Preliminary estimate of climate change impact on water quality attainment using CH3D-ICM (Beta4 nutrient loadings and ICM code run137)

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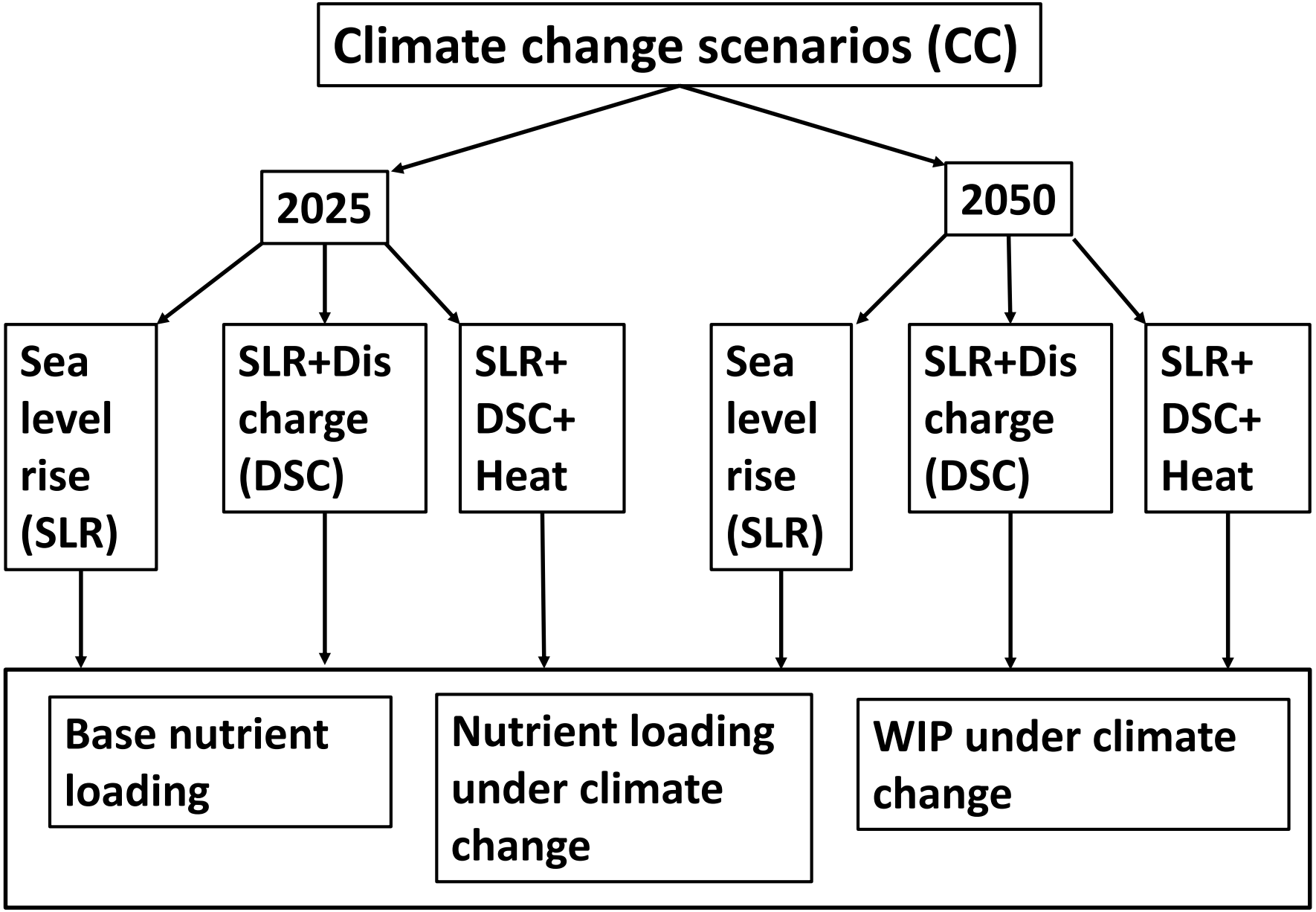
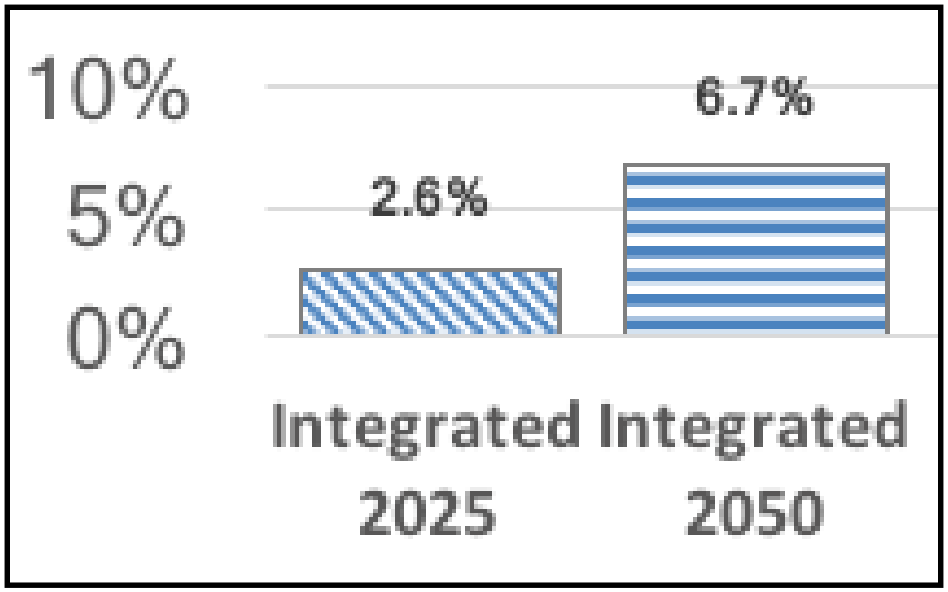

Climate change scenarios (CC)
2025
2050
Sea level rise (SLR)
SLR+Dis charge (DSC)
SLR+ DSC+ Heat
Sea level rise (SLR)
SLR+Dis charge (DSC)
SLR+ DSC+ Heat
Base nutrient loading
Nutrient loading under climate change
WIP under climate change

Sea level rise

- **2025: 30 cm**
- **2050: 50 cm**

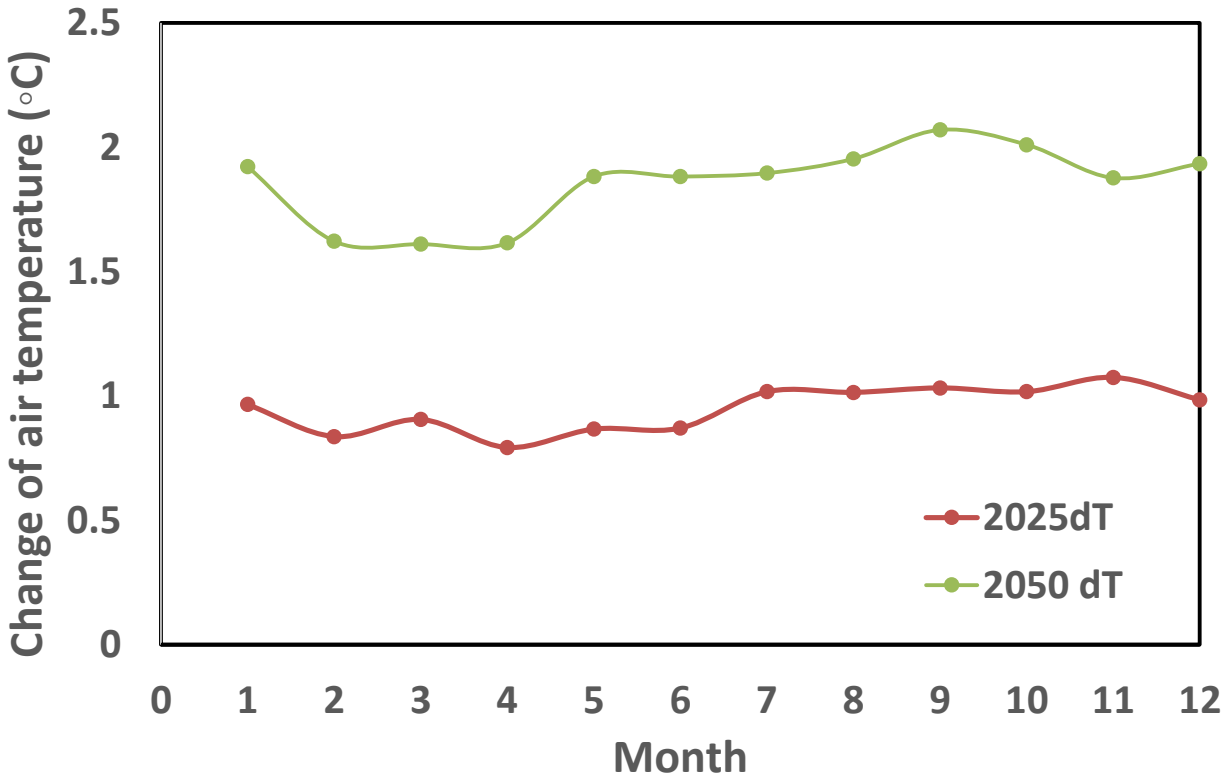
- **Change at the open boundary**
- **Sea level rise added on the surface layer**

Changes in river flow discharge under climate change as compared to the base case



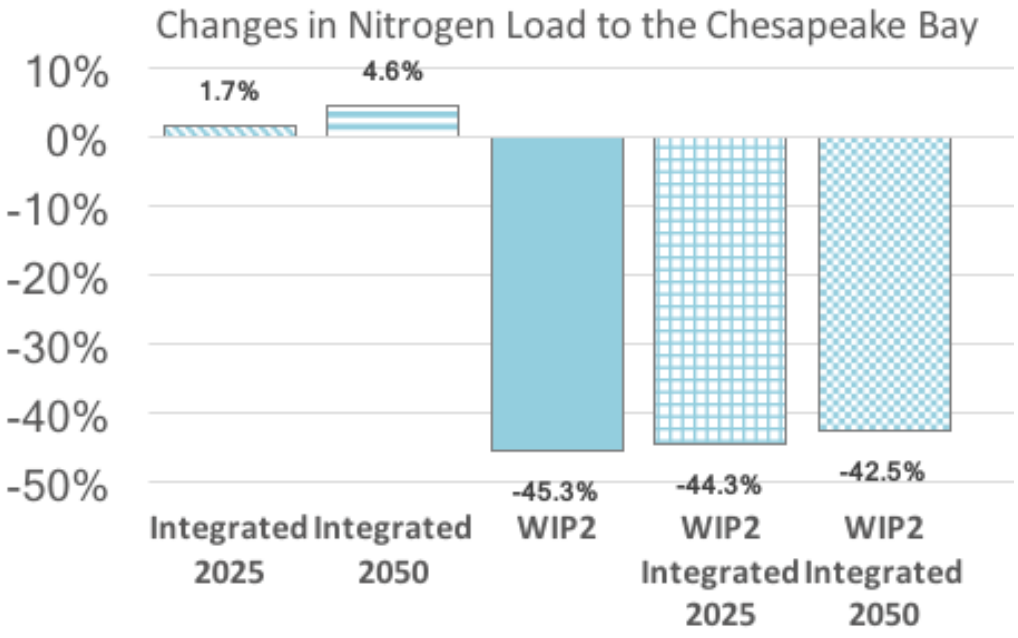
Gopal Bhatt

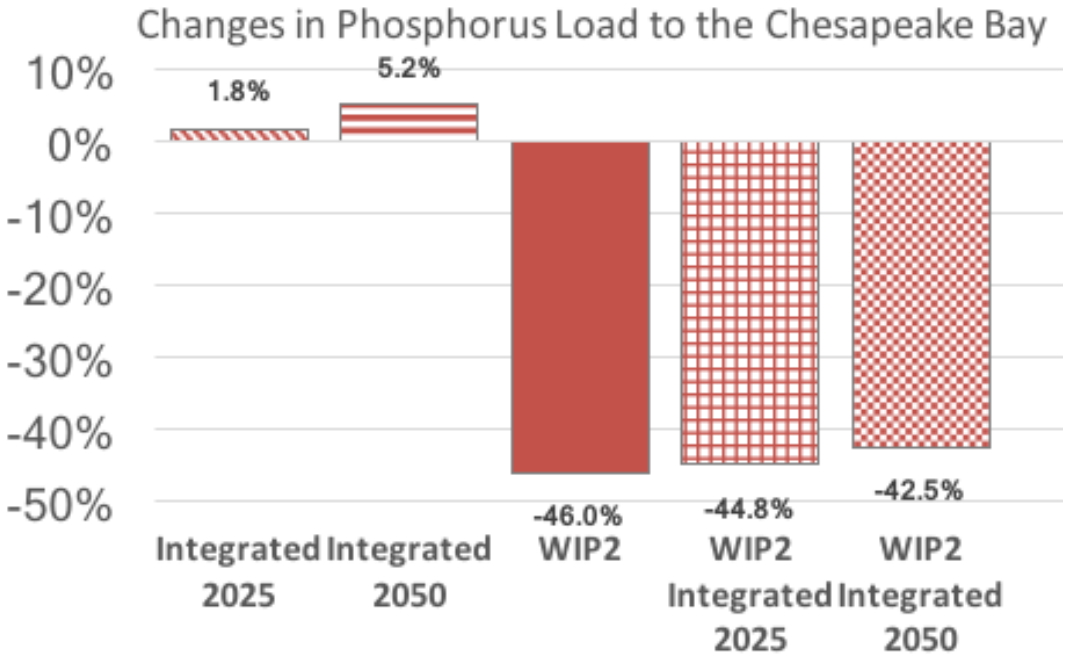
Changes in air temperature under climate change as compared to the base case



Data from Gopal Bhatt et al.

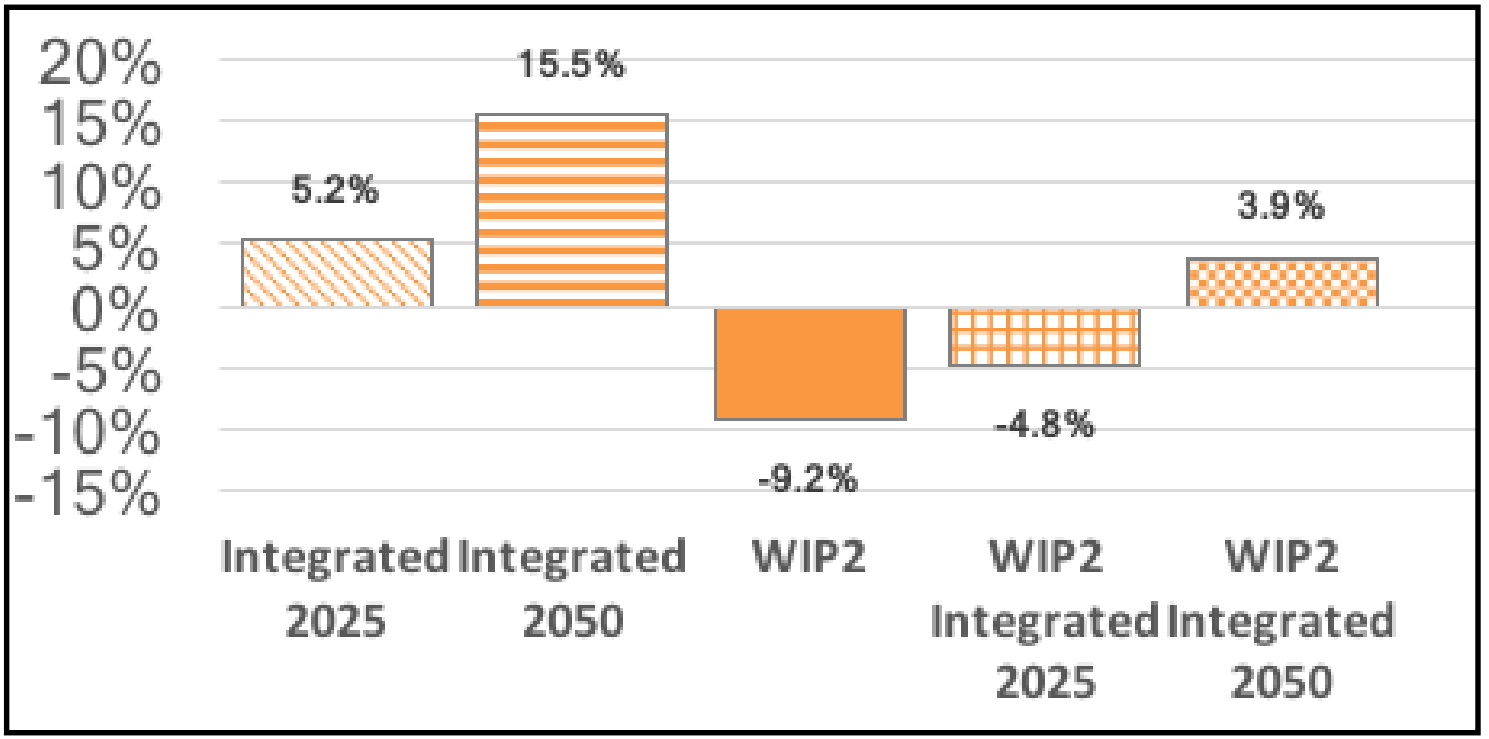
Changes in nutrient loadings under climate change and WIP2 as compared to the base loadings





Gopal Bhatt

Changes in sediment loadings under climate change and WIP2 as compared to the base loadings



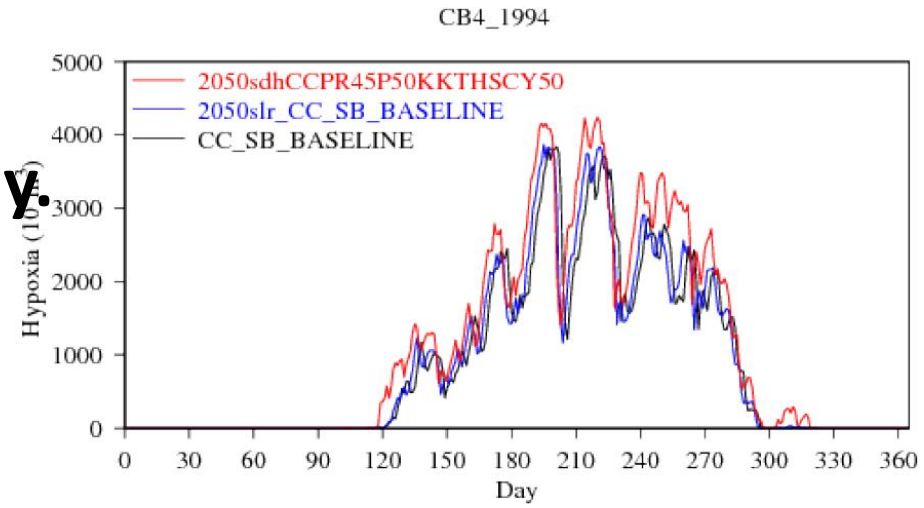
Gopal Bhatt

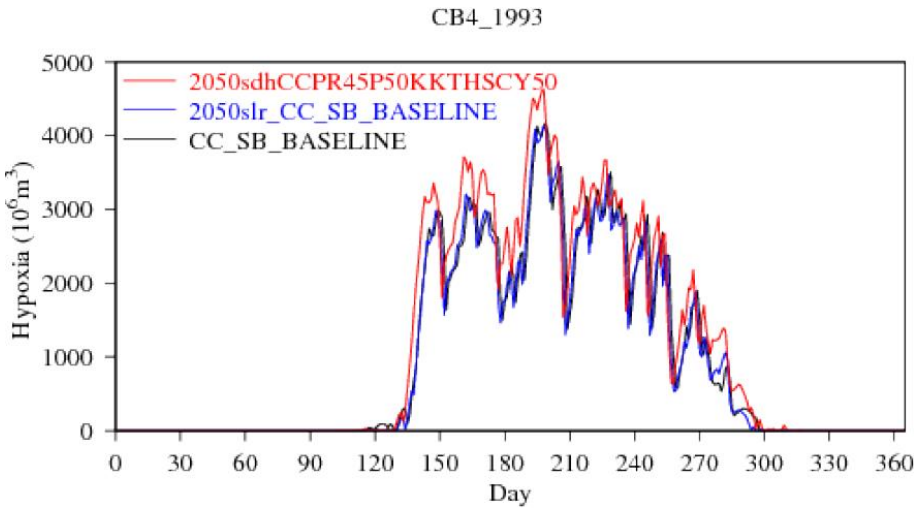
Hypoxia (DO<2 mg/l) volume in CB4MH in 1993, 1994 and 1995

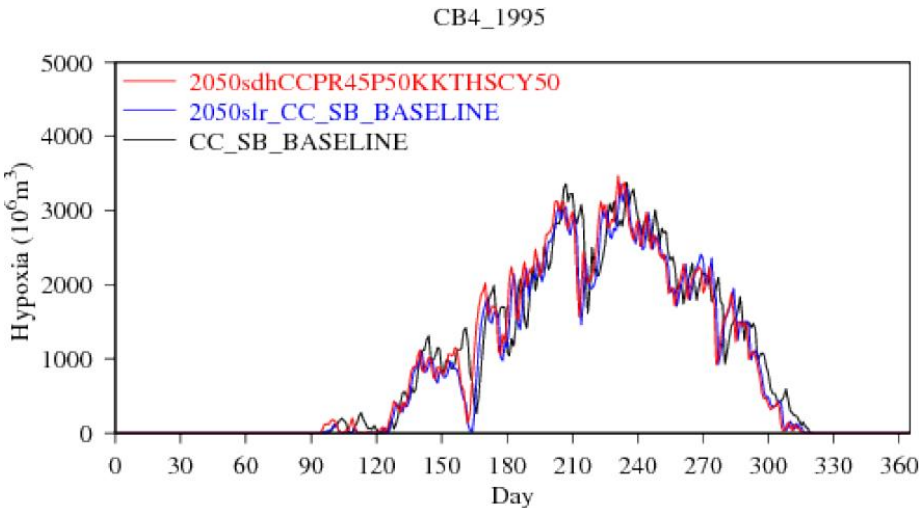
Black: Base case.

Blue: Sea level rise 2050 only.

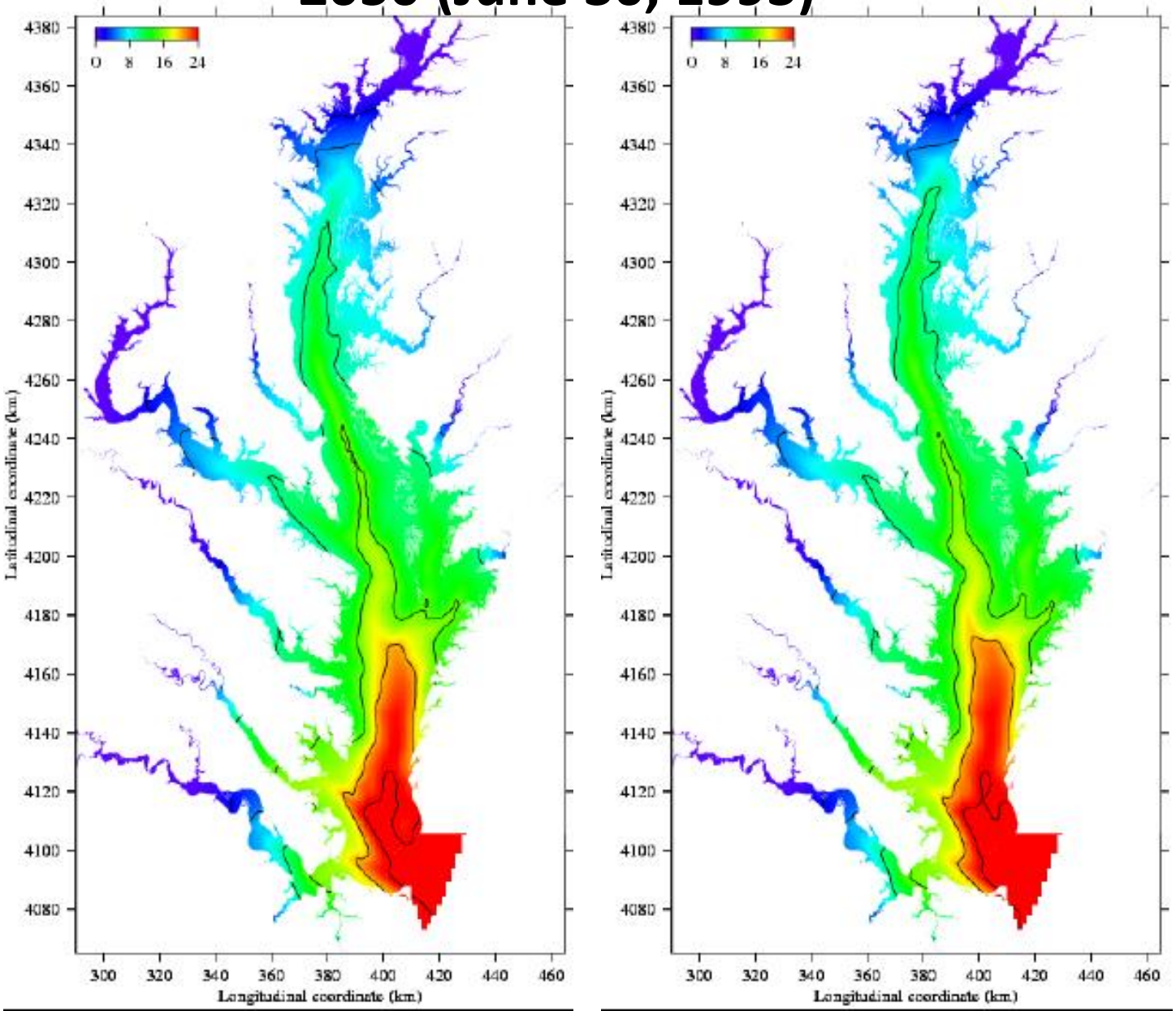
Red: Sea level rise + Discharge + Heat flux.



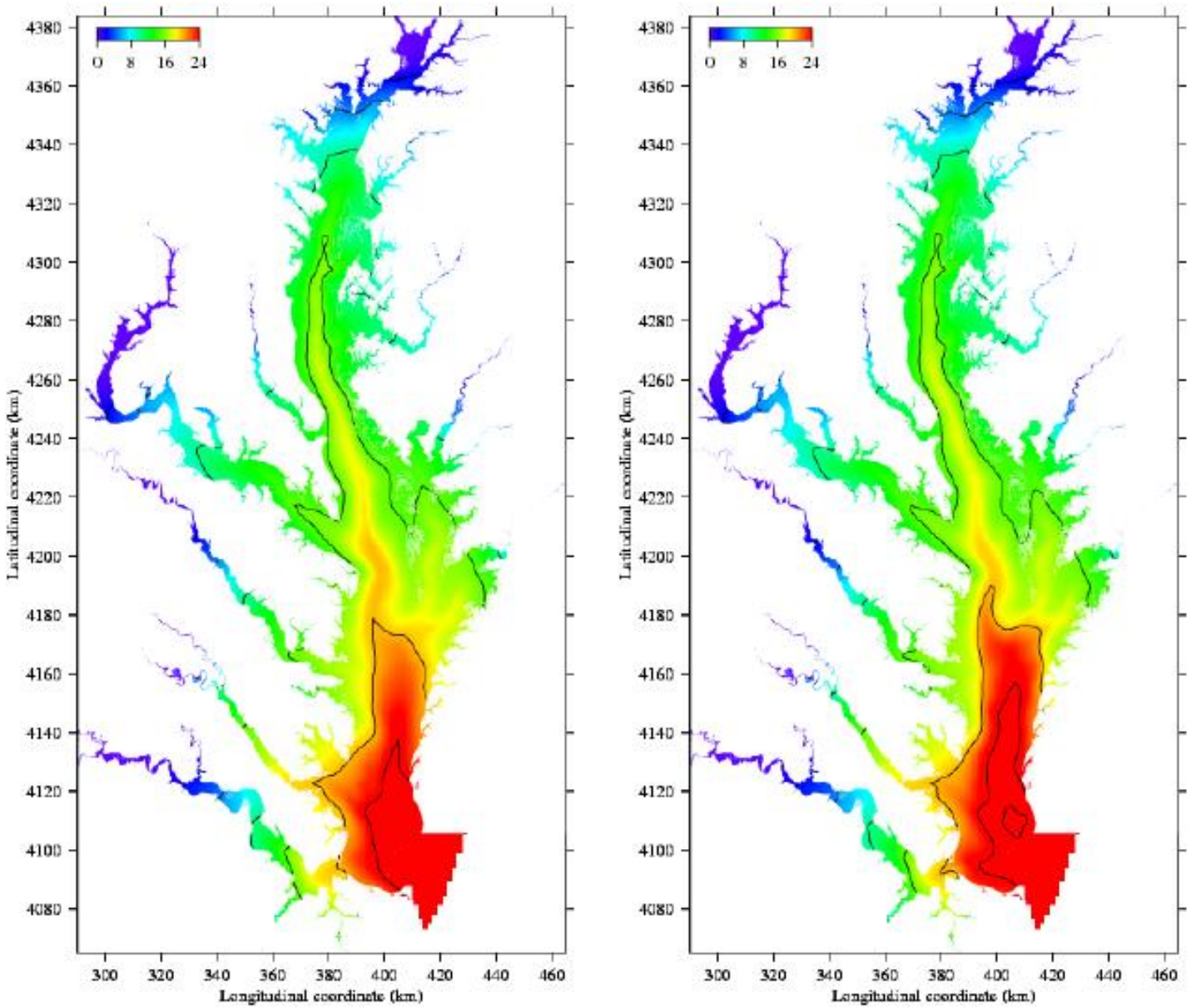




Bottom salinity between base (left) and sea level rise (right) 2050 (June 30, 1993)

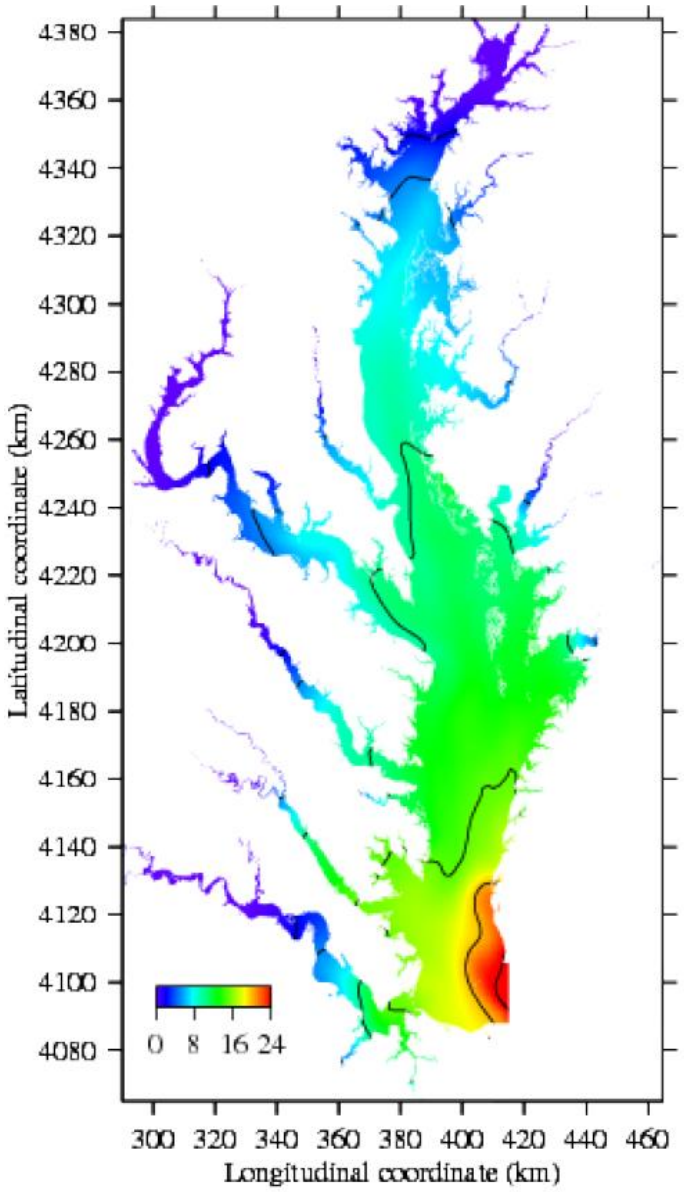


Bottom salinity between base (left) and sea level rise (right) 2050 (Aug 31, 1993)

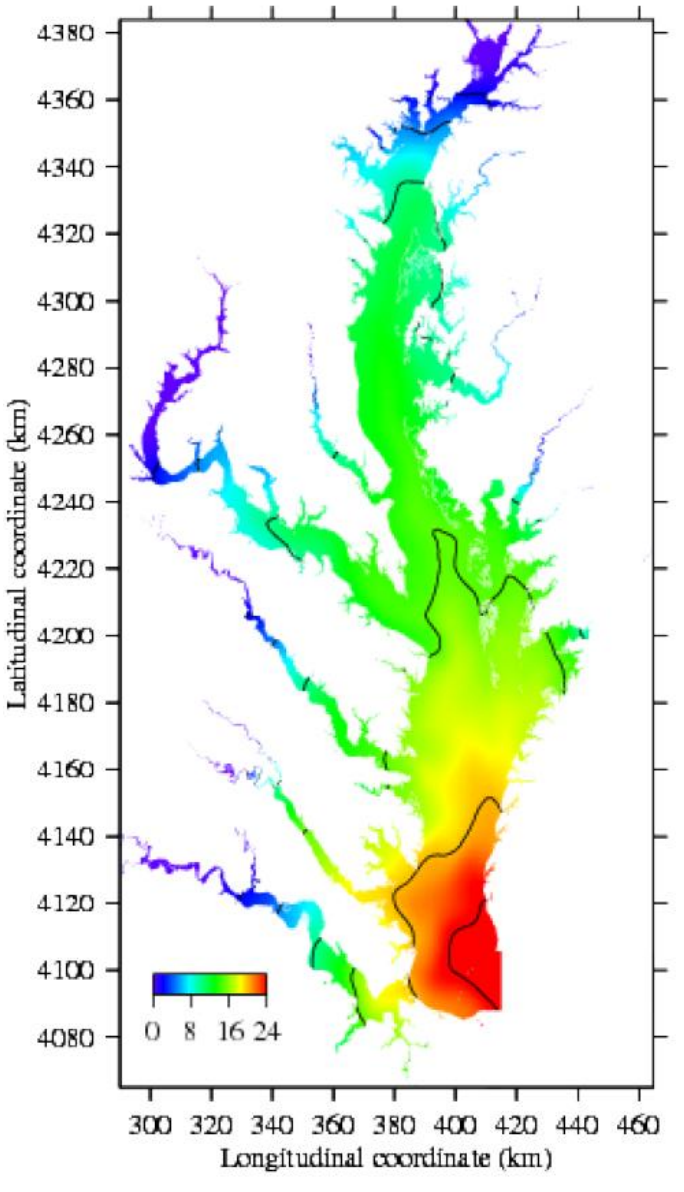


Surface salinity in the base scenario

June 1993



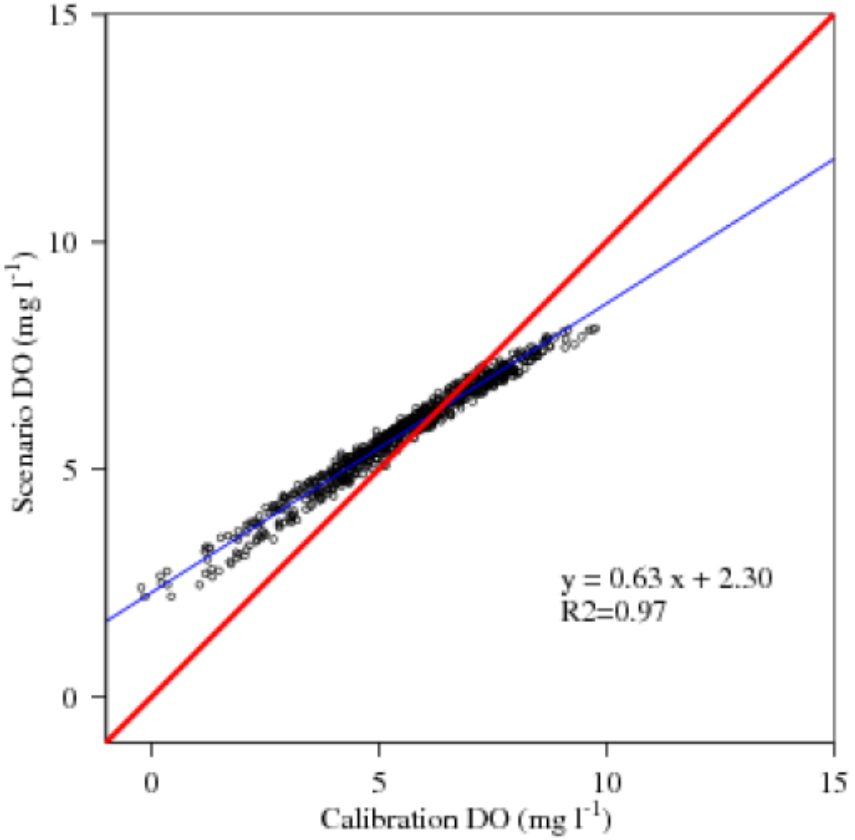
August 1993



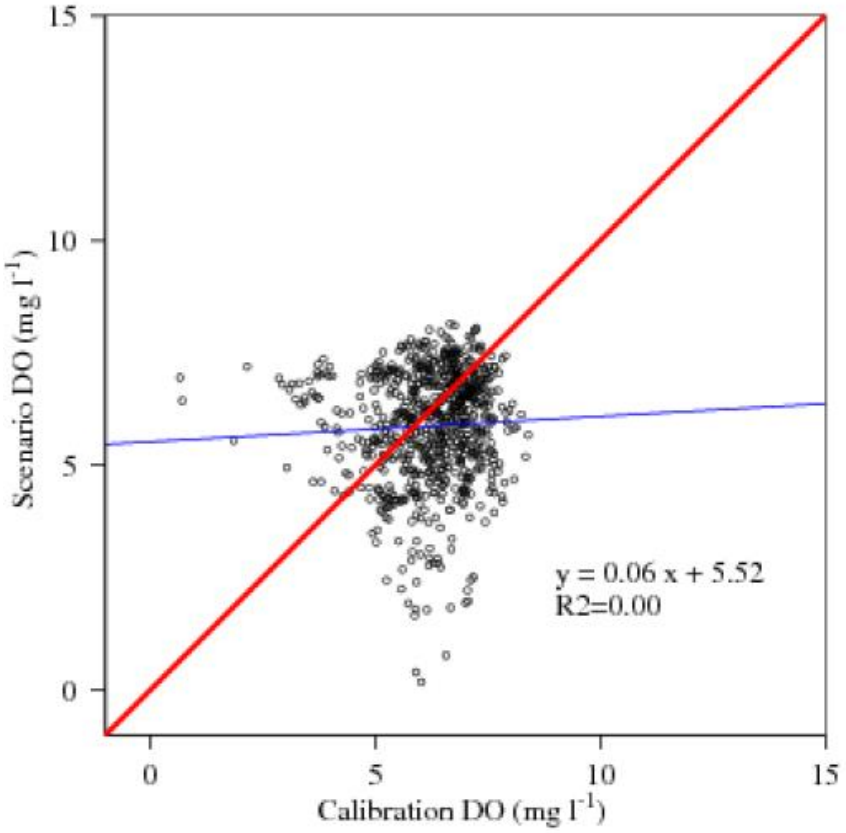
Regression methods for criteria assessment

Least Square regression has as been used over the years

WIP2

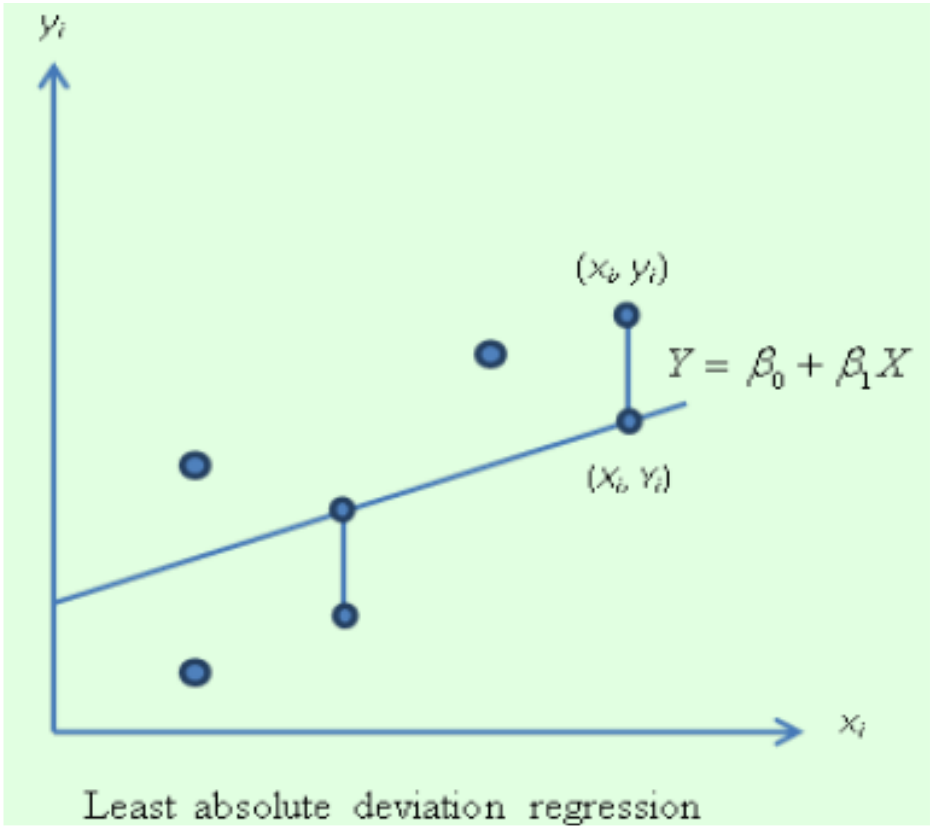


Climate change

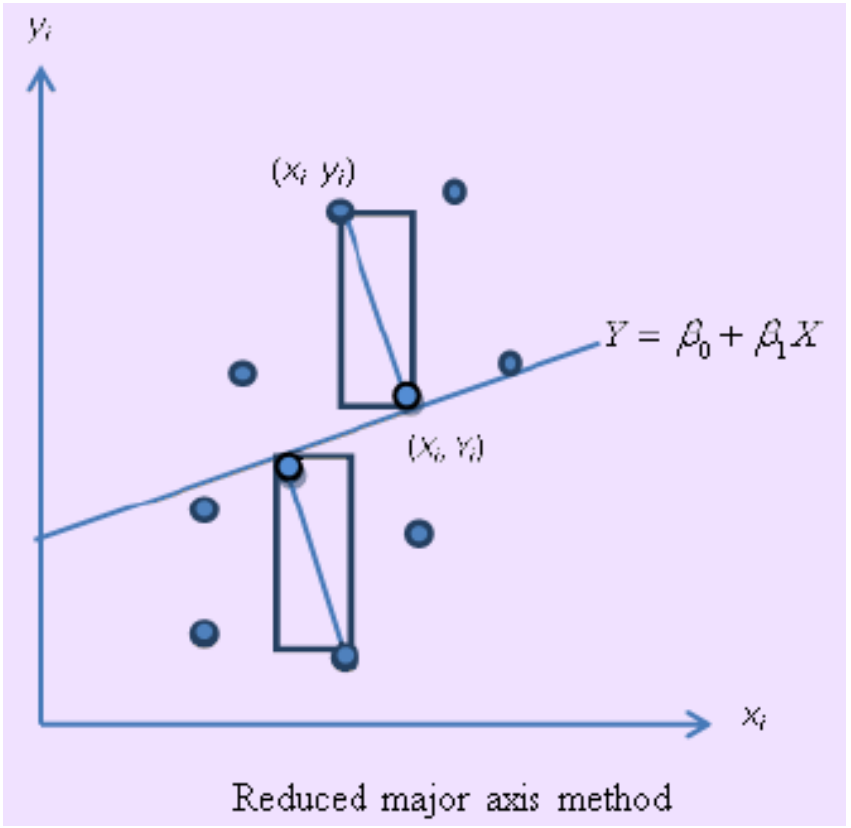


Ordinary least square method (OLS) versus reduced major axis method (RMA)

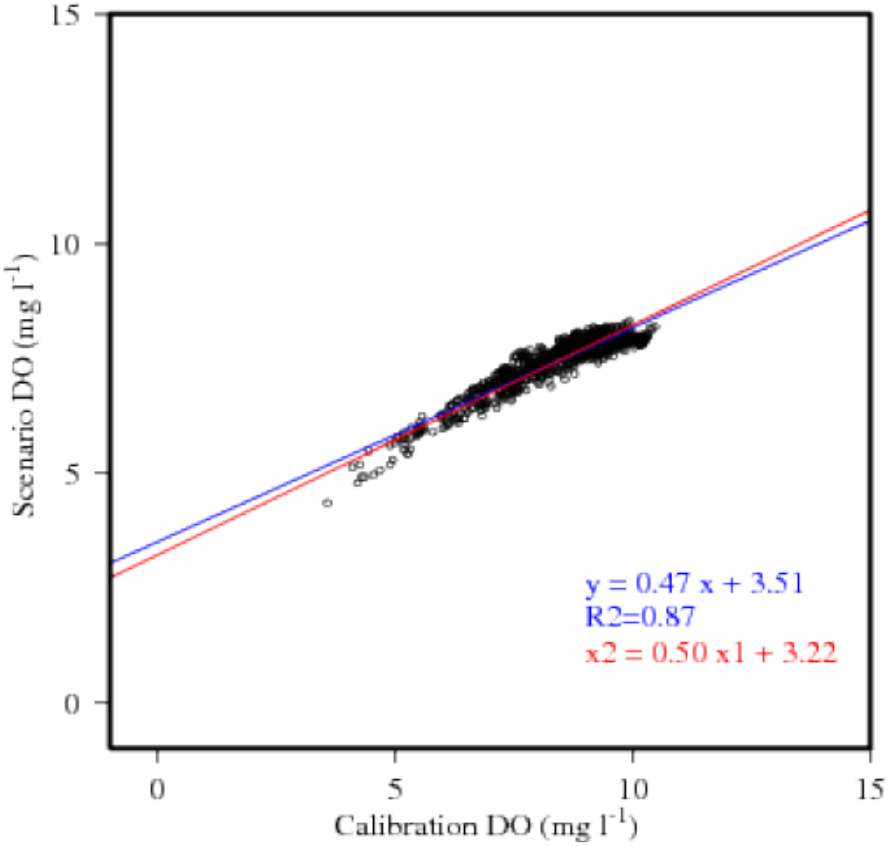
OLS

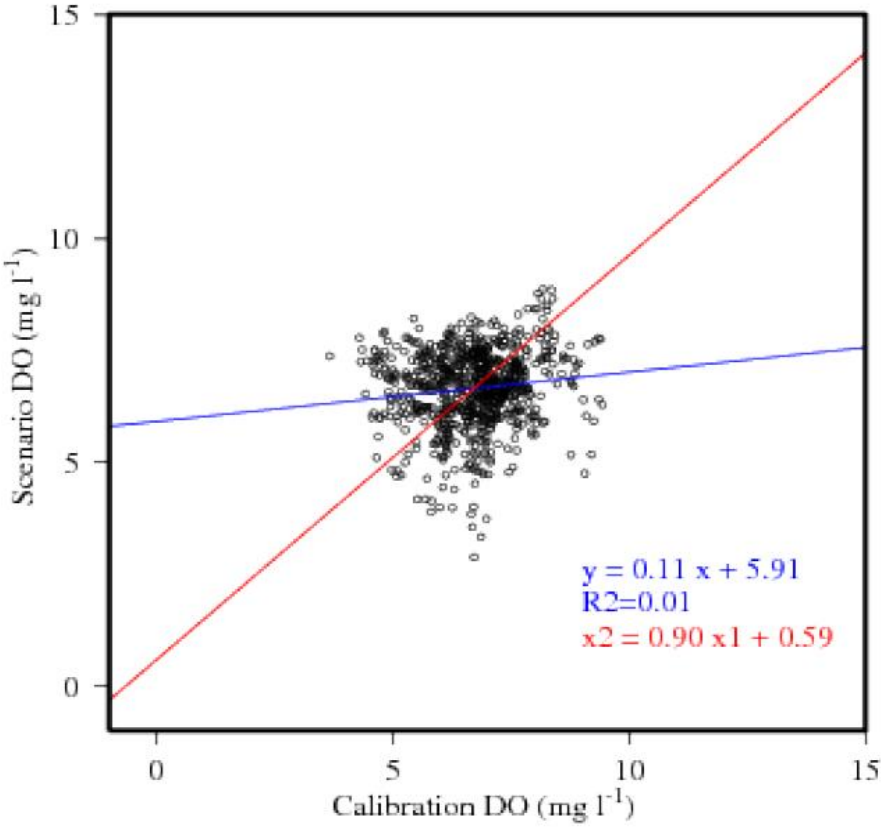


RMA

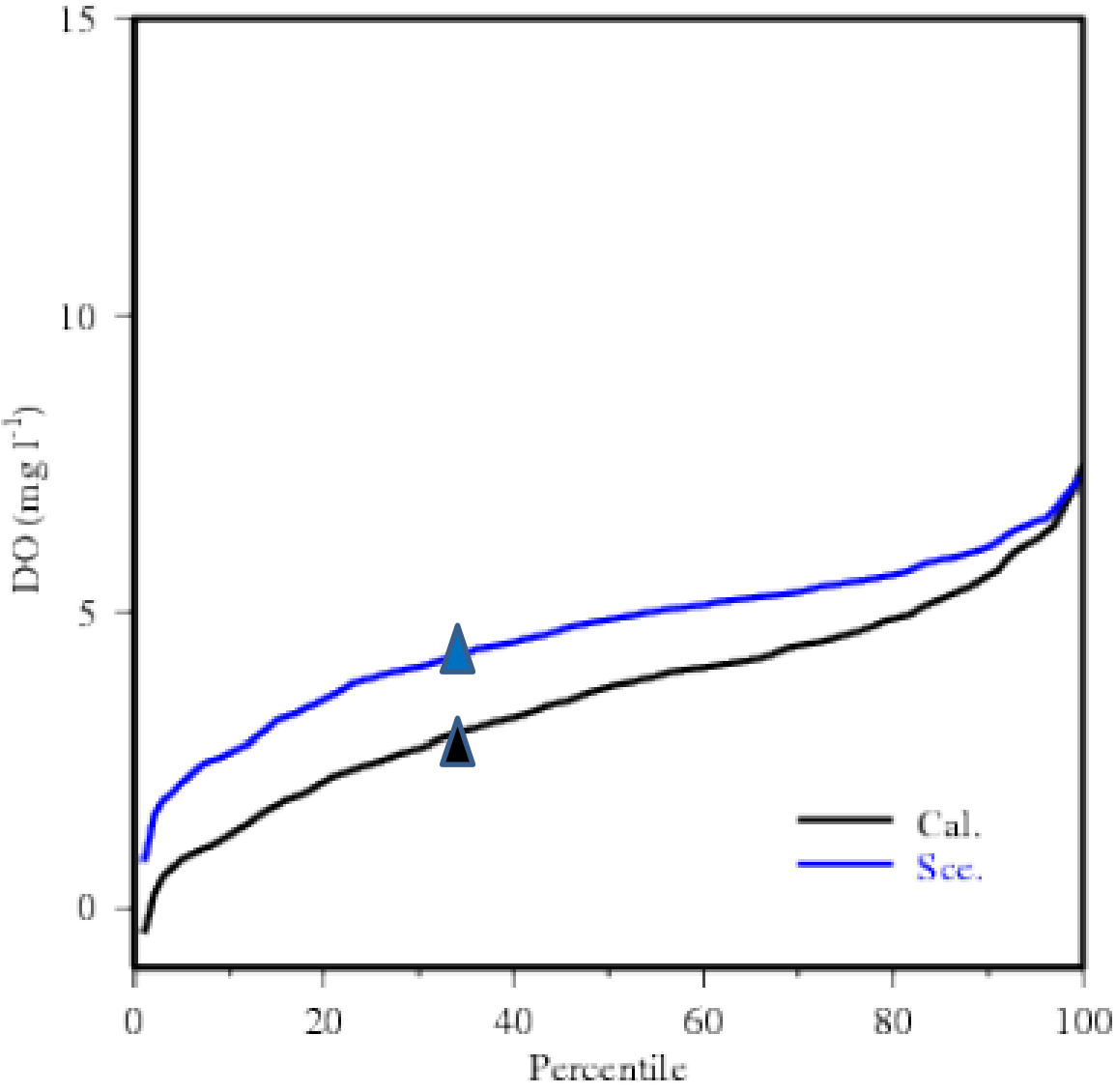


RMA does not handle cases of poor correlation between scenario and calibration





Percentile method



Lack of predictability

Selected method

Scenario data = RMA•R^2 + (1-R^2)•Percentile

Criteria assessment of WIP2 Deep Channel 1993-1995

		Data	OLS	RMA+Percentile
CB3MH	MD	16.00%	0.20%	0.36%
CB4MH	MD	46.03%	2.48%	2.26%
CB5MH	MD/VA	14.21%	0.00%	0.00%
CHSMH	MD	37.36%	16.57%	12.62%
POTMH	MD/VA	20.24%	0.00%	0.00%
POMMH	MD	20.35%	0.00%	0.00%
RPPMH	VA	18.98%	0.00%	0.00%
EASMH	MD	25.35%	1.42%	2.16%
MD5MH	MD	21.66%	0.00%	0.00%
VA5MH	VA	4.46%	0.00%	0.00%
PATMH	MD	24.78%	0.00%	0.00%

2025CC with base nutrient loadings

		Base	SLR	SLR DSCHRG	SLR DSCHRG Heat
CB3MH	MD	16.00%	18.49%	18.33%	18.45%
CB4MH	MD	46.03%	46.74%	46.50%	47.08%
CB5MH	MD/VA	14.21%	13.73%	13.75%	13.76%
CHSMH	MD	37.36%	39.94%	39.94%	39.94%
POTMH	MD/VA	20.24%	19.52%	19.61%	19.55%
POMMH	MD	20.35%	19.63%	19.72%	19.65%
RPPMH	VA	18.98%	25.38%	24.66%	25.14%
EASMH	MD	25.35%	26.65%	26.85%	26.95%
MD5MH	MD	21.66%	20.85%	20.75%	20.84%
VA5MH	VA	4.46%	4.33%	4.51%	4.41%
PATMH	MD	24.78%	20.80%	21.40%	21.40%

2025CC with projected nutrient loadings

		Base	SLR	SLR DSCHRG	SLR DSCHRG Heat
CB3MH	MD	16.00%	18.54%	18.35%	18.56%
CB4MH	MD	46.03%	47.11%	47.00%	47.44%
CB5MH	MD/VA	14.21%	13.82%	13.85%	13.87%
CHSMH	MD	37.36%	39.94%	39.94%	39.94%
POTMH	MD/VA	20.24%	19.42%	19.48%	19.32%
POMMH	MD	20.35%	19.53%	19.59%	19.43%
RPPMH	VA	18.98%	25.41%	24.82%	25.21%
EASMH	MD	25.35%	26.90%	26.92%	27.00%
MD5MH	MD	21.66%	21.08%	20.97%	21.10%
VA5MH	VA	4.46%	4.20%	4.44%	4.31%
PATMH	MD	24.78%	20.80%	21.33%	21.33%