

Updates on CBP Phase 6 Watershed Model and DLEM Comparisons

CHAMP Meeting – February 2019

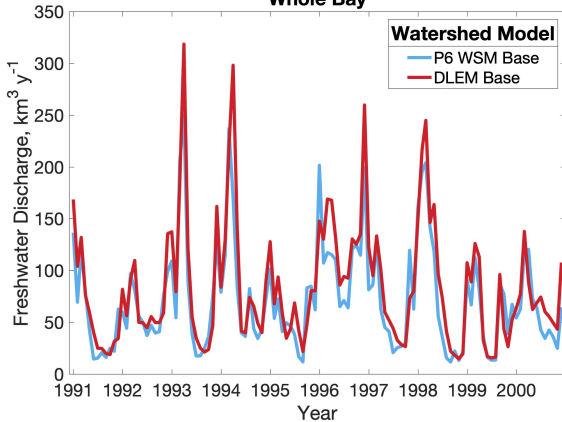
Presentation Outline

1. Comparison of Phase 6 Watershed Model (**P6WSM**) and Dynamic Land Ecosystem Model (**DLEM**) calibrations
2. Agreement in how delta change data are applied in climate change simulations – **Yuanzhi Yao & Zihao Bian**

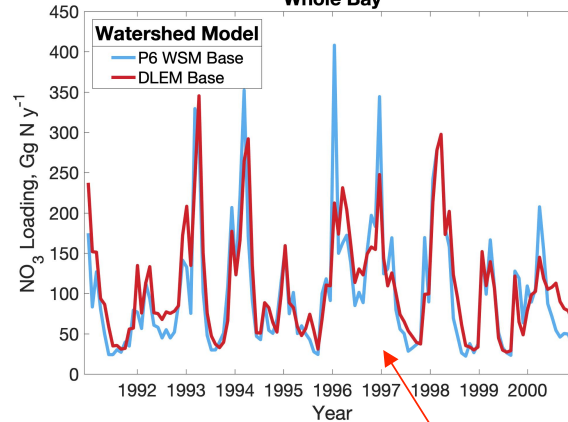
Kyle & Pierre have shown P6WSM and DLEM comparisons

Chesapeake Bay Watershed –

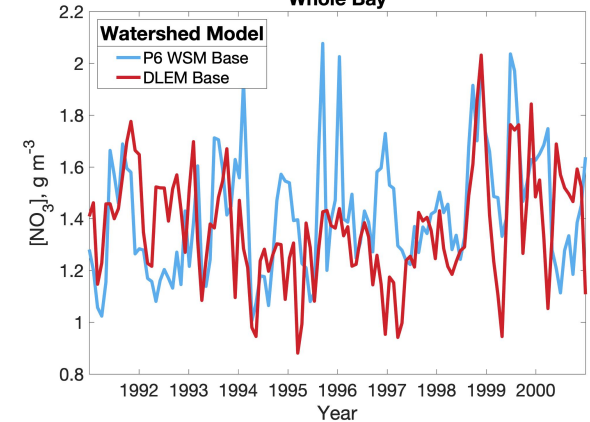
Watershed Inputs Comparison: P6 vs DLEM
Whole Bay



Watershed Inputs Comparison: P6 vs DLEM
Whole Bay



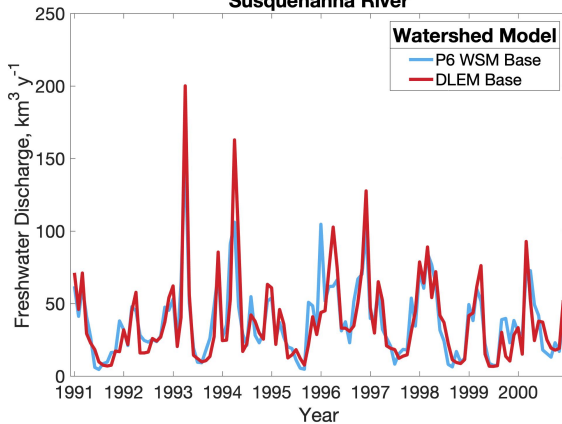
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Whole Bay



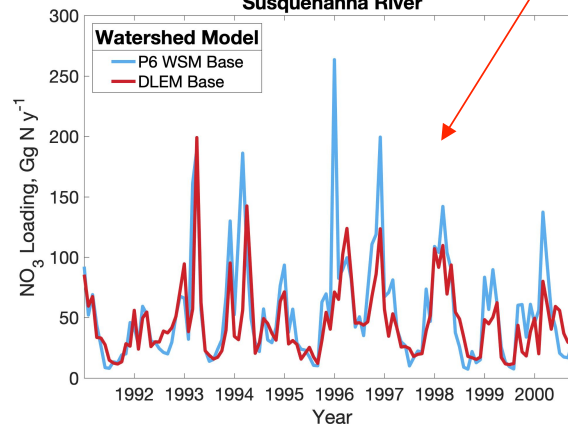
#1. There is good agreement in P6WSM and DLEM monthly Nitrate Loads.

Susquehanna River Basin –

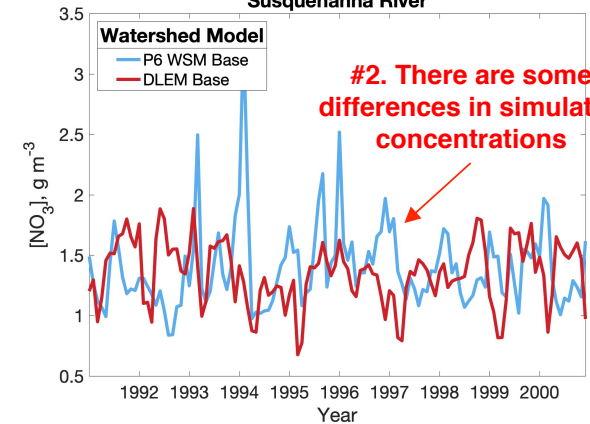
Watershed Inputs Comparison: P6 vs DLEM
Susquehanna River



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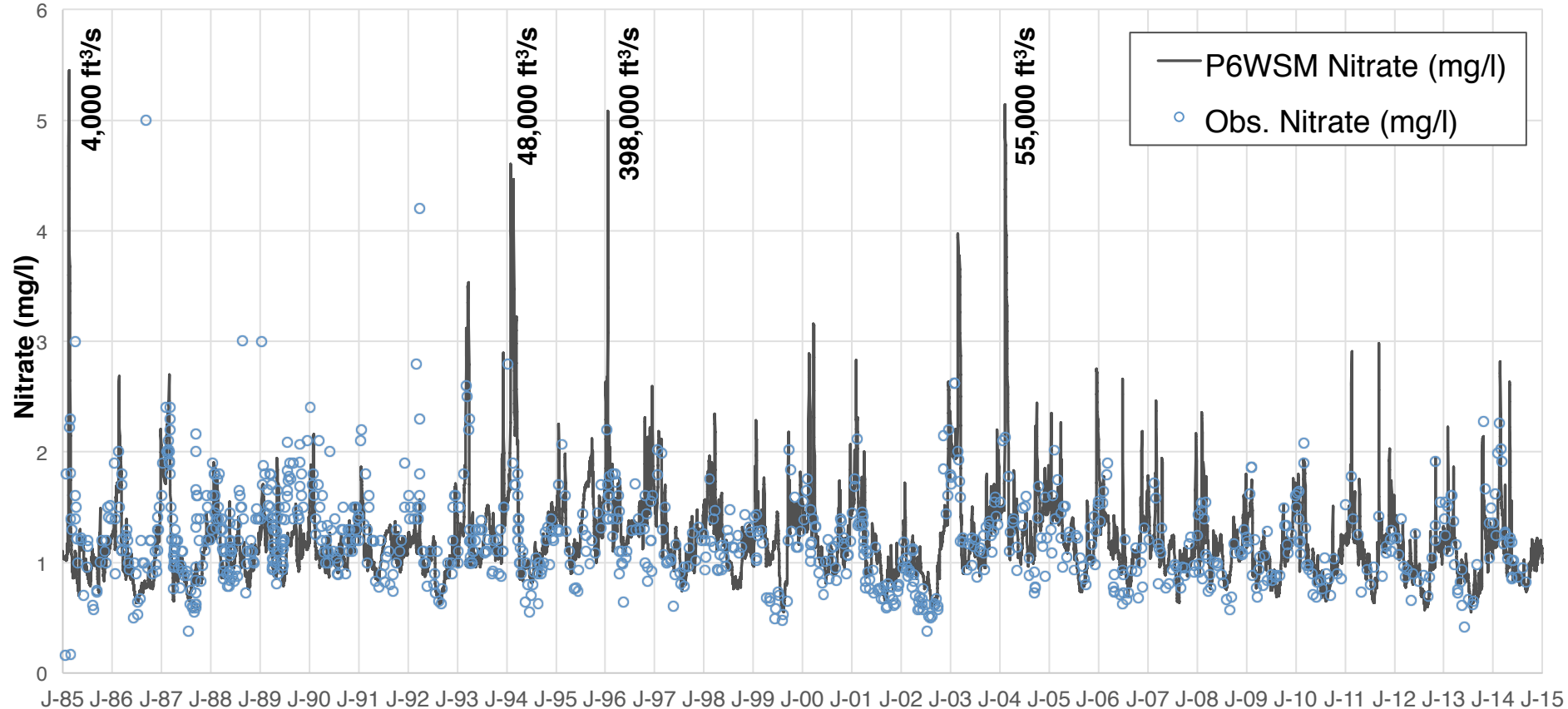
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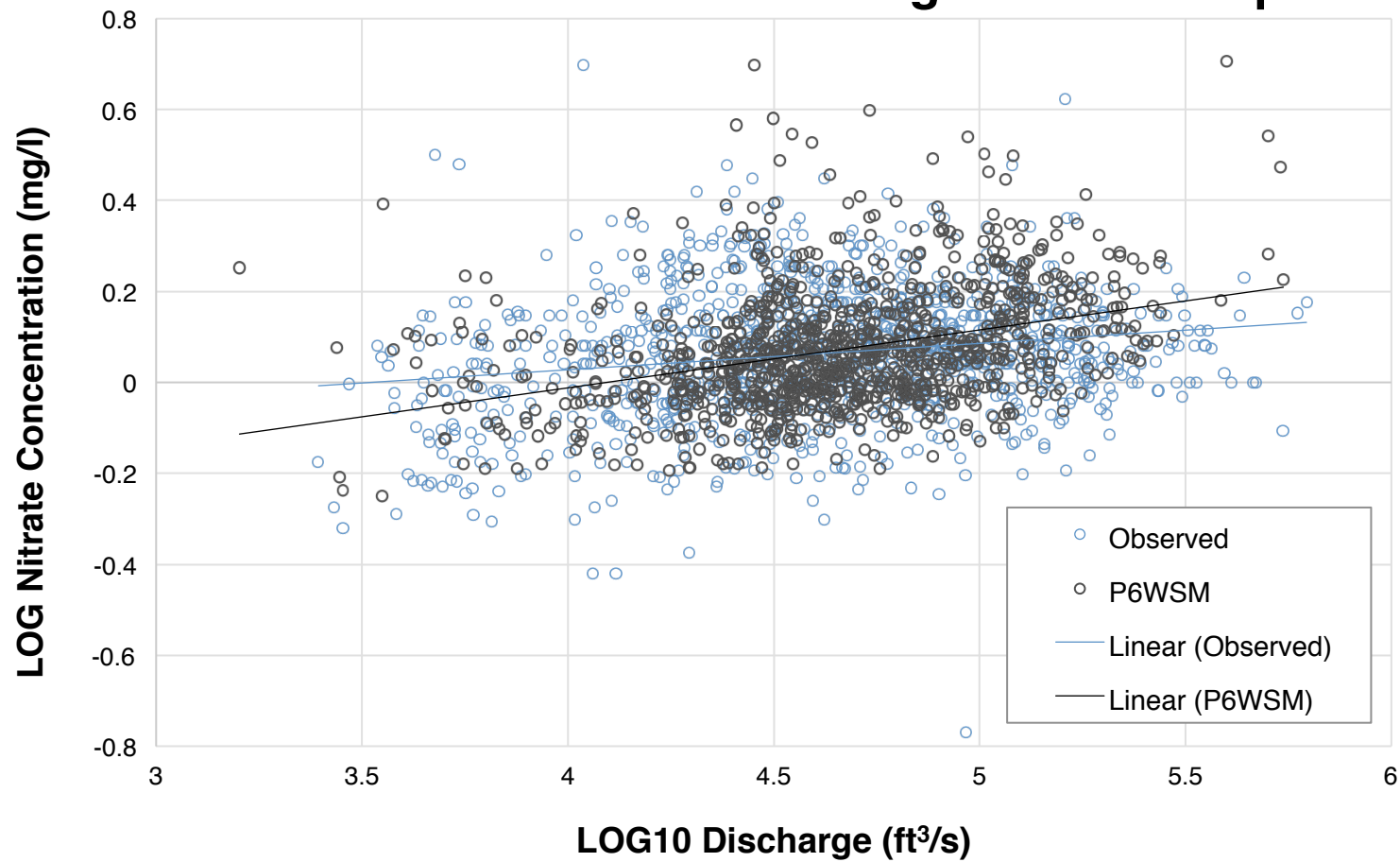
#2. There are some differences in simulated concentrations

Nitrate Concentrations (daily)

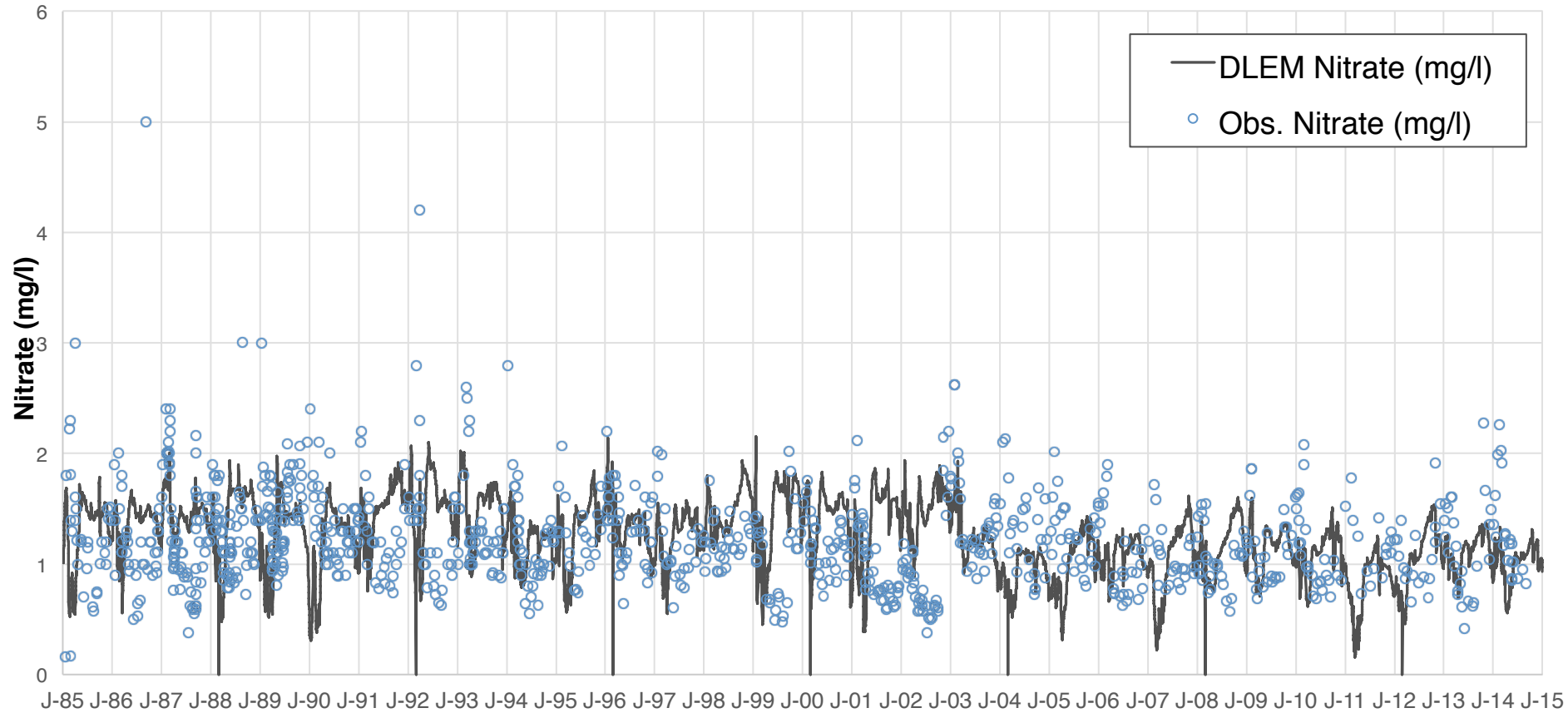
Susquehanna at Conowingo, MD – Daily Nitrate Concentrations



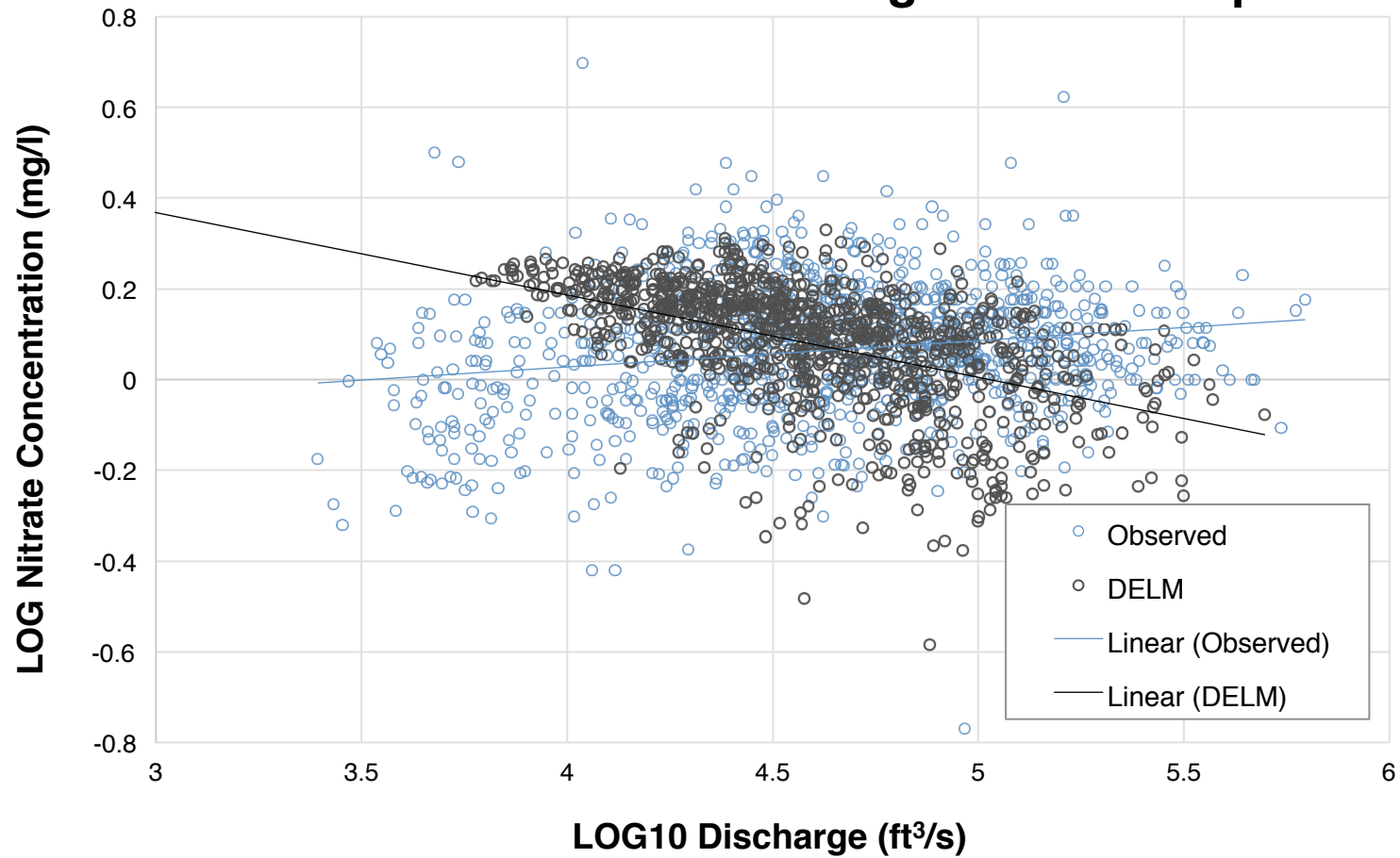
P6WSM - Concentration Discharge Relationship



Susquehanna at Conowingo, MD – Daily Nitrate Concentrations

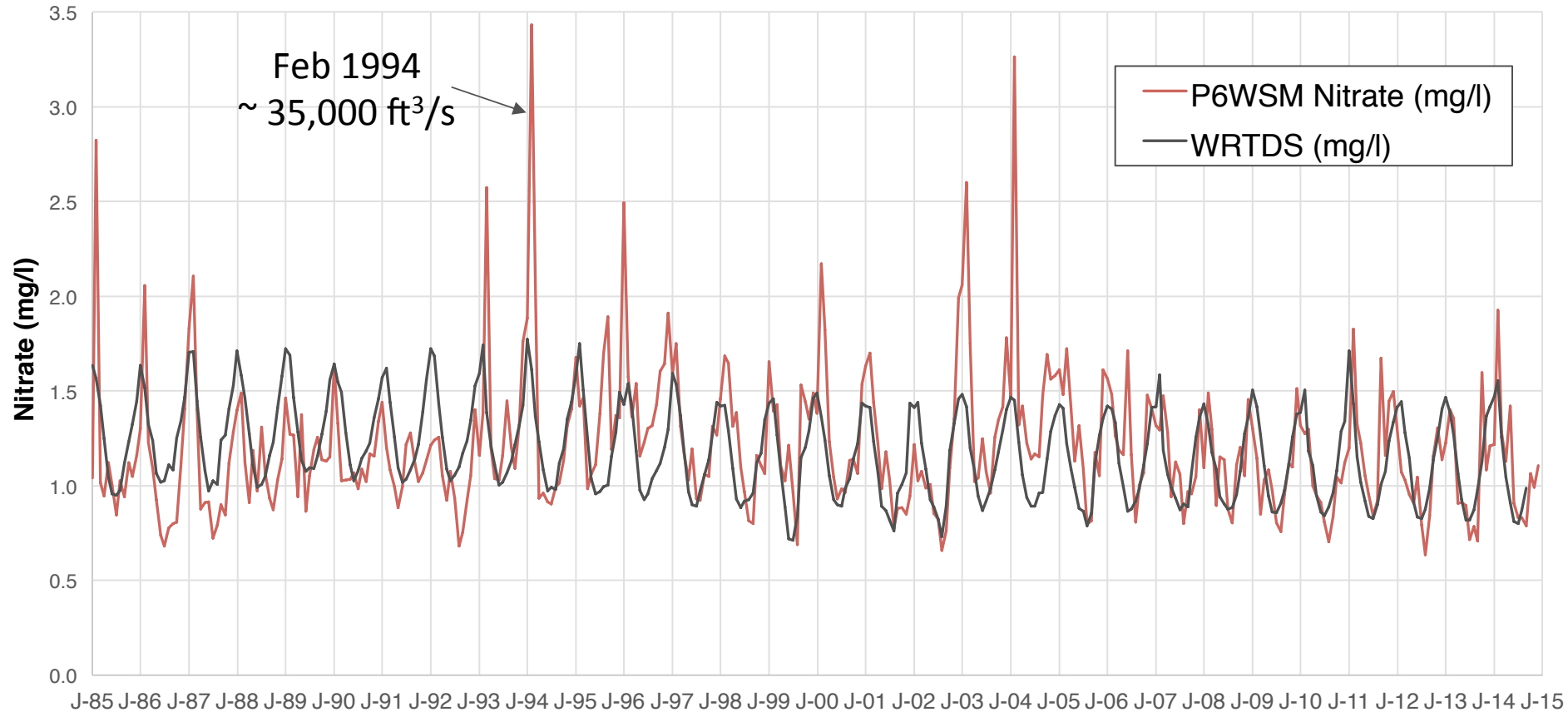


DLEM - Concentration Discharge Relationship

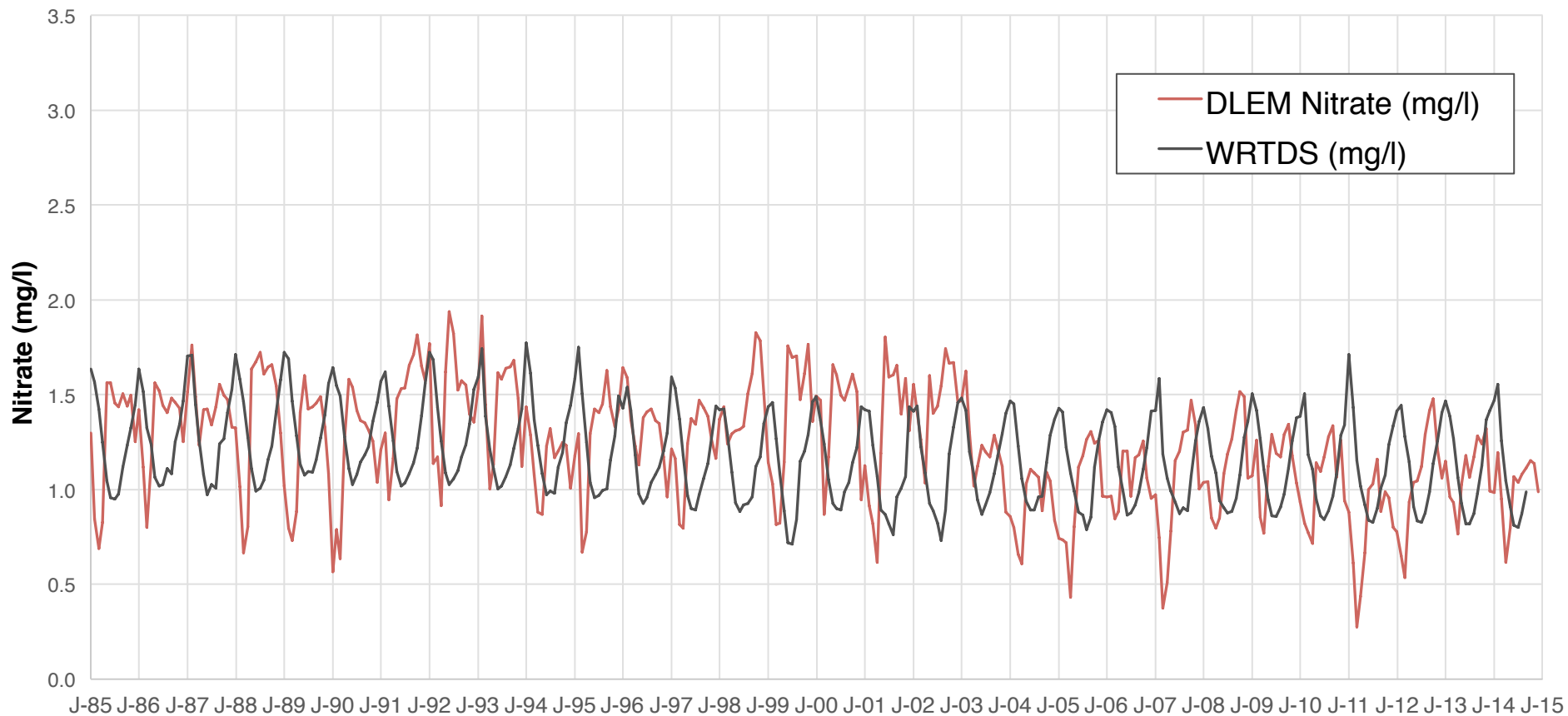


USGS WRTDS - Nitrate Concentrations

Susquehanna at Conowingo, MD – Monthly Nitrate Concentrations

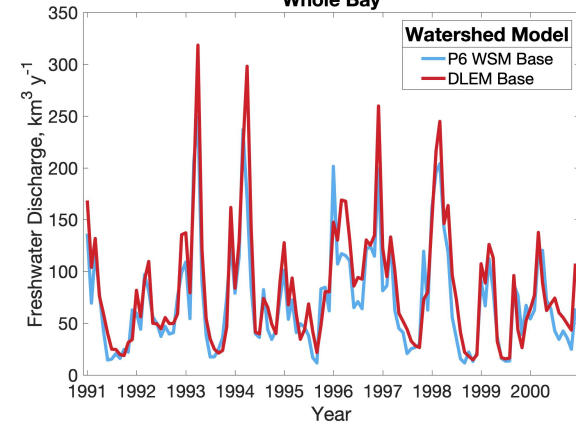


Susquehanna at Conowingo, MD - Monthly Nitrate Concentrations

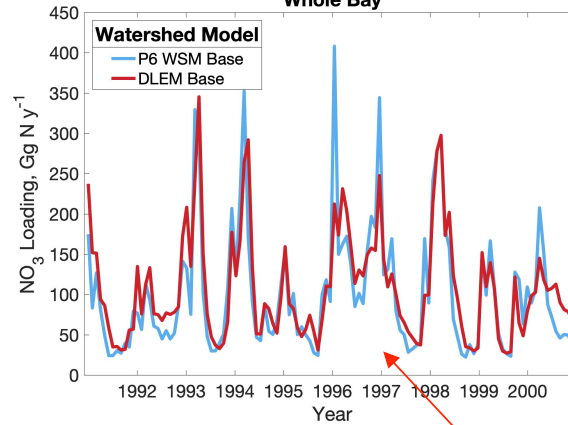


Chesapeake Bay Watershed –

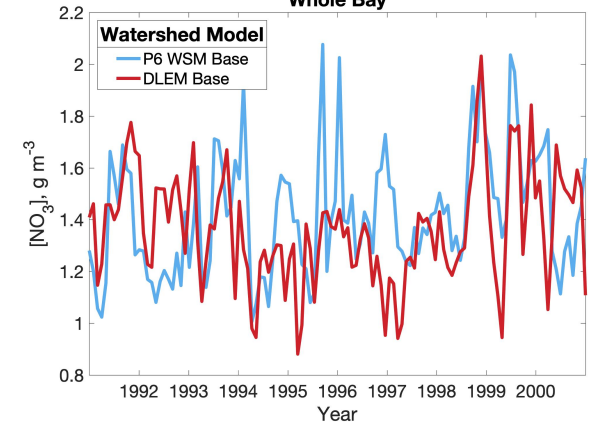
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Whole Bay



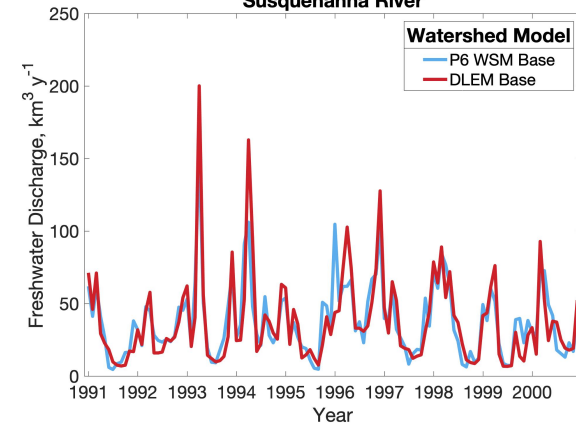
Watershed Inputs Comparison: P6 vs DLEM
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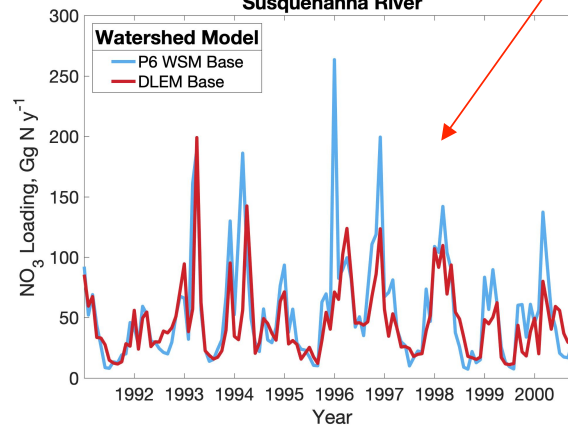
There is good agreement in P6WSM and DLEM monthly Nitrate Loads

Susquehanna River Basin –

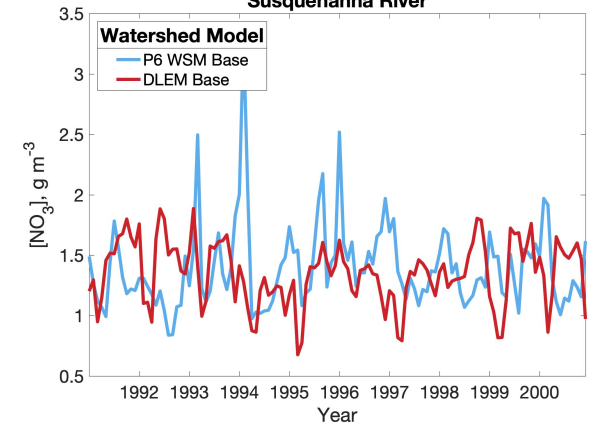
Watershed Inputs Comparison: P6 vs DLEM
Susquehanna River



Watershed Inputs Comparison: P6 vs DLEM
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Watershed Inputs Comparison: P6 vs DLEM
Susquehanna River

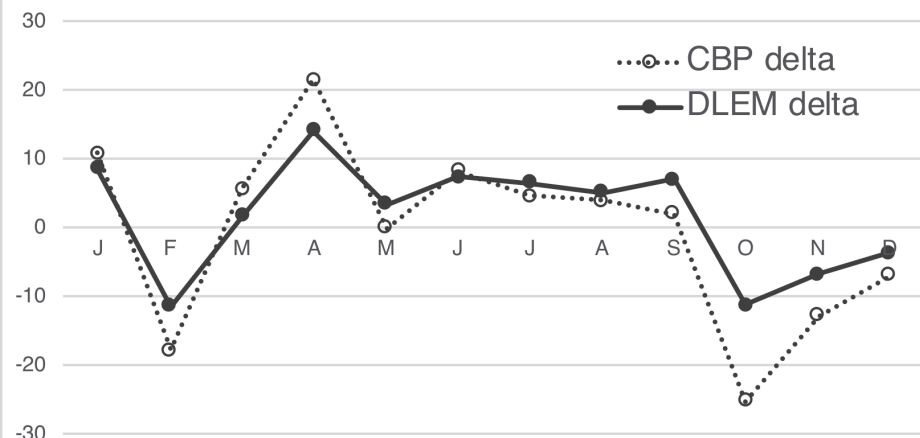


Watershed Average Delta Change

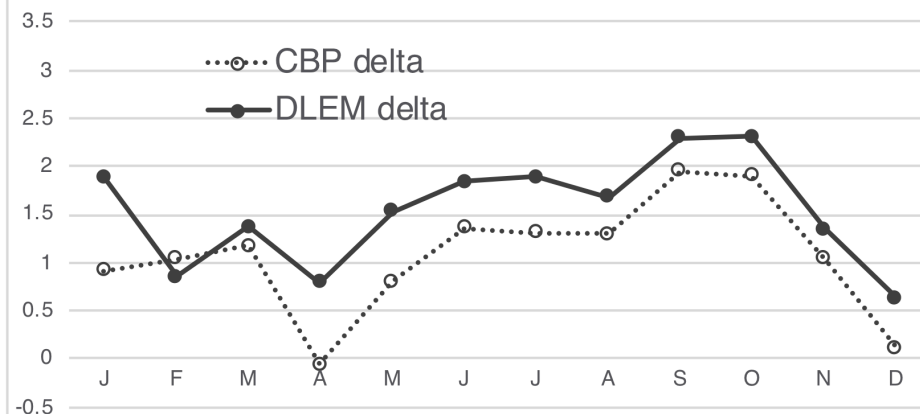
*MACA RCP 8.5 data were provided
by Maria Herrmann & Ray Najjar*

2025 Watershed Average Delta Change – BEFORE

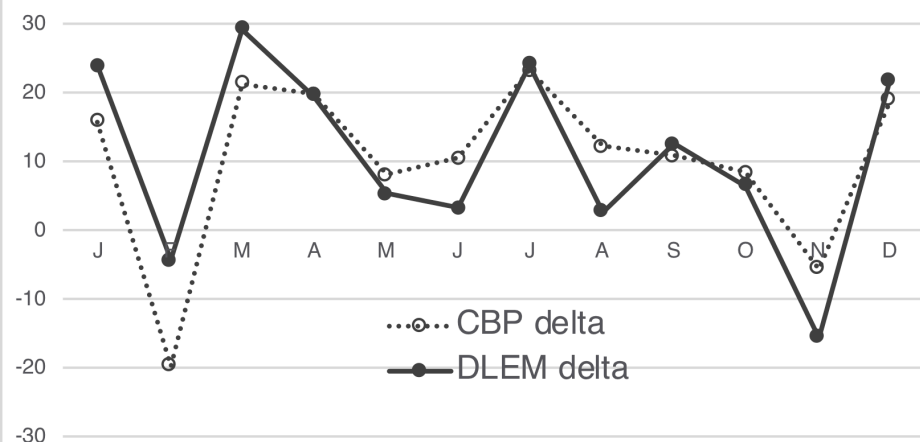
2025 Precipitation RCP8.5 IPSL-CM5A-MR



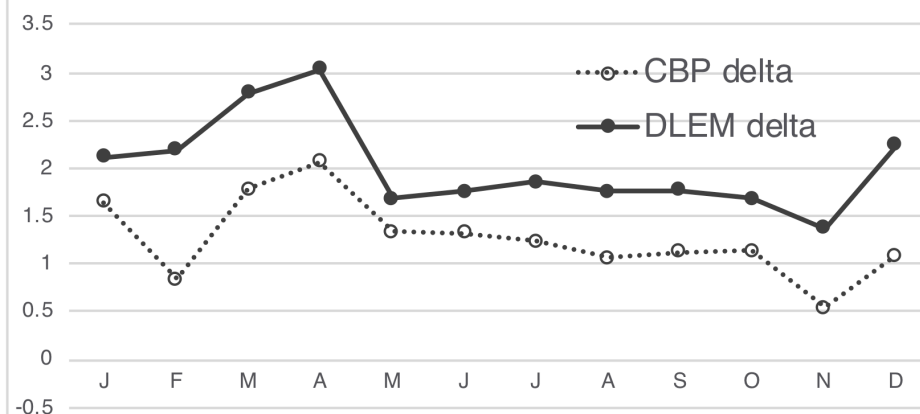
2025 Temperature RCP8.5 IPSL-CM5A-MR



2025 Precipitation RCP8.5 MIROC5



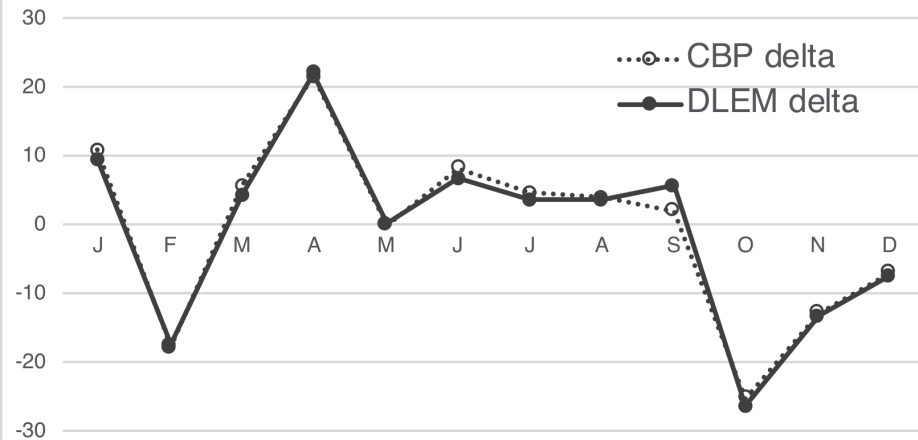
2025 Temperature RCP8.5 MIROC5



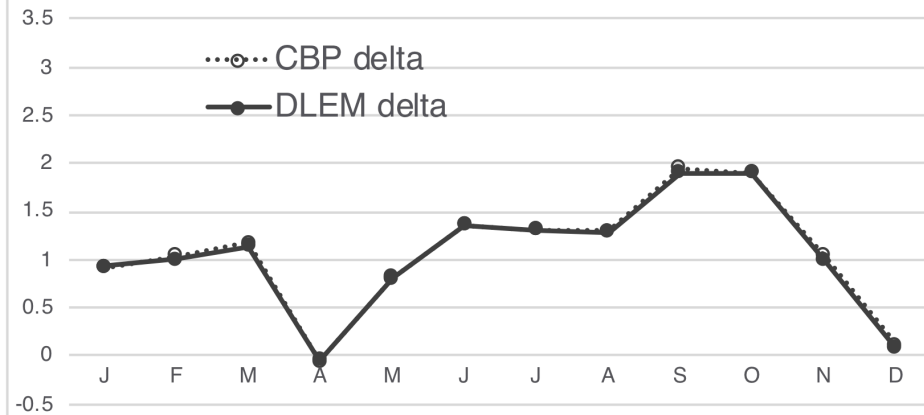
Precipitation delta change – percent
Temperature delta change – degree Celsius

2025 Watershed Average Delta Change – AFTER

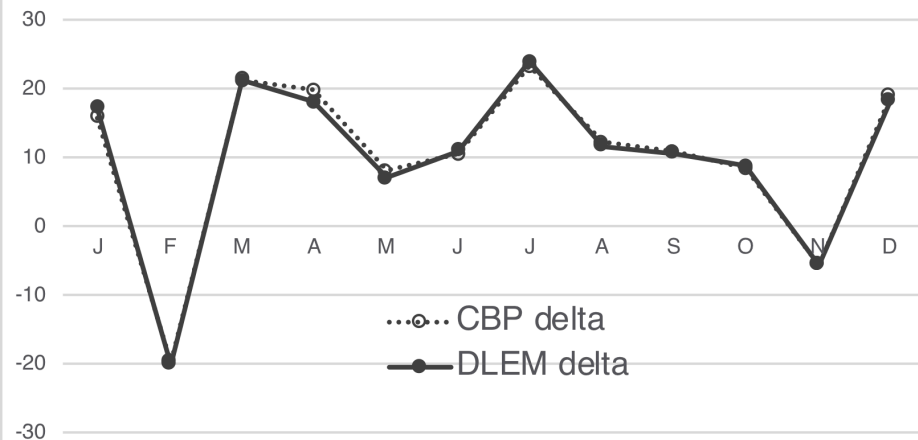
2025 Precipitation RCP8.5 IPSL-CM5A-MR



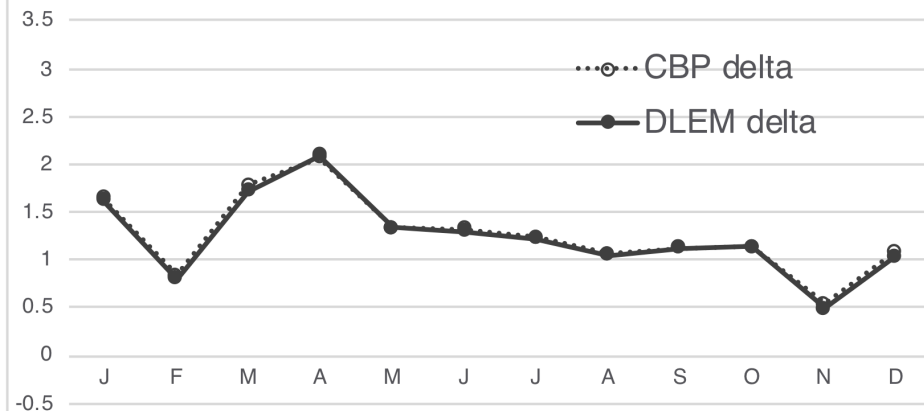
2025 Temperature RCP8.5 IPSL-CM5A-MR



2025 Precipitation RCP8.5 MIROC5



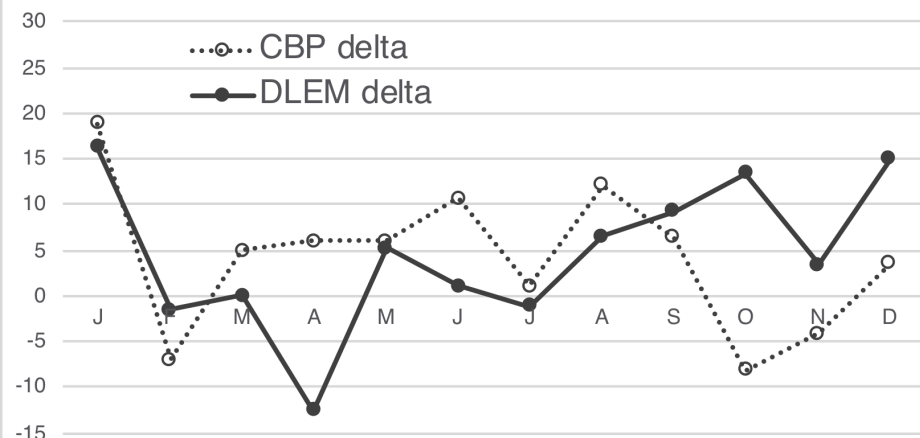
2025 Temperature RCP8.5 MIROC5



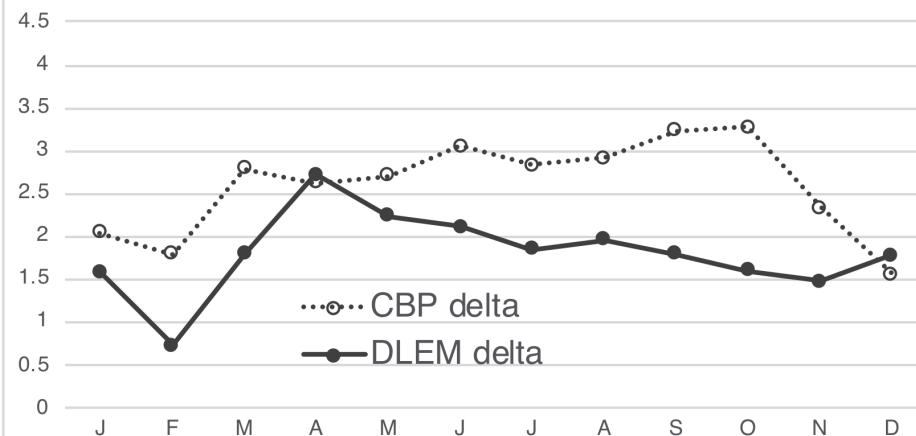
The issue was related to inconsistency in geographic projection

2050 Watershed Average Delta Change – BEFORE

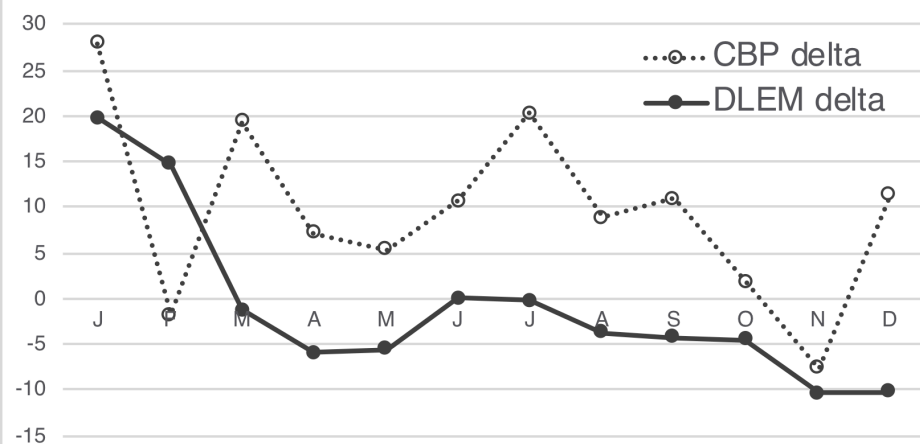
2050 Precipitation RCP8.5 IPSL-CM5A-MR



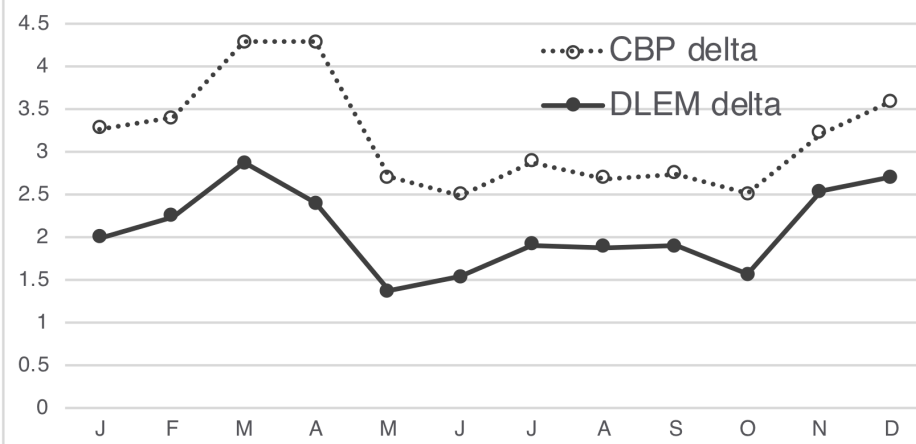
2050 Temperature RCP8.5 IPSL-CM5A-MR



2050 Precipitation RCP8.5 MIROC5

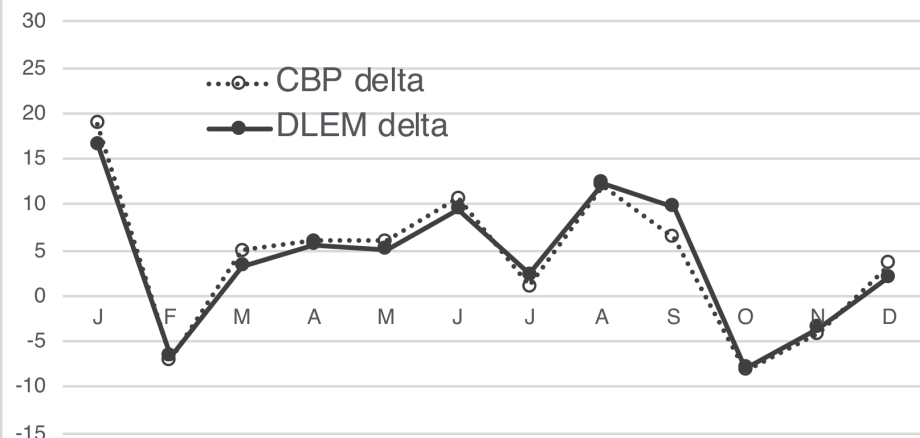


2050 Temperature RCP8.5 MIROC5

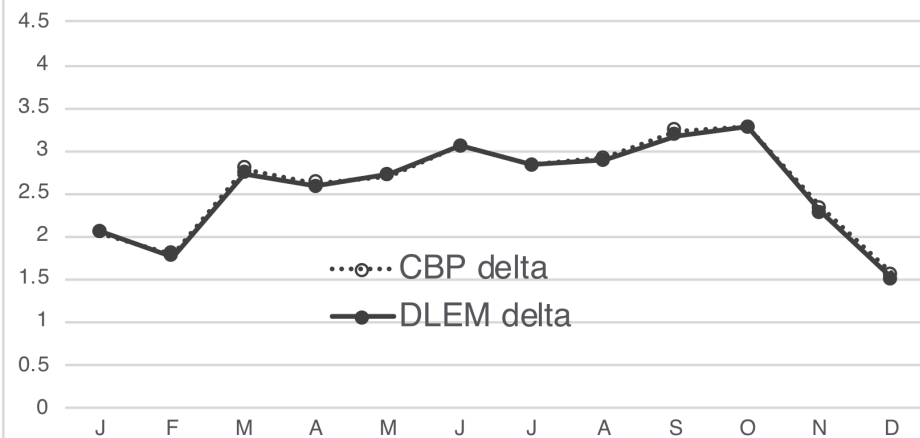


2050 Watershed Average Delta Change – AFTER

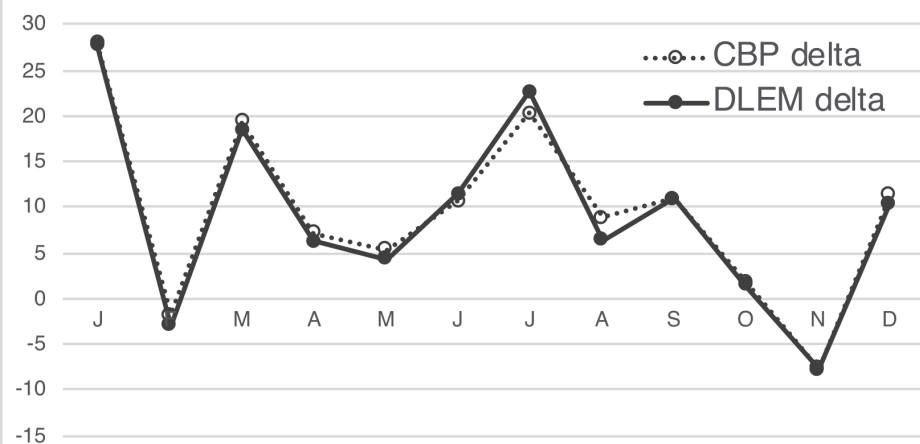
2050 Precipitation RCP8.5 IPSL-CM5A-MR



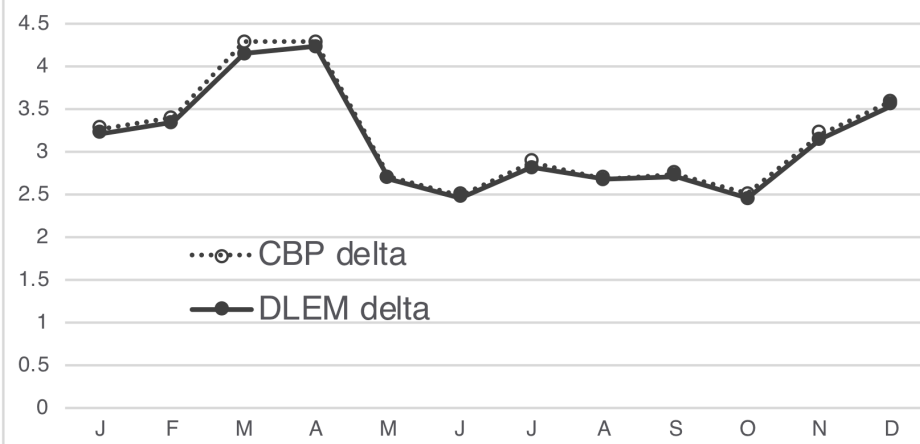
2050 Temperature RCP8.5 IPSL-CM5A-MR



2050 Precipitation RCP8.5 MIROC5



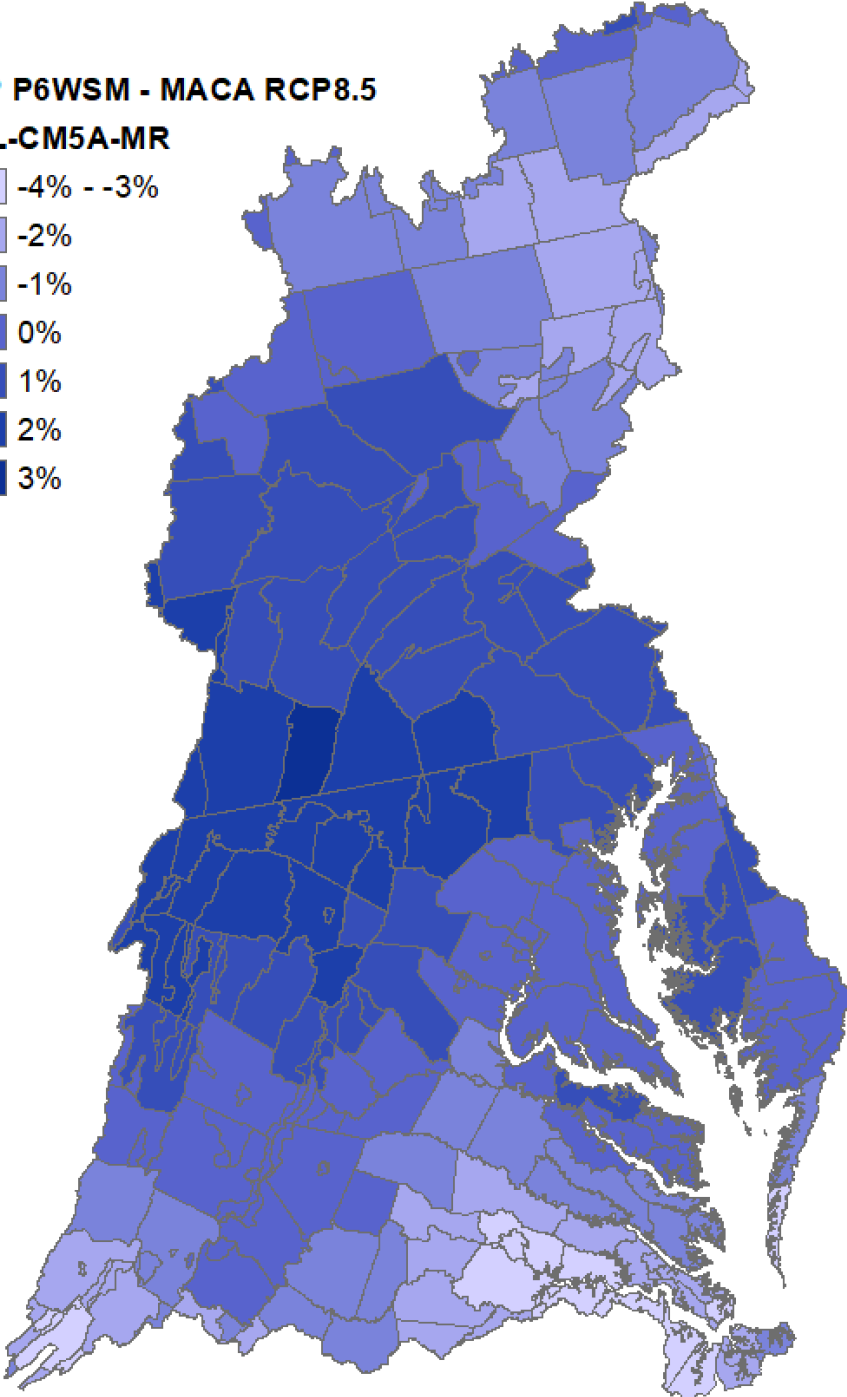
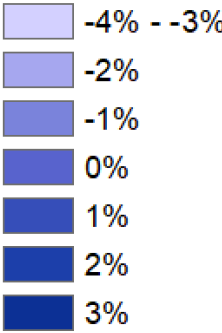
2050 Temperature RCP8.5 MIROC5



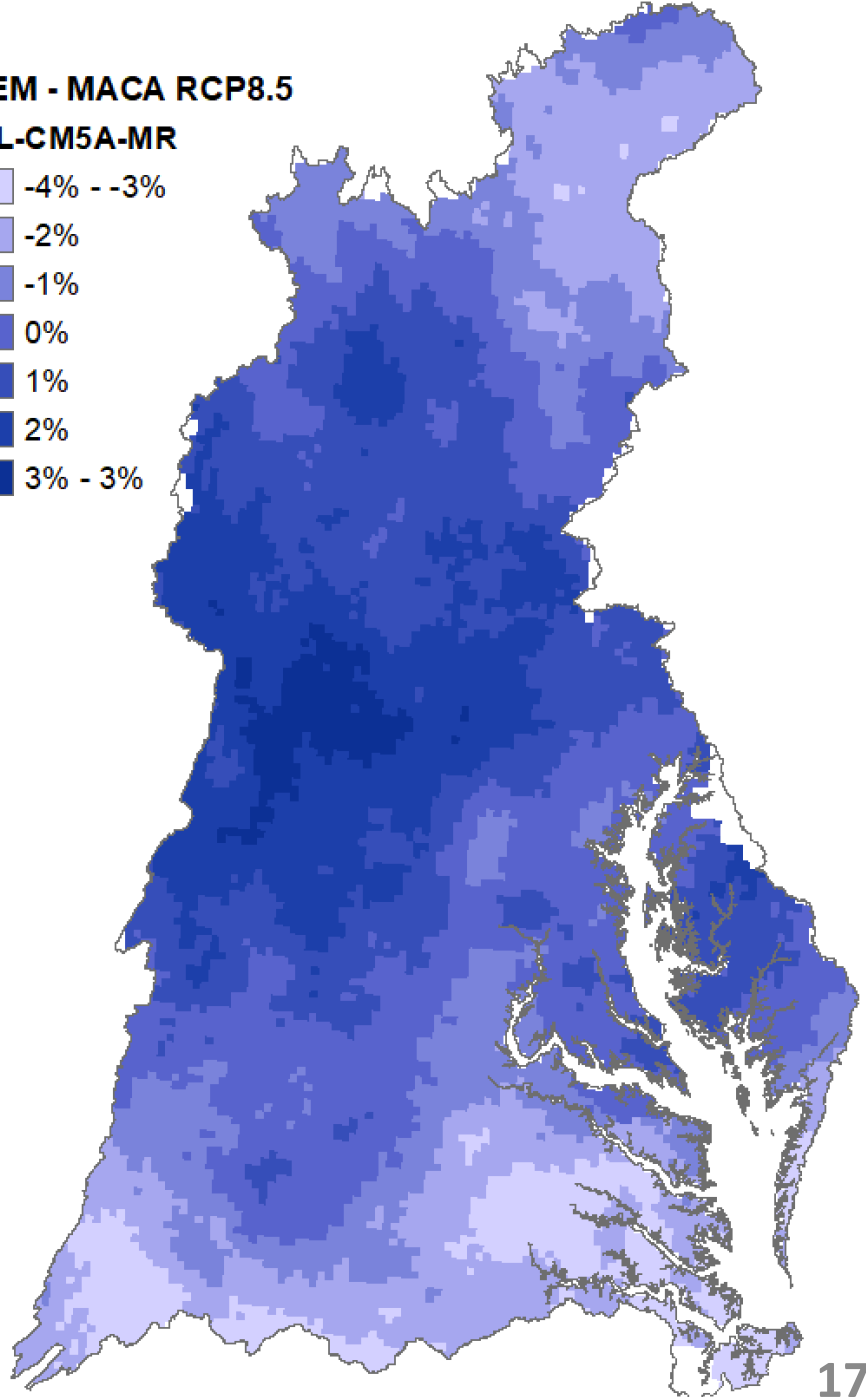
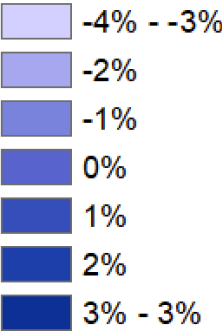
The issue was related to periods that were used in the delta calculation

2025 Precipitation

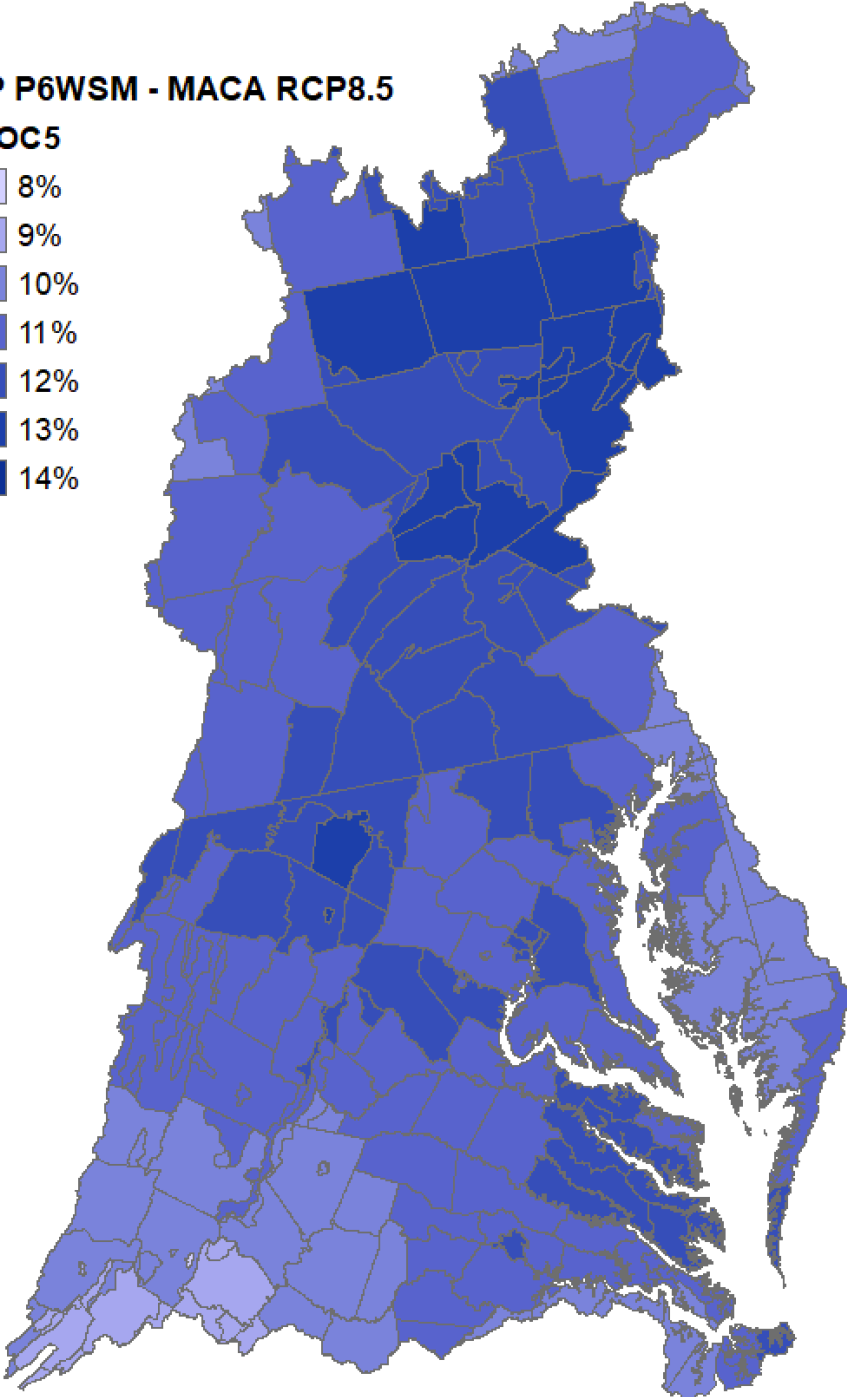
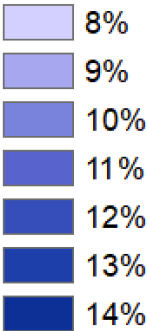
CBP P6WSM - MACA RCP8.5
IPSL-CM5A-MR



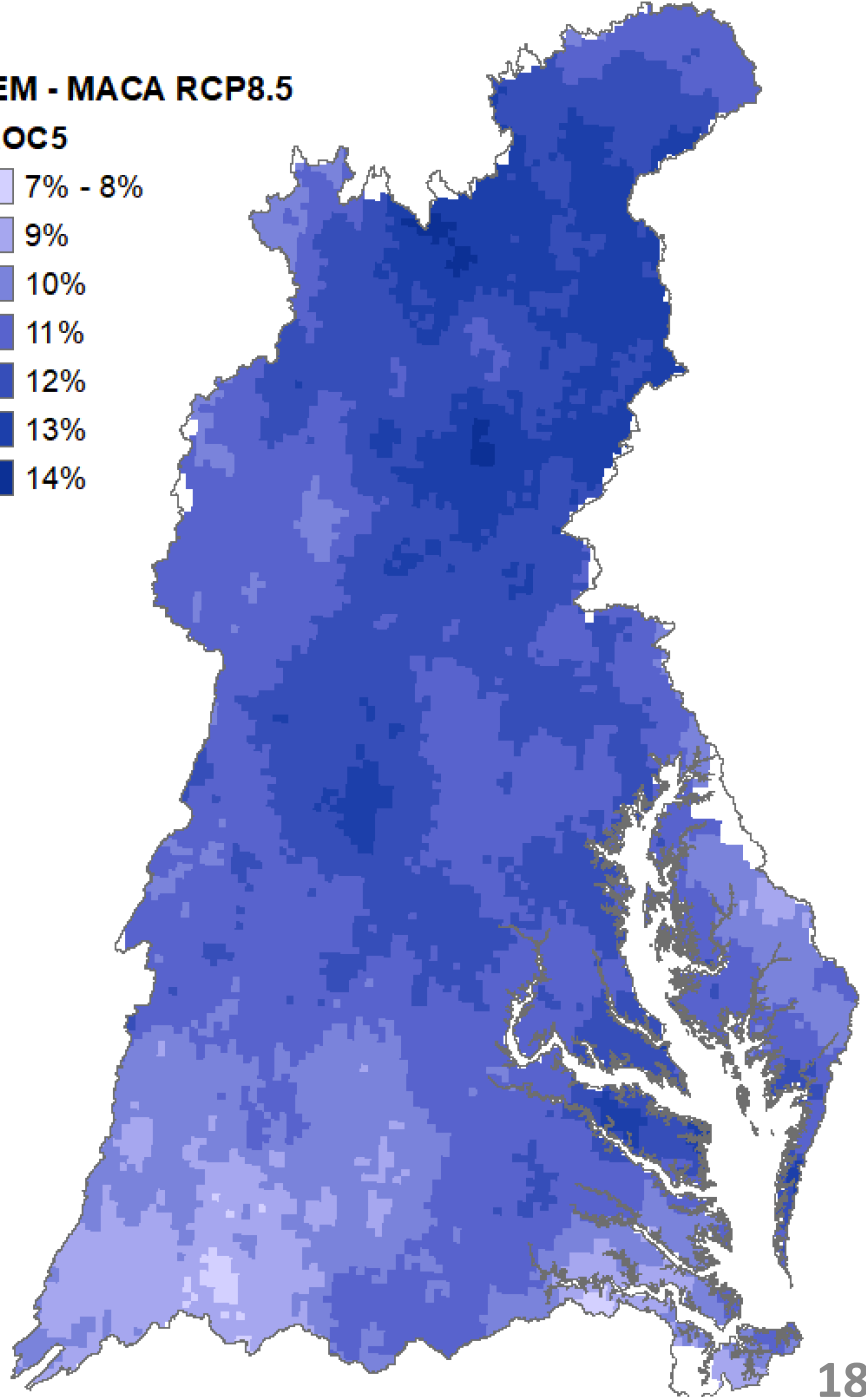
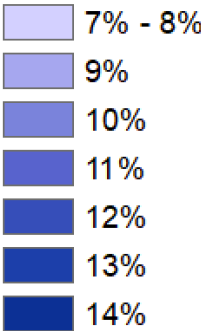
DLEM - MACA RCP8.5
IPSL-CM5A-MR



CBP P6WSM - MACA RCP8.5
MIROC5



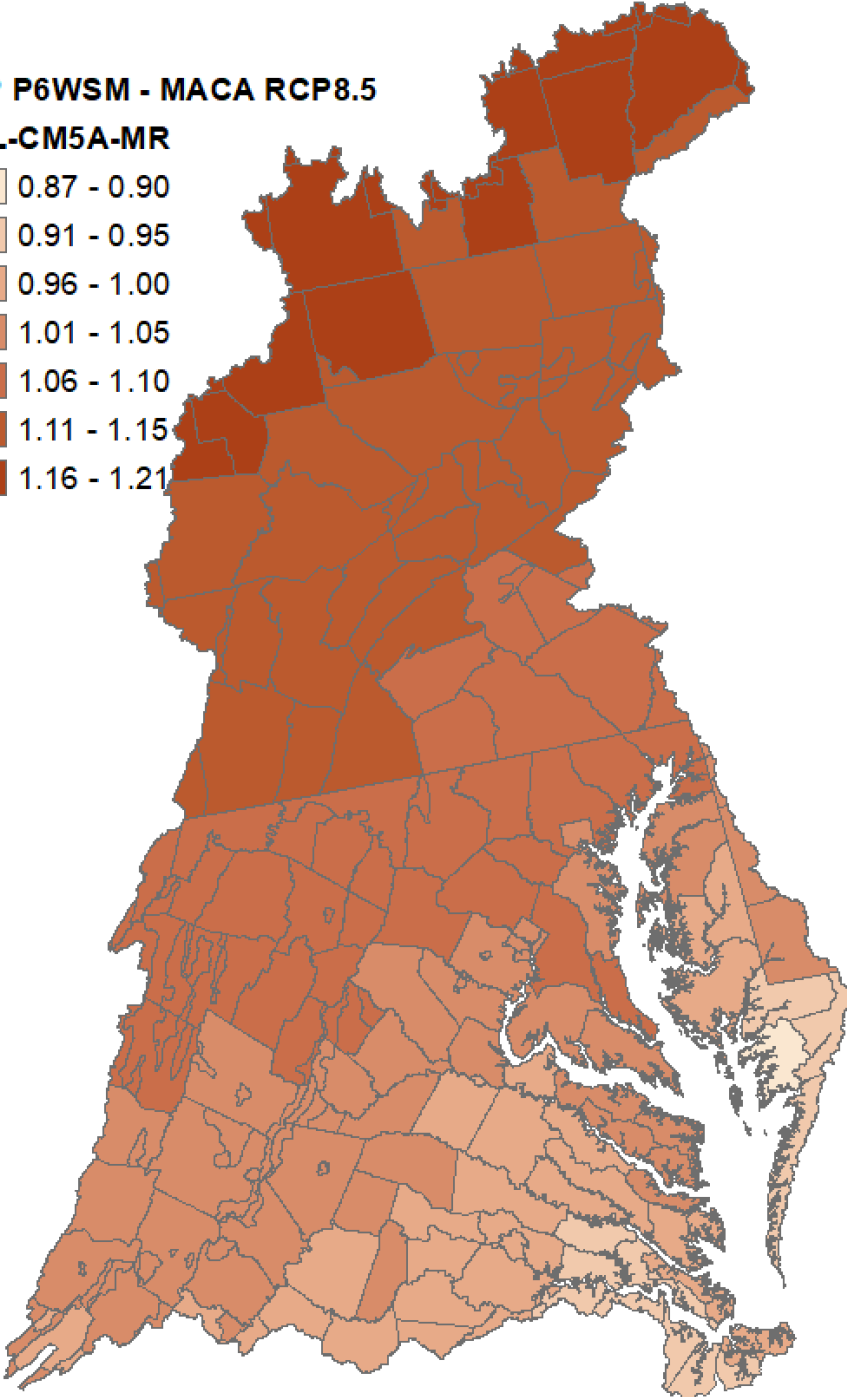
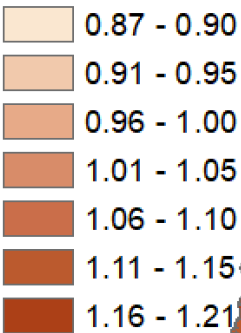
DLEM - MACA RCP8.5
MIROC5



2025 Temperature

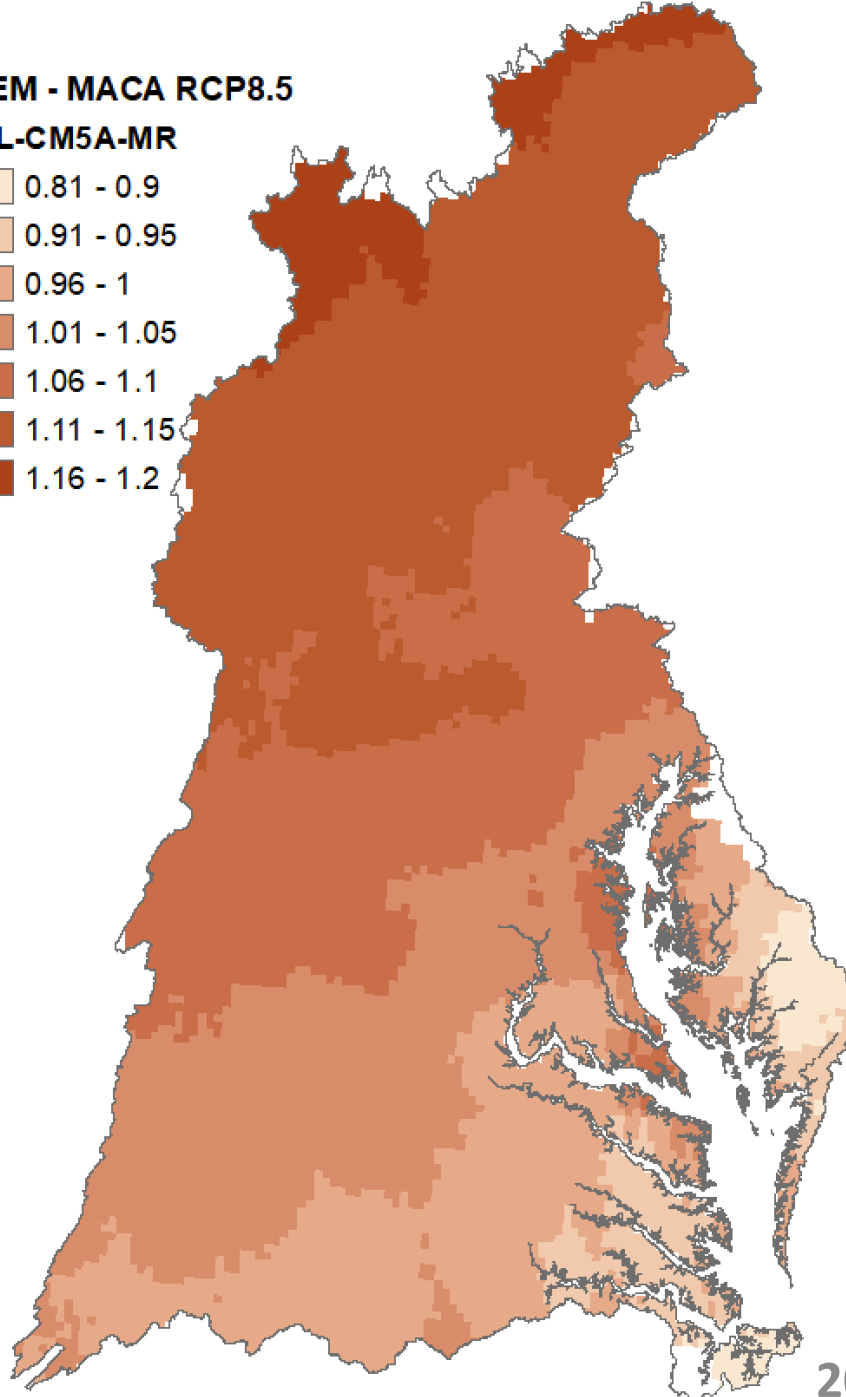
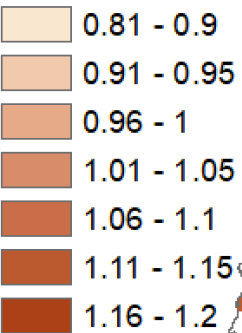
CBP P6WSM - MACA RCP8.5

IPSL-CM5A-MR

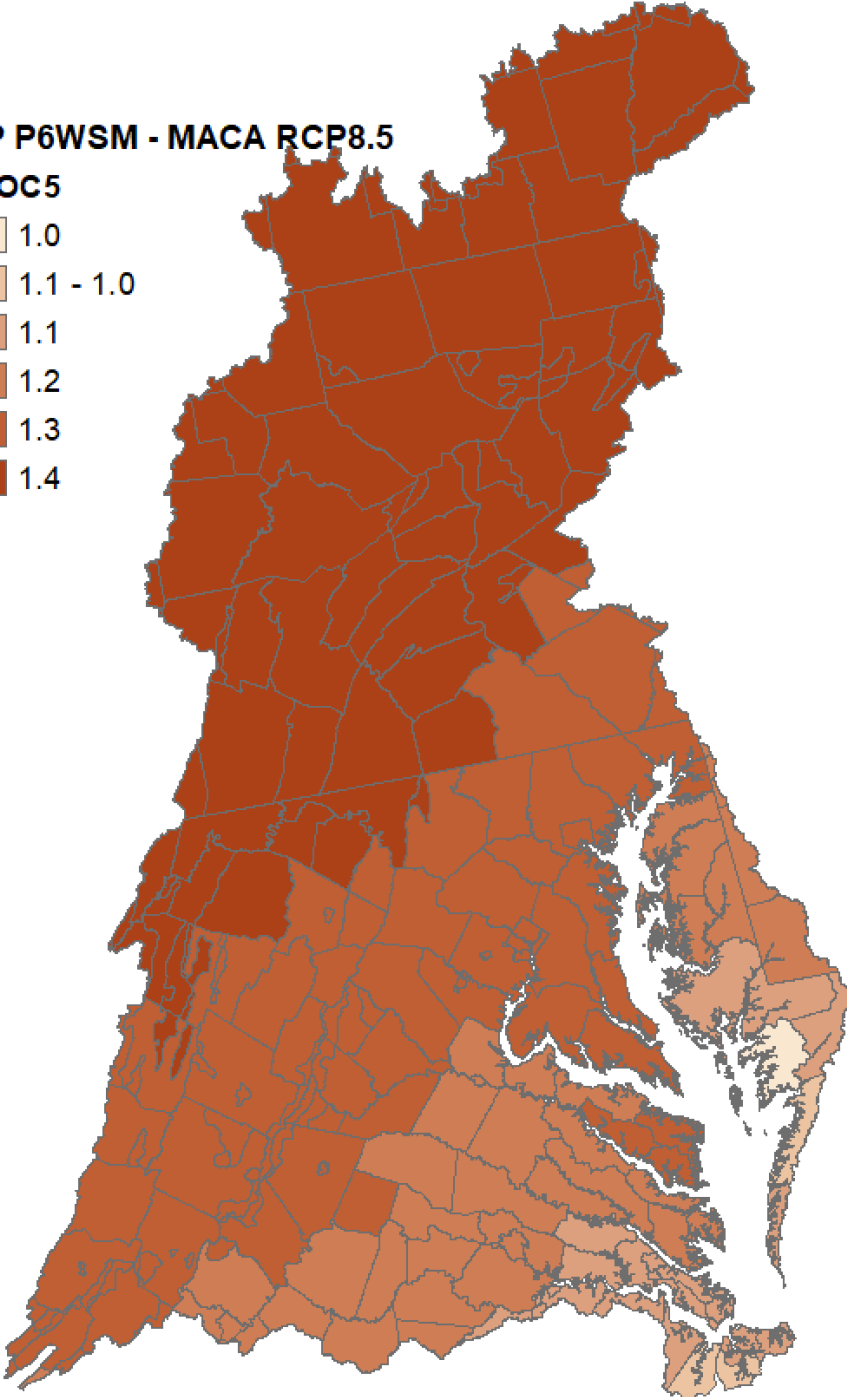
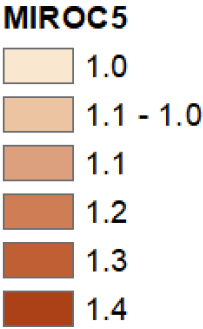


DLEM - MACA RCP8.5

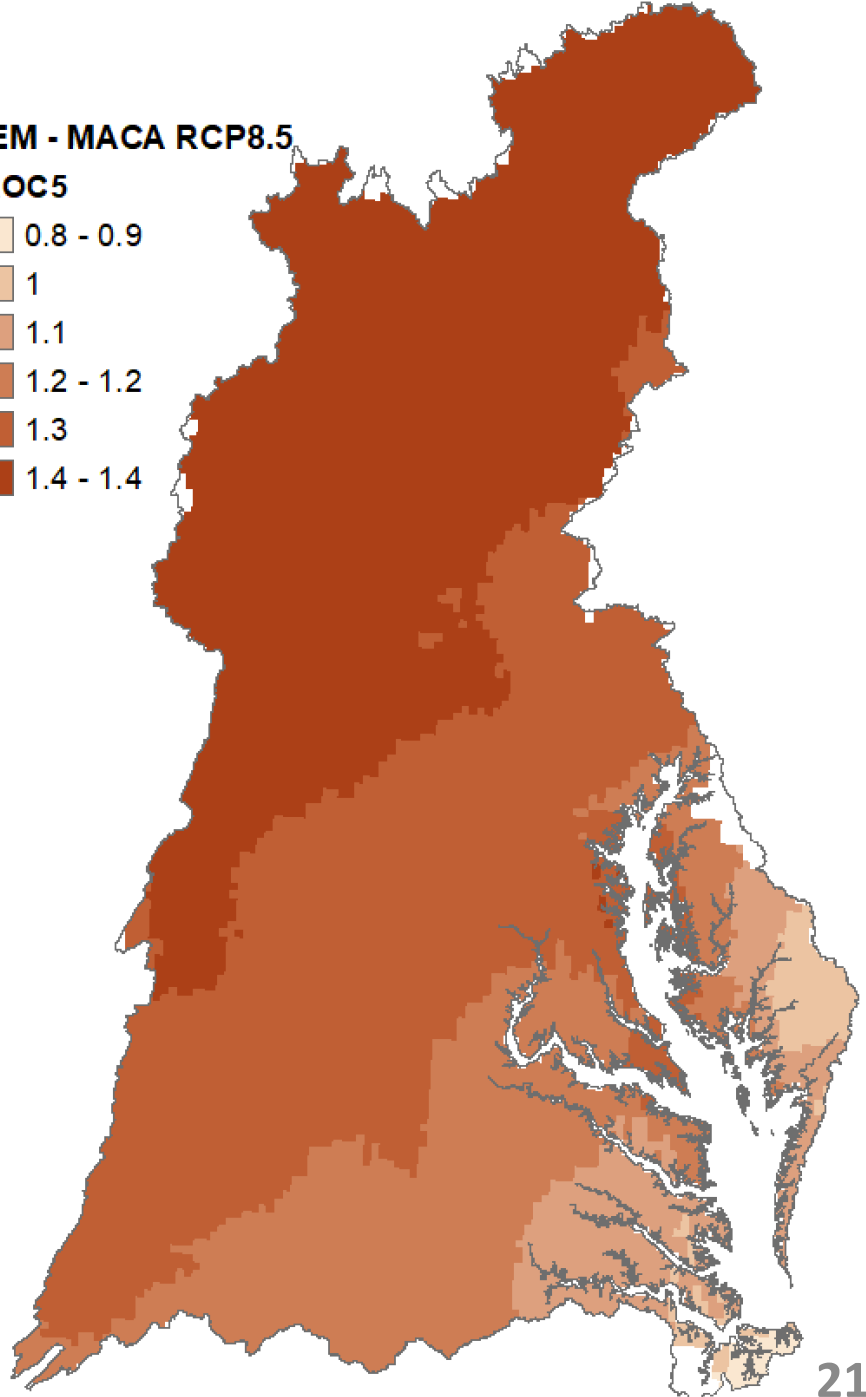
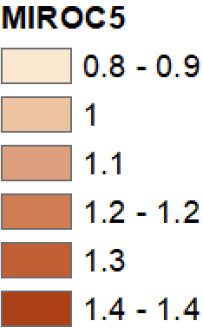
IPSL-CM5A-MR



CBP P6WSM - MACA RCP8.5



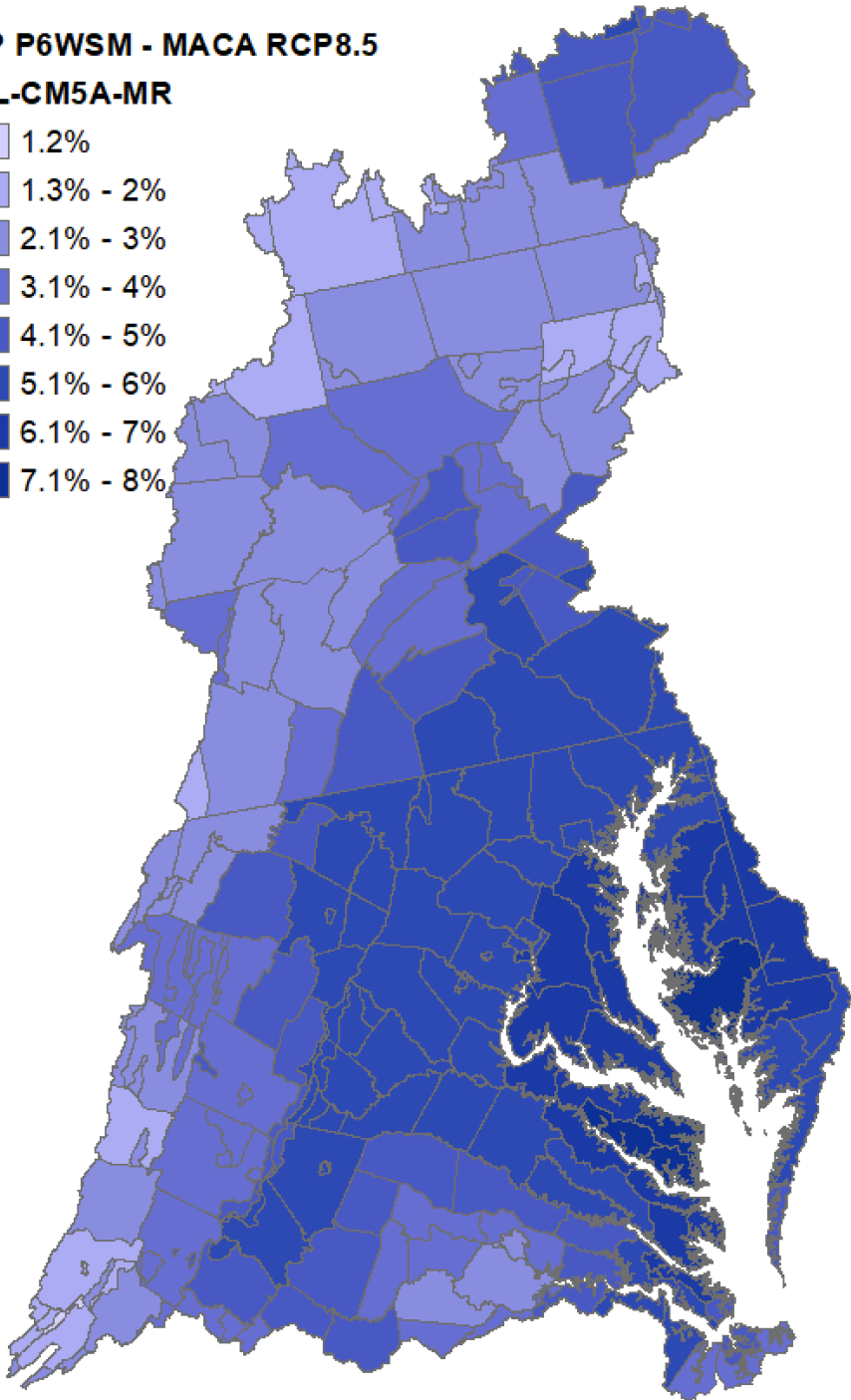
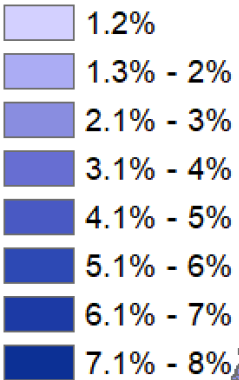
DLEM - MACA RCP8.5



2050 Precipitation

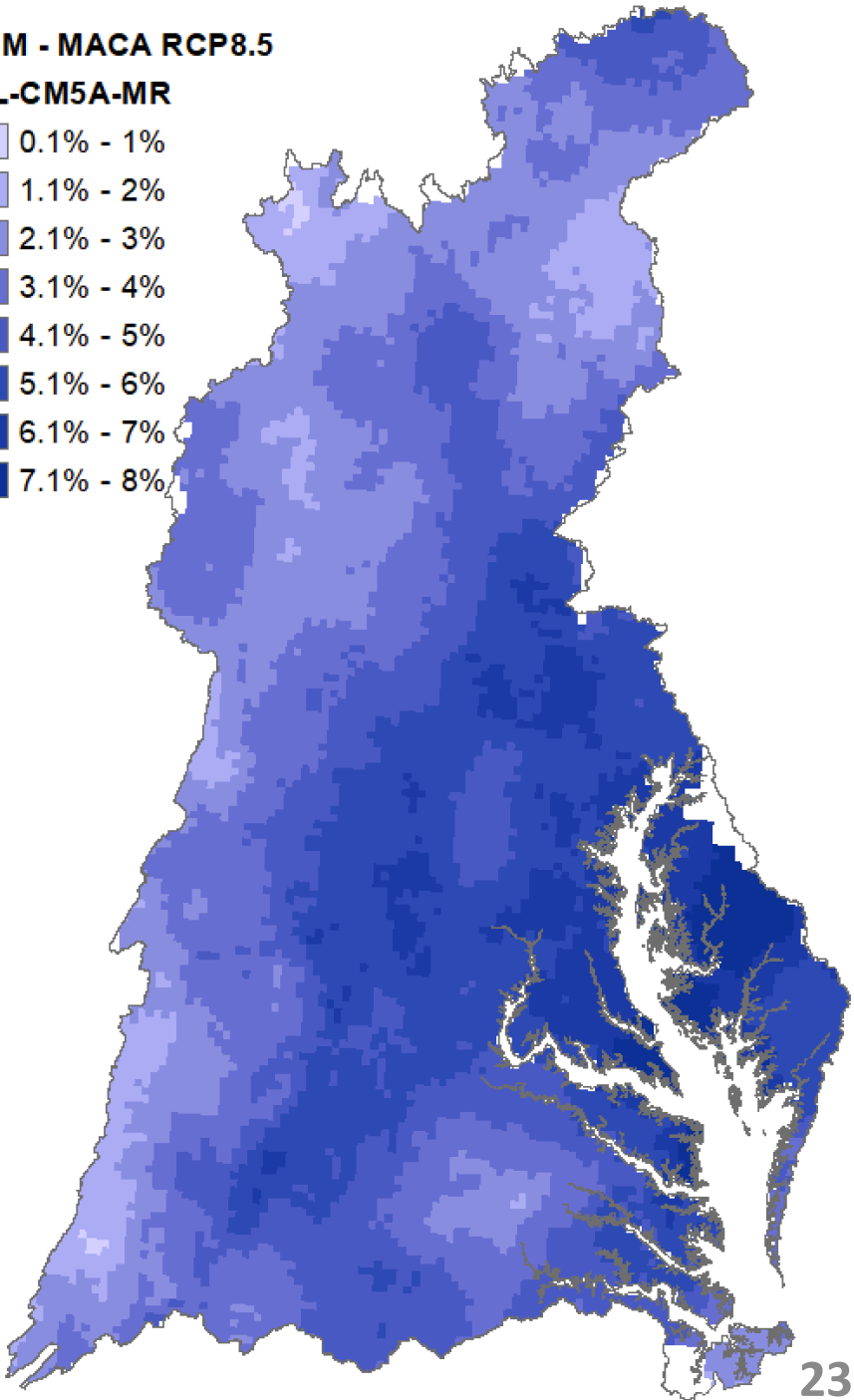
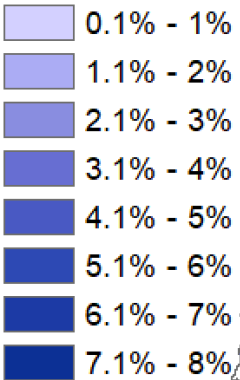
CBP P6WSM - MACA RCP8.5

IPSL-CM5A-MR



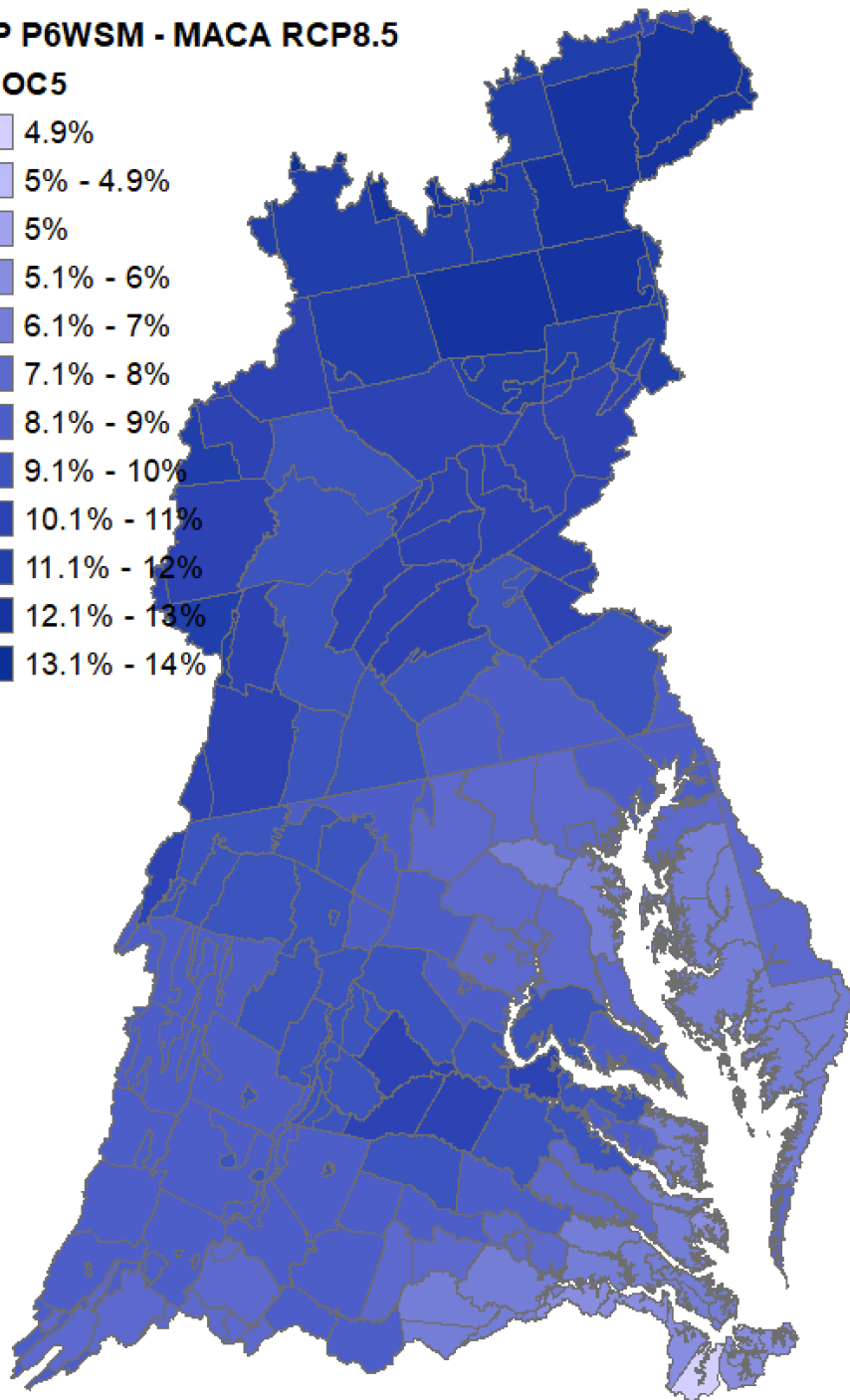
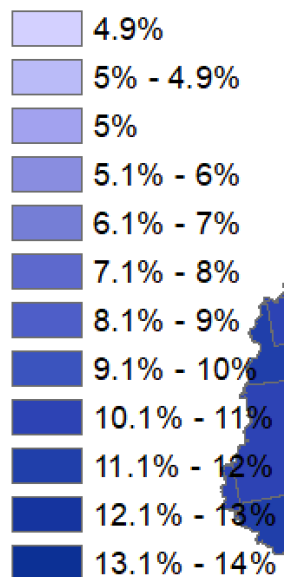
DLEM - MACA RCP8.5

IPSL-CM5A-MR



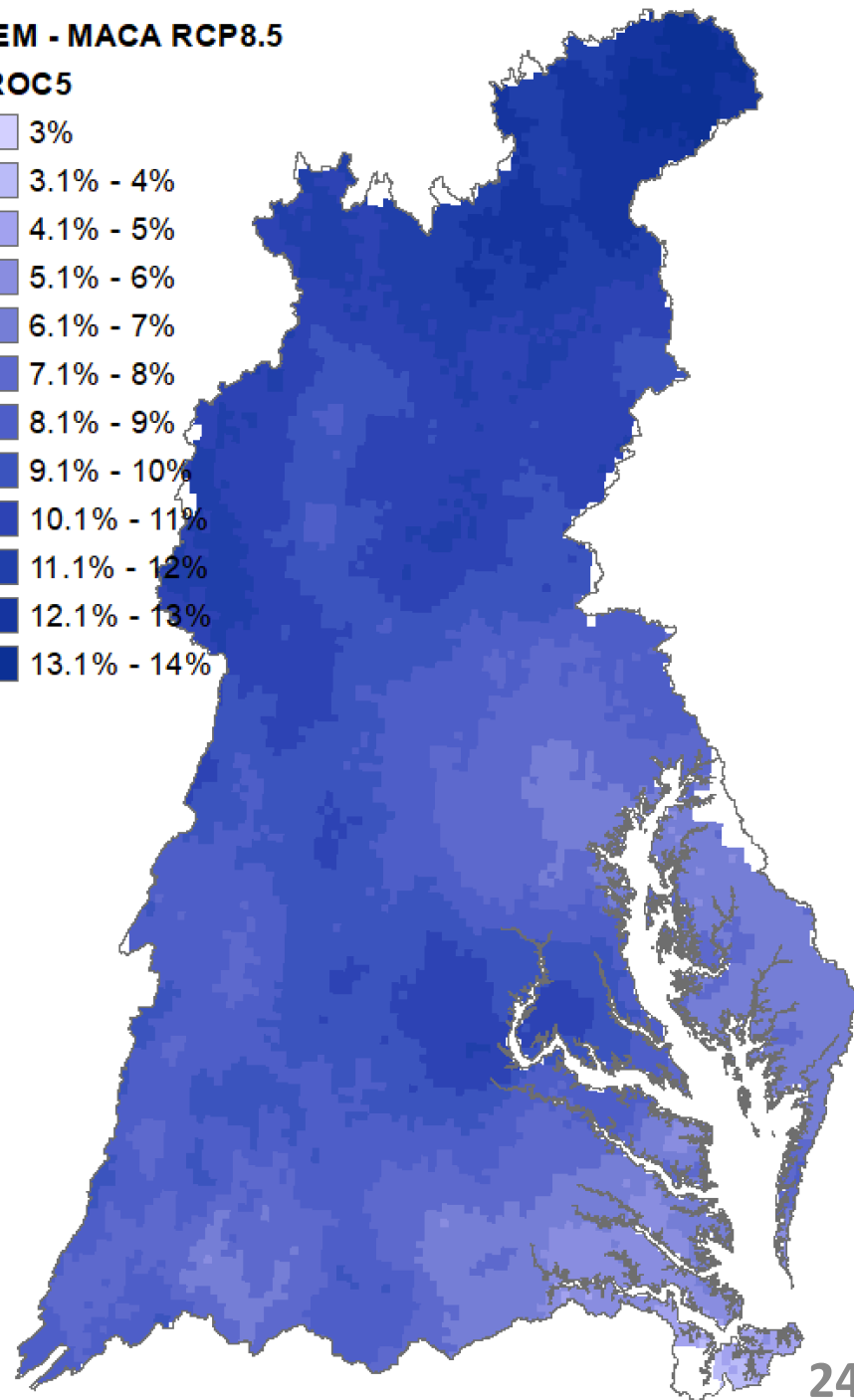
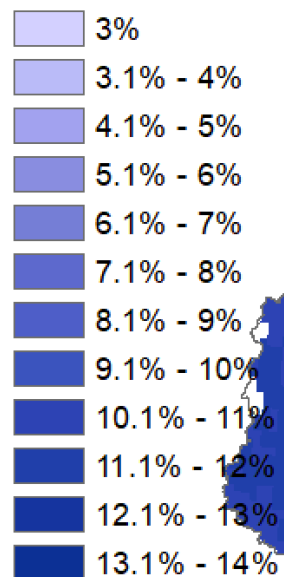
CBP P6WSM - MACA RCP8.5

MIROC5



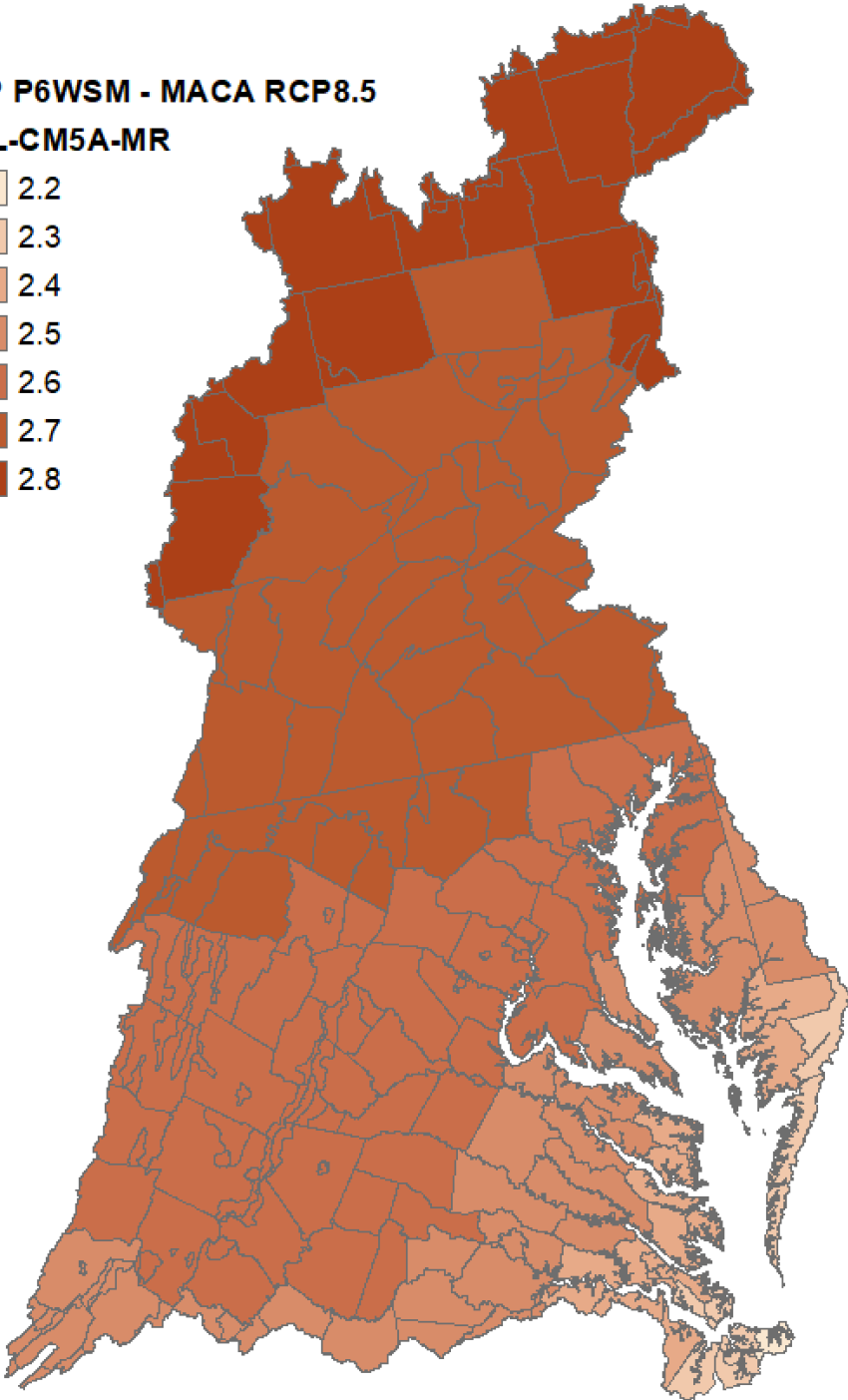
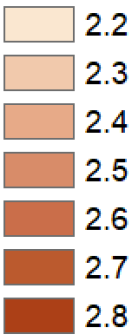
DLEM - MACA RCP8.5

MIROC5

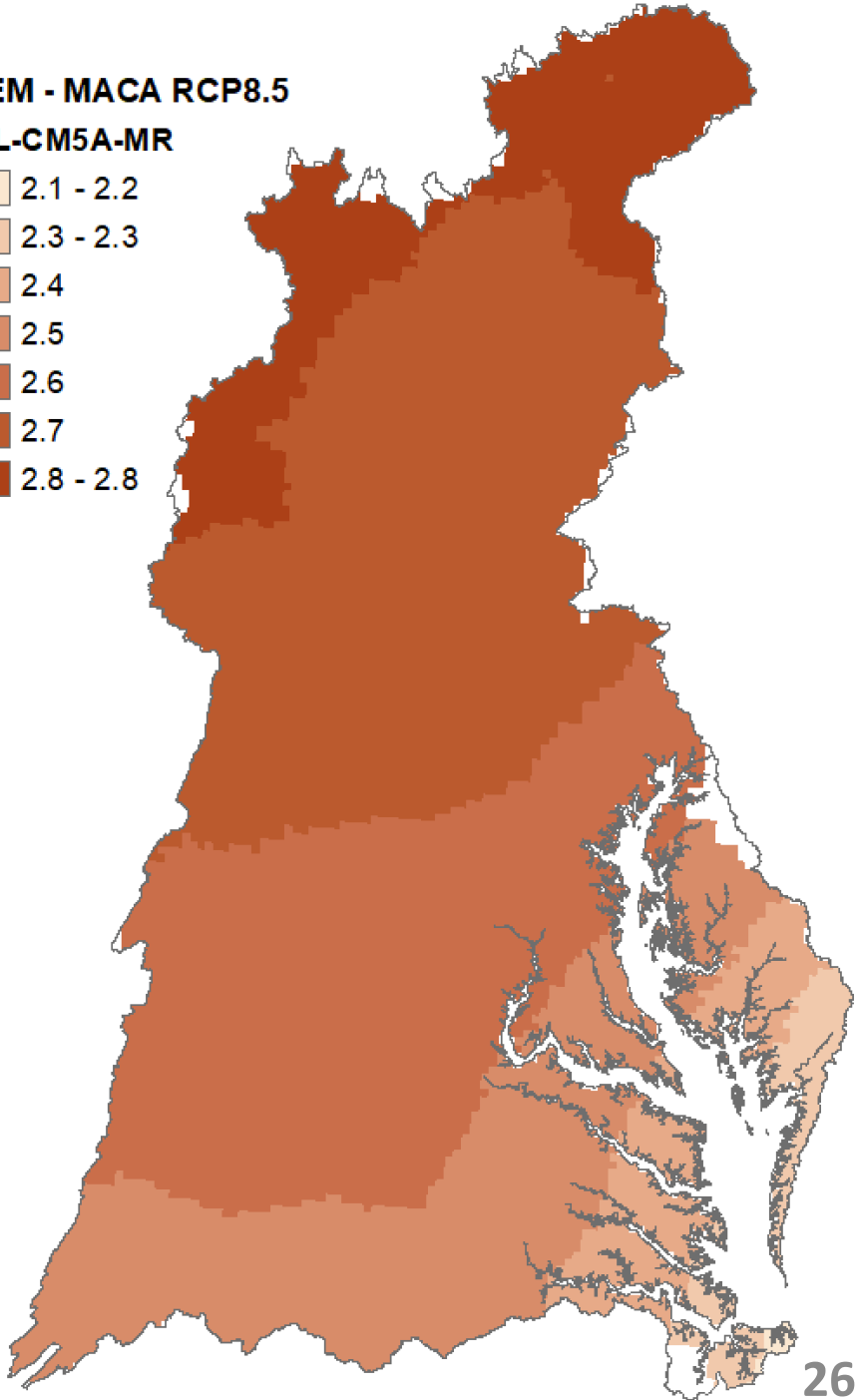
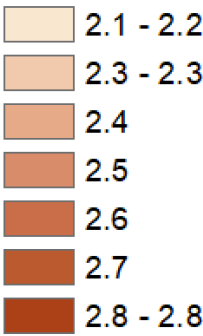


2050 Temperature

CBP P6WSM - MACA RCP8.5
IPSL-CM5A-MR

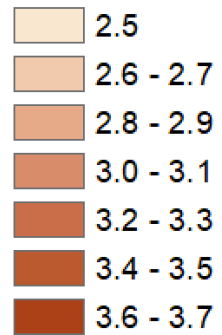


DLEM - MACA RCP8.5
IPSL-CM5A-MR



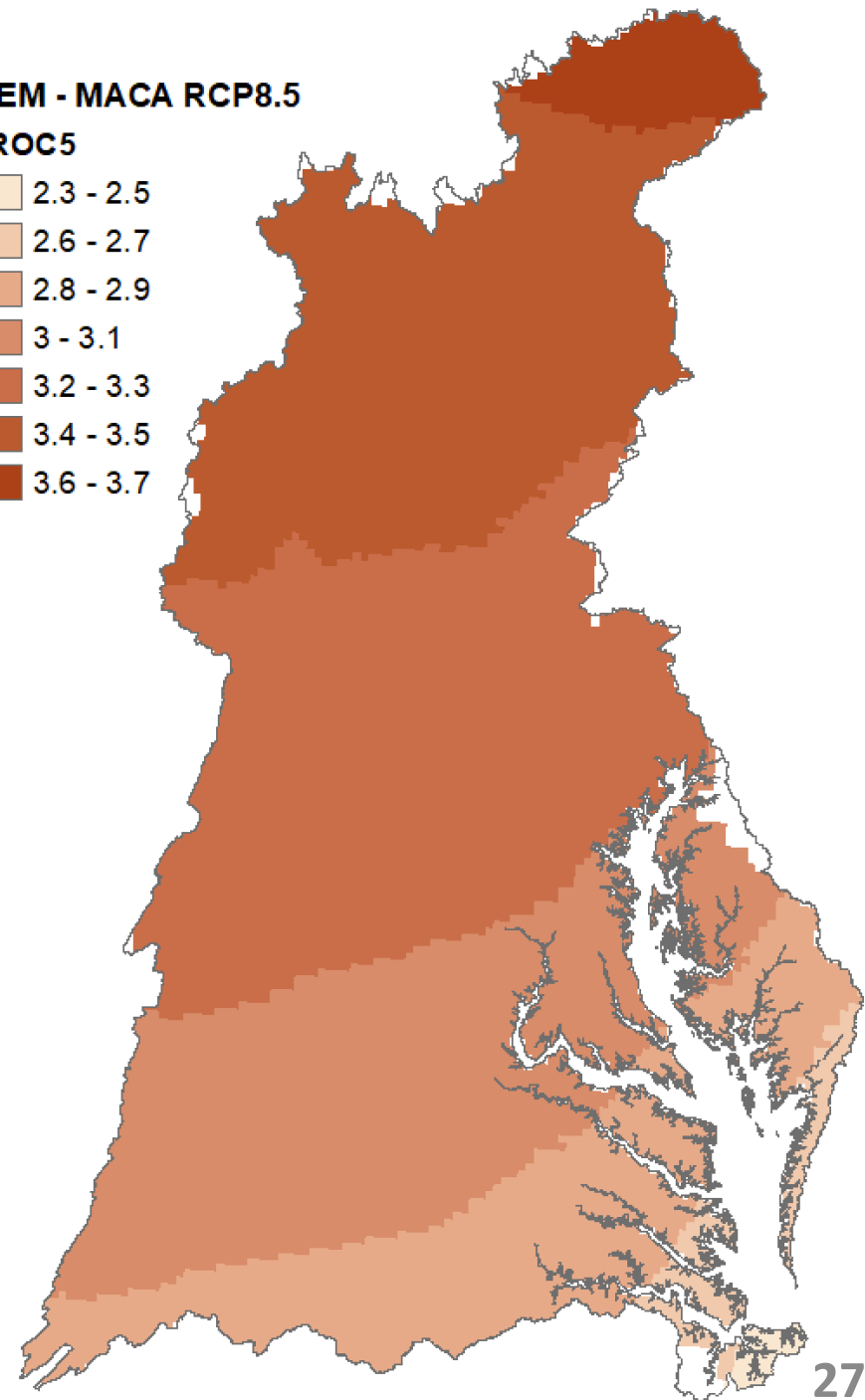
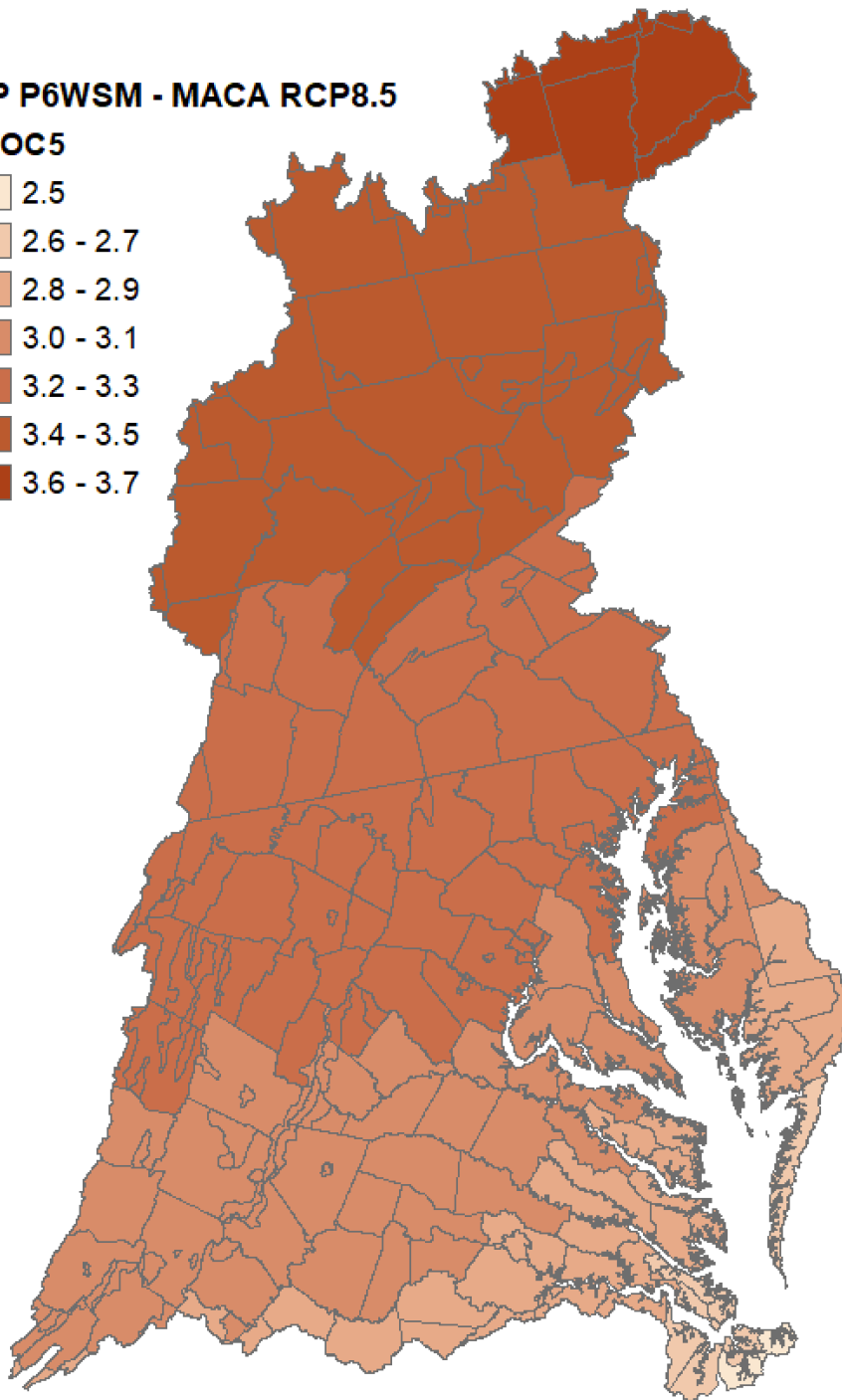
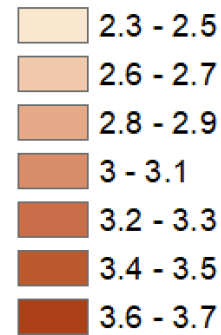
CBP P6WSM - MACA RCP8.5

MIROC5



DLEM - MACA RCP8.5

MIROC5

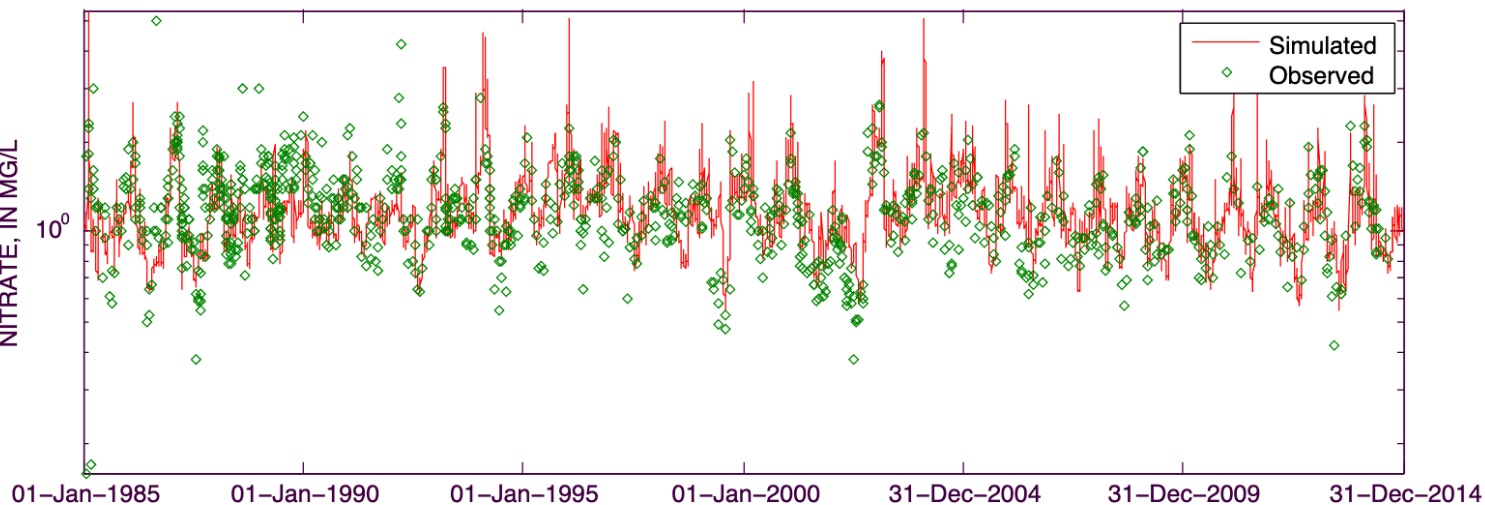


Summary and next steps

- Now there is good agreement in delta change computed for P6WSM and DLEM applications
- DLEM group is using the delta change in preparing model inputs for climate change simulations
- Next phase will look into P6WSM and DLEM hydrologic responses for climate change simulations

NITRATE, IN MG/L

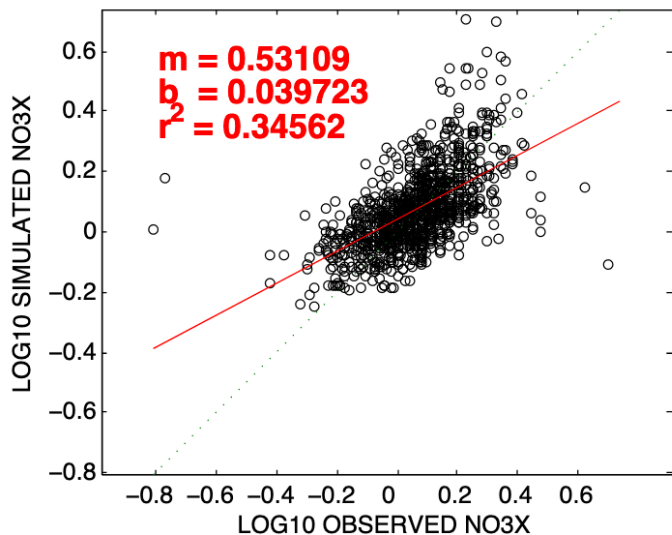
SUSQUEHANNA RIVER AT CONOWINGO, MD: NO3X TIME-SERIES



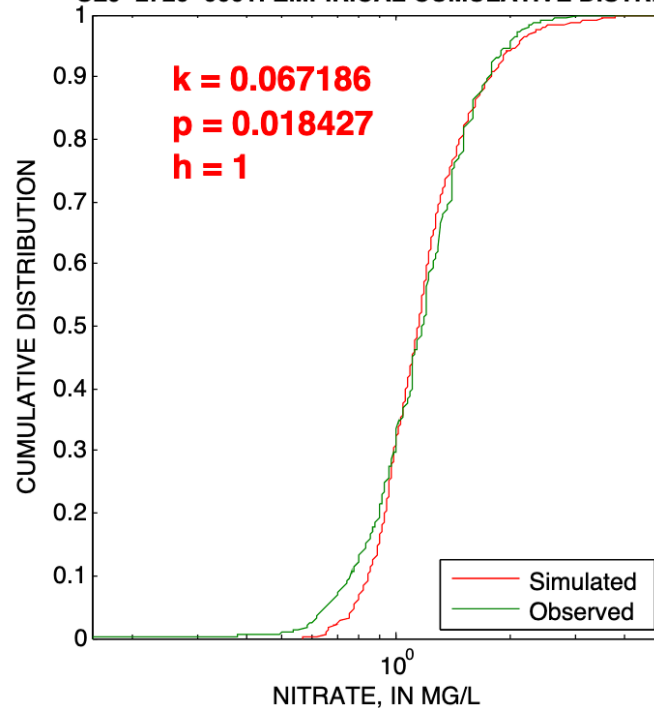
DATA SELECTION	
scenario	file
P620171001WQI	NO3X.calib
plot	
NO3X - nitrate	
Dates	1/1/1985 12/31/201
Drive Directory	Observed
N/A	model
	OBS20161101

STATISTICS		
n	1027	1027
	observe	simulate
min	0.156	0.56257
	-0.806875	-0.249823
mean	1.22203	1.24604
	0.0626557	0.0729989
media	1.18	1.1437
	0.071882	0.0583121
max	5	5.0836
	0.69897	0.706171
varian	0.182034	0.217094
	0.0216481	0.0176667
JB	0.001	0.001
	0.001	0.001
	ra	log
%	1.96489	16.5081
err.va	0.19112	0.0164277
rel.std.err	1.04992	0.758853
mod.eff	-0.0499155	0.241147

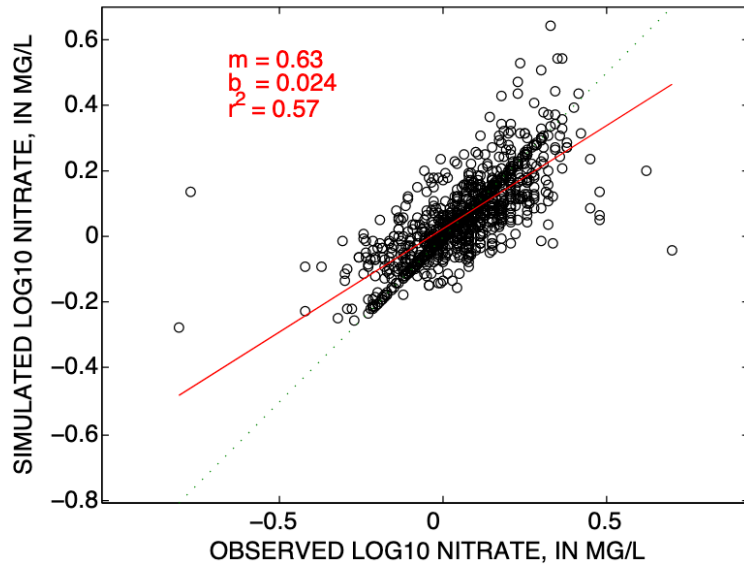
SL9-2720-0001: SIMULATED VS. OBSERVED



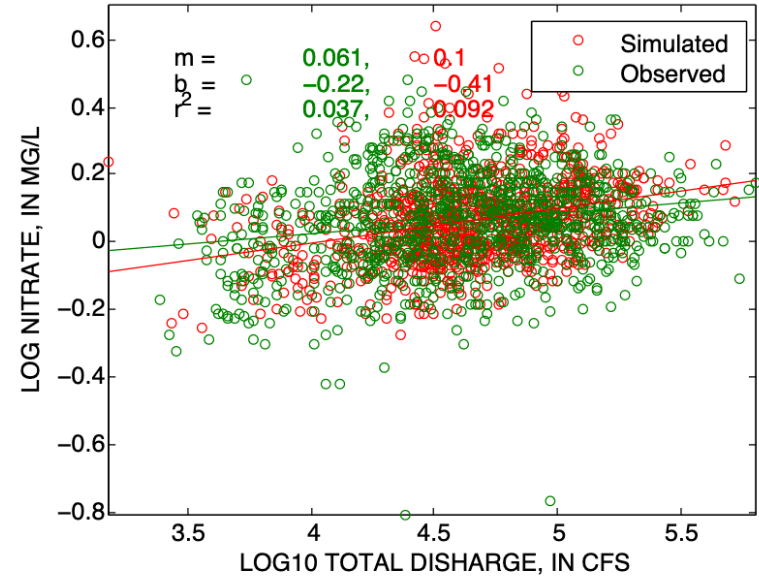
SL9-2720-0001: EMPIRICAL CUMULATIVE DISTRIBUTION



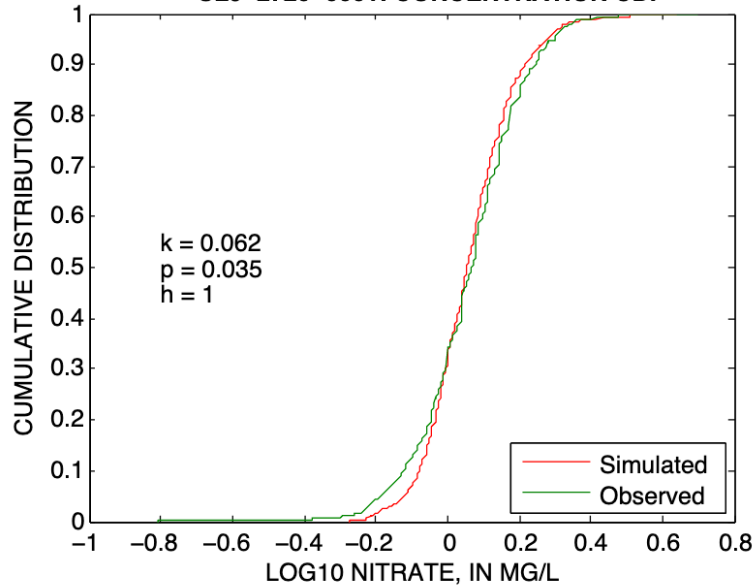
SL9-2720-0001: SIM VS. OBS CONCENTRATION



SL9-2720-0001: C-Q SCATTER PLOTS



SL9-2720-0001: CONCENTRATION CDF



SL9-2720-0001: CONCENTRATION HISTOGRAMS

