

Advancing Coastal Hydrodynamic Modeling: Integrating D-Flow FM into the NextGen Framework for Lake Champlain's Water Level Predictions



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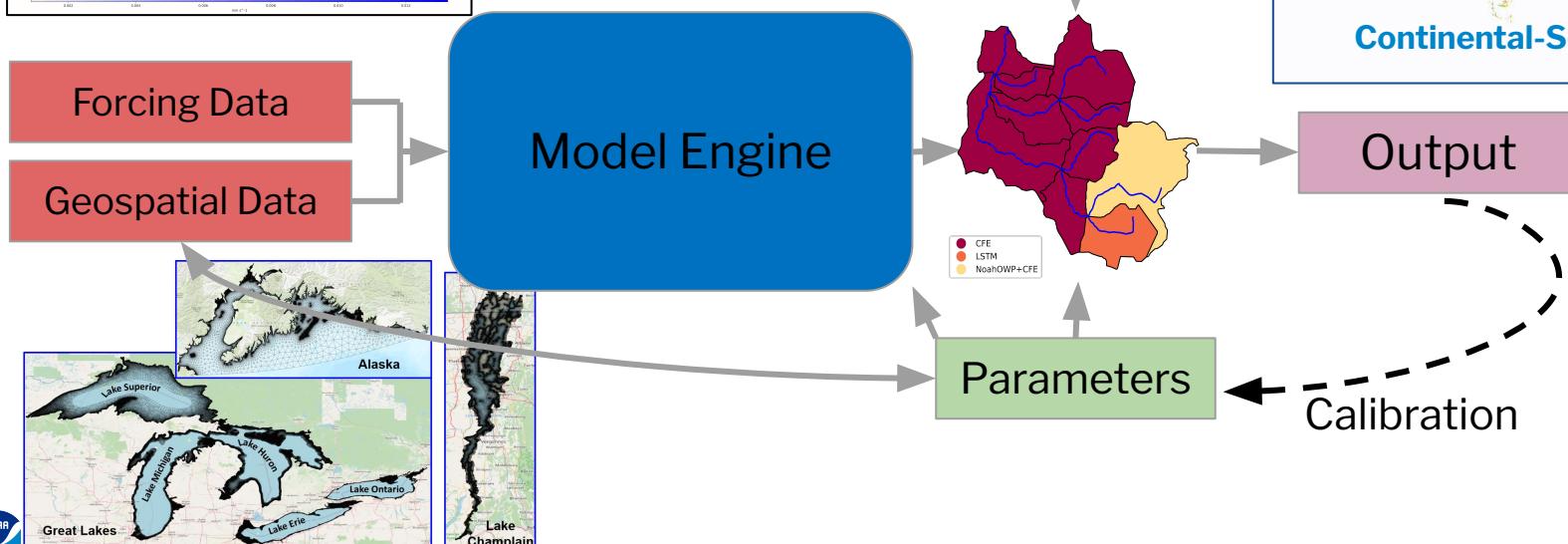
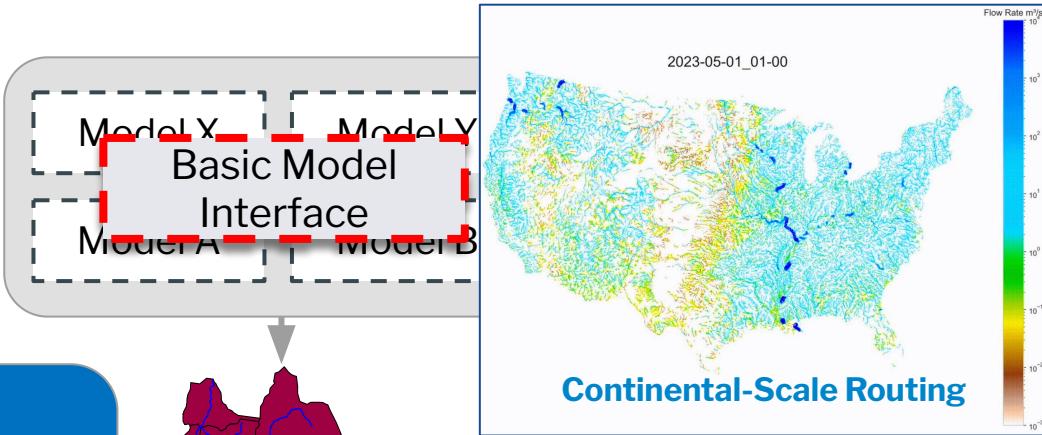
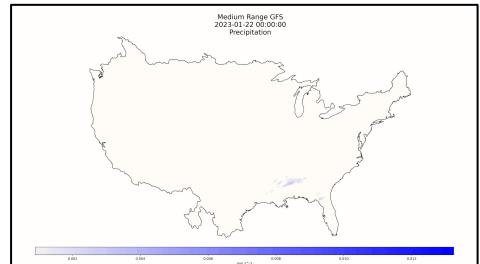
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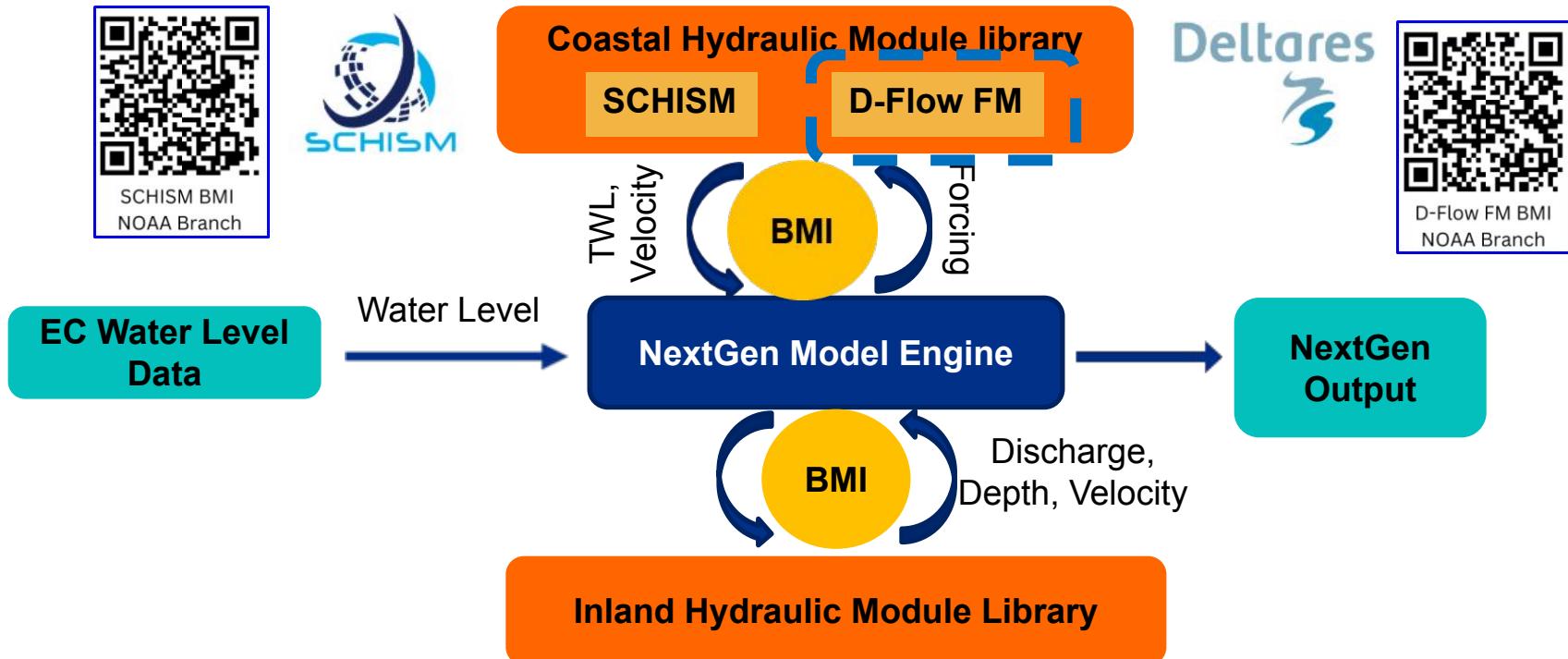
³Cooperative Institute for Research to Operations in Hydrology, Tuscaloosa, AL, USA

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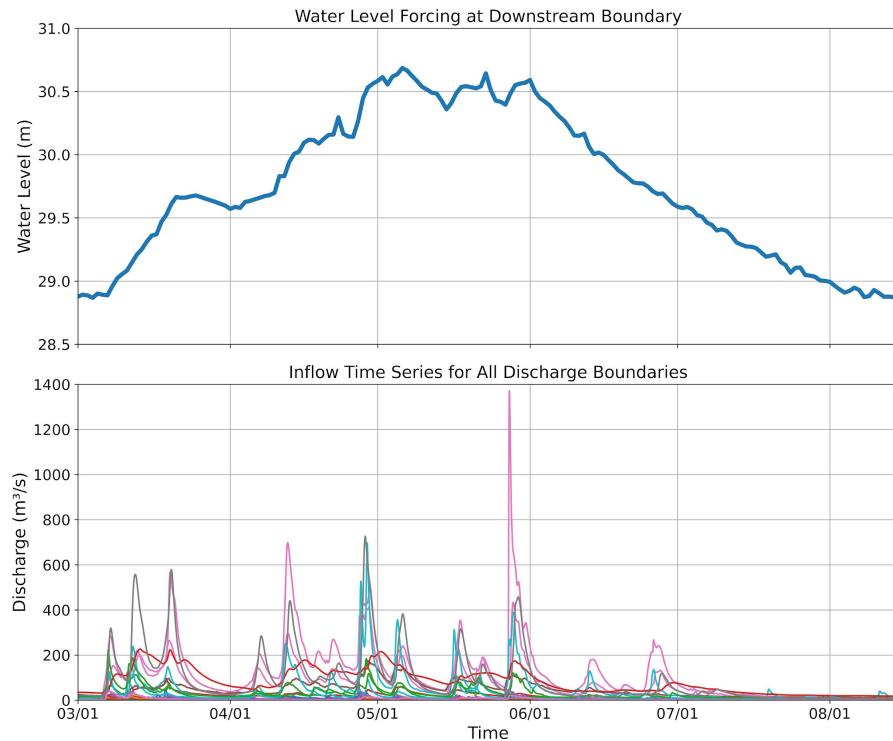
NWM v.4.0 - Community Development Using NextGen



Coastal Module Library in the NextGen Framework



Lake Champlain Coastal Forcing Inputs



WL boundary from
Environment Canada

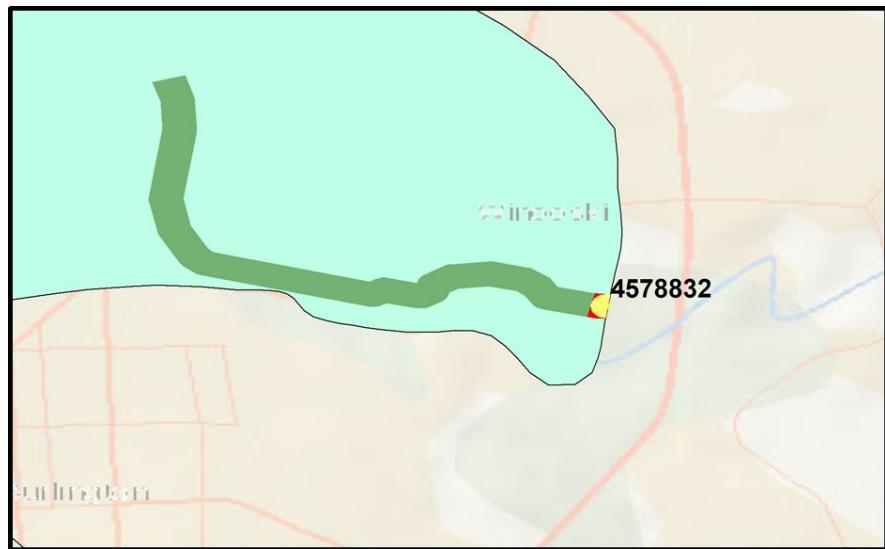
68 NWM v3 inland
boundary stream flows



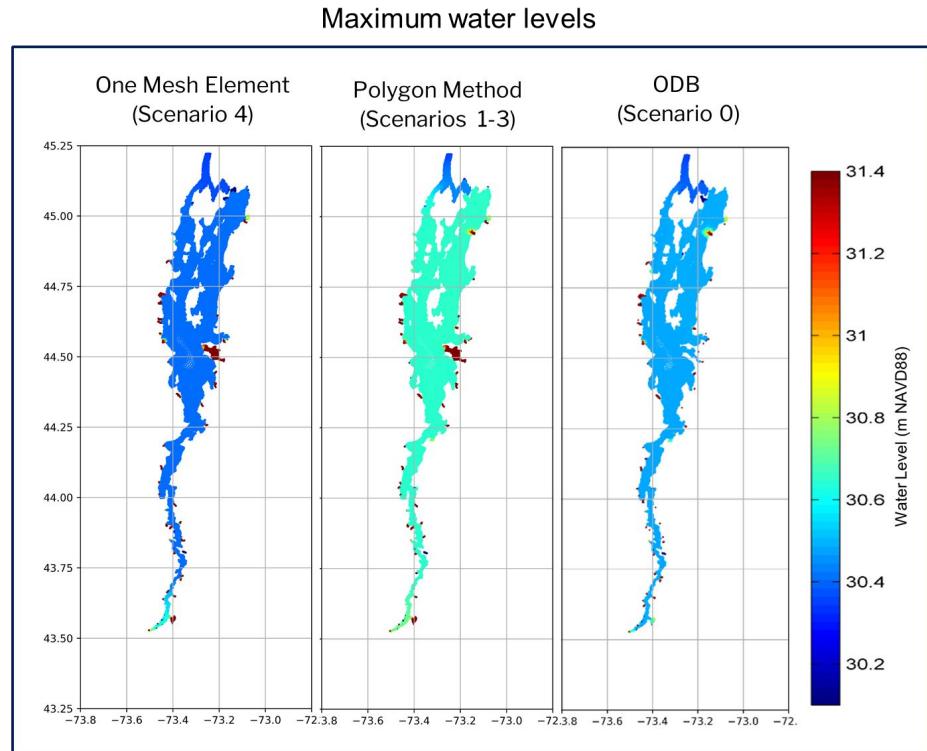
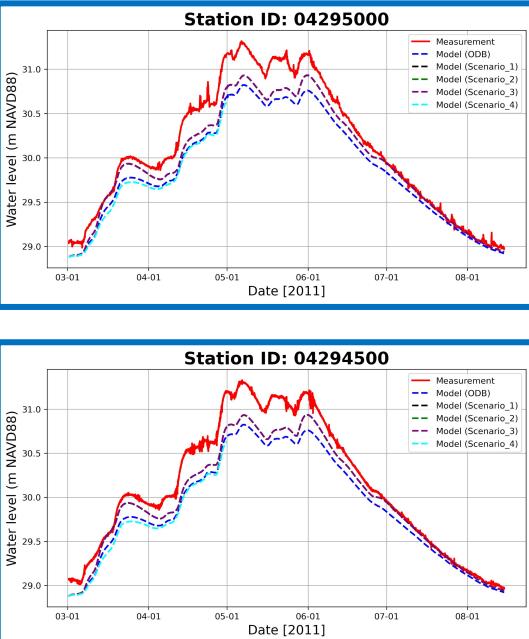
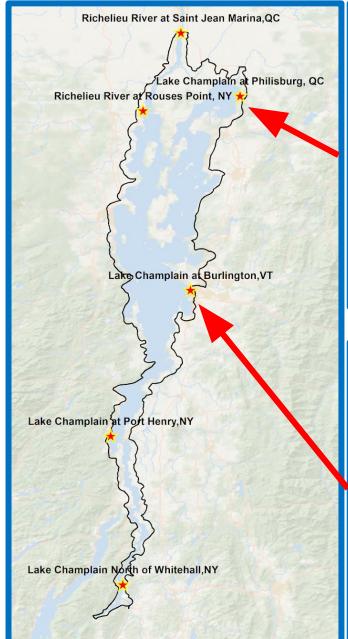
WL Boundary
Discharge

Strategies to Incorporate Inflows

| Scenario | Polygon |
|----------|-------------------------------------|
| 0 | Open Discharge BNDs (ODB) |
| 1 | Polygon: Green Areas |
| 2 | Polygon: Yellow Semicircle |
| 3 | Polygon: Red Quadrangle |
| 4 | One Mesh Element |



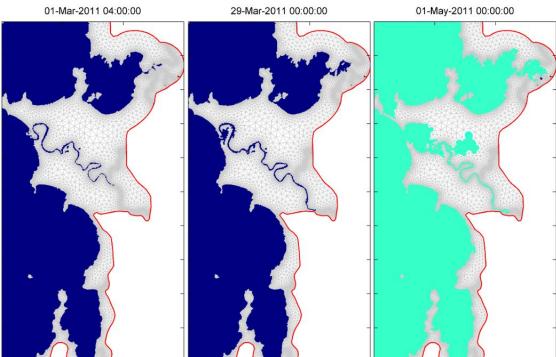
The Open Discharge Boundaries (ODB) Method Under-predicted the TWL Compared to the Polygon Approach



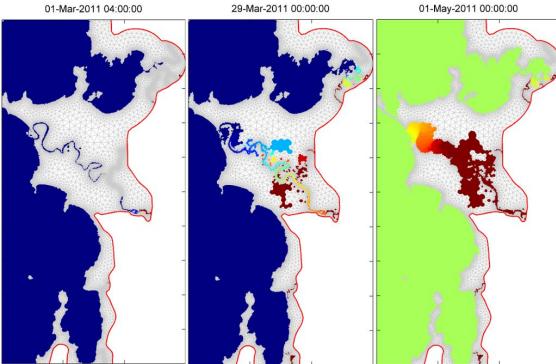
The ODB Method Requires Topo-Bathy Modification

ODB

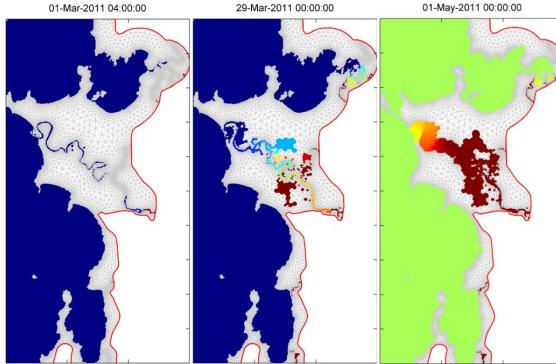
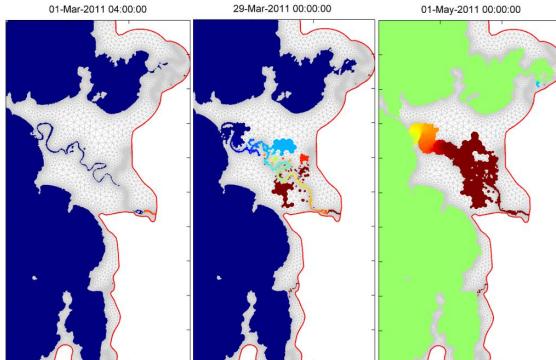
Original Bathymetry



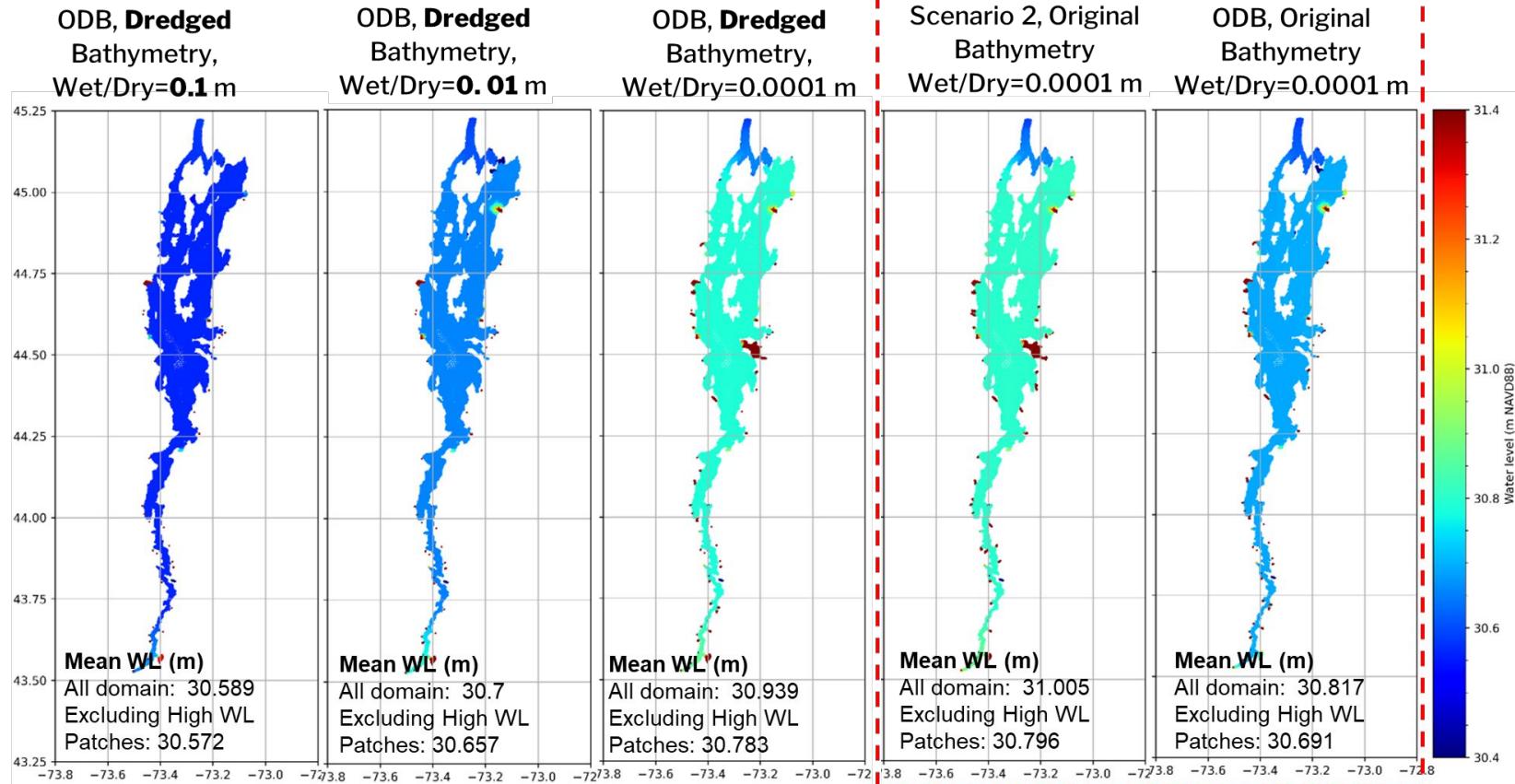
Polygon
(Scenario 2)



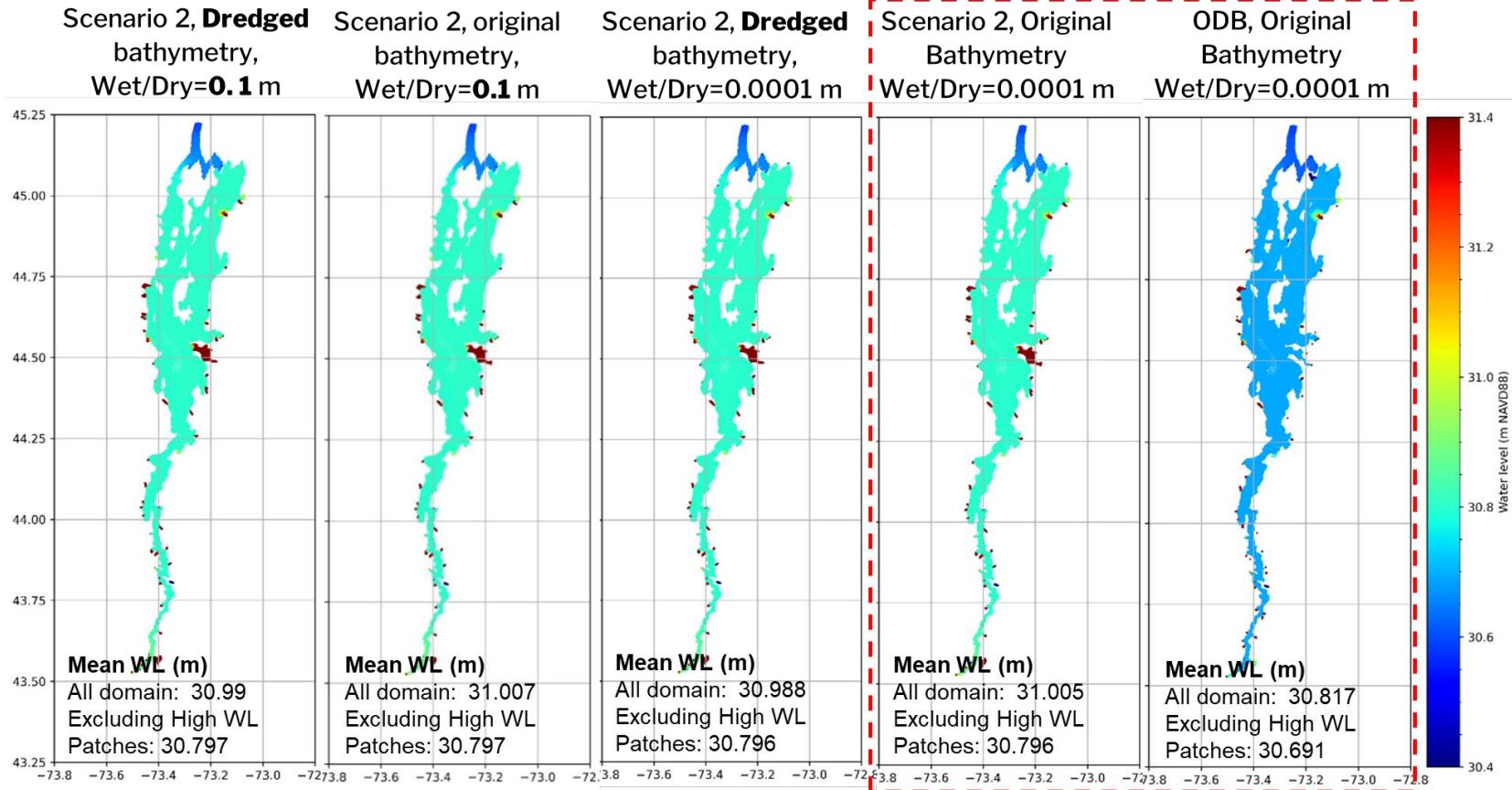
Modified Bathymetry at Inflow Boundaries



ODB is Sensitive to Wetting/Drying Threshold



The Polygon Approach is Insensitive to the Dredged Bathymetry at Inflow Locations and Wetting/Drying Threshold



Conclusions and Future Work

- The ODB method requires modification of the topo-bathy to ensure that inflows will enter the model domain.
- The **polygon approach** takes advantage of natural bed slopes to route the inflows, thus **eliminating the need for bathymetry adjustments**.
- The polygon approach results in **faster and more stable model runs** which are independent from the selected wetting/drying threshold.
- Future improvements include coupling D-Flow FM with inland t-route streamflow, incorporation of wind and rainfall, and further evaluation of the TWL forecast capability under the NextGen Framework.



**Thank You
to our Partners!**

Related Presentations on Tuesday & Wednesday

- **Tuesday, 8:30-10:00 Hassan Mashriqui**, "Evaluation of Alaska's Coastal Zone Total Water Level Modeling System Developed for the Next Generation Water Resources Modeling Framework (NextGen)."
- **Wednesday, 3:00-4:30 Tayebeh Sangchoulie**, "Enhancing Total Water Level Forecasting for the Great Lakes and Lake Champlain using the Next Generation Water Resources Modeling Framework (NextGen)."





Thank You!



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<https://water.noaa.gov>

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