Using iHESP to drive a coastal model (for inundation)

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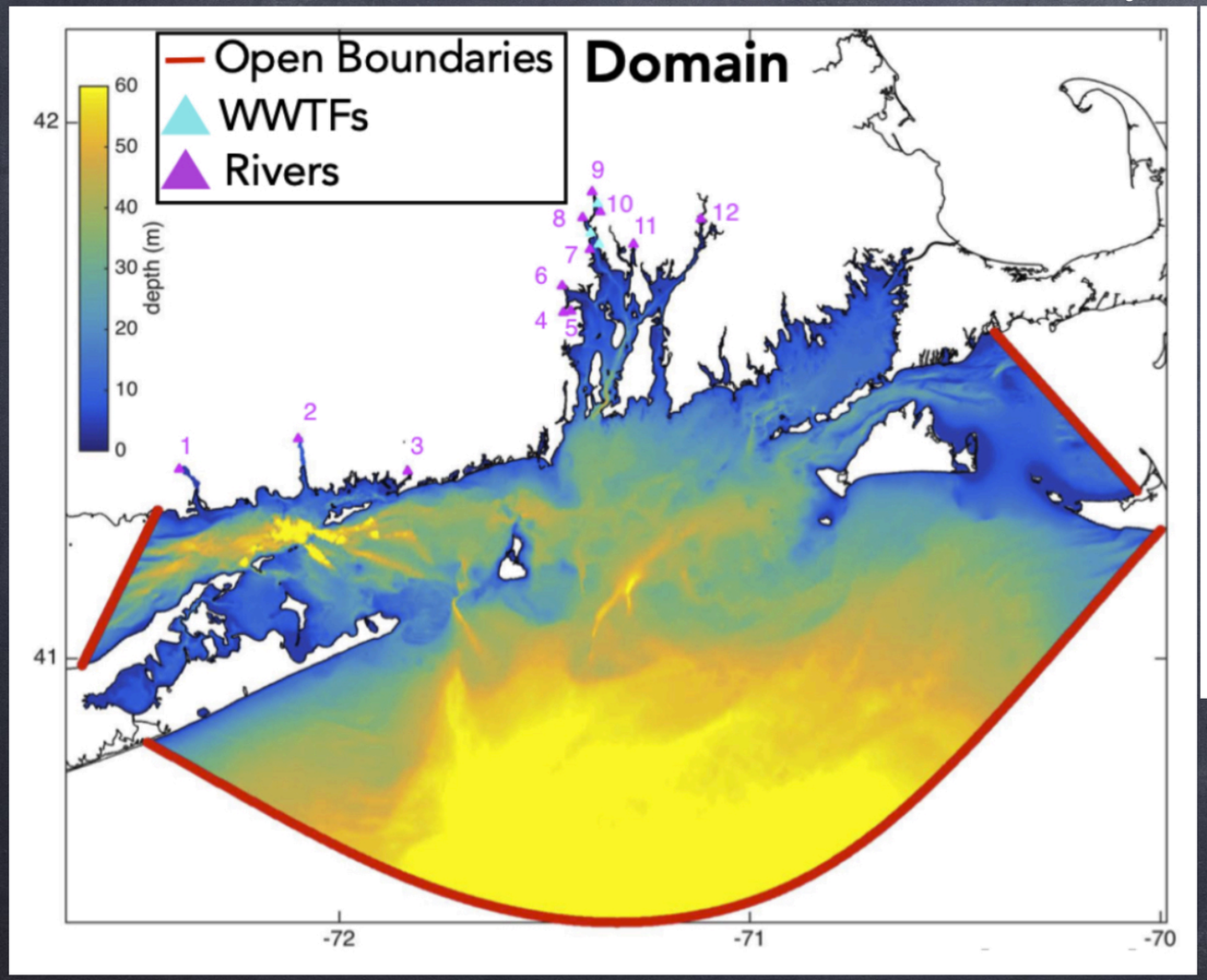
OMWG Meeting, Feb 9, 2023

Credit to Jonny Benoit, Brown Undergrad!

J. Benoit. Modeling Estuary-Scale Climate Change: Narragansett Bay Under RCP8.5. ScB thesis, Geology-Physics/Mathematics, Brown University, May 2022.

Help from Maya Gong, Aakash Sane, Rain Fan, Arin Nelson, Paul Hall

Ocean State Ocean Model (A ROMS implementation)



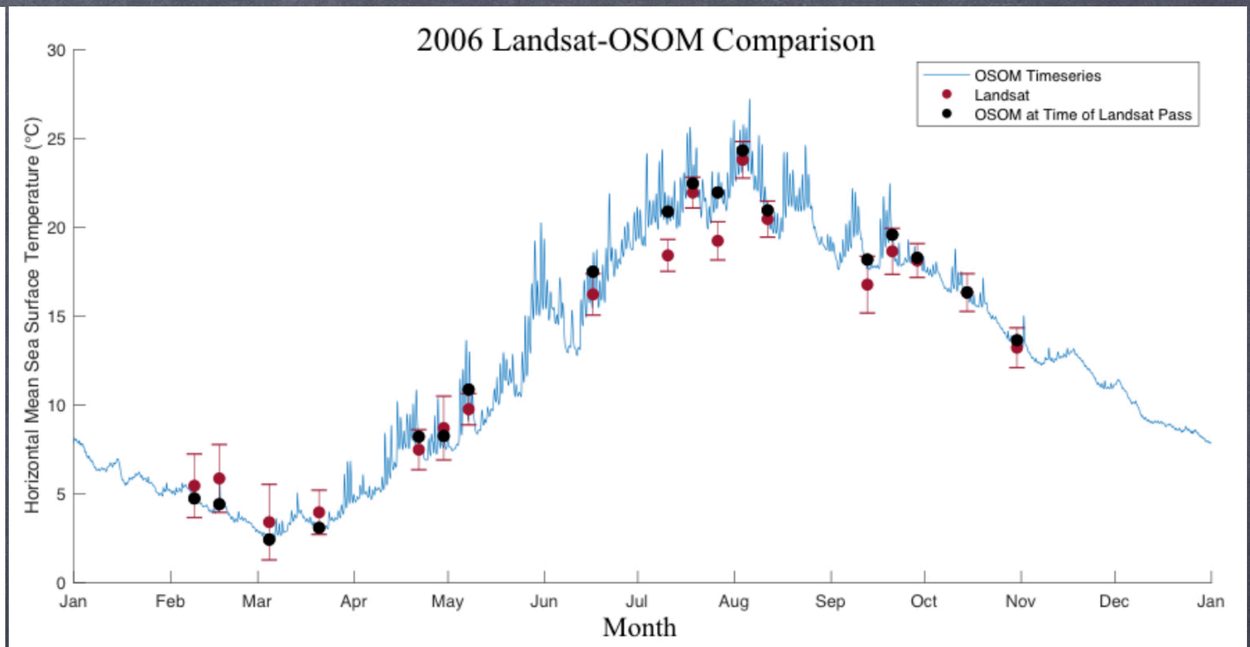
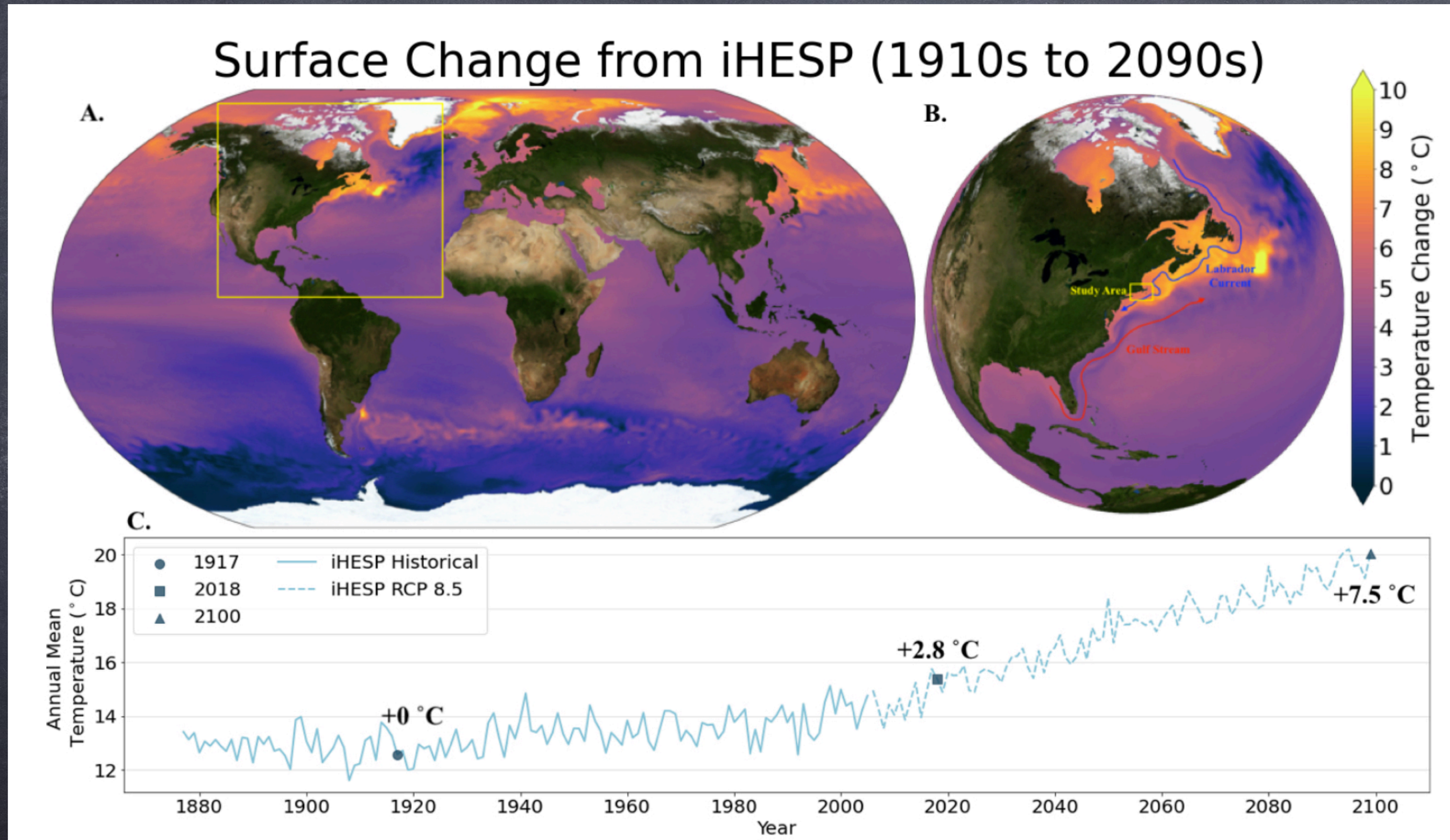


Figure 7: Comparison of OSOM to Landsat data for a 2006 OSOM simulation year.

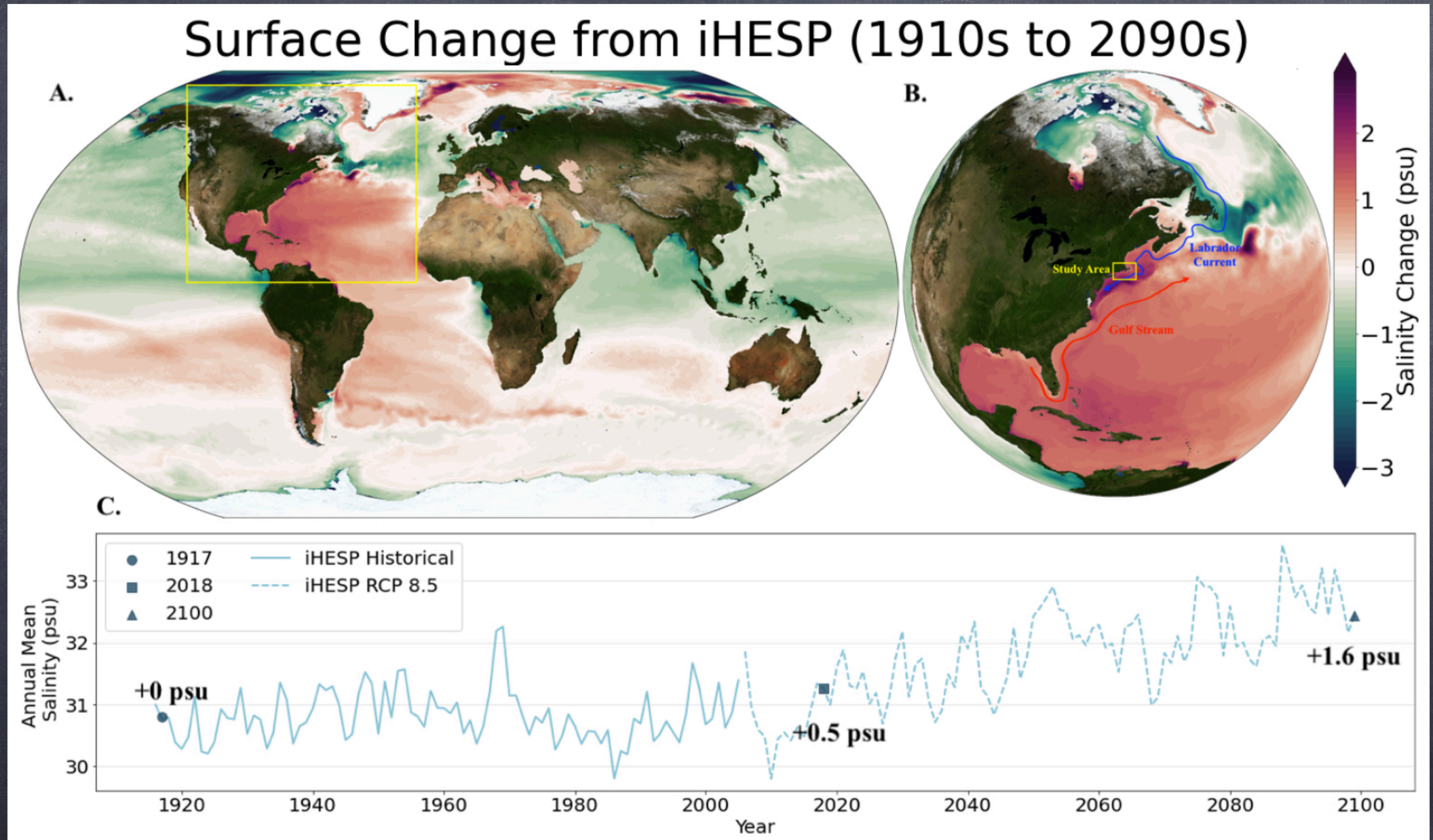
A. Sane, B. Fox-Kemper, D. Ullman, C. Kincaid, and L. Rothstein. Consistent predictability of the Ocean State Ocean Model (OSOM) using information theory and flushing timescales. Journal of Geophysical Research - Oceans, 126(7):e2020JC016875, June 2021.

J. Benoit and B. Fox-Kemper. Contextualizing thermal effluent impacts in Narragansett Bay using Landsat-derived surface temperature. Frontiers in Marine Science: Marine Pollution, 8:1247, September 2021.

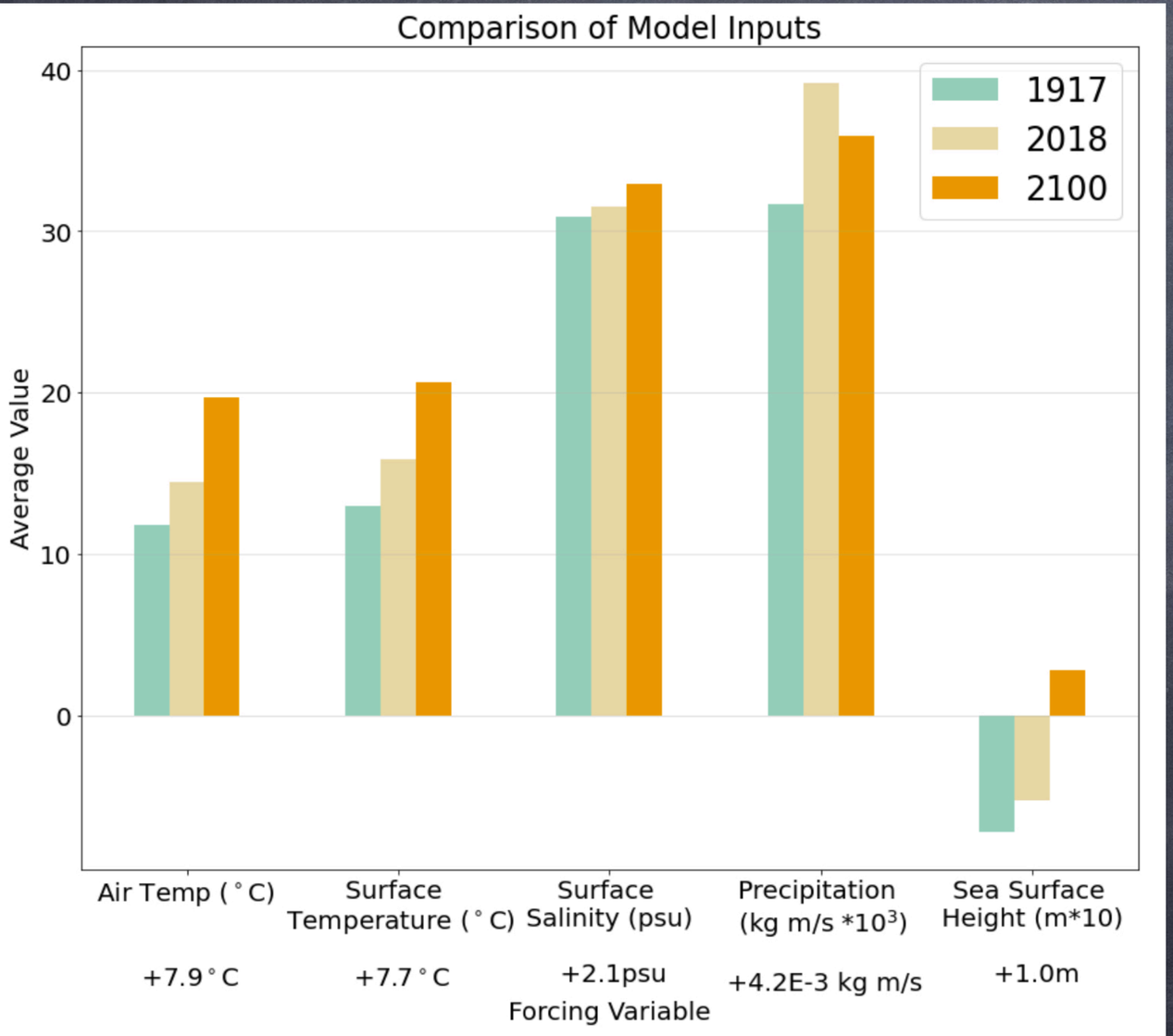
iHESP forcing

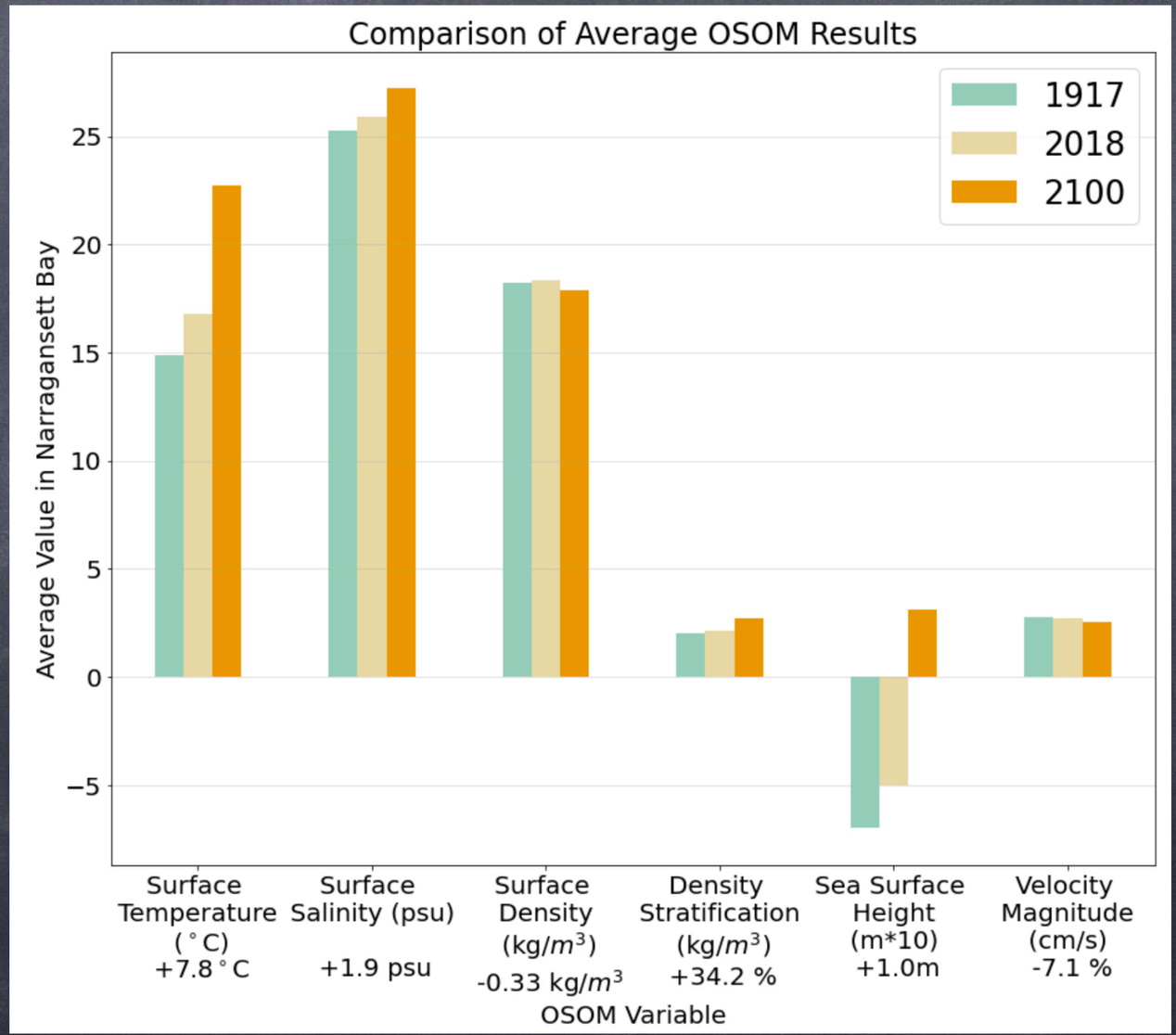


iHESP forcing



iHESP forcing & basic results

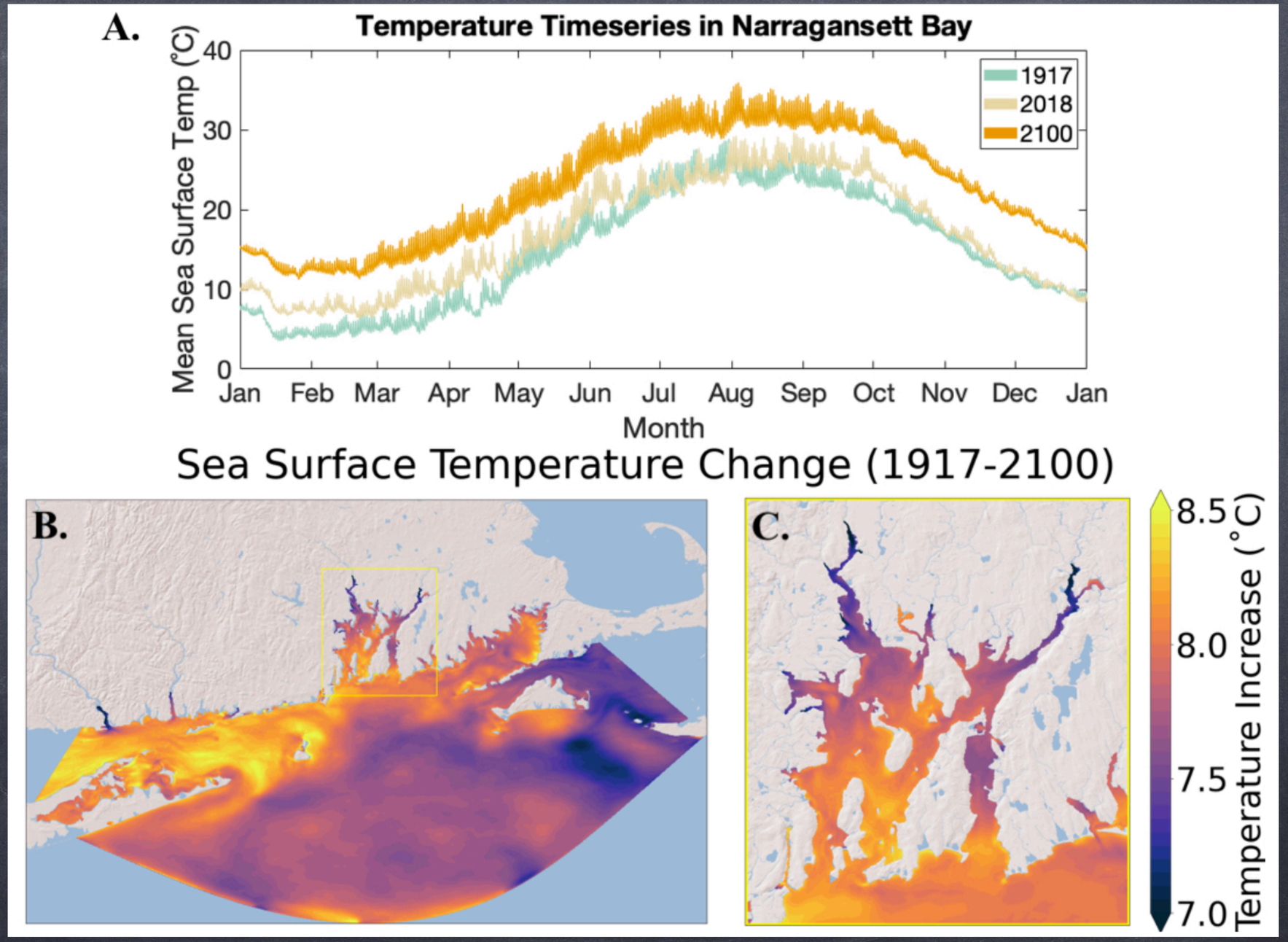




Results

Generally warmer,
Especially up-Bay

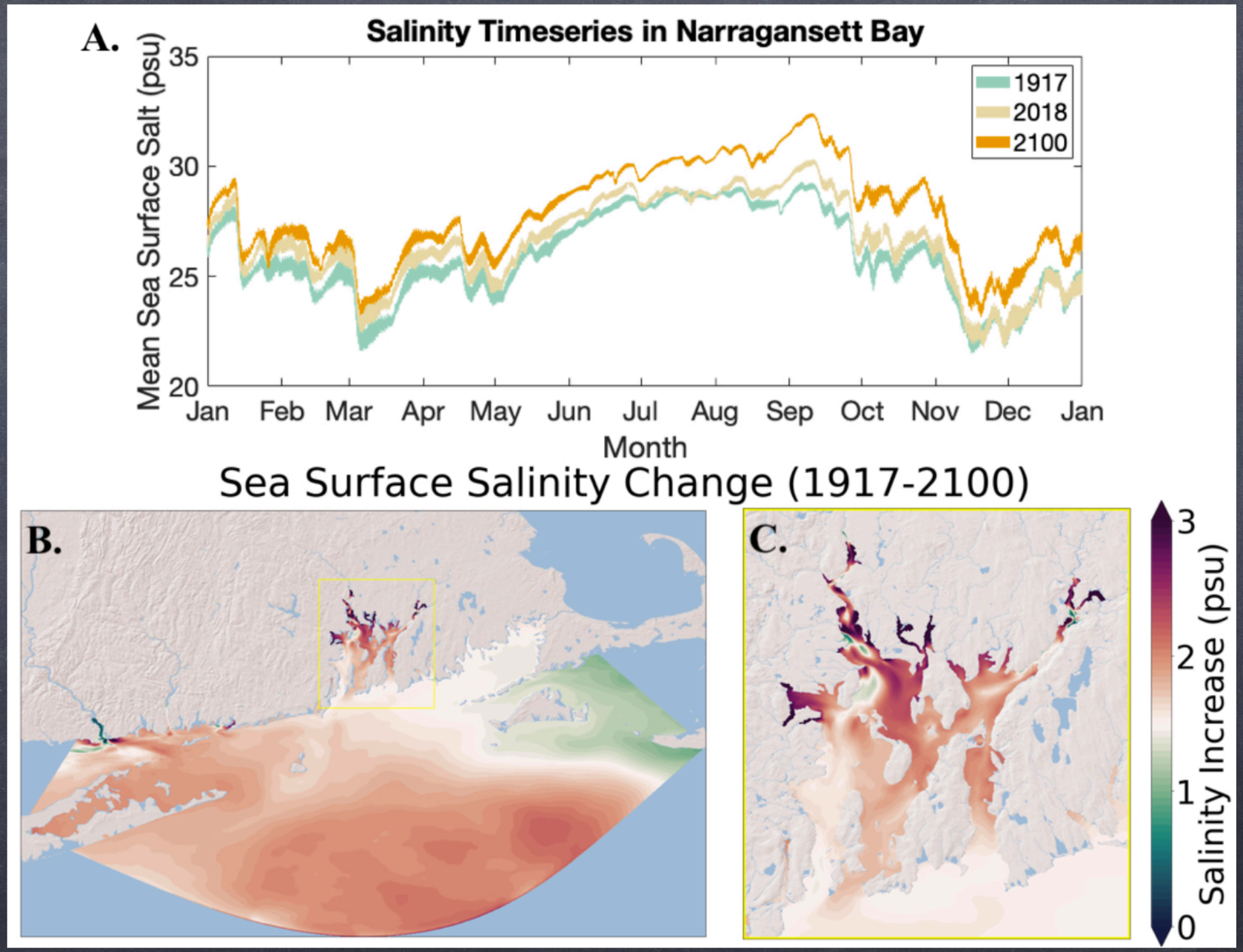
(Note—rivers fixed
in volume, and
N-S temperature
difference fixed)

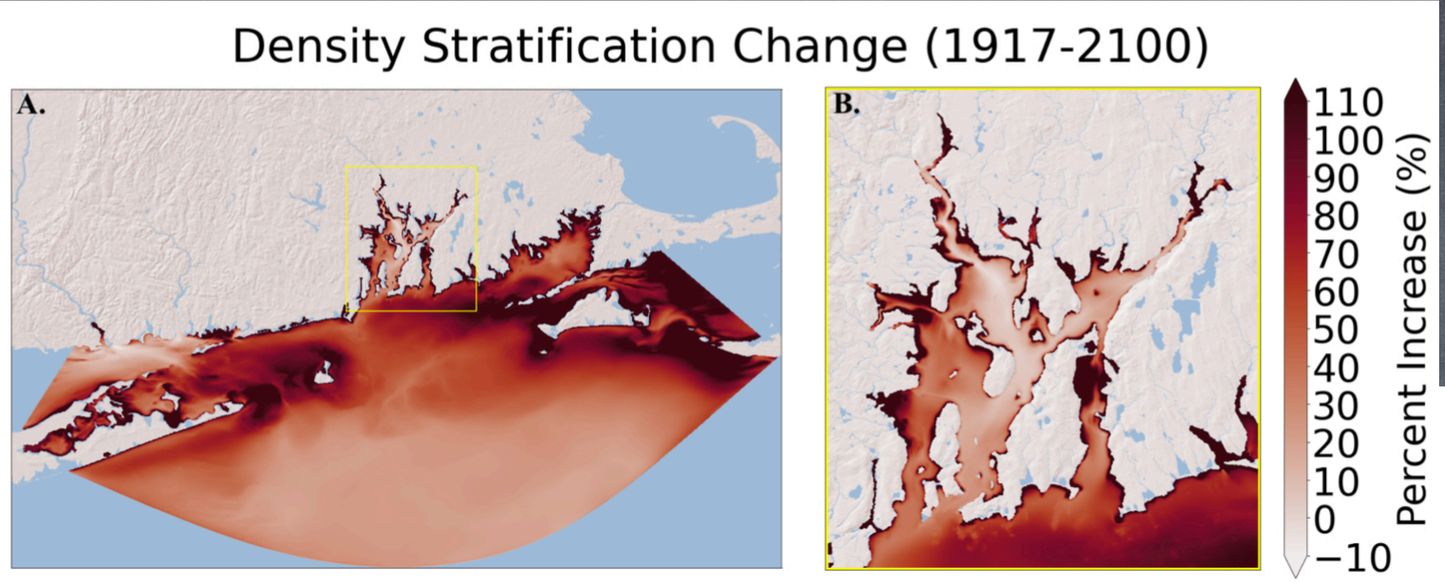


Results

Generally saltier,
Especially up-Bay

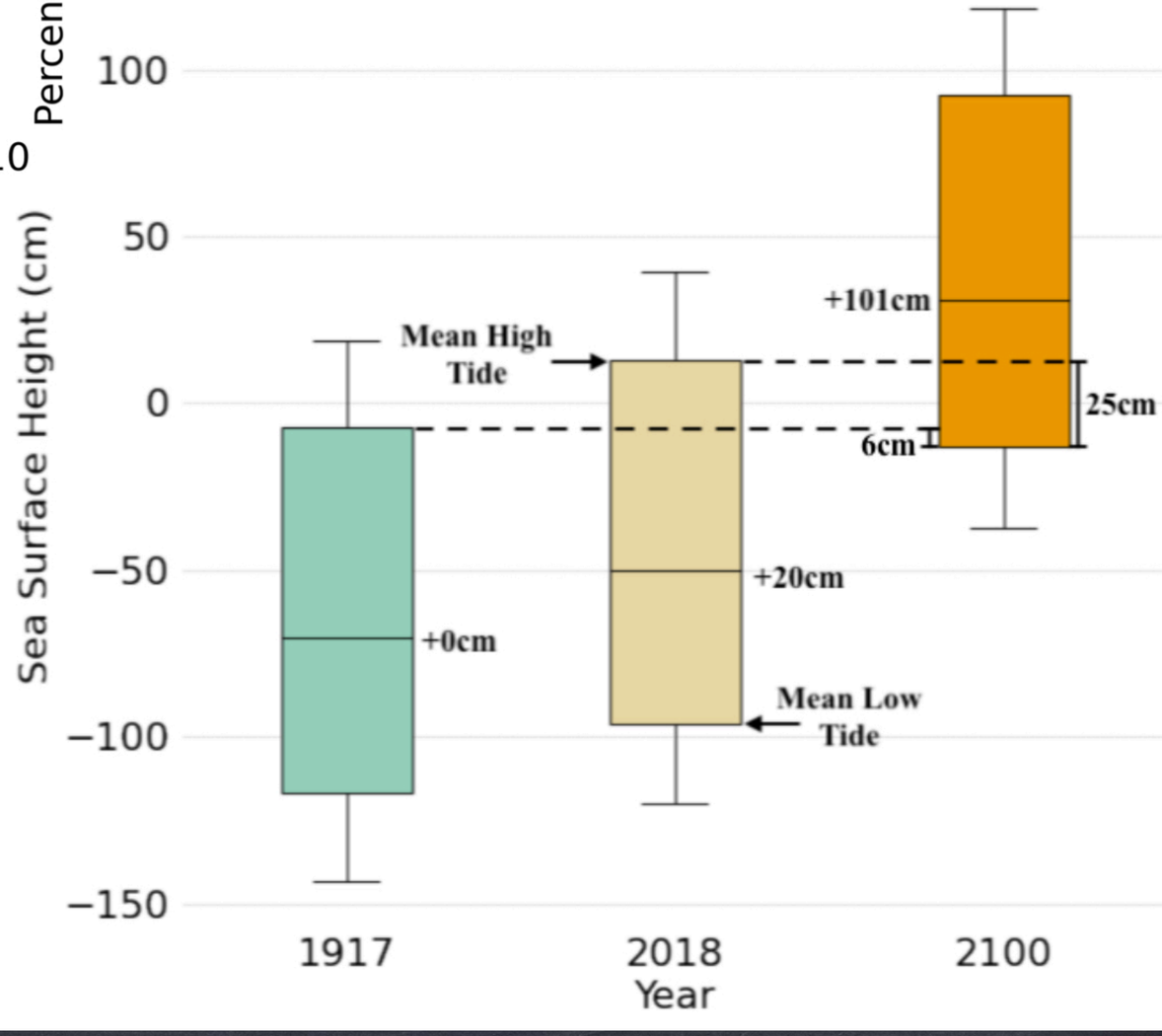
(Note—rivers fixed)





Tides not too different aside from mean, but no wetting & drying

Stratification change pattern nontrivial!



Toy river hydrology emulator—maybe?

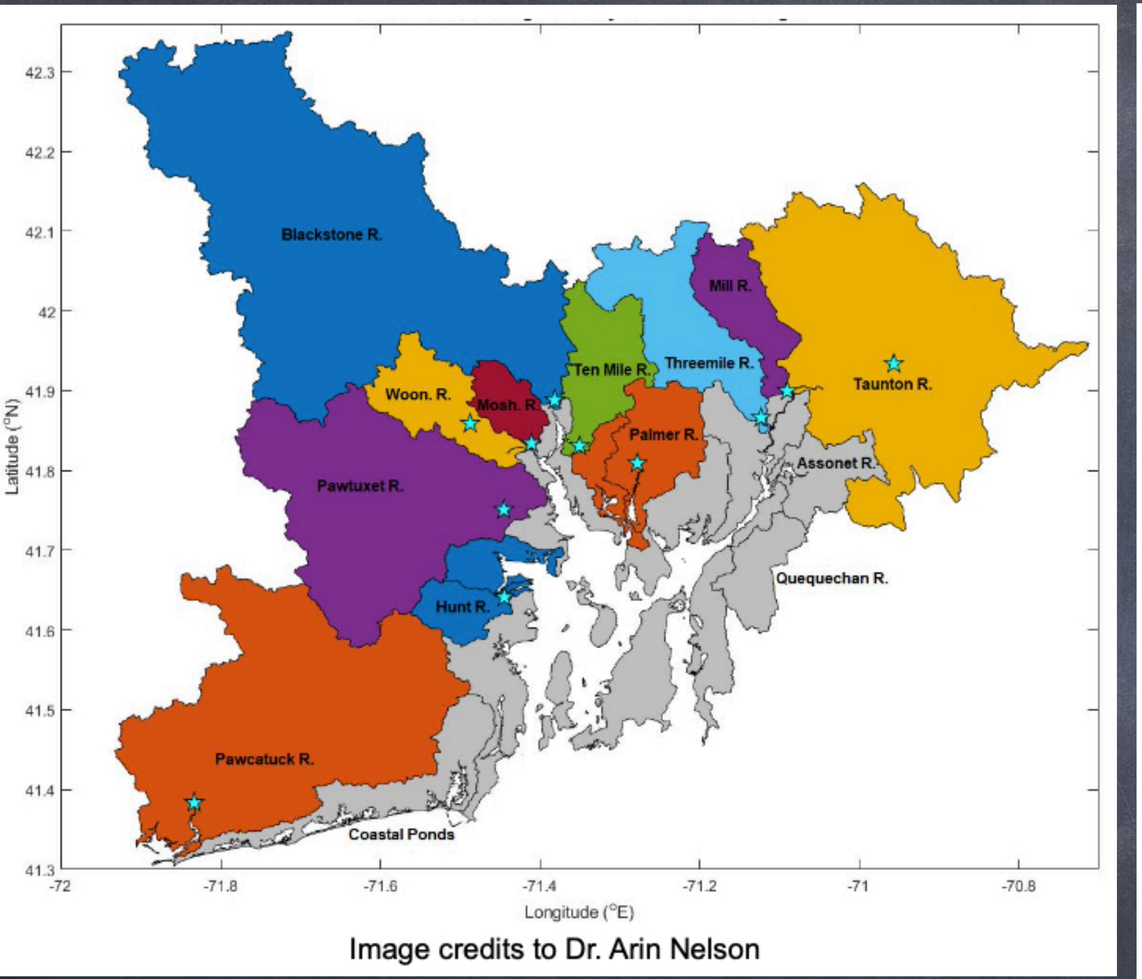
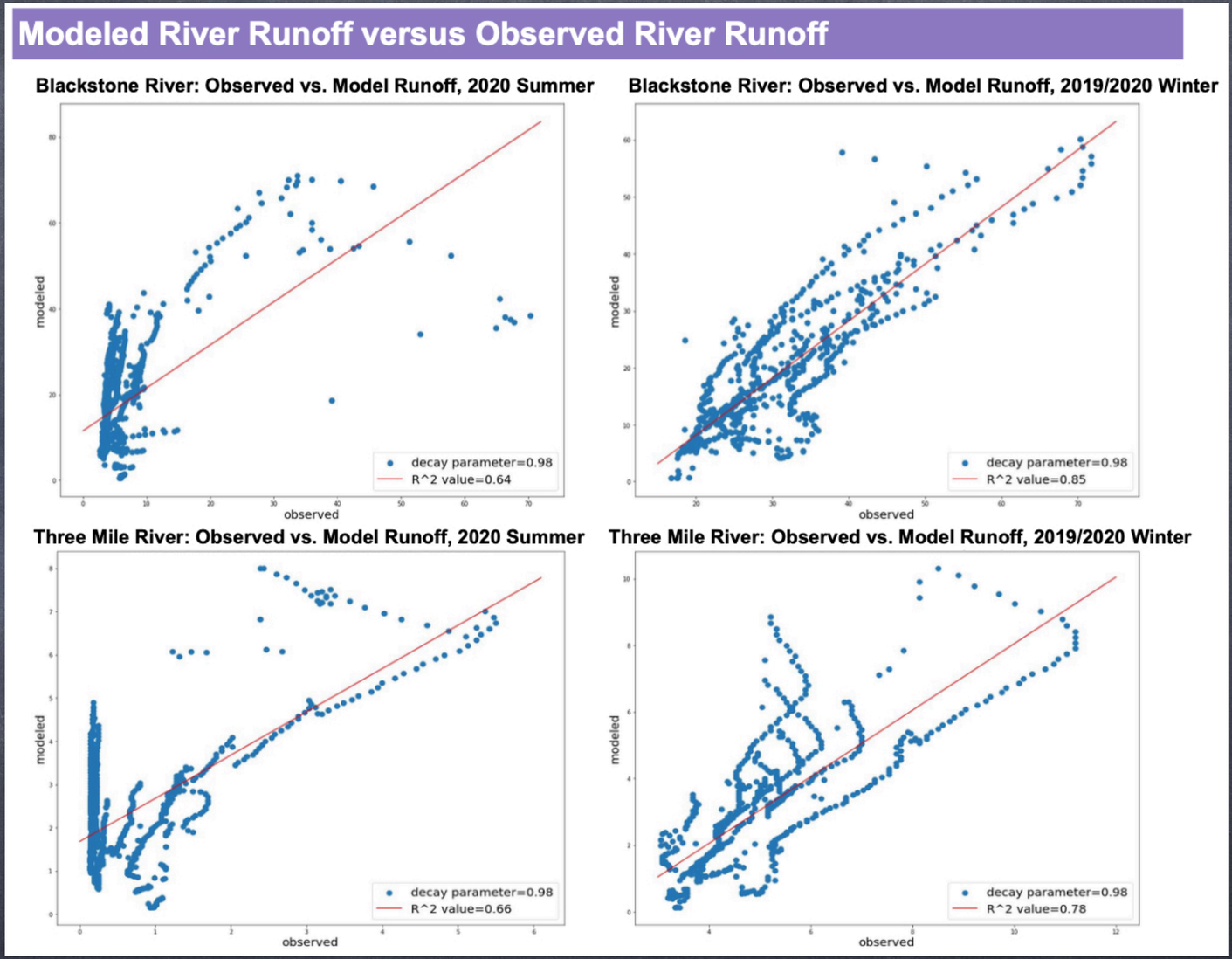


Image credits to Dr. Arin Nelson



Credit: Maya Gong, Haverford College (Brown Summer Visitor)

Room to improve…

- Wetting & drying
- Improved rivers (right now, same for all years. Have a simple emulator, potentially coupling a hydrology model funding permitting)
- Improved solar (clouds are just taken from one year)
- Forcing challenges (not every year saved in iHESP, couldn't get flux forcing to work, etc.)
- Investigated Brayton Point Power Plant (what if it didn't shut down?), but other local issues (hypoxia, beach closures) would have been good
- iHESP has only RCP8.5—no scenario sensitivity tests easily done.
- Better selection of years—or more years/ensemble—inter annual variability large
- Proposals out! Forecast (data assimilation), Plastics, Hydrology, etc.