Sensitivity tests for Phase-7 MBM

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8 Apr 2026

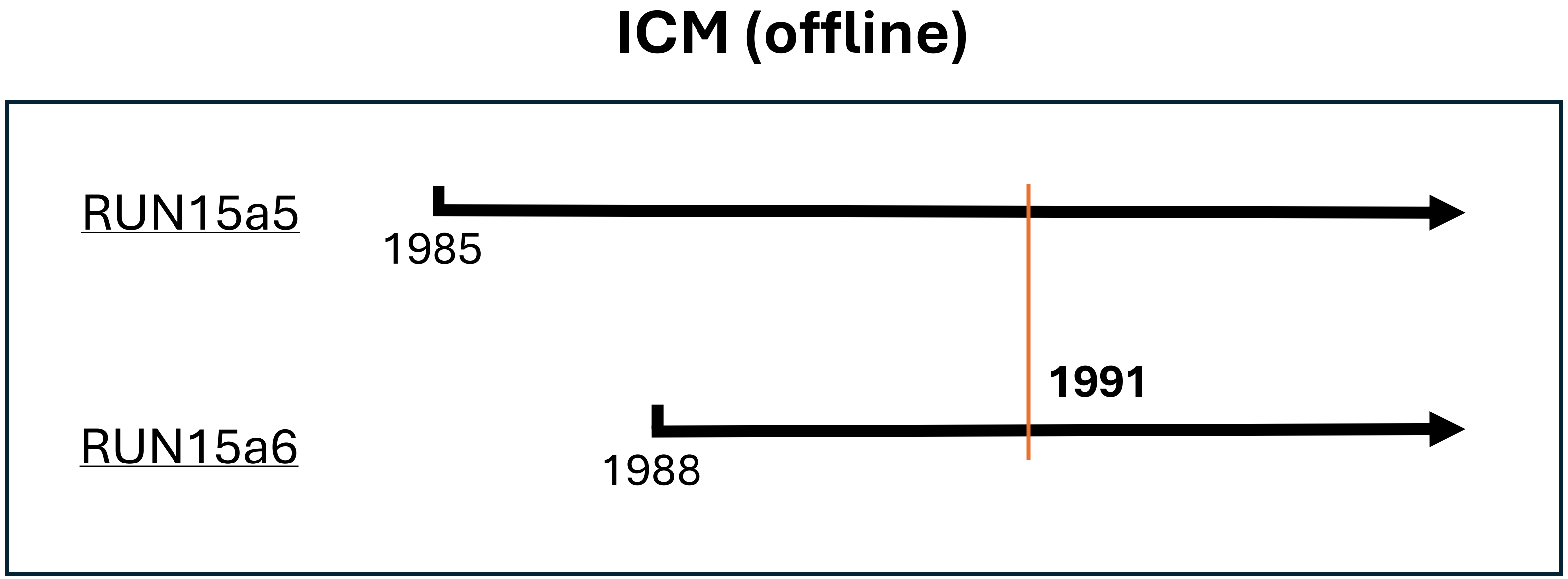
Key takeaway

- ❑ Sensitivity experiments to ICM initial conditions (spin-up time requirements)
  - ✓ Three-yr spin-up was found to be sufficient for the MBM to reach equilibrium (ICM)

- ❑ Sensitivity experiments for riverine nutrient loadings: first results
  - ✓ In preparation for WIP scenarios
  - ✓ Tested NO3/NH4/PO4
  - ✓ Response of hypoxia to riverine nutrient changes

Sensitivity Experiments to ICM Initial Conditions

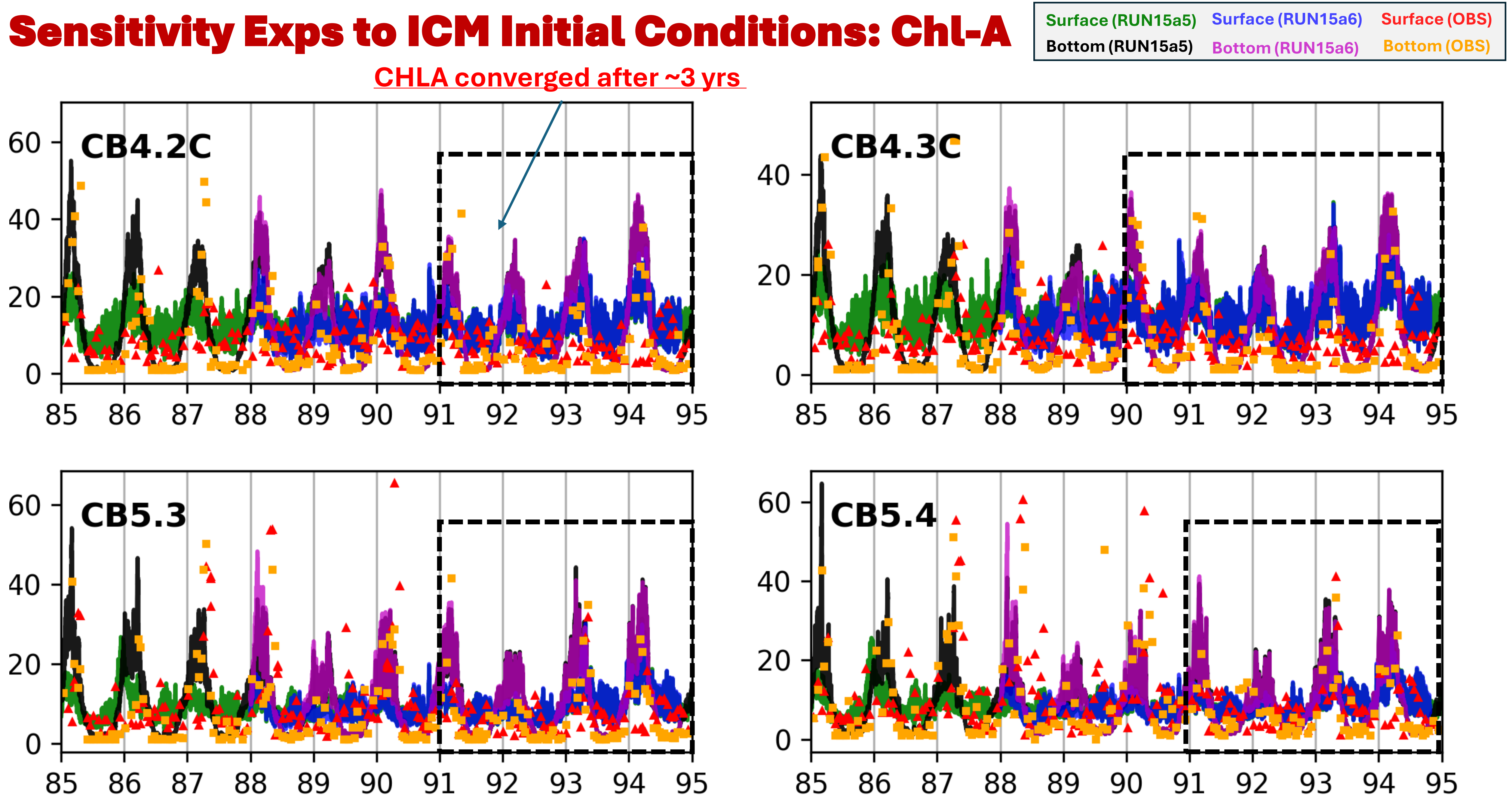
- ❑ Two ICM offline experiments are assessed in long-term simulations (1985-2020)



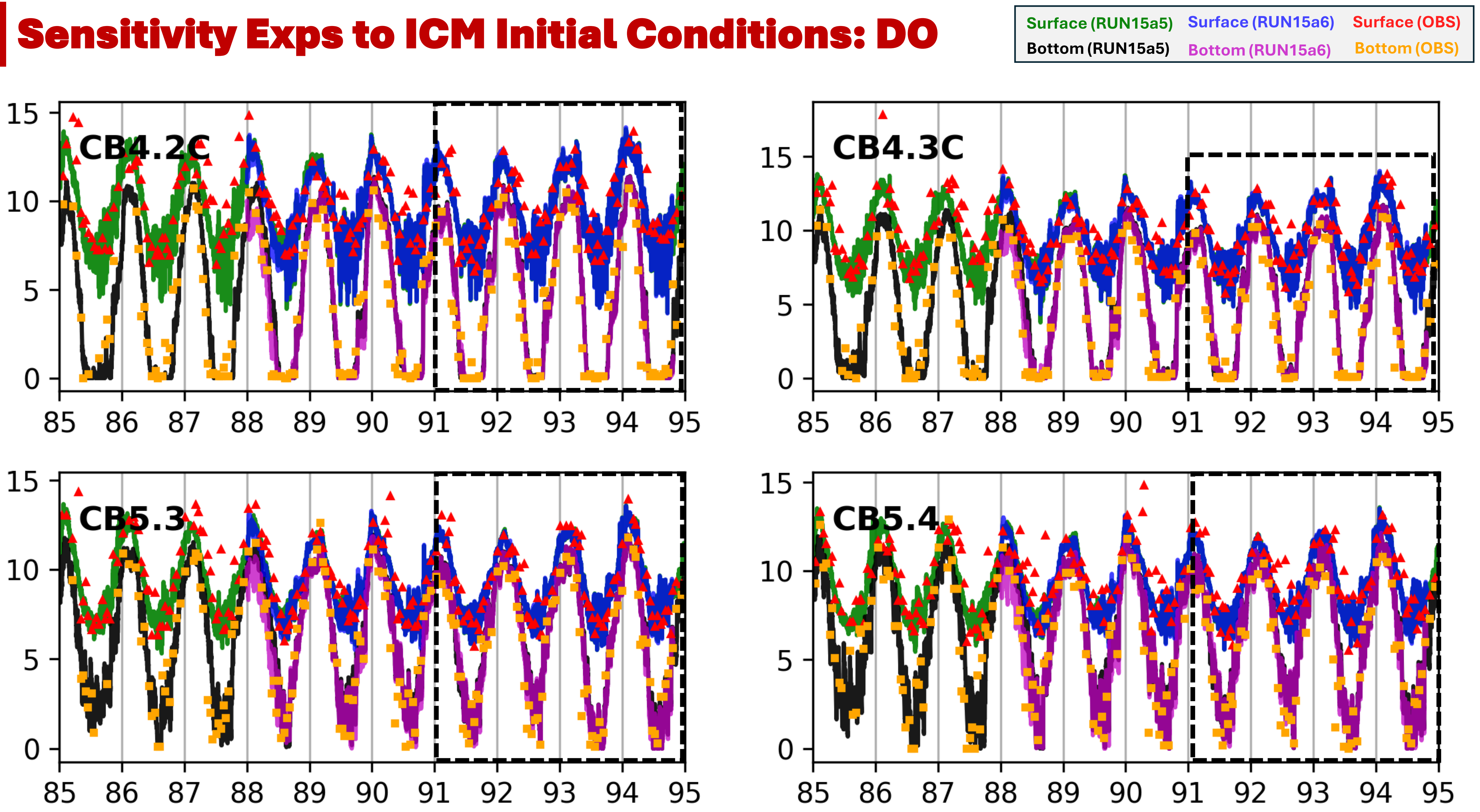
- Same initial condition (**hotstart.nc in 1991**)
- Same ICM parameters (icm.nml)
- Time-dependent boundary inputs catered to each experiment

How long do the two simulations take to converge?

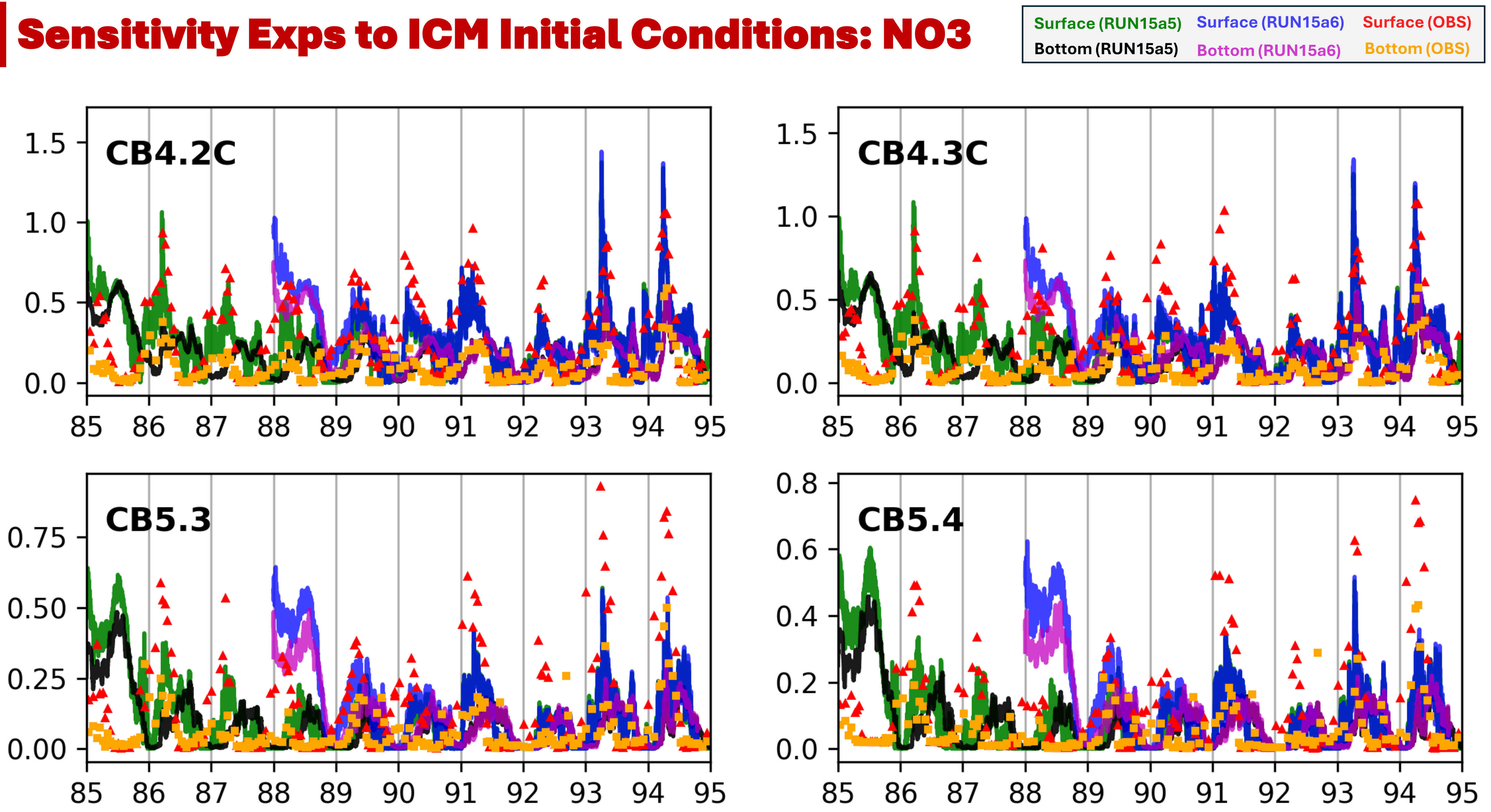
Sensitivity Exps to ICM Initial Conditions: Chl-A



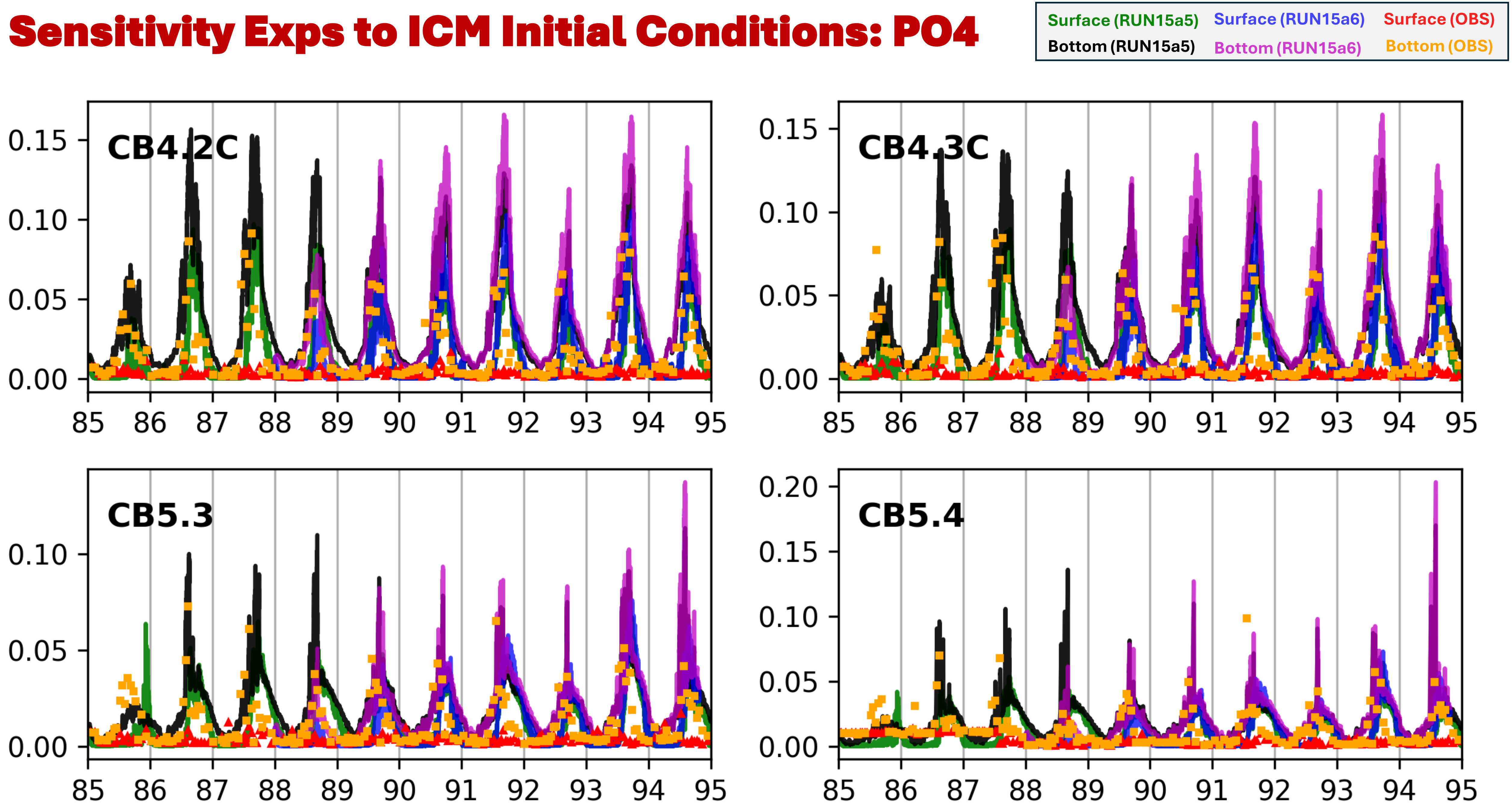
Sensitivity Exps to ICM Initial Conditions: DO



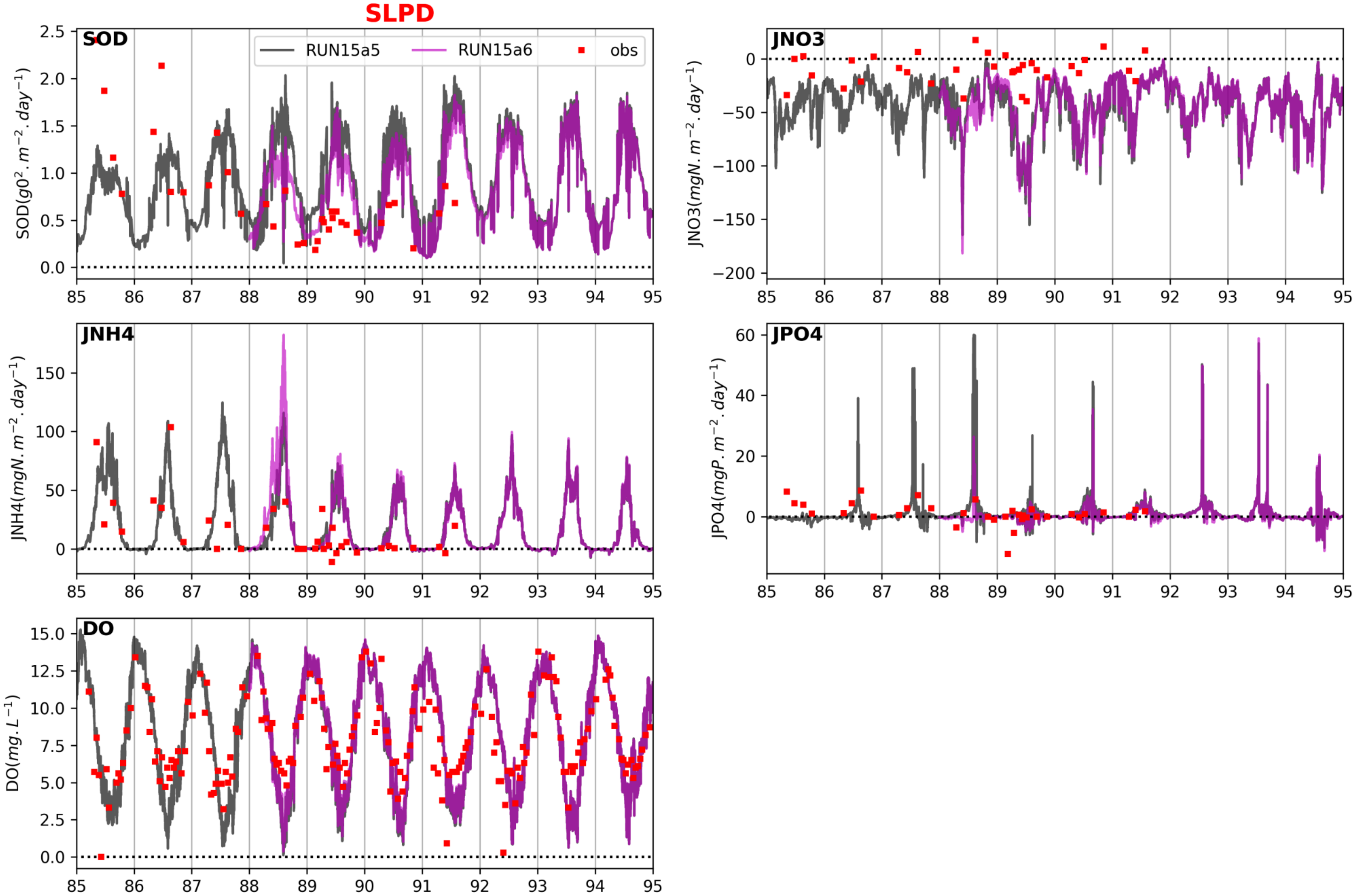
Sensitivity Exps to ICM Initial Conditions: NO3

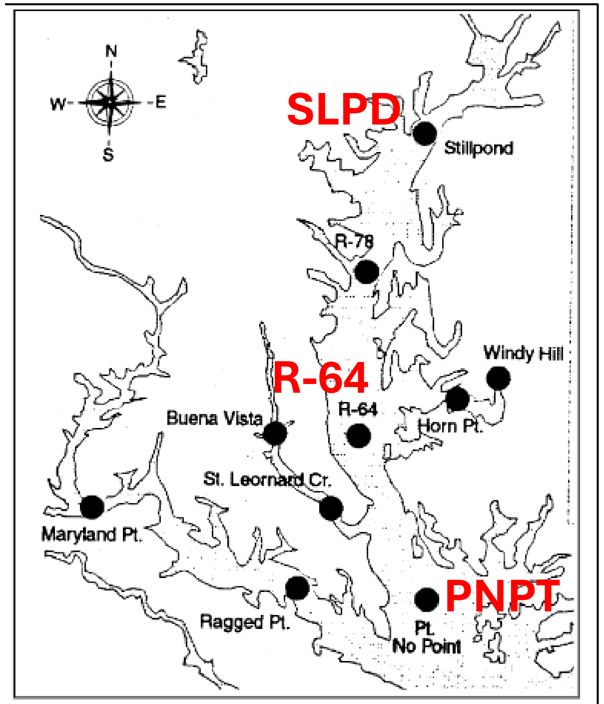


Sensitivity Exps to ICM Initial Conditions: PO4

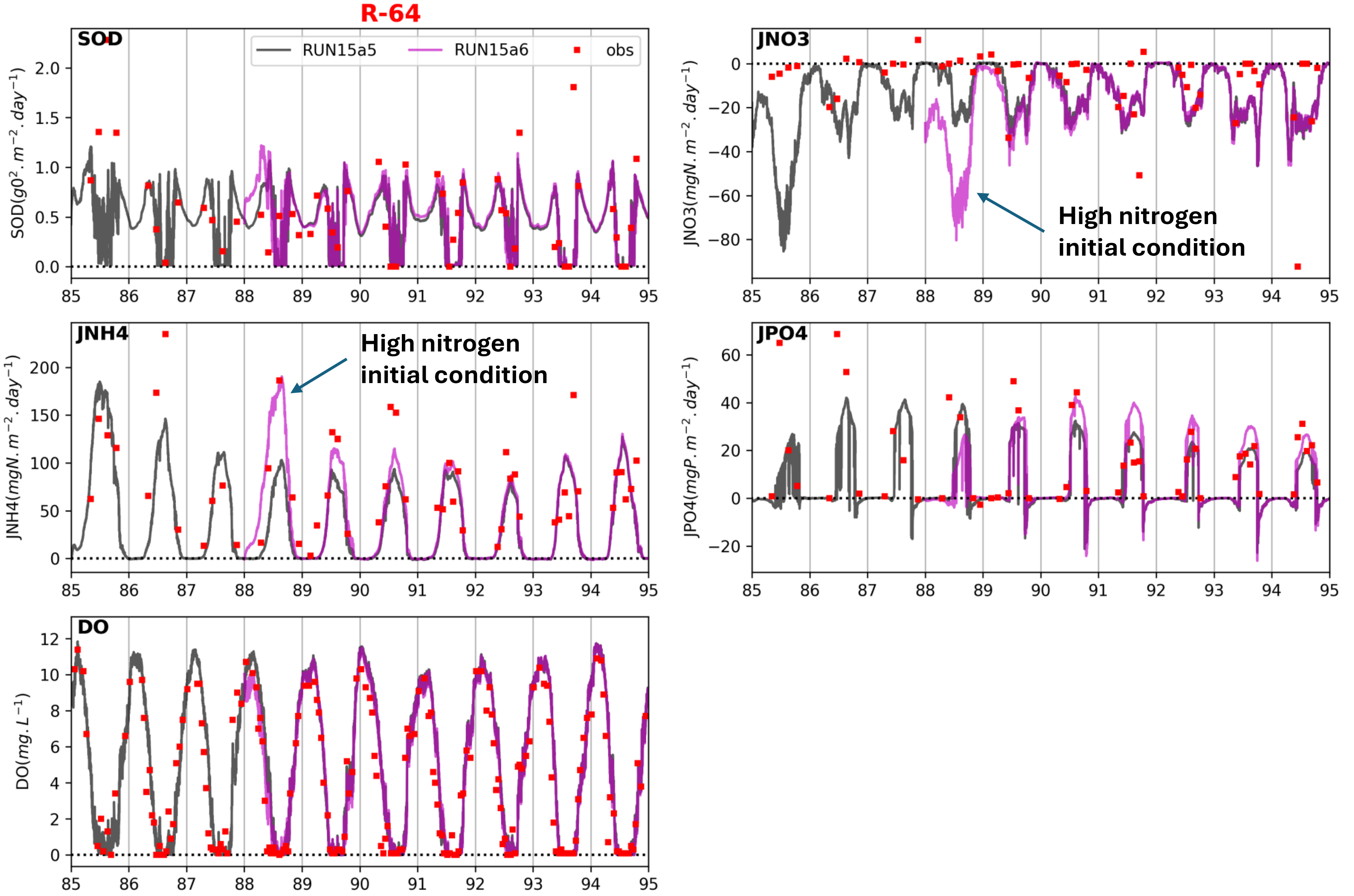


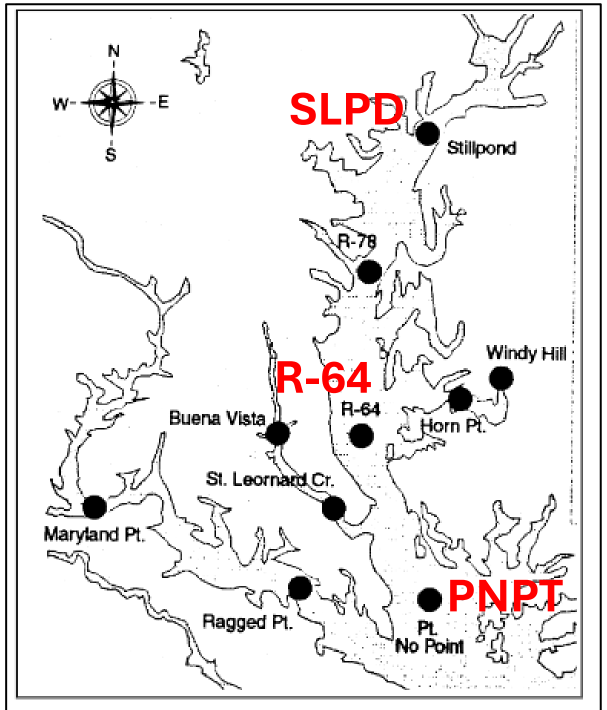
Sensitivity Exps to ICM Initial Conditions: sediment fluxes



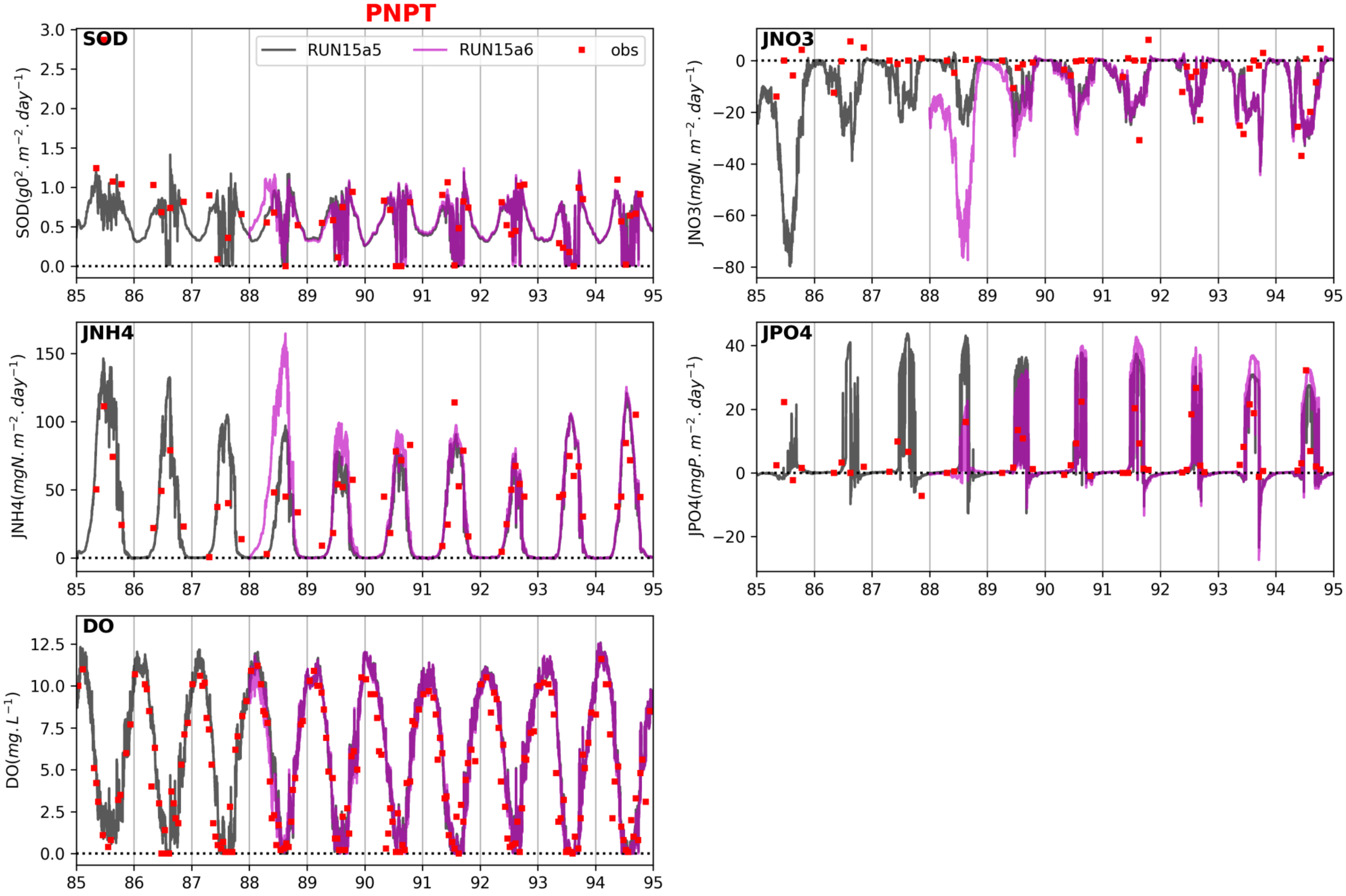


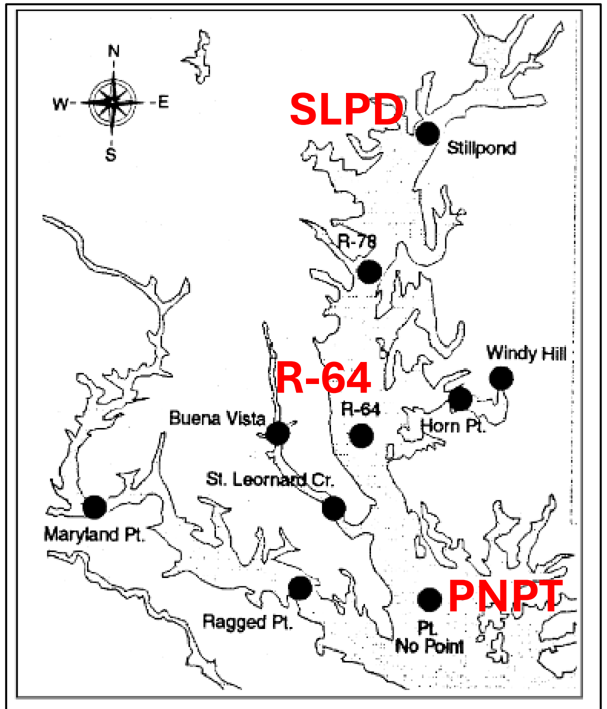
Sensitivity Exps to ICM Initial Conditions: sediment fluxes



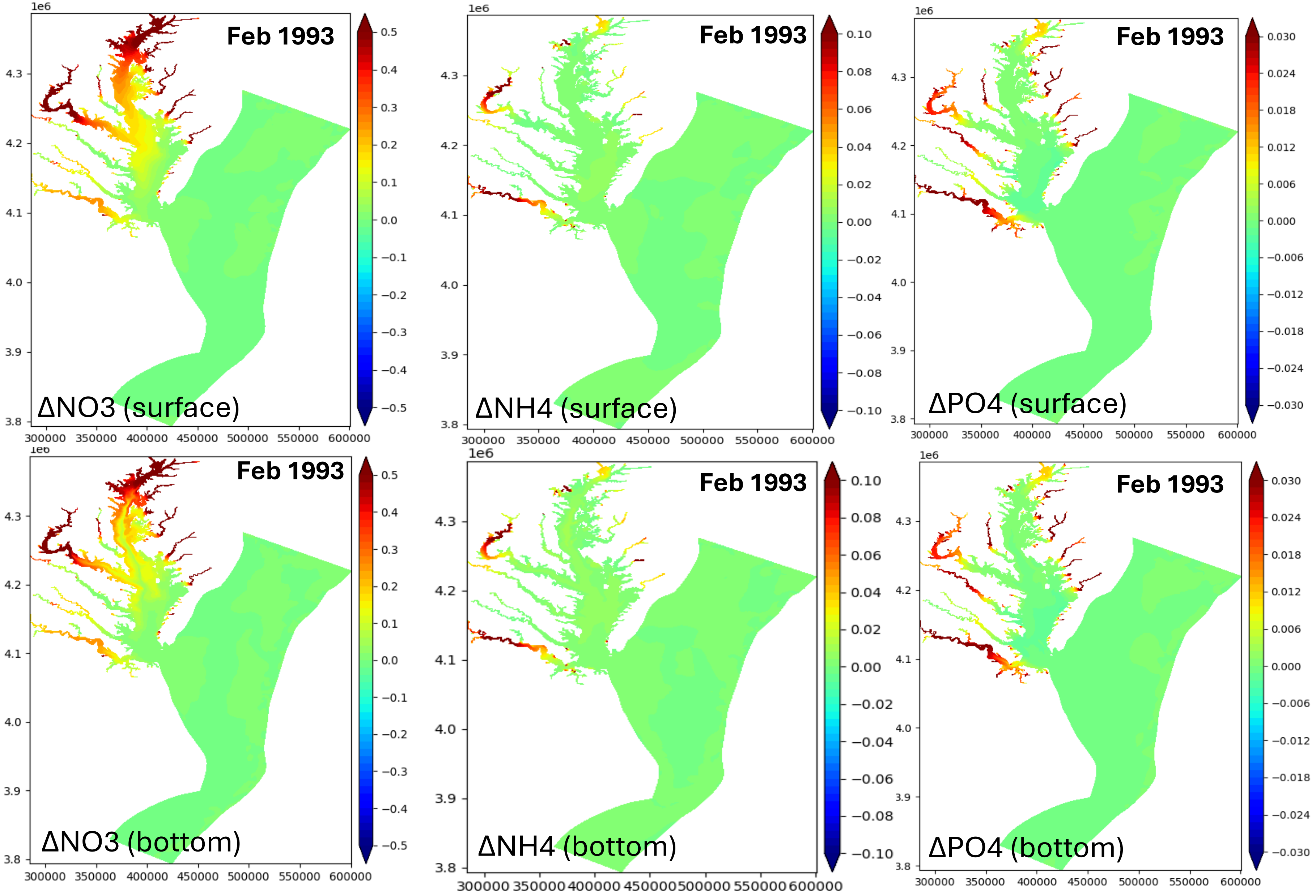


Sensitivity Exps to ICM Initial Conditions: sediment fluxes





Sensitivity Experiments to Riverine Nutrient Loadings: First results



RUN14v26 (1.5 times): higher riverine NO3/NH4/PO4

RUN14v25 (0.5 times): lower riverine NO3/NH4/PO4

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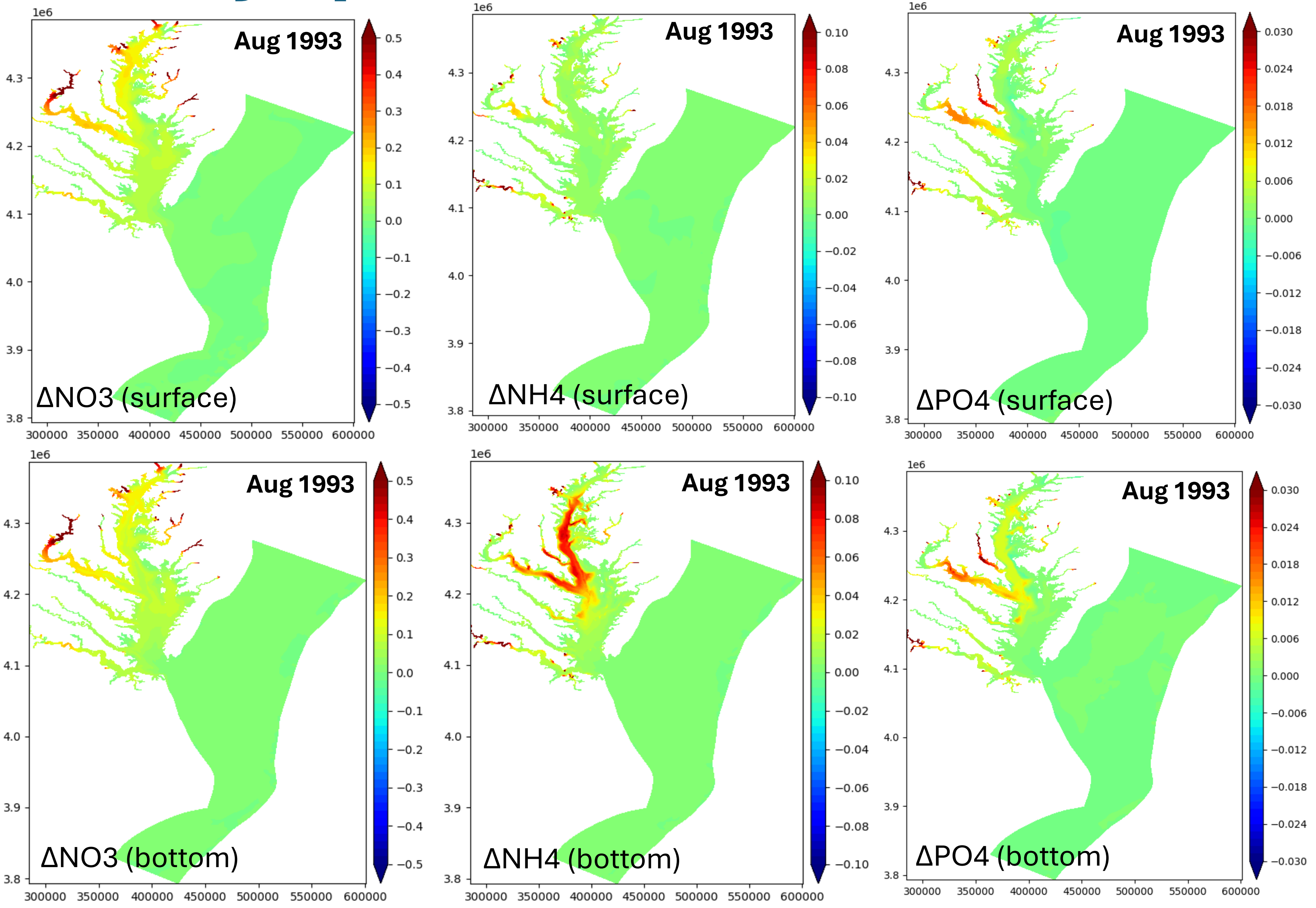
In prep for WIP scenarios

RUN14v26 – base run

WINTER

Sensitivity Experiments to Riverine Nutrient Loadings



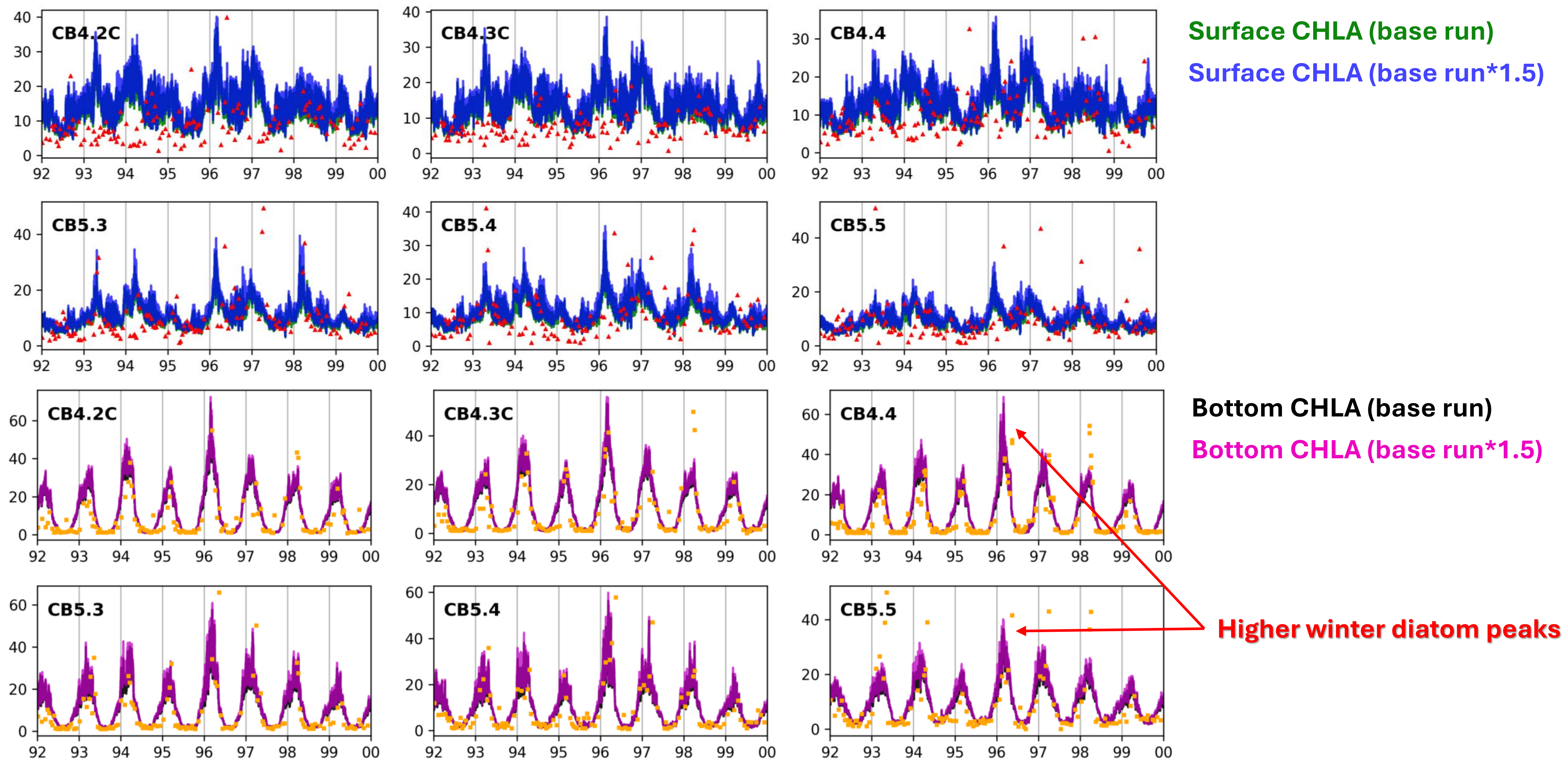
RUN14v26 – base run

SUMMER

- ➢ NO3 is highly correlated to river flow, showing higher responses in winter and lower in summer.
- ➢ PO4 & NH4 show quite similar responses, which are stronger in the bottom layer during summer.

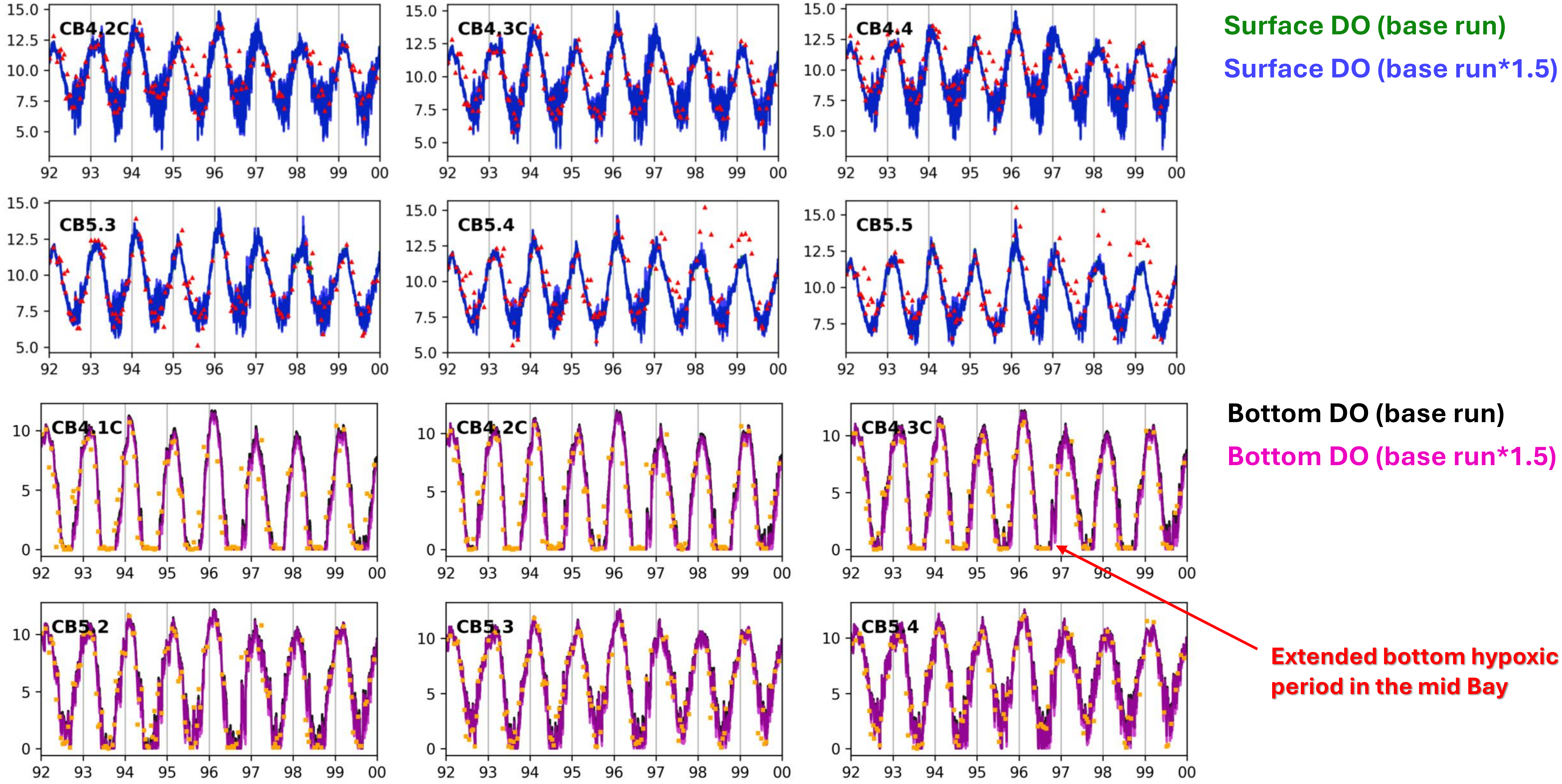
Sensitivity Exps to Riverine Nutrient Loadings: CHLA

- ❑ Surface CHLA increased in all seasons; Winter bottom CHLA peaks are higher



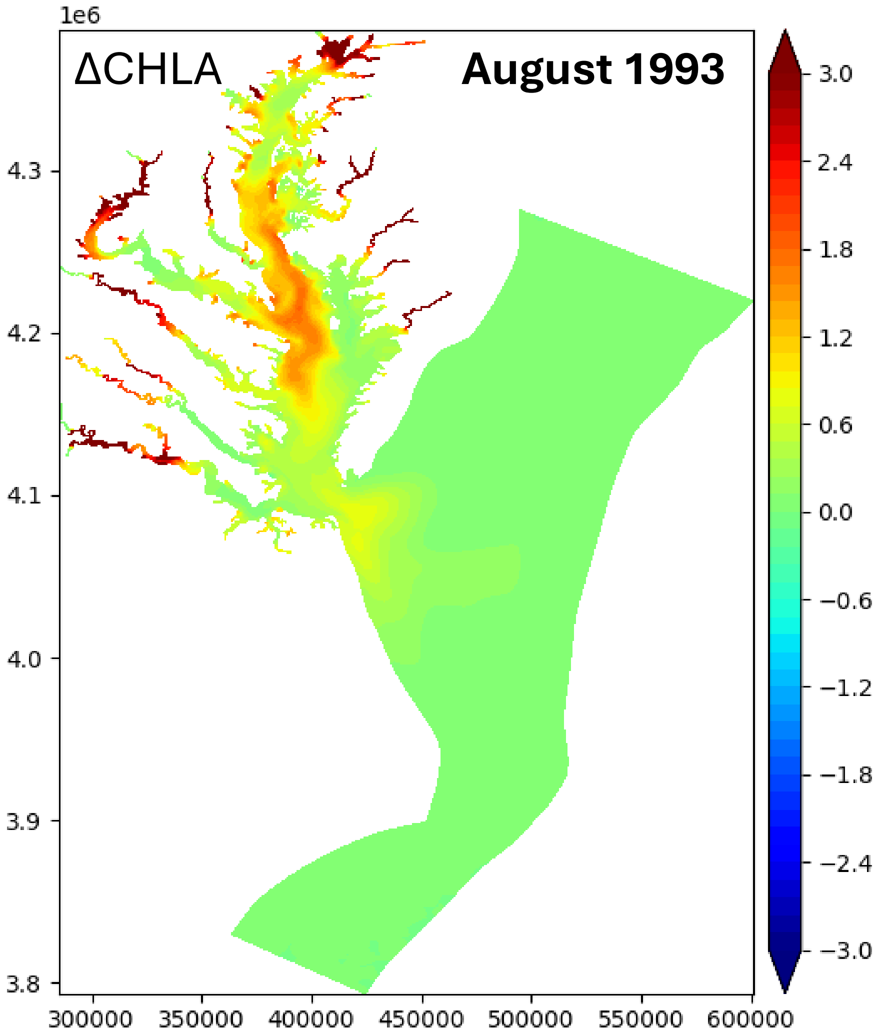
Sensitivity Exps to Riverine Nutrient Loadings: DO

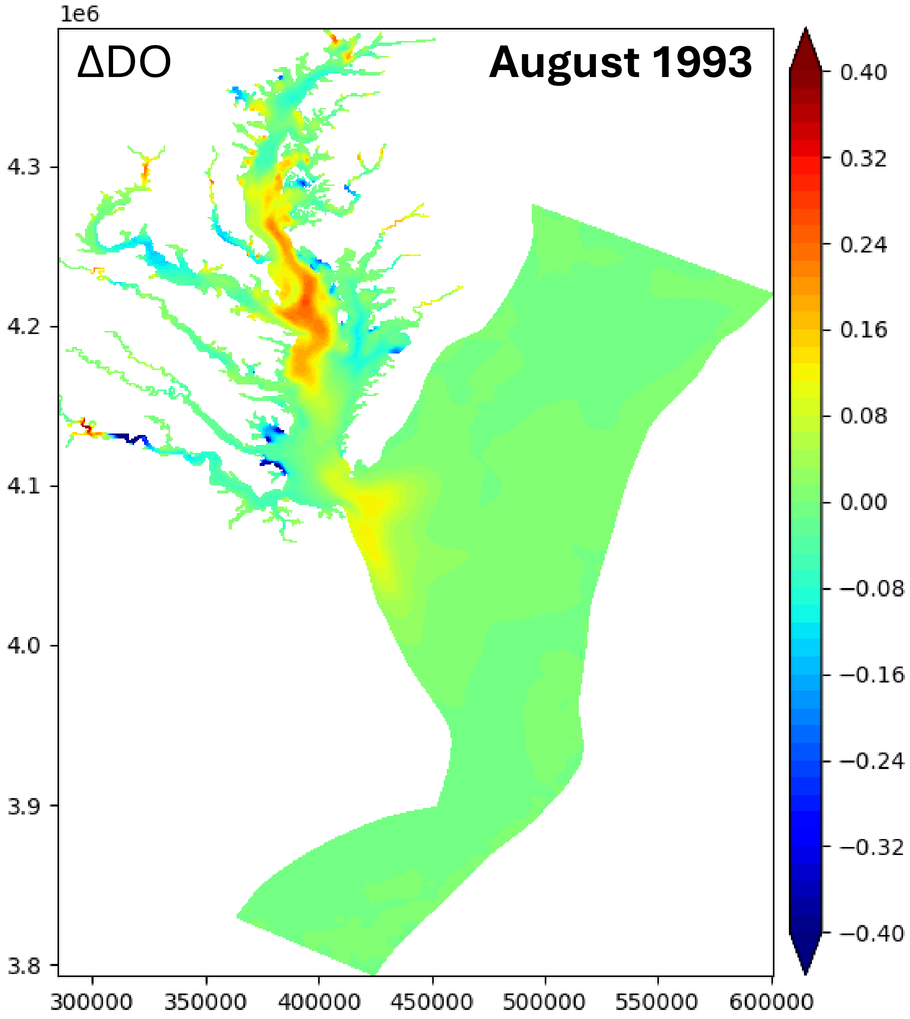
- ❑ Surface DO increased, while bottom DO decreased with increased riverine nutrient loading.



Sensitivity Experiments to Riverine Nutrient Loadings: surface CHLA & DO

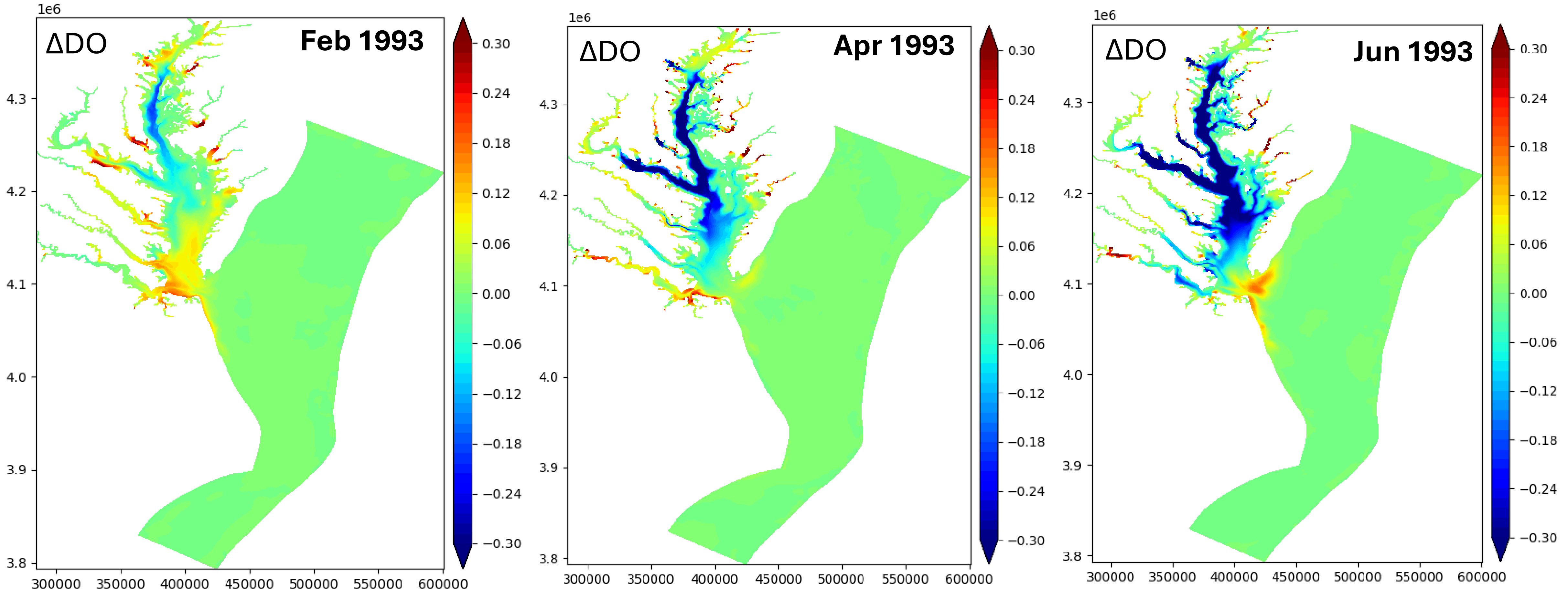
- Higher CHLA is directly responsible for higher DO in the surface layer of mid-Bay





Sensitivity Experiments to Riverine Nutrient Loadings: bottom DO

- ❑ Bottom DO begins to decrease in the deep channel since early spring
- ❑ Higher CHLA leads to more DO consumption



Summary

- ✓ Three-year spin-up may be sufficient for the MBM to reach equilibrium (ICM)
  - We may consider building a database of different initial conditions for each WIP scenario

- ✓ Preliminary results of sensitivity to nutrient inputs in prep for WIP scenarios
  - Higher nutrient loading increases surface DO but decreases bottom DO
  - NO3 response is highly correlated to watershed loading
  - NH4 & PO4 changes may be more related to the phytoplankton response
  - Will continue to test with newer versions of WSM, MBM