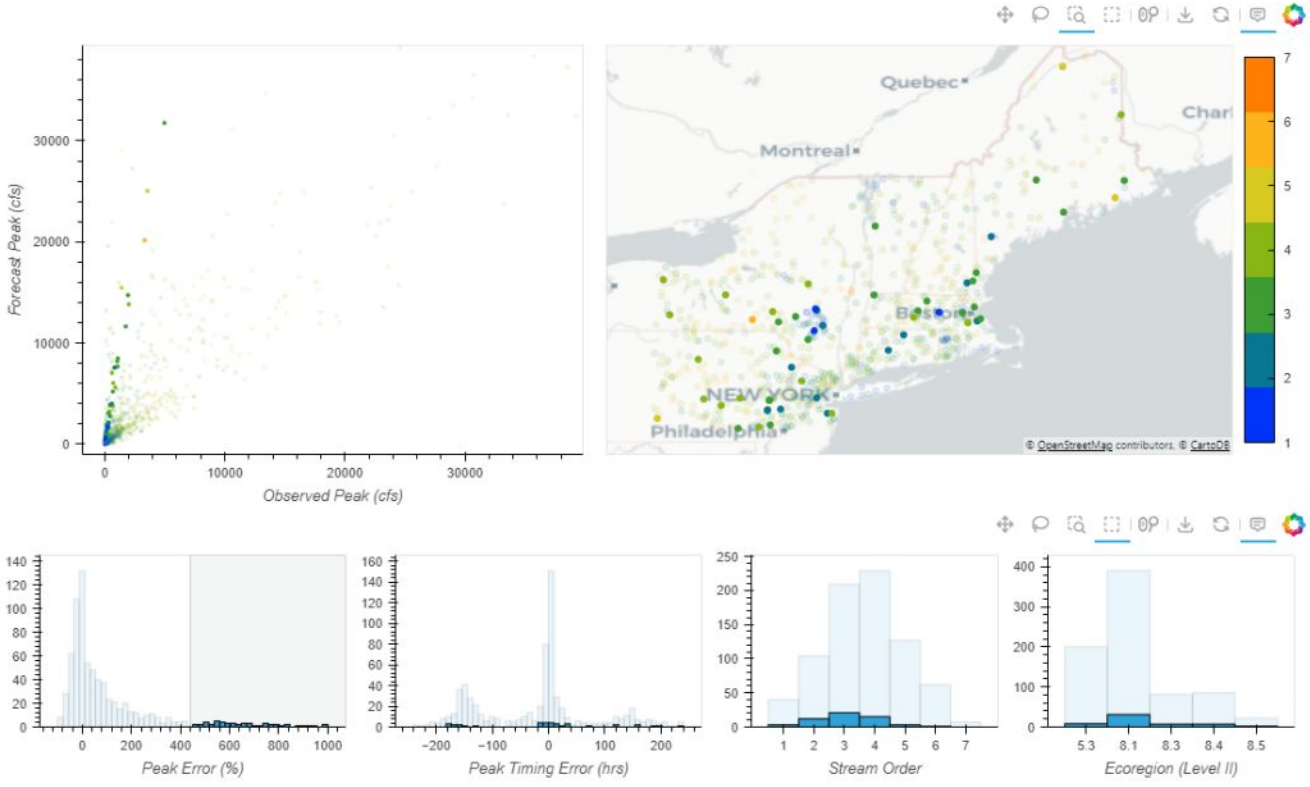
# Linked scatter, map and distributions – large streams



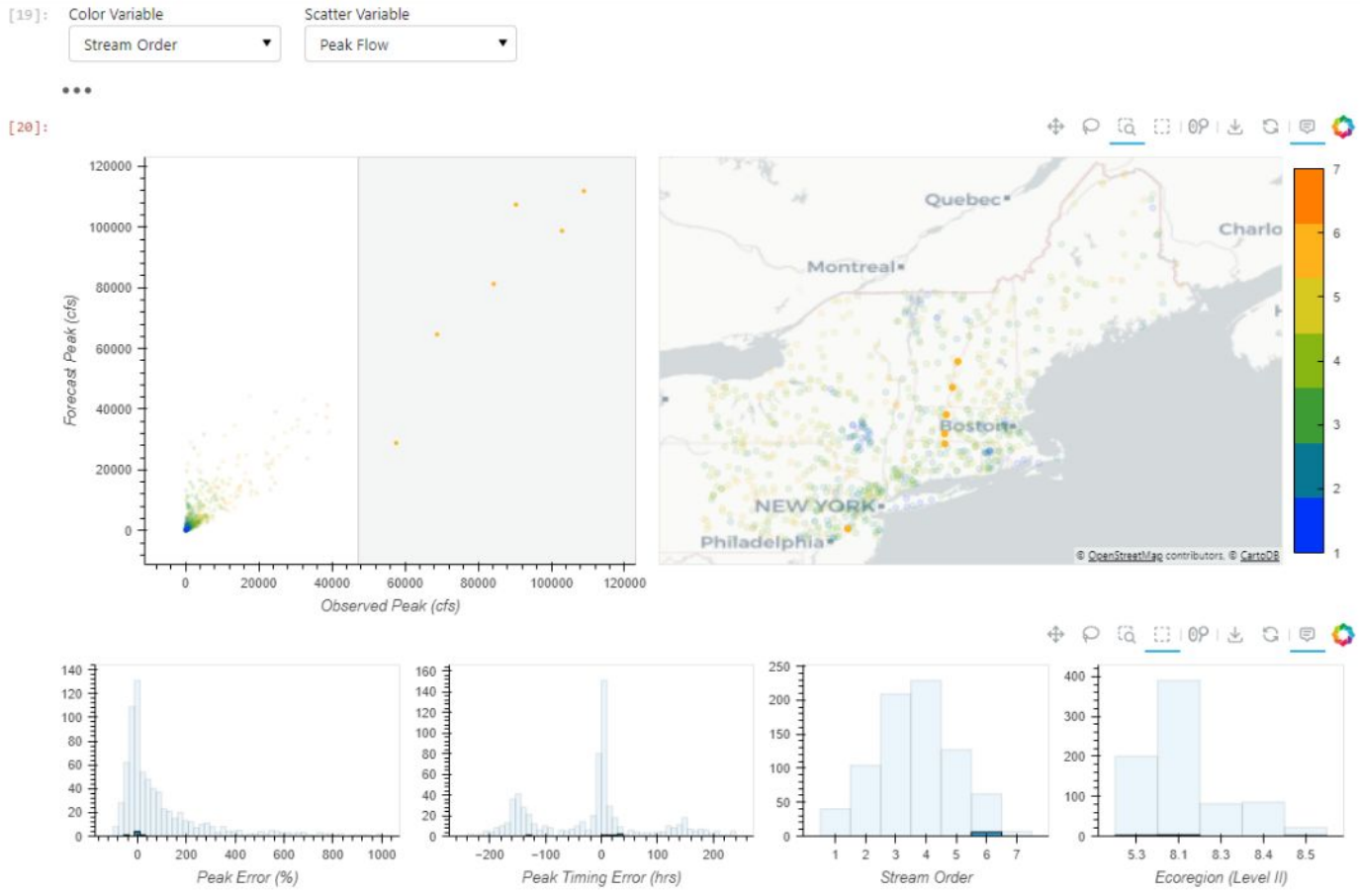
# Linked scatter, map and distributions – over predictions

[14]: Color Variable: Stream Order | Scatter Variable: Peak Flow

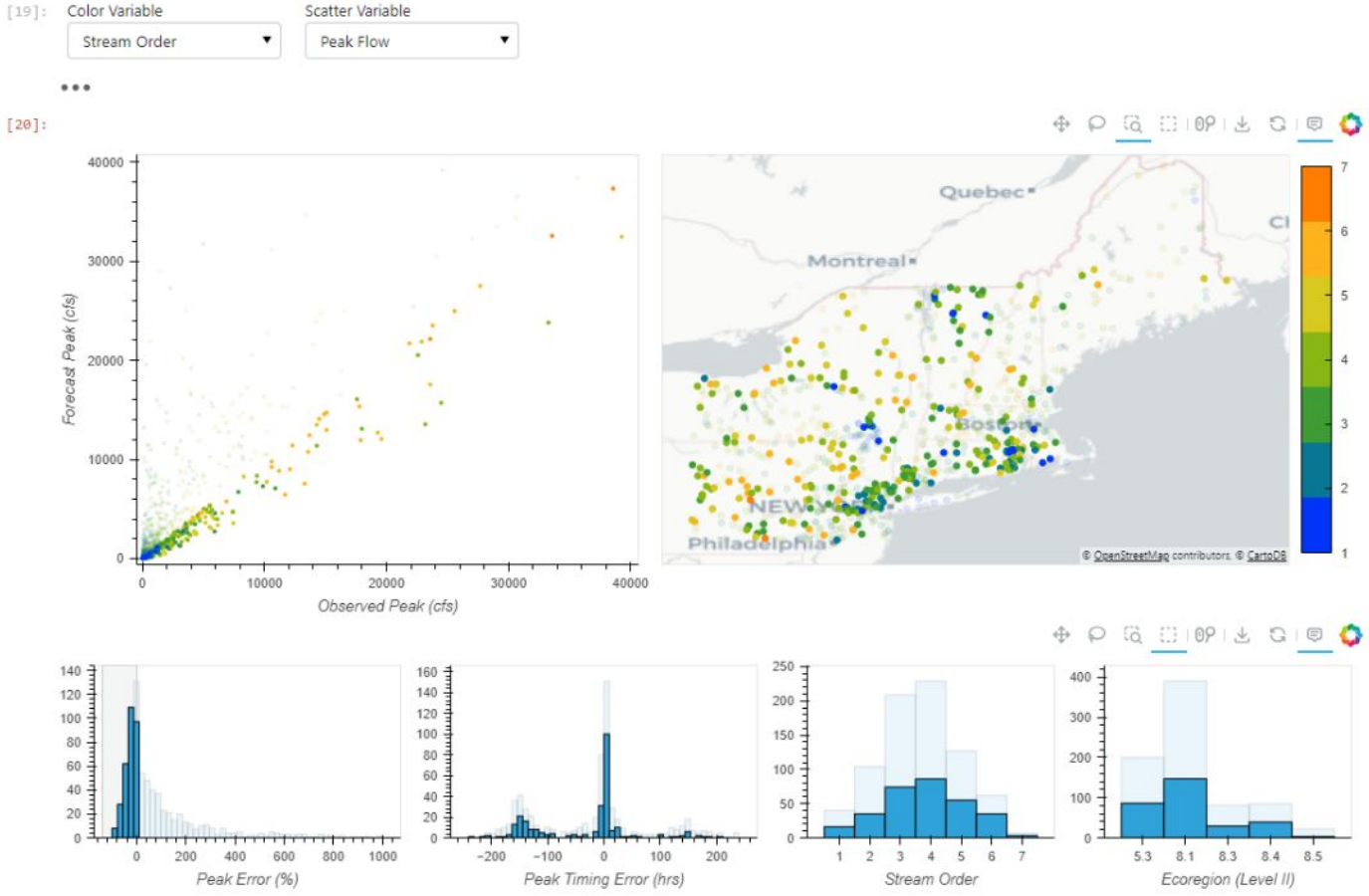
[17]:



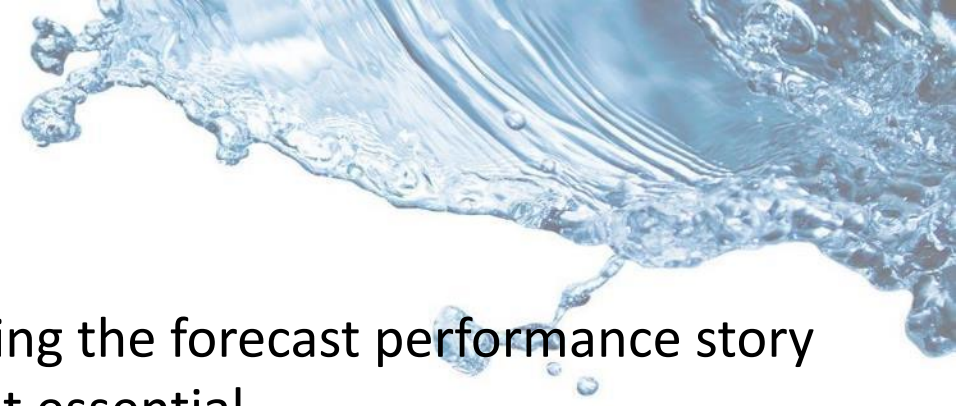
# Linked scatter, map and distributions – outliers?



# Linked scatter, map and distributions – under predictions



# The Take Aways



- Discovering and communicating the forecast performance story after floods is challenging, but essential
- Statistics mask the story and single locations tell only a very small part of the story
- OWP and CIROH are working on creative, interactive tools to explore the forecasts, tell the full performance story, find issues and their causes, and **to continue improving the forecasts for public benefit**

Acknowledgments

# *Thank You!*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