Progress on the MTM in the Potomac River

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ORISE

Chesapeake Bay Program

40 years of science, restoration and partnership

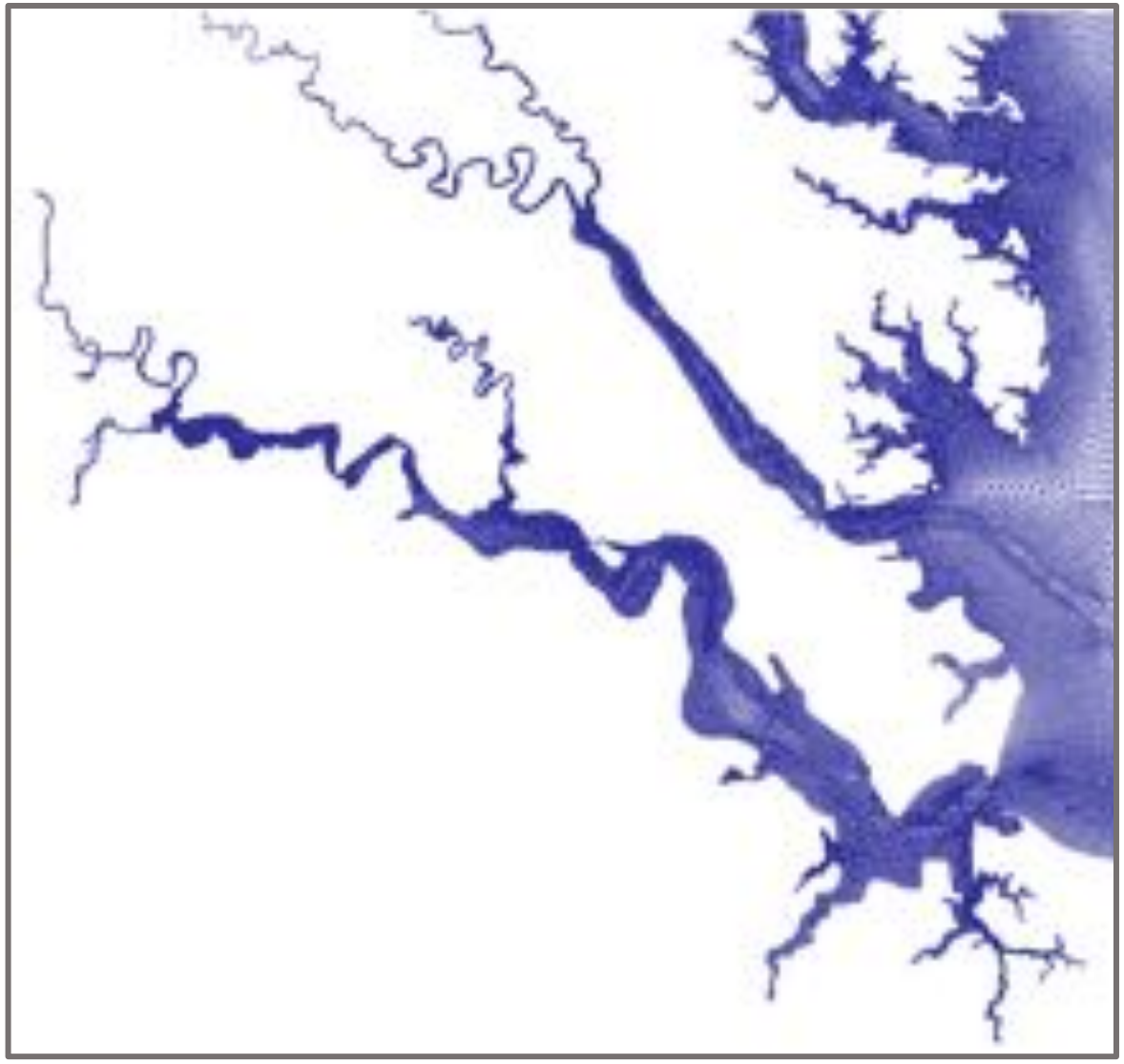
VIMS | William & Mary

Virginia Institute of Marine Science

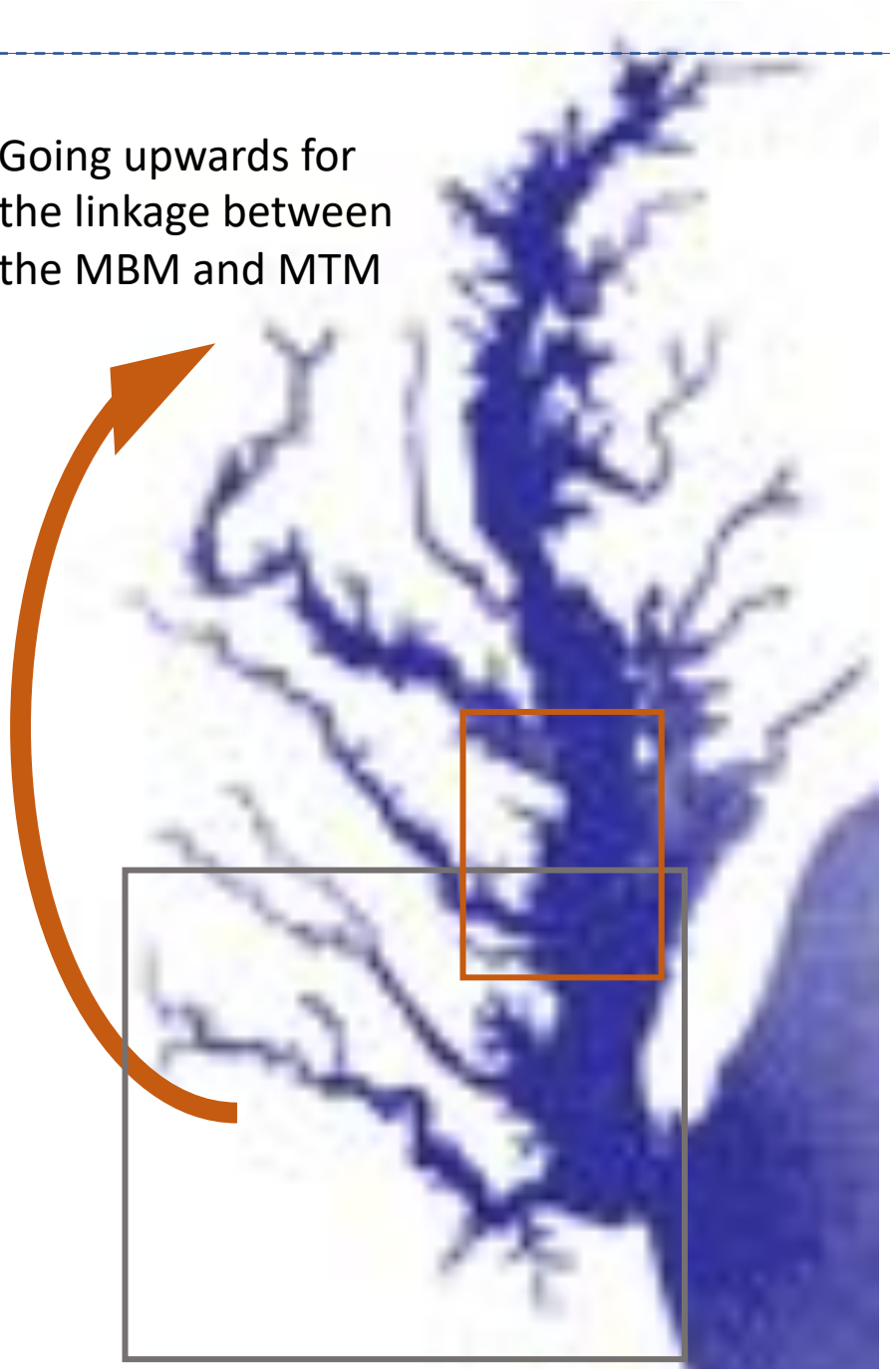
SCHISM

Progress of MTM development

Tidal James and York Rivers

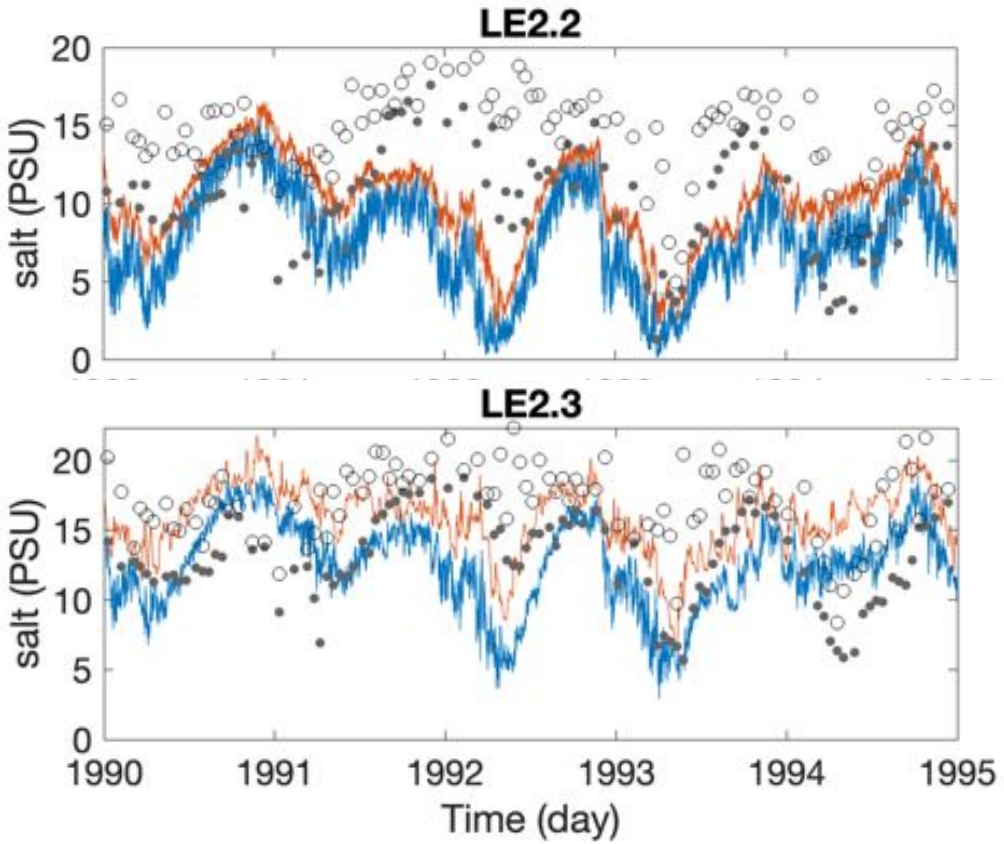


Going upwards for the linkage between the MBM and MTM

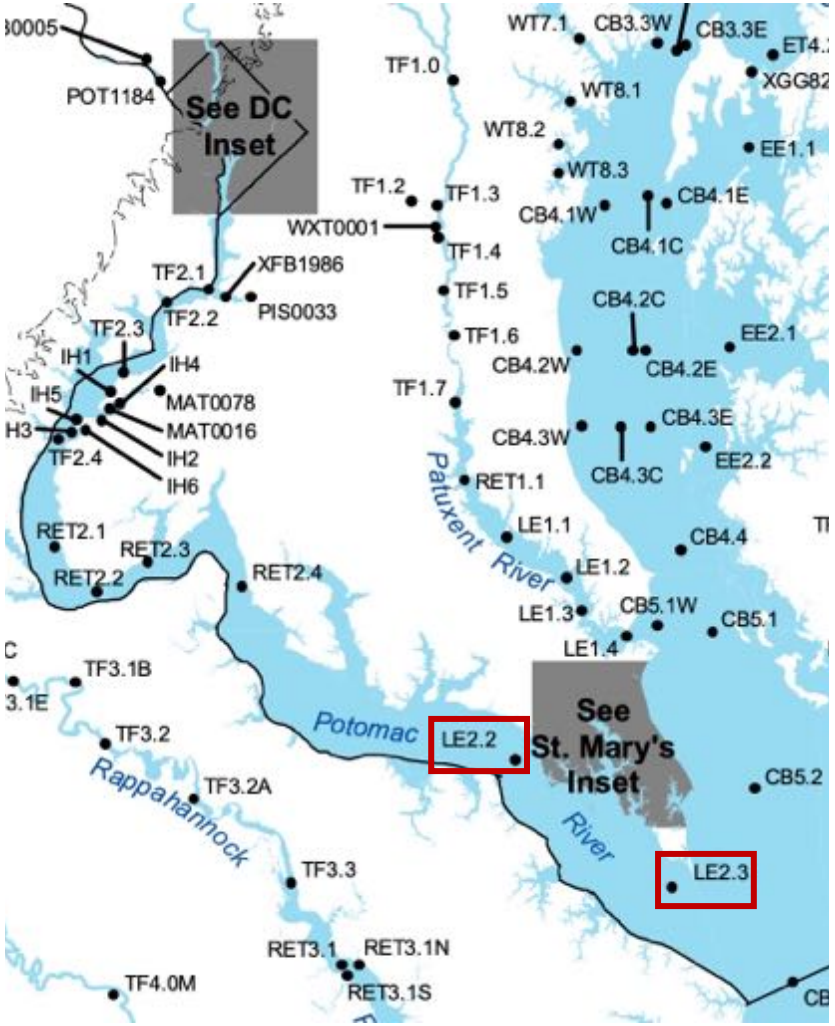


Improvement from grid refinements

Overall insufficient stratification from the mouth

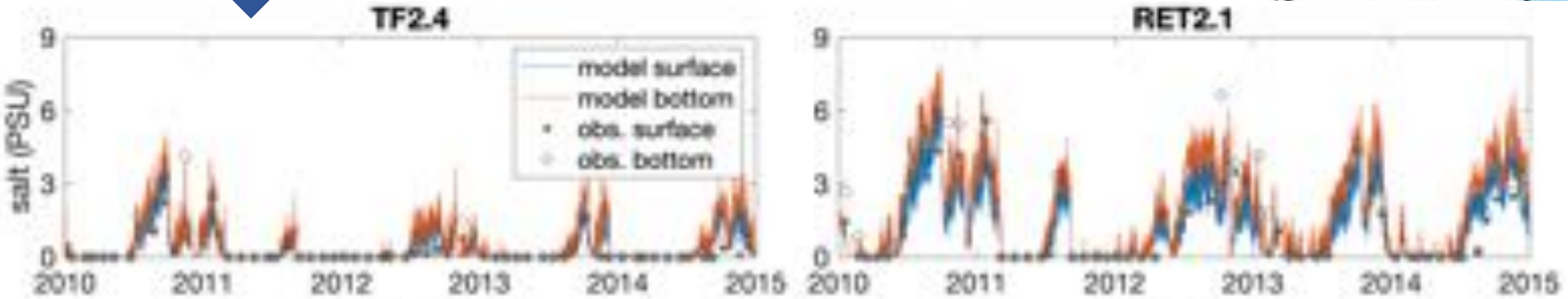


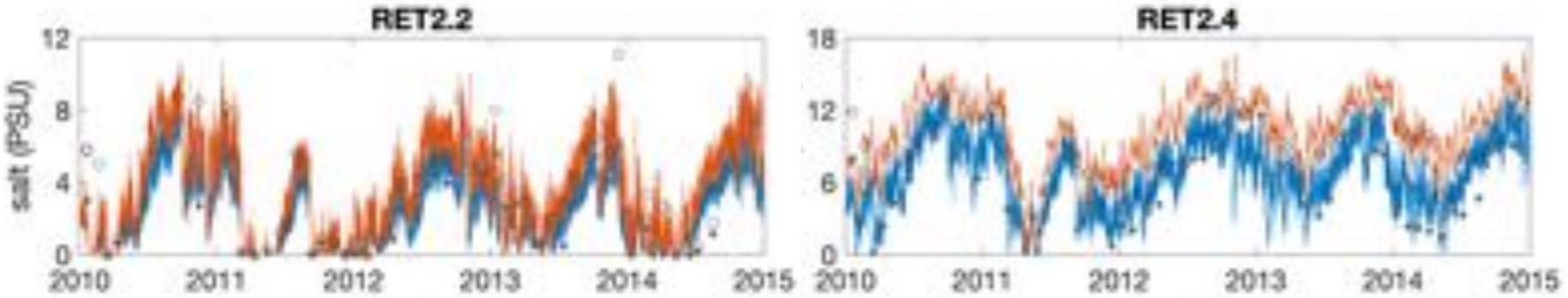
Before grid refinements

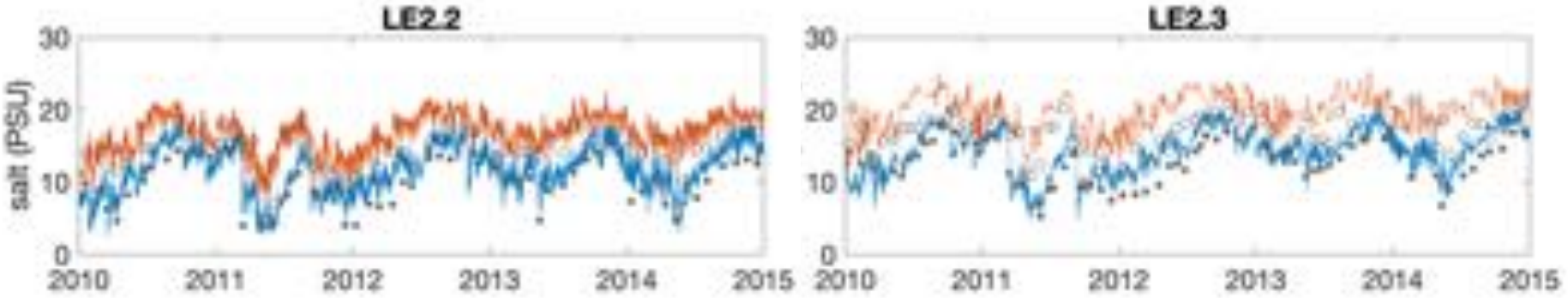


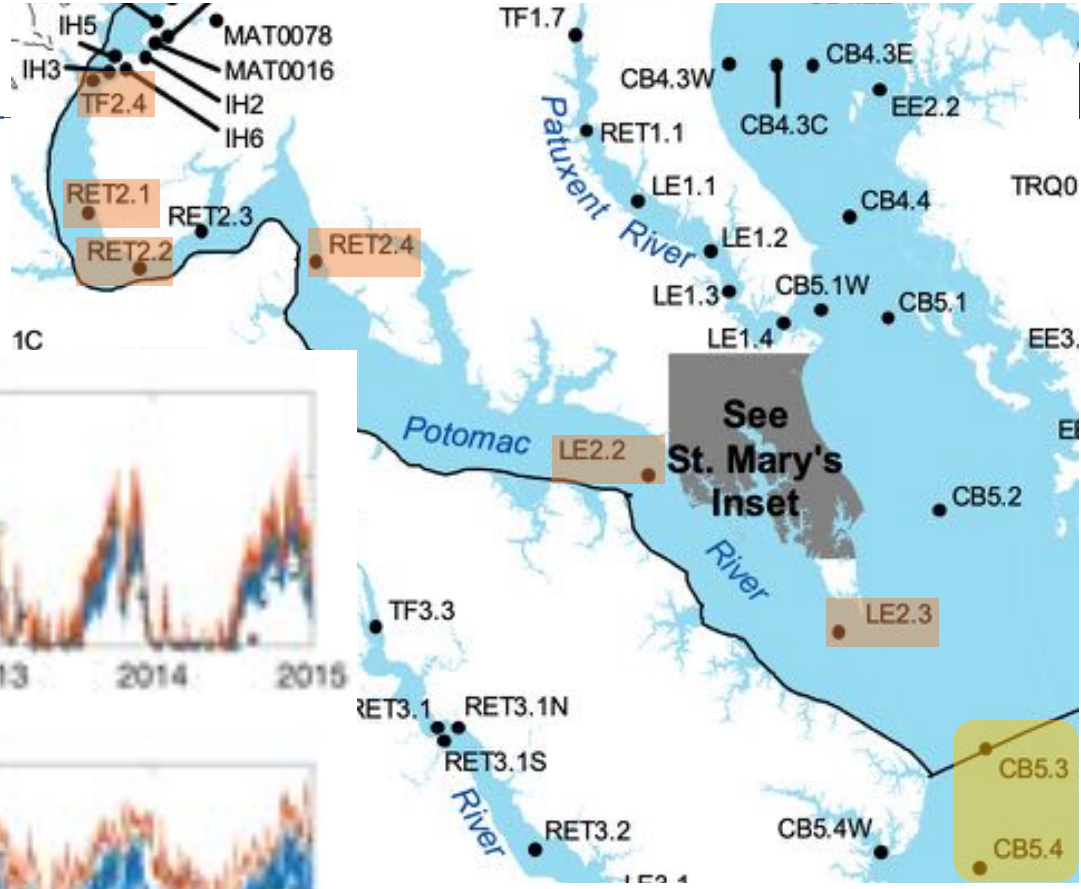
Salinity

Well capture of saltwater intrusion distance



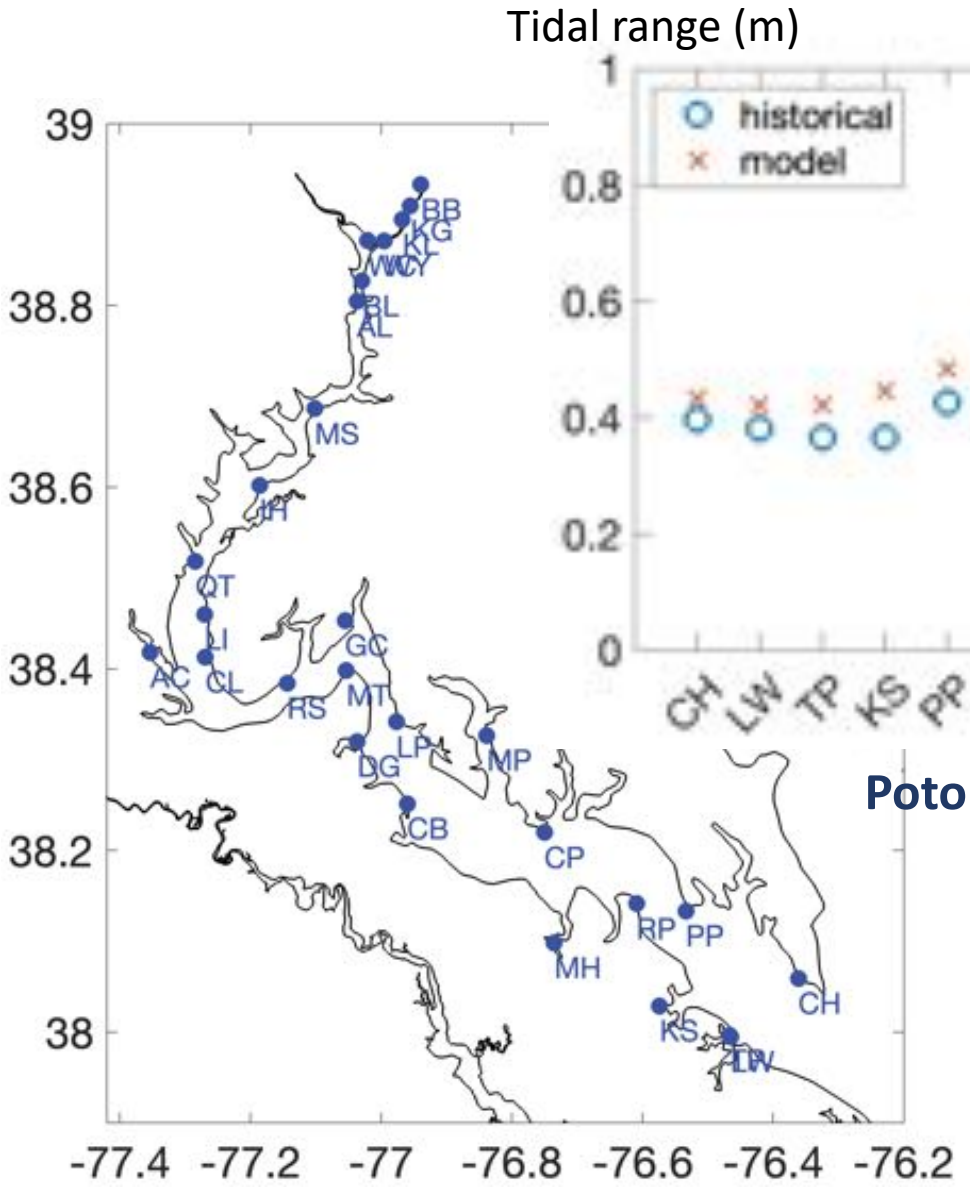


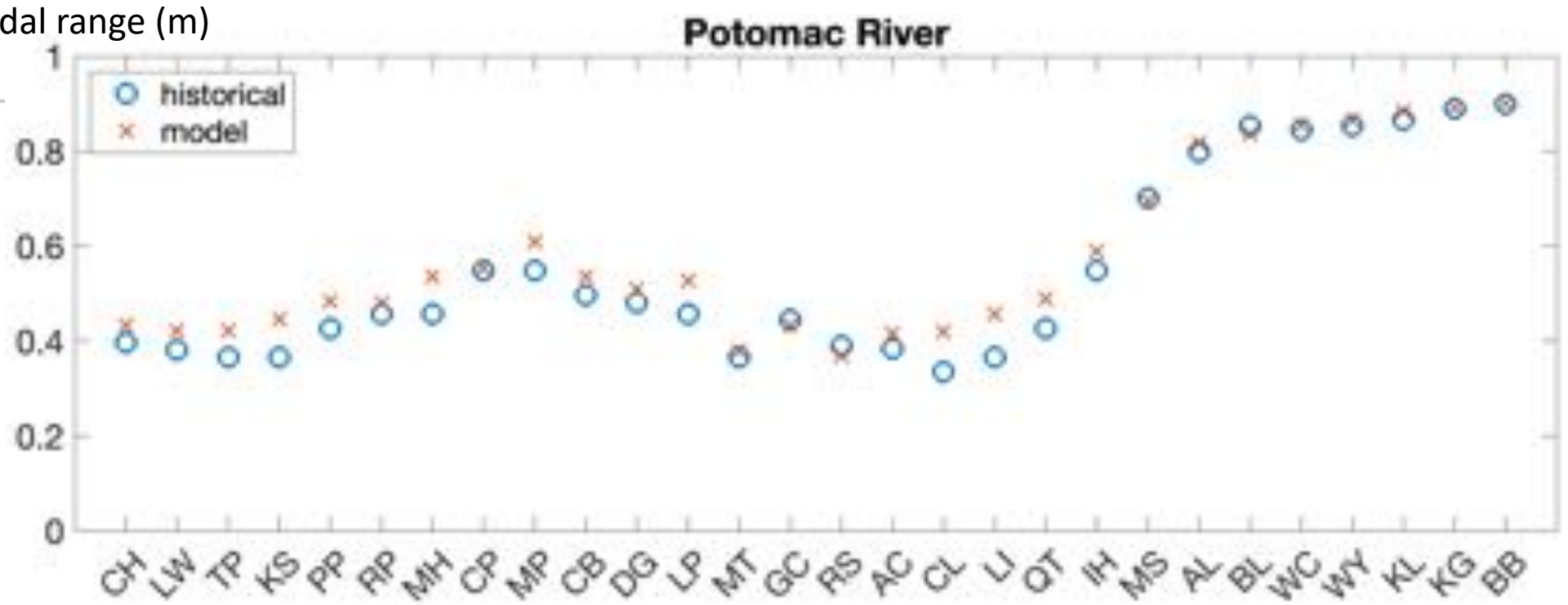




Reasonable capture of mid-Potomac stratification

Tidal range



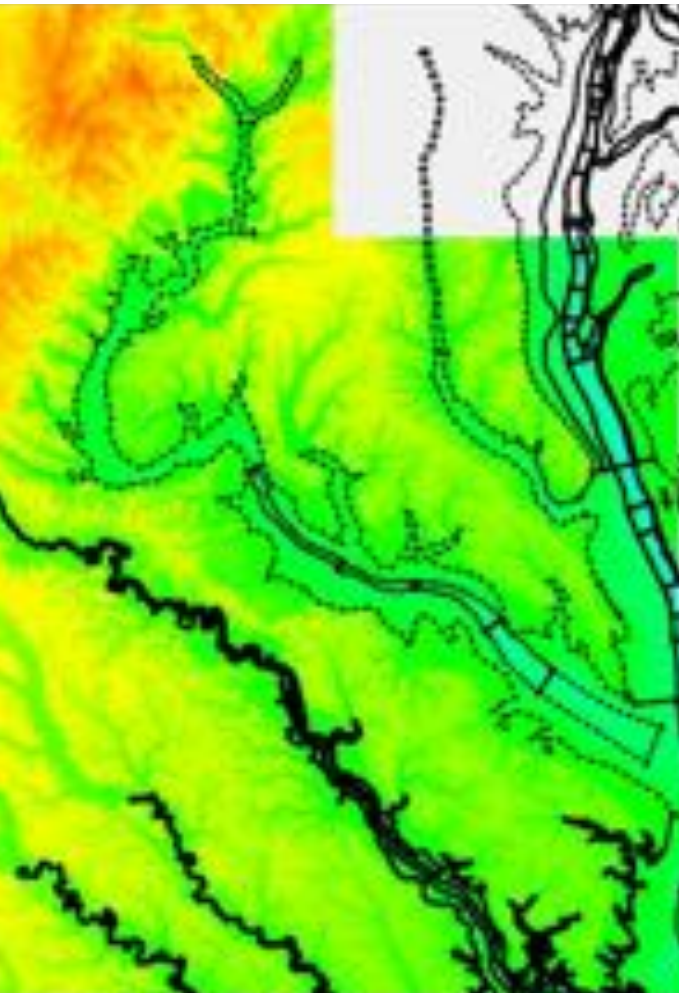


Potomac mouth → **Potomac head**

Well-capture of the trend and magnitude

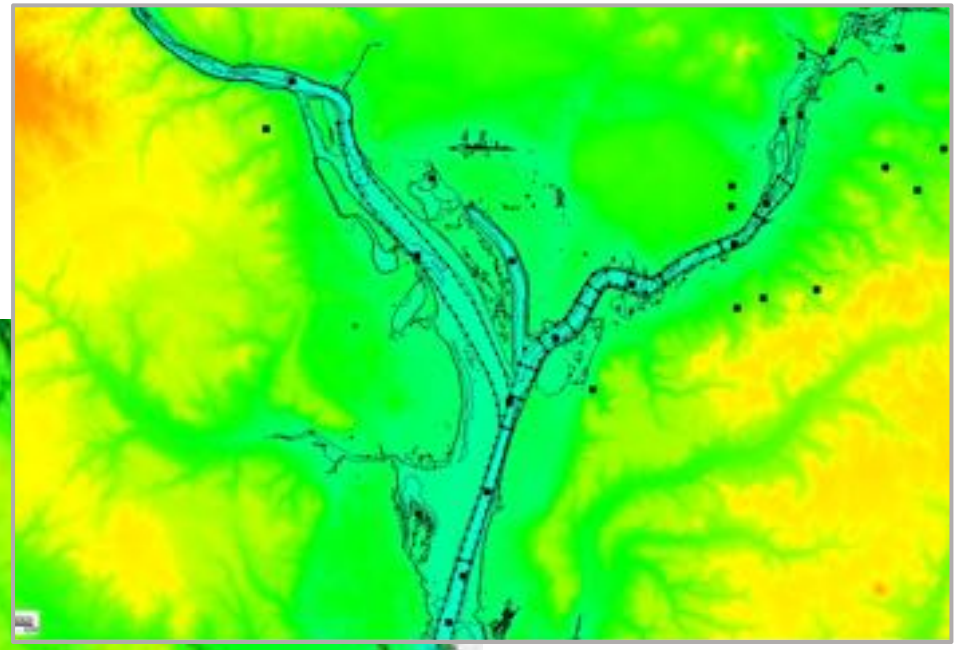
- Sufficient and accurate bathymetry data
- Stable shoal line

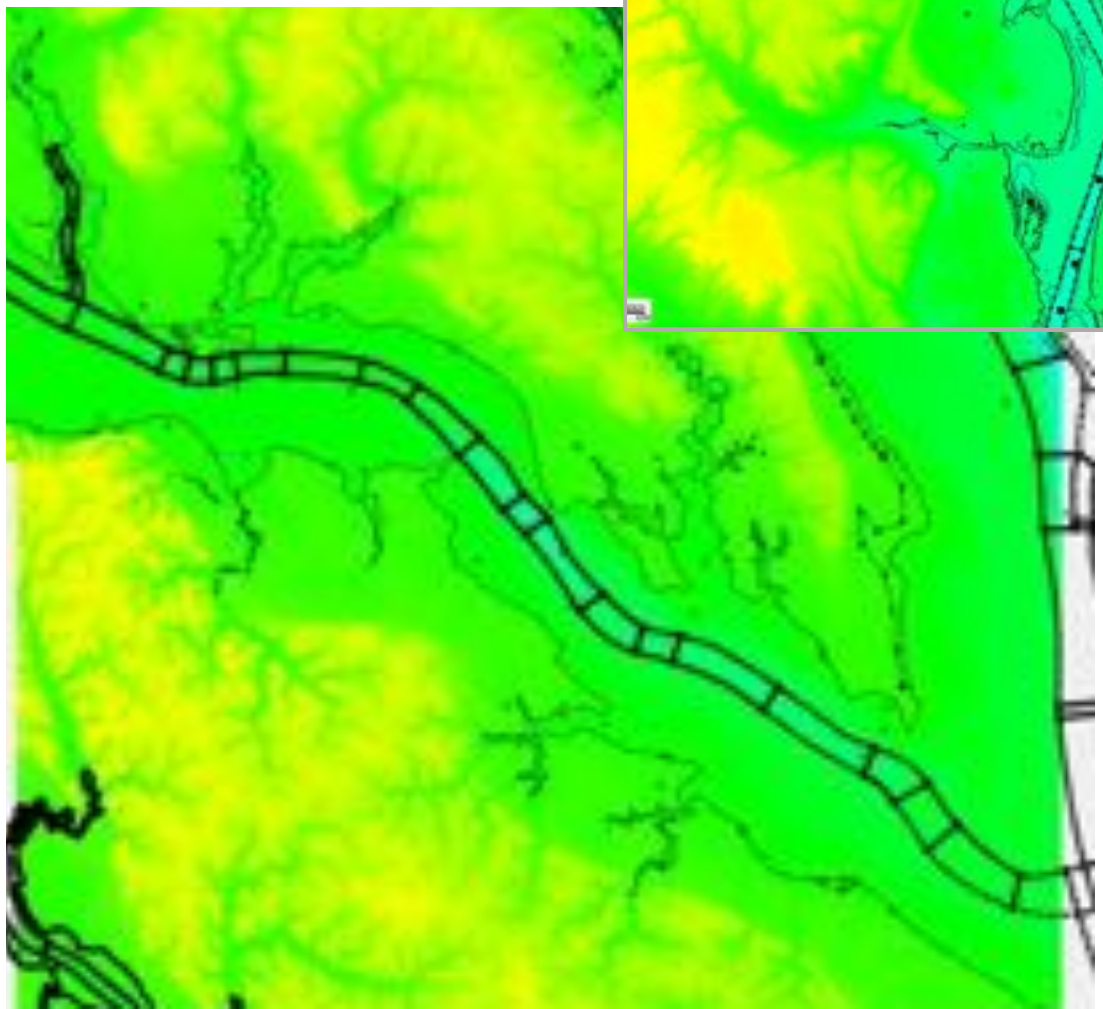
Grid construction screenshots



Old grid

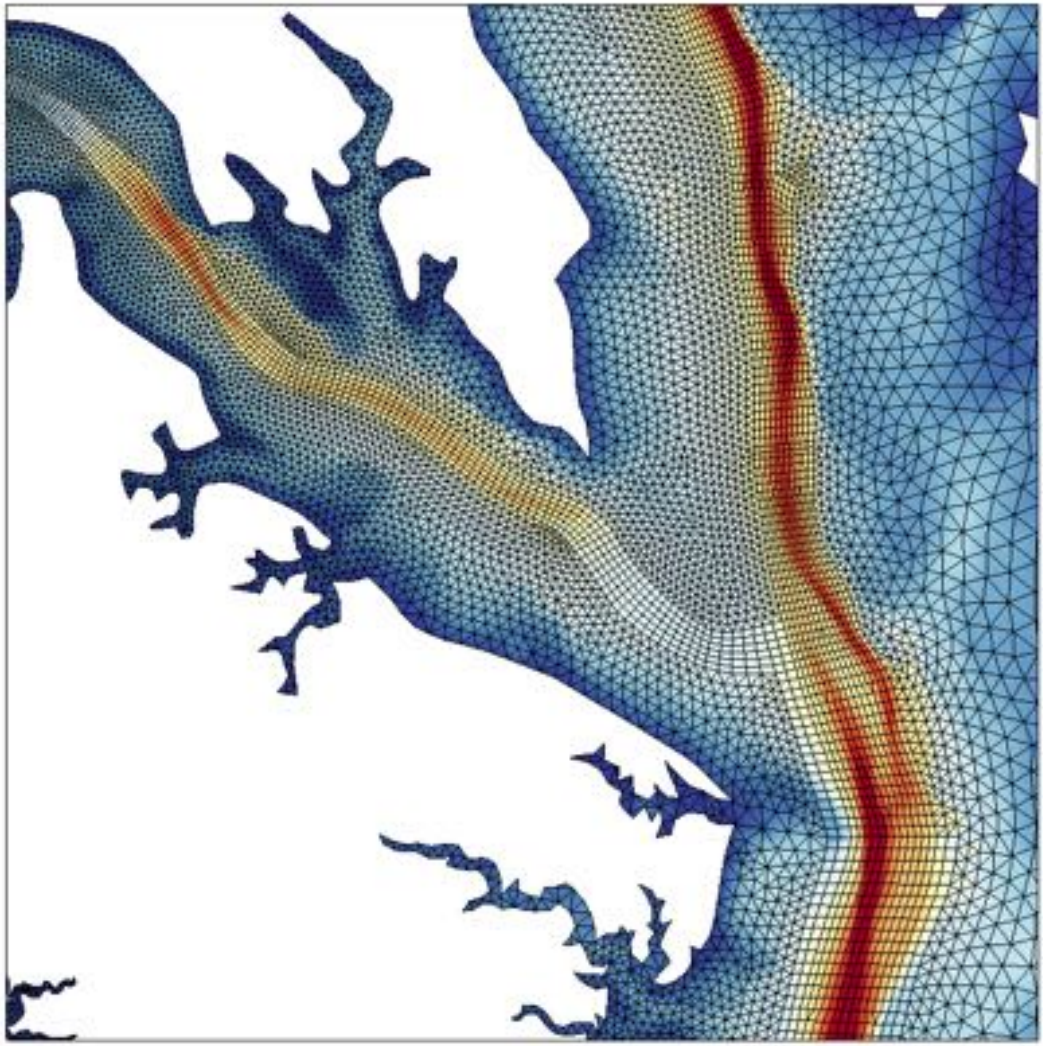
- Head of the Potomac connected to the Anacostia River
- In rectangular mesh





Lower Potomac connected the main stem of the Chesapeake Bay

Potomac horizontal grid



Potomac mouth

Potomac head

Interactions between each tributaries

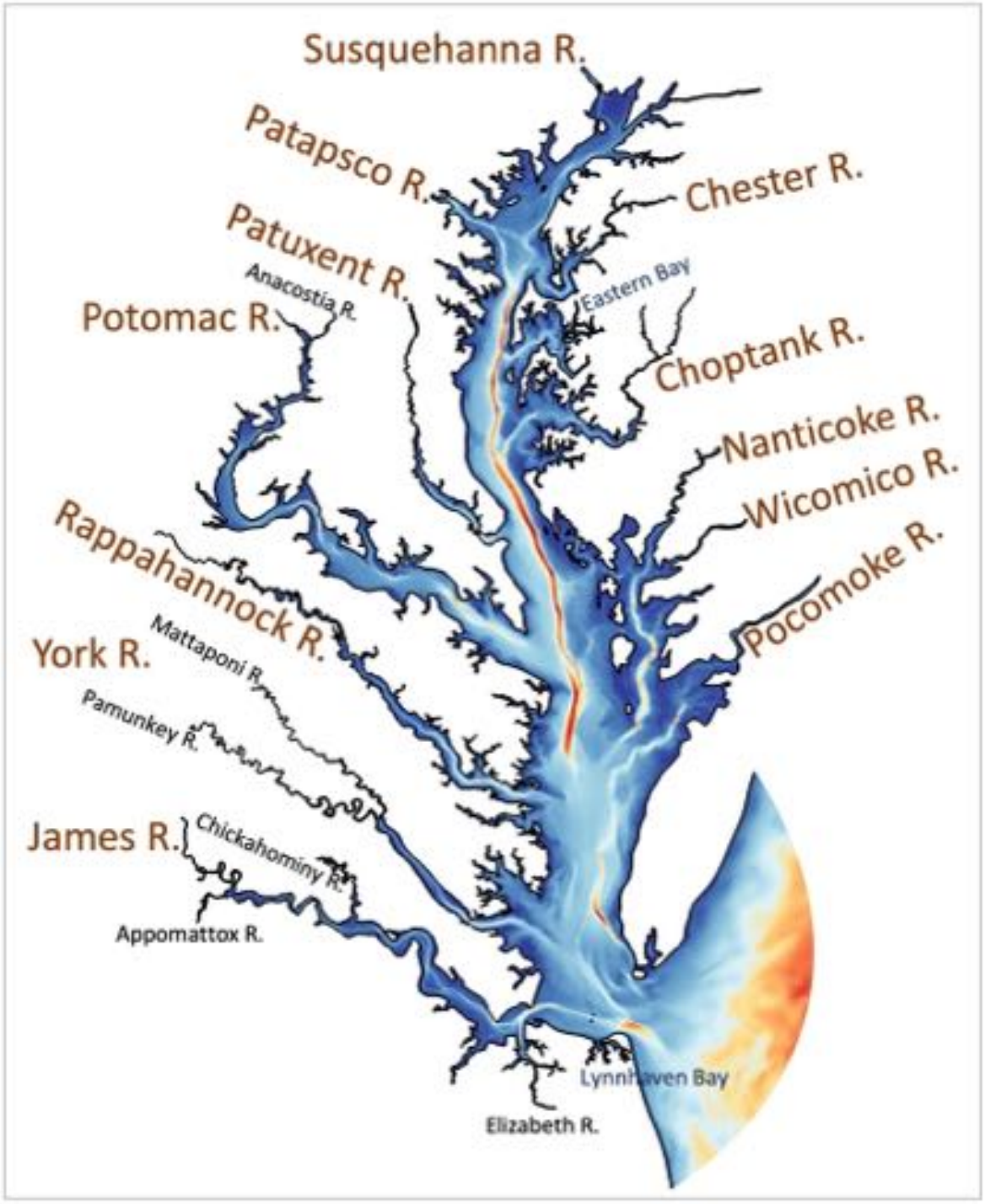
-- Generic tracer study

Introduction

- Parallel to the revamping of SCHISM-ICM
- Accompany the development of MBM
- A test to exclude grid-induced errors or hidden transport issues

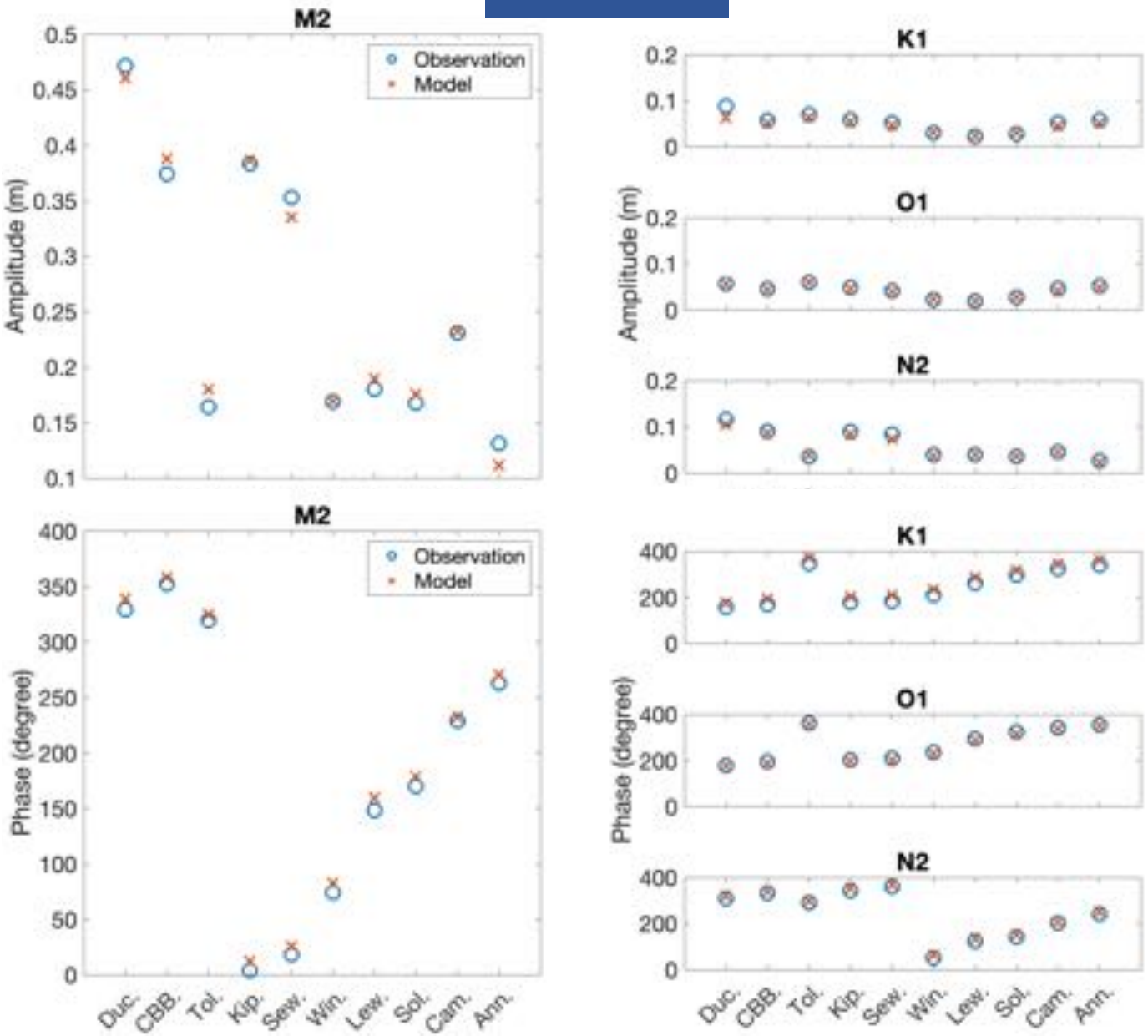
Motivation

- First time to have a fine grid covering all the tributaries and shallow regions
- Quantitatively synthesize the interactions between each sub-tributaries

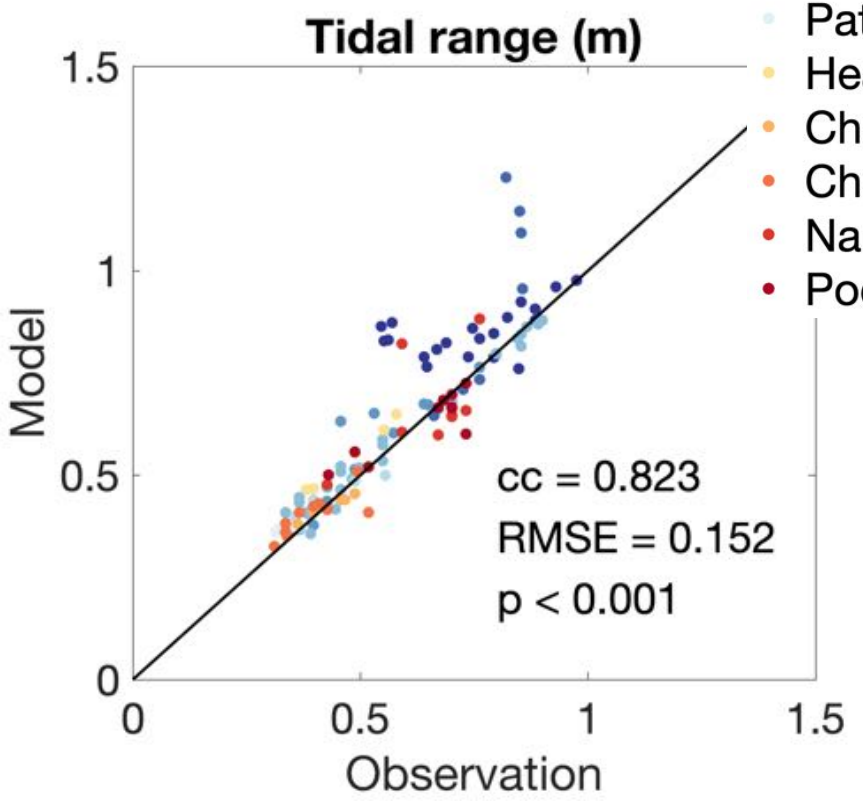


Elevation and tide

Main stem

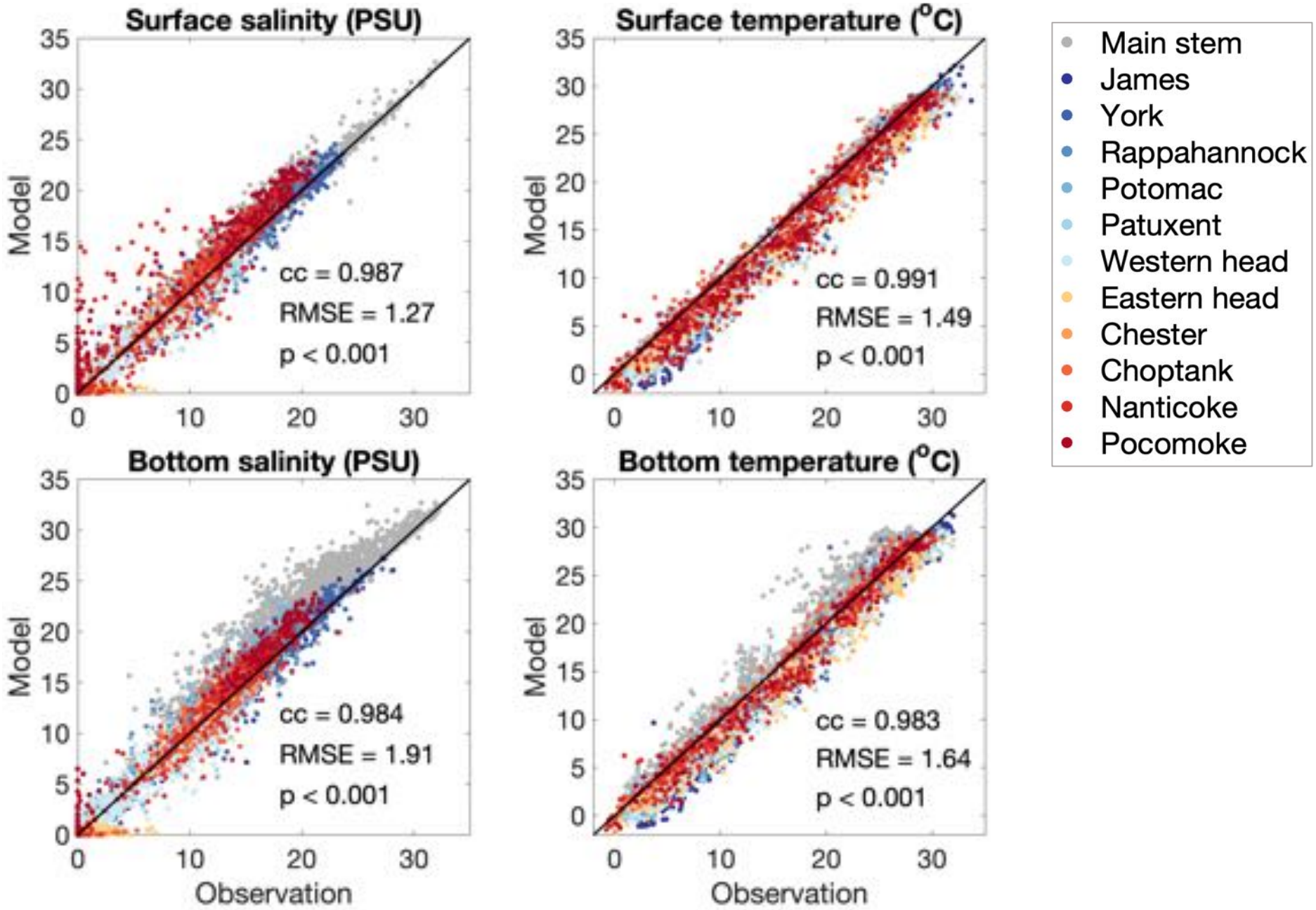


Tributaries

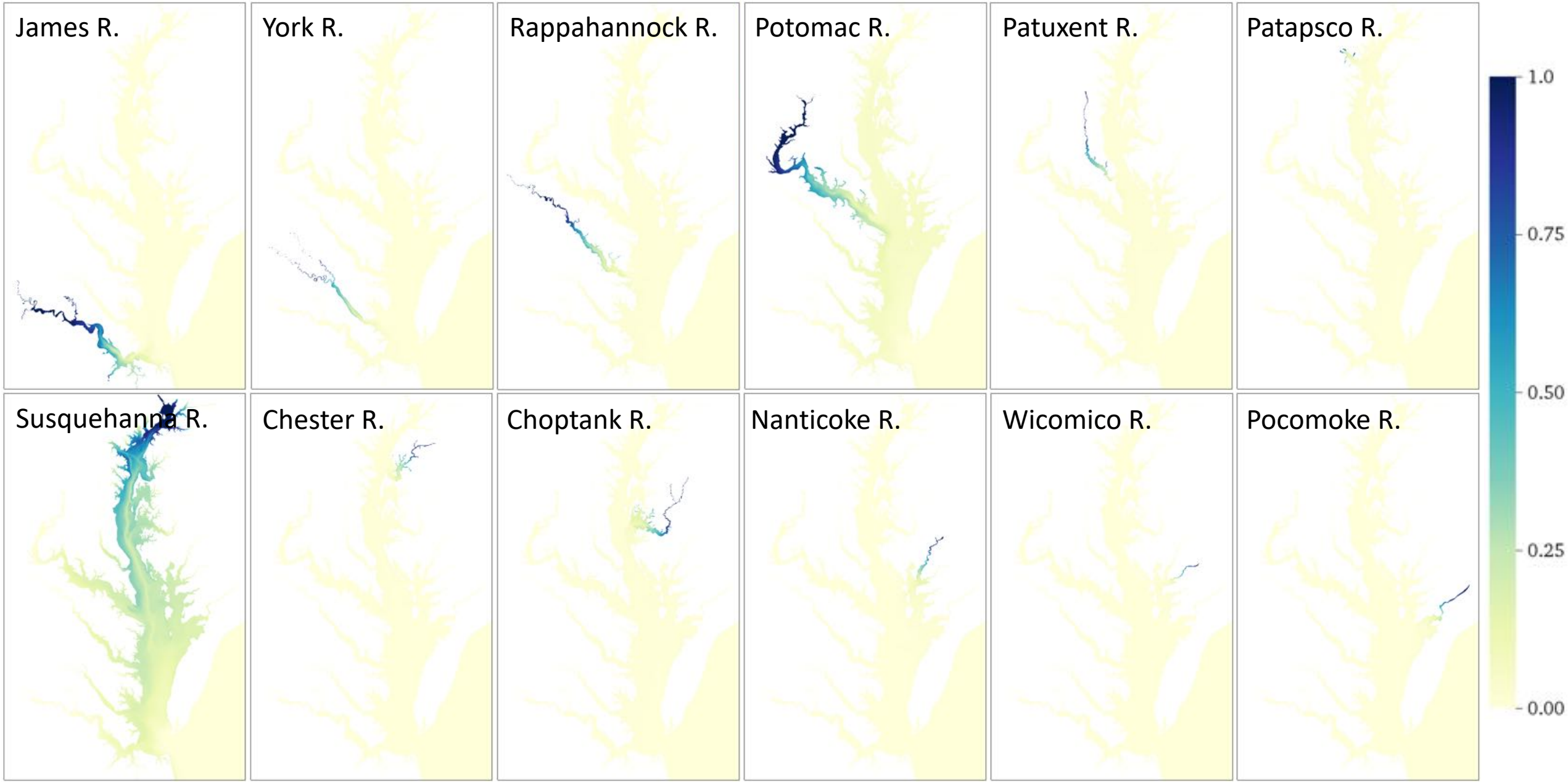


- James
- York
- Rappahannock
- Potomac
- Patuxent
- Patapsco
- Head
- Chester
- Choptank
- Nanticoke
- Pocomoke

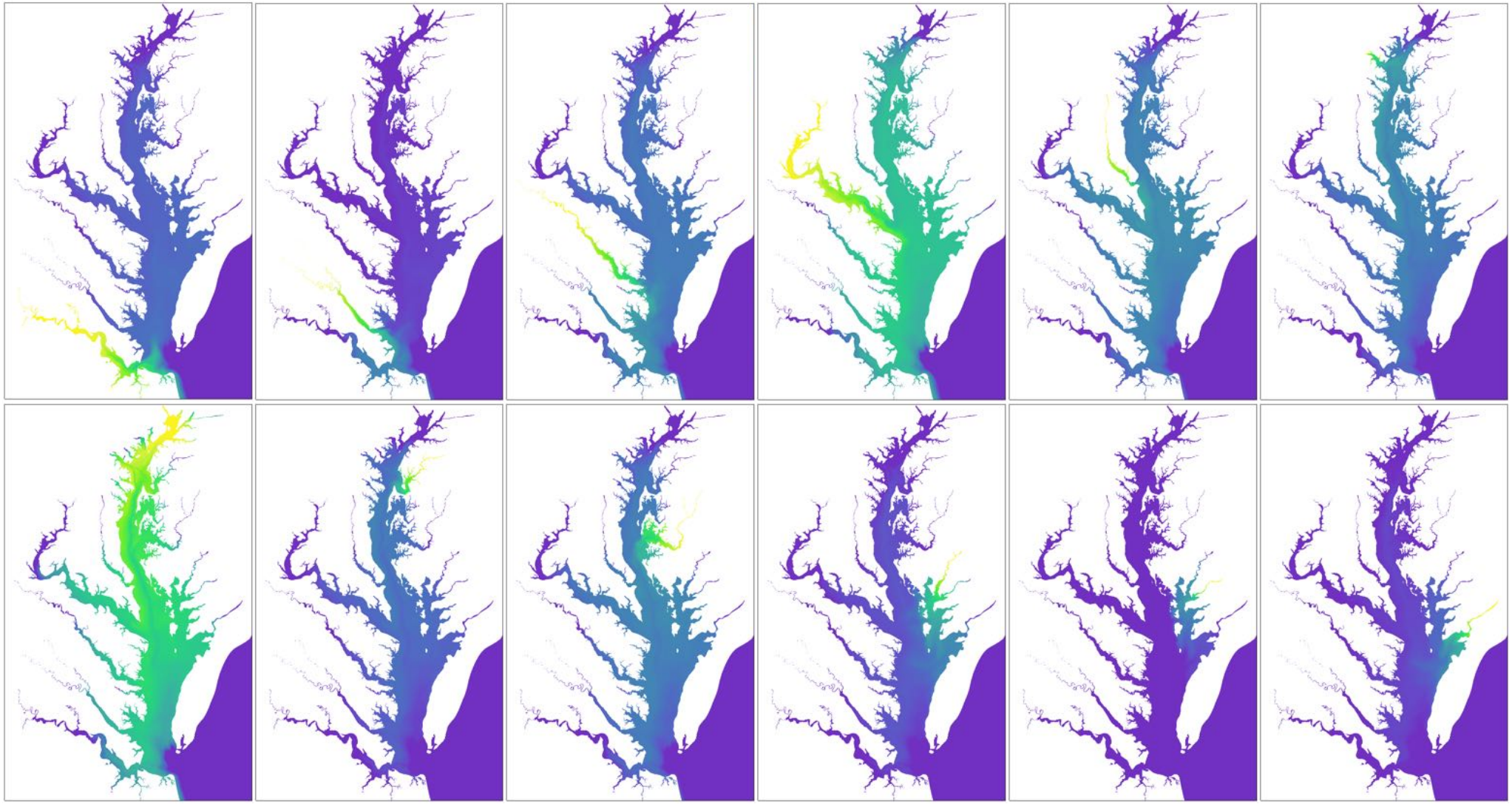
Salinity and temperature

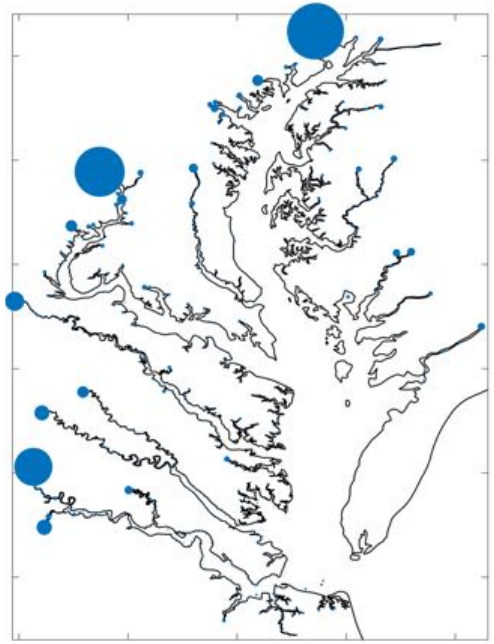


Generic tracer application and distribution



Tracer distribution and role of each tributary

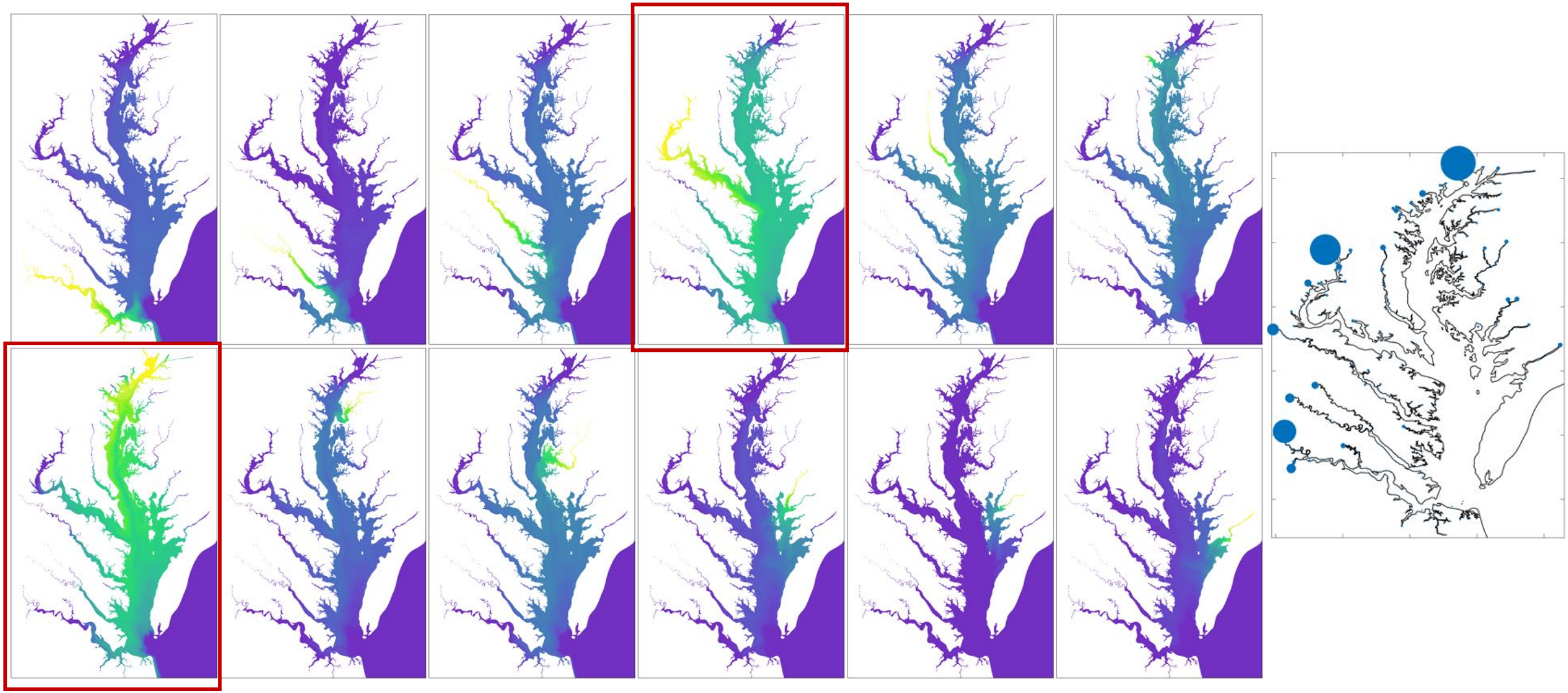




Log plot

Source amount, location, and other processes

Tracer distribution and role of each tributary



Log plot

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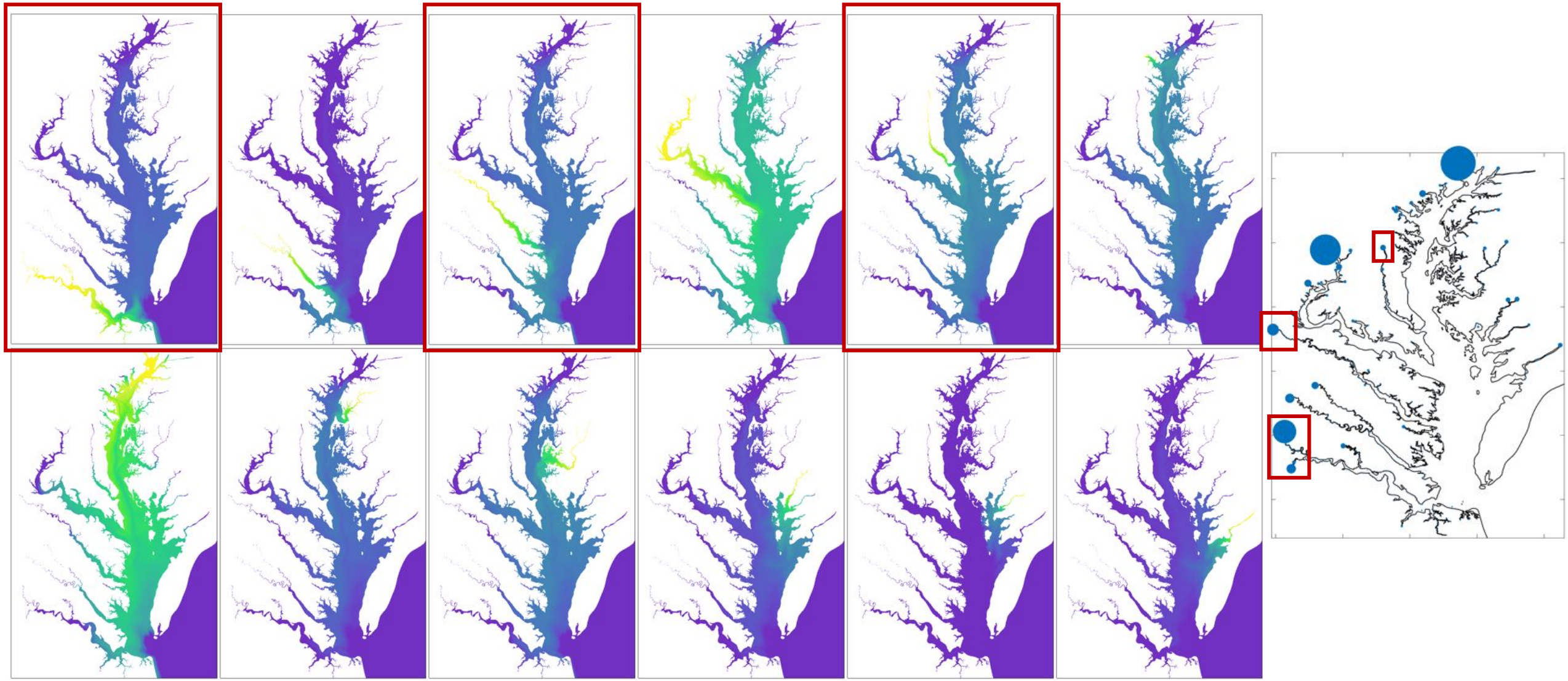

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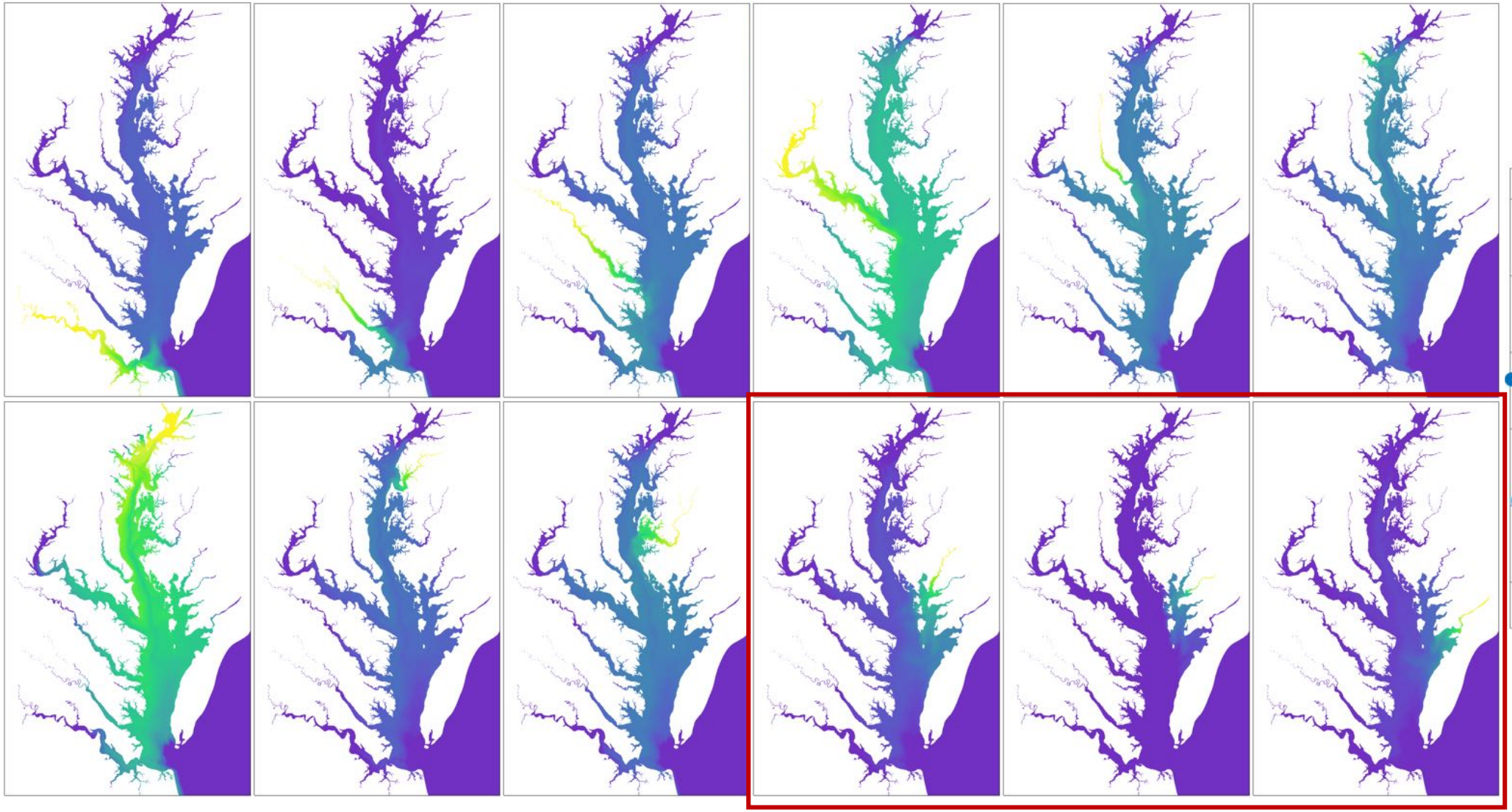
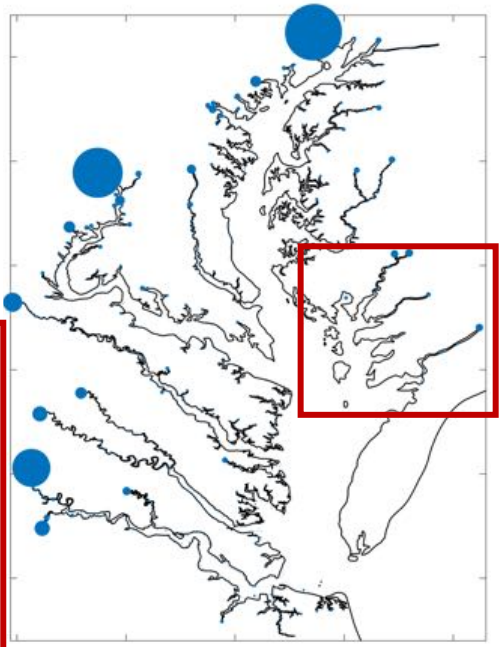


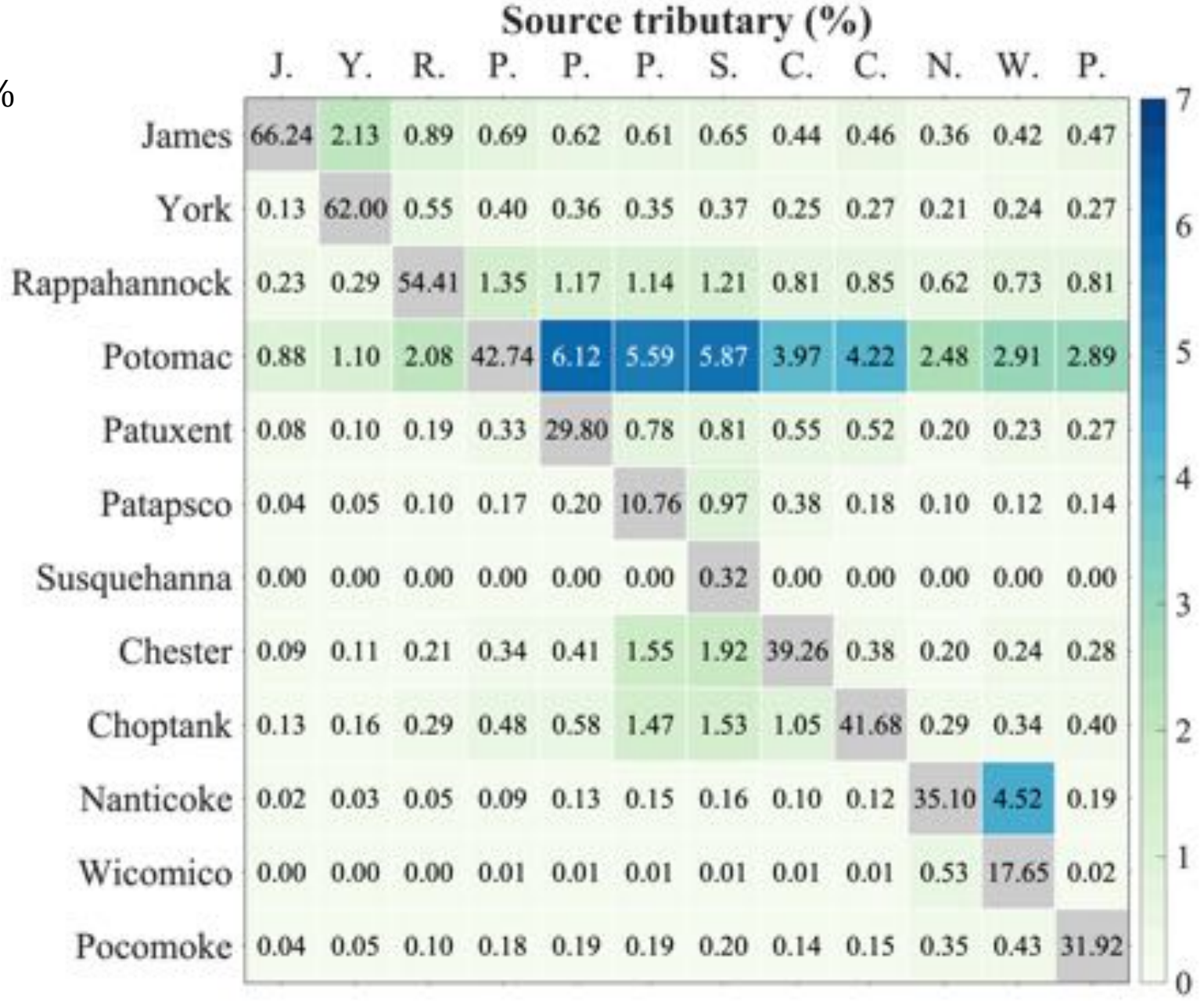


Log plot

Source amount, location, and other processes

Source-sink connectivity matrix

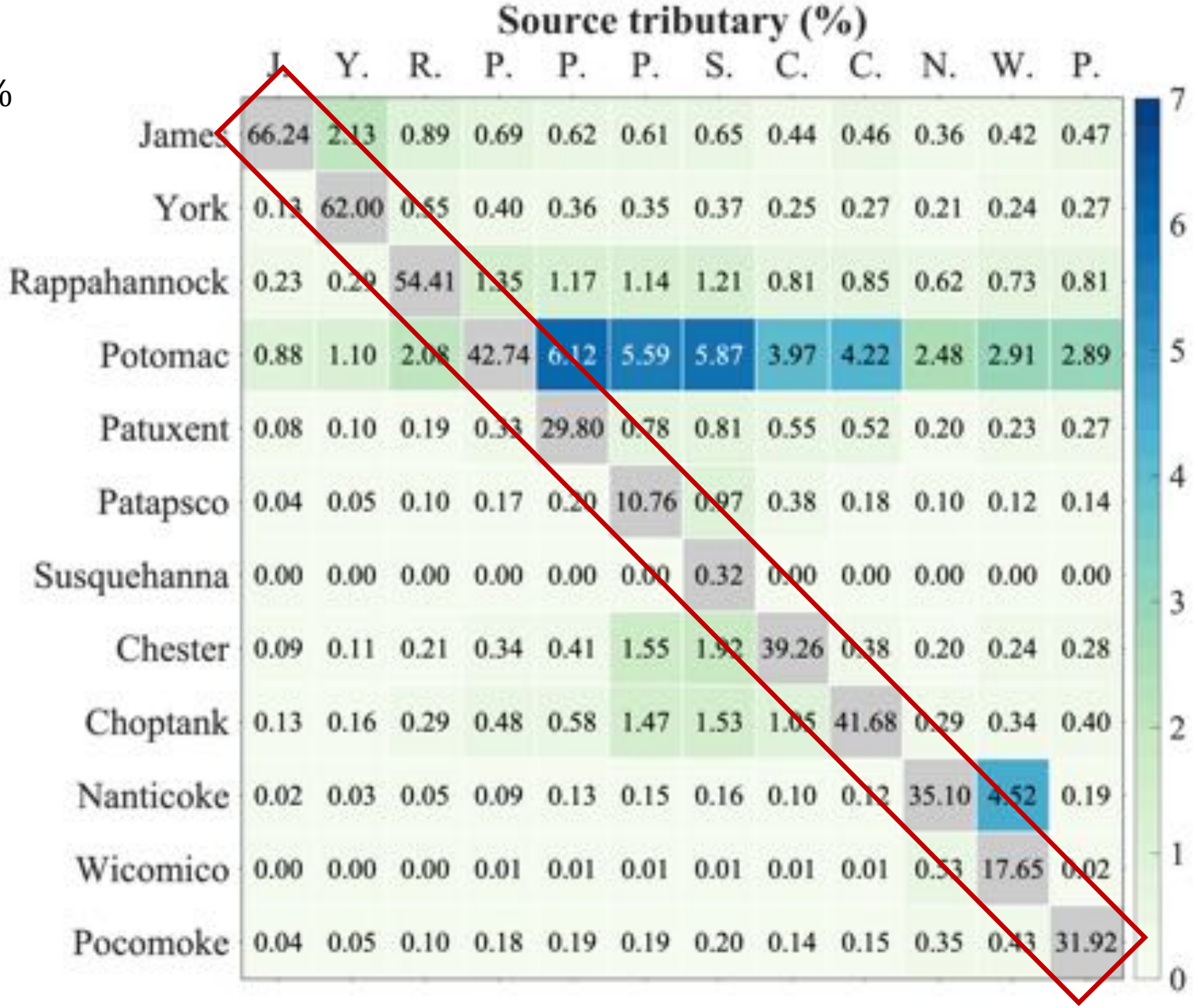
$$M_{trib} = \frac{\sum_{trib} G_{tracer} \cdot V}{\sum_{total} G_{tracer} \cdot V} \cdot 100\%$$



Source-sink connectivity matrix

$$M_{trib} = \frac{\sum_{trib} G_{tracer} \cdot V}{\sum_{total} G_{tracer} \cdot V} \cdot 100\%$$

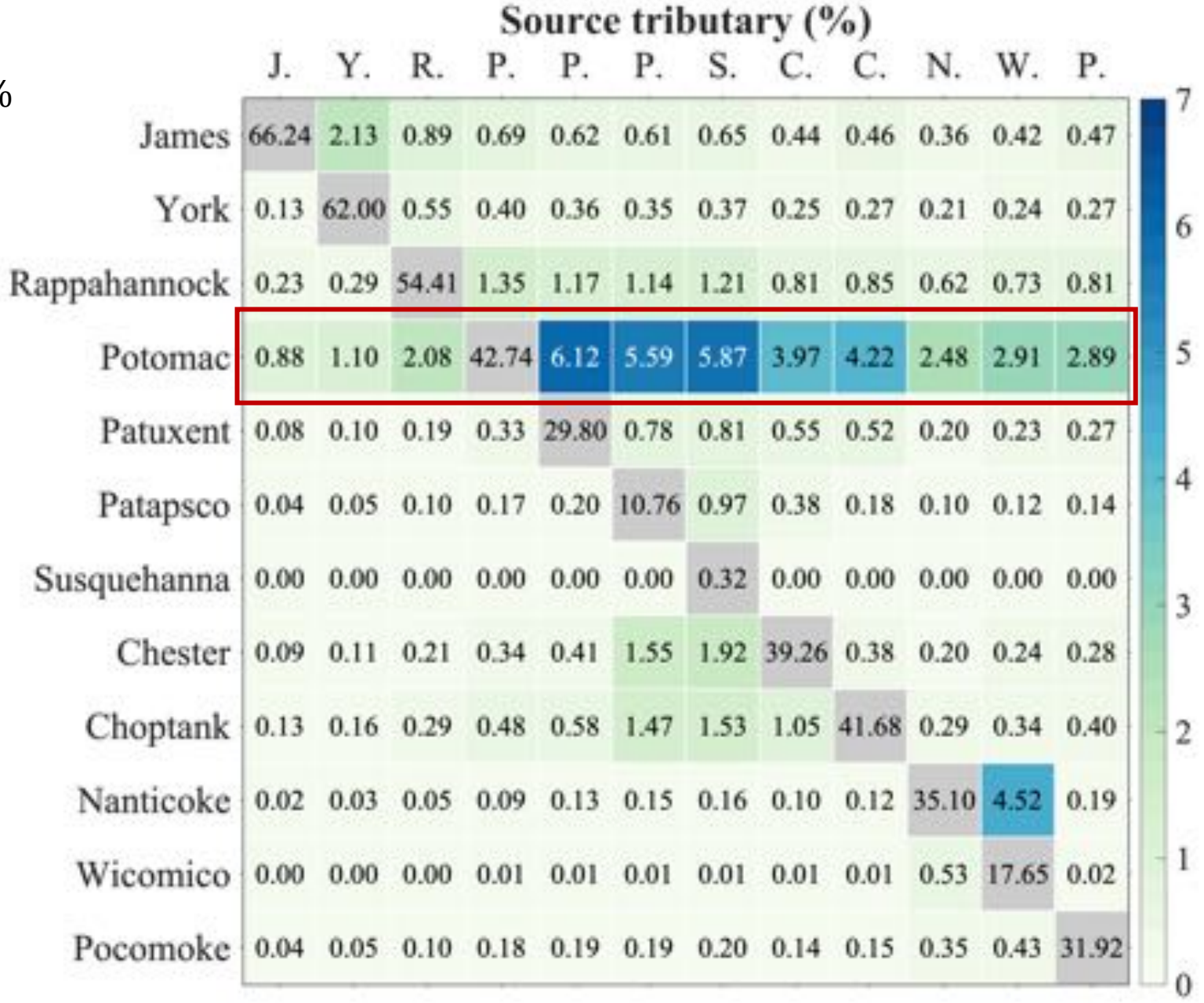
On the western side of the Bay, Lower Bay tributaries tend to have a large local retention than Upper Bay tributaries



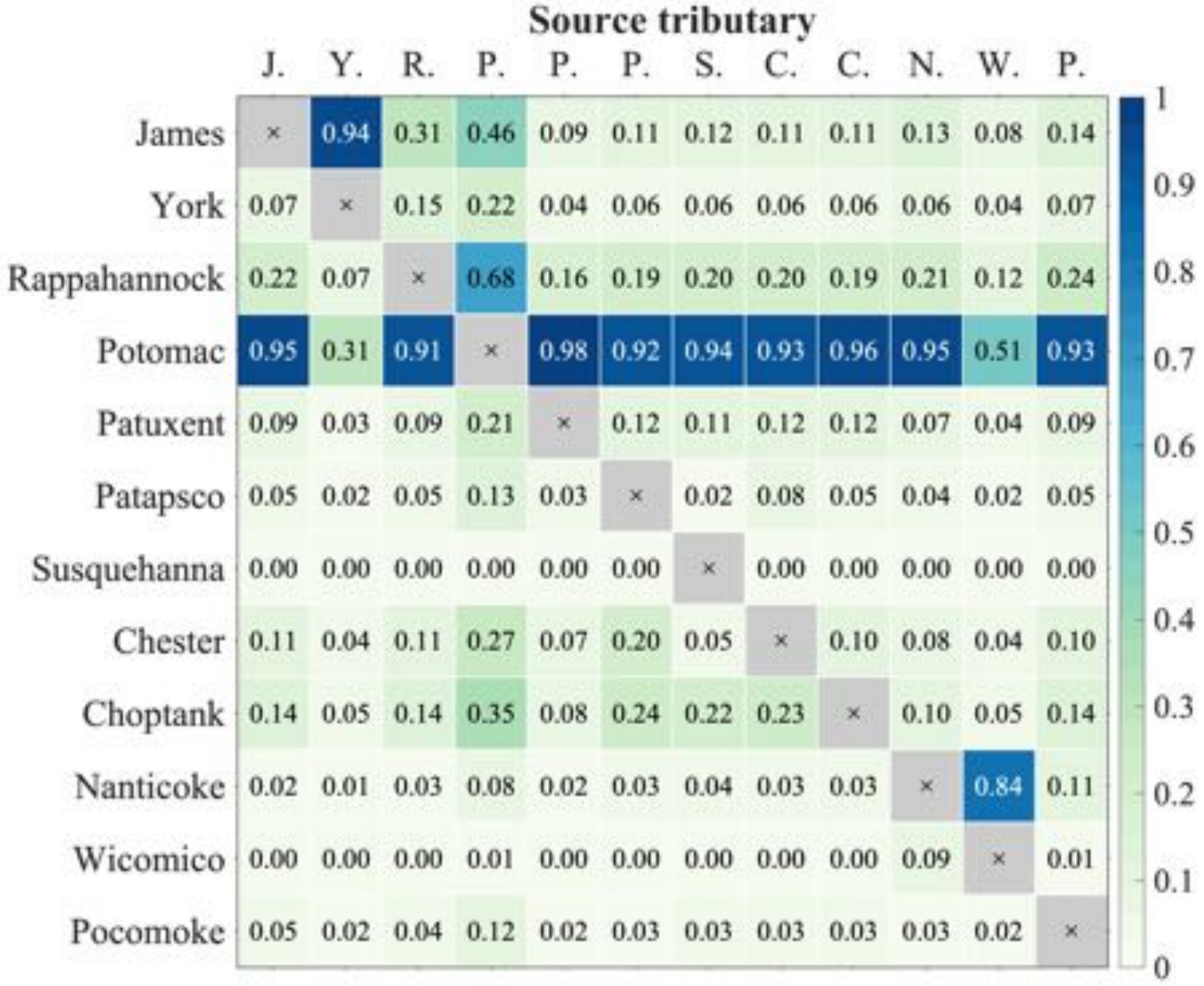
Source-sink connectivity matrix

$$M_{trib} = \frac{\sum_{trib} G_{tracer} \cdot V}{\sum_{total} G_{tracer} \cdot V} \cdot 100\%$$

Mostly, Potomac R. is the largest receiver of the sources from the other tributaries, except the sources from the York R. and Wicomoco R.

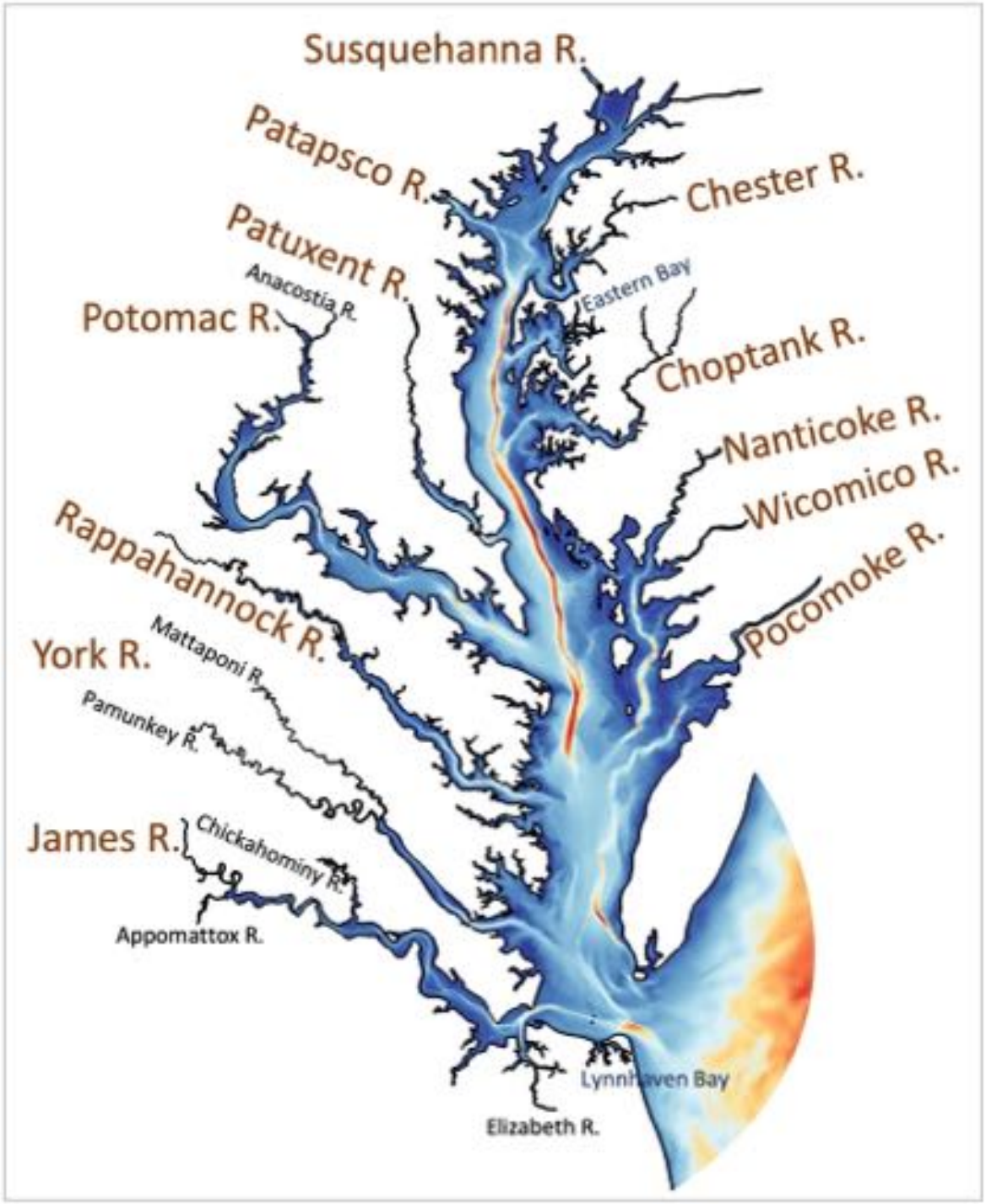


EOF analysis: spatial vector



Summary

- Initial grid prepared for the other MTMs from the Potomac Model
- Fully coupled MTM shows reasonable preliminary calibrations
- A generic tracer study is conducted to study the connectivity between each tributary



To be continued …

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