Criteria assessment of modeled scenarios based on the 3D interpolator

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modeling team

Modeling Quarterly Review Meeting

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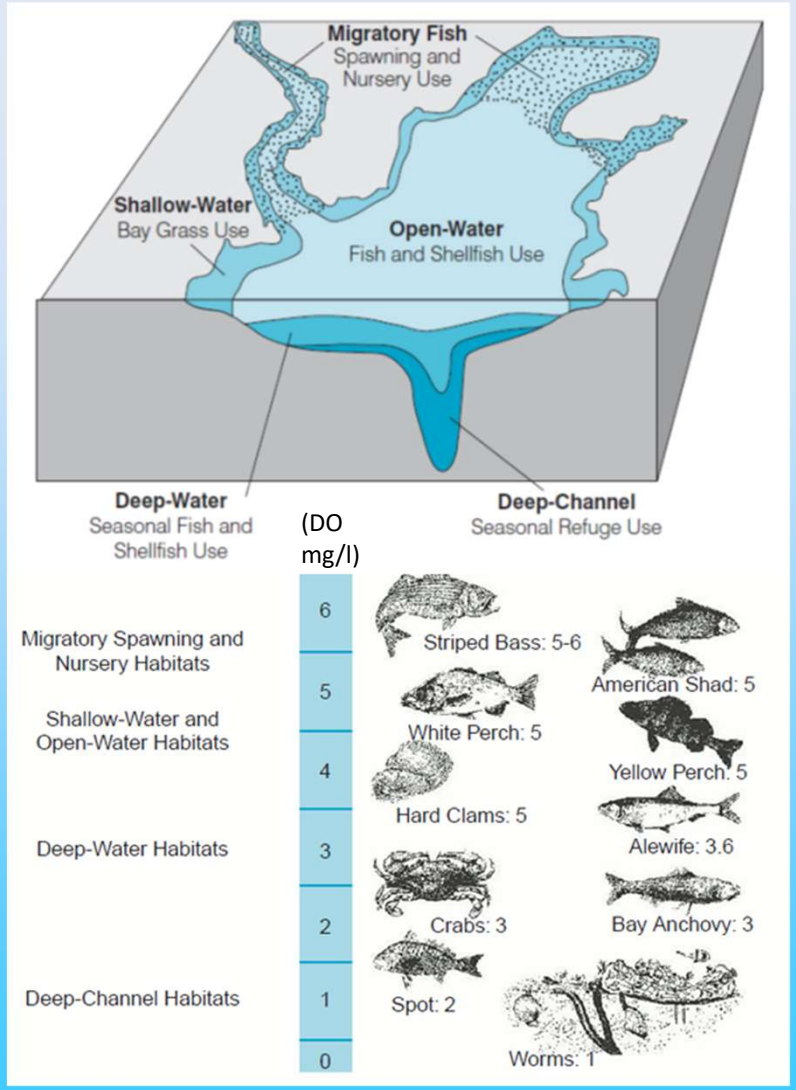
Designated Uses (DUs)

Six DUs:

- **DO DC: deep channel,**
- **DO DW: deep water,**
- **DO OW: open water,**
- **DO MSN: migratory fish, spawning and nursery,**
- **Chlorophyll: James and Anacostia rivers,**
- **SAV: Water clarity and sea grass in shallow waters**

p.s.: Surface pycnocline: 0.1 kg/m^4; Bottom pycnocline: 0.2 kg/m^4



WQS Criteria

Table S1. Water quality standards criteria for dissolved oxygen, water clarity/underwater bay grasses, and chlorophyll-a and the designated uses (USEPA, 2003b; USEPA, 2003a; USEPA, 2004b). Criterion thresholds that were used in the water quality standards attainment procedures are shown in blue color.

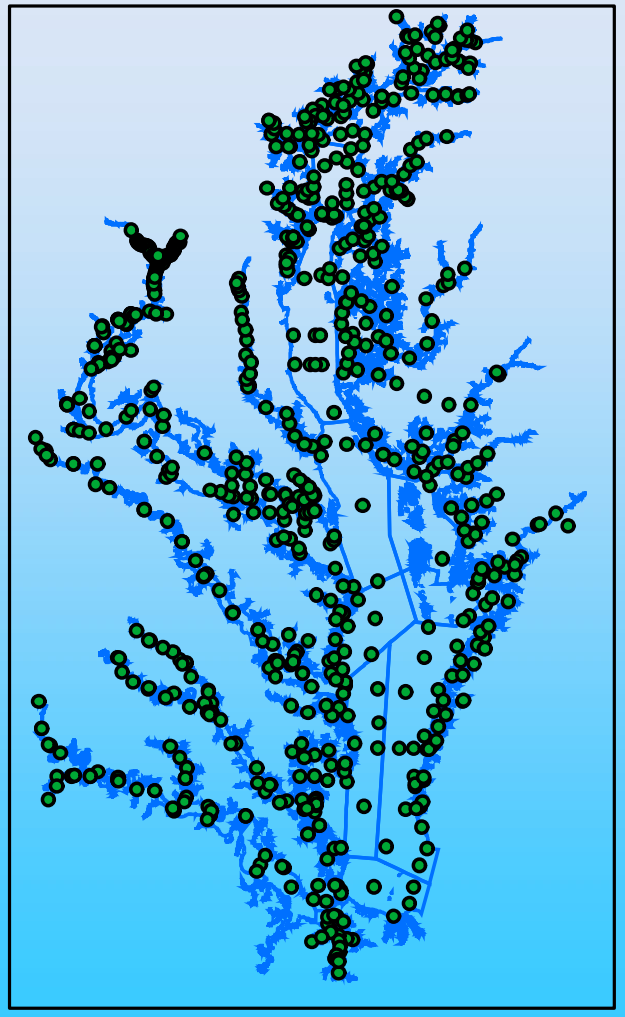
Criterion	Designated Use	Season	Threshold	Critical Value
Dissolved Oxygen (DO)	Migratory fish spawning and nursery (MSN)	February 1 - May 31	30-day mean [a]	6 mg L^{-1}
		February 1 - May 31	7-day mean	6 mg L^{-1}
		February 1 - May 31	Instantaneous	5 mg L^{-1}
		June 1 - January 31	*OW criteria apply*	
	Open-water fish and shellfish (OW)	Year-round	30-day mean [b]	5.5 mg L^{-1} in very low salinity; 5 mg L^{-1} otherwise
			7-day mean	4 mg L^{-1}
			Instantaneous	3.2 mg L^{-1}
	Deep-water seasonal fish and shellfish (DW)	June 1 - September 30	30-day mean	3 mg L^{-1}
		June 1 - September 30	1-day mean	2.3 mg L^{-1}
		June 1 - September 30	Instantaneous	1.7 mg L^{-1}
		October 1 - May 31	*OW criteria apply*	
	Deep-channel seasonal refuge (DC)	June 1 - September 30	Instantaneous	1 mg L^{-1}
		October 1 - May 31	*OW criteria apply*	
	Shallow-water bay grass (SW)	June 1 - September 30	*Dependent upon OW attainment assessment*	
Chlorophyll-a (CHLA)	Open-water fish and shellfish (OW)	Spring (March 1 - May 31)	10 to 15 µg L^{-1} (salinity based)	
		Summer (July 1 - September 30)	10 to 25 µg L^{-1} (salinity based)	
SAV and/or Water Clarity	Shallow-water bay grass (SW)	SAV season	Segment specific water clarity and bay grass acreage goals	

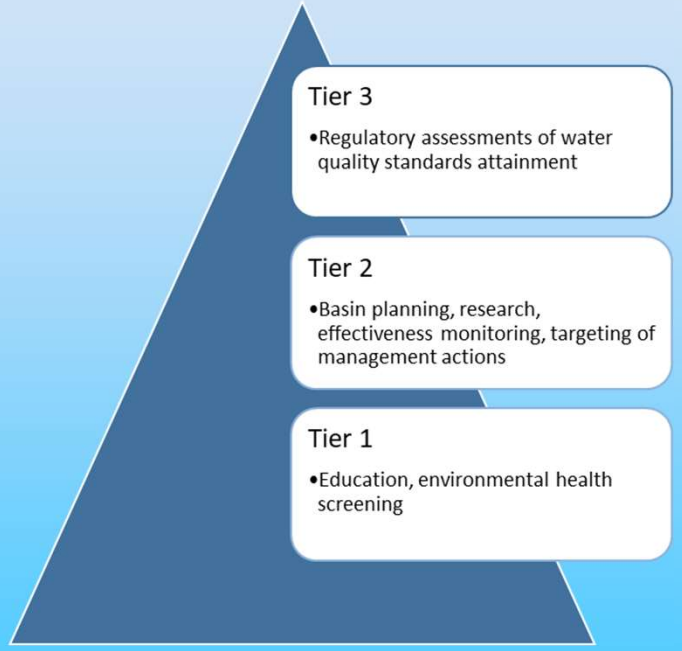
[a] USEPA (2003) does not have a 30-day mean February-May threshold for MSN. The decision for indicator used a 30-day mean of 6 mg L^{-1} as February-May threshold, same as the 7-day mean threshold.

[b] June-September (as opposed to the entire year) is evaluated for the 30-day mean criterion for OW in the attainment assessment procedures.

Tidal stations included in criteria assessment

- **763 stations**
- **Only Tier 3 data**
- **1991-2000**
- **No high-frequency data**

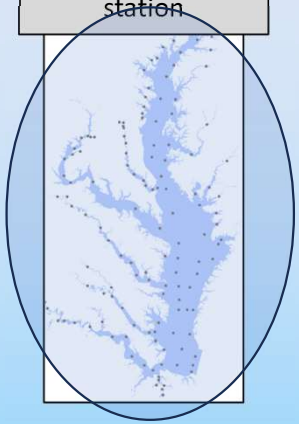




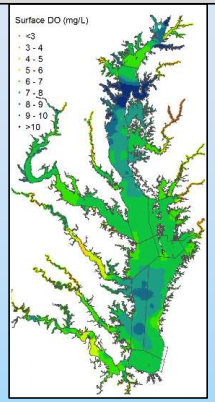
WQS Criterion Assessment

1. Collect bi-weekly to monthly data at each monitoring station

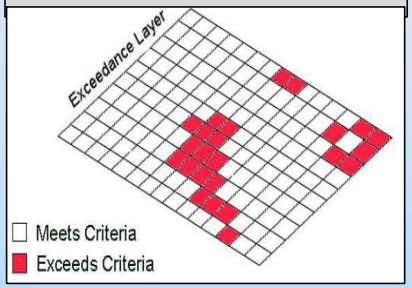
Model



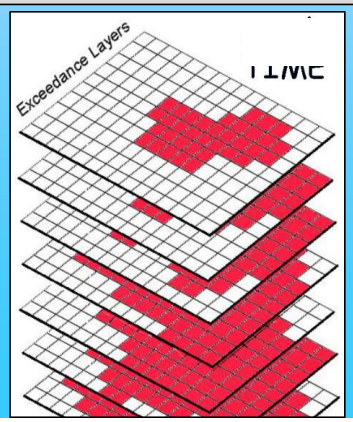
2. Convert the station DO data to Baywide values using the CBP interpolator



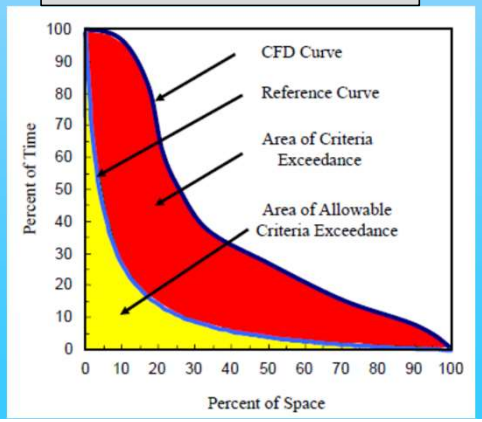
4. Compare the interpolated values with appropriate criterion values to compute the spatial extent of exceedance



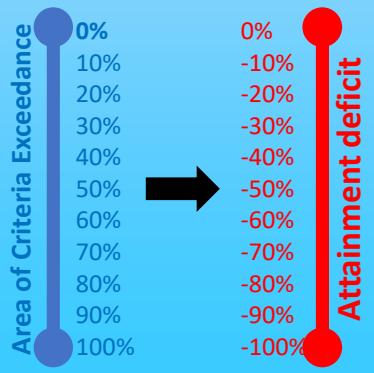
5. Repeat Step 4 for each sampling event in the 3-year period to determine the cells' extent of exceedance



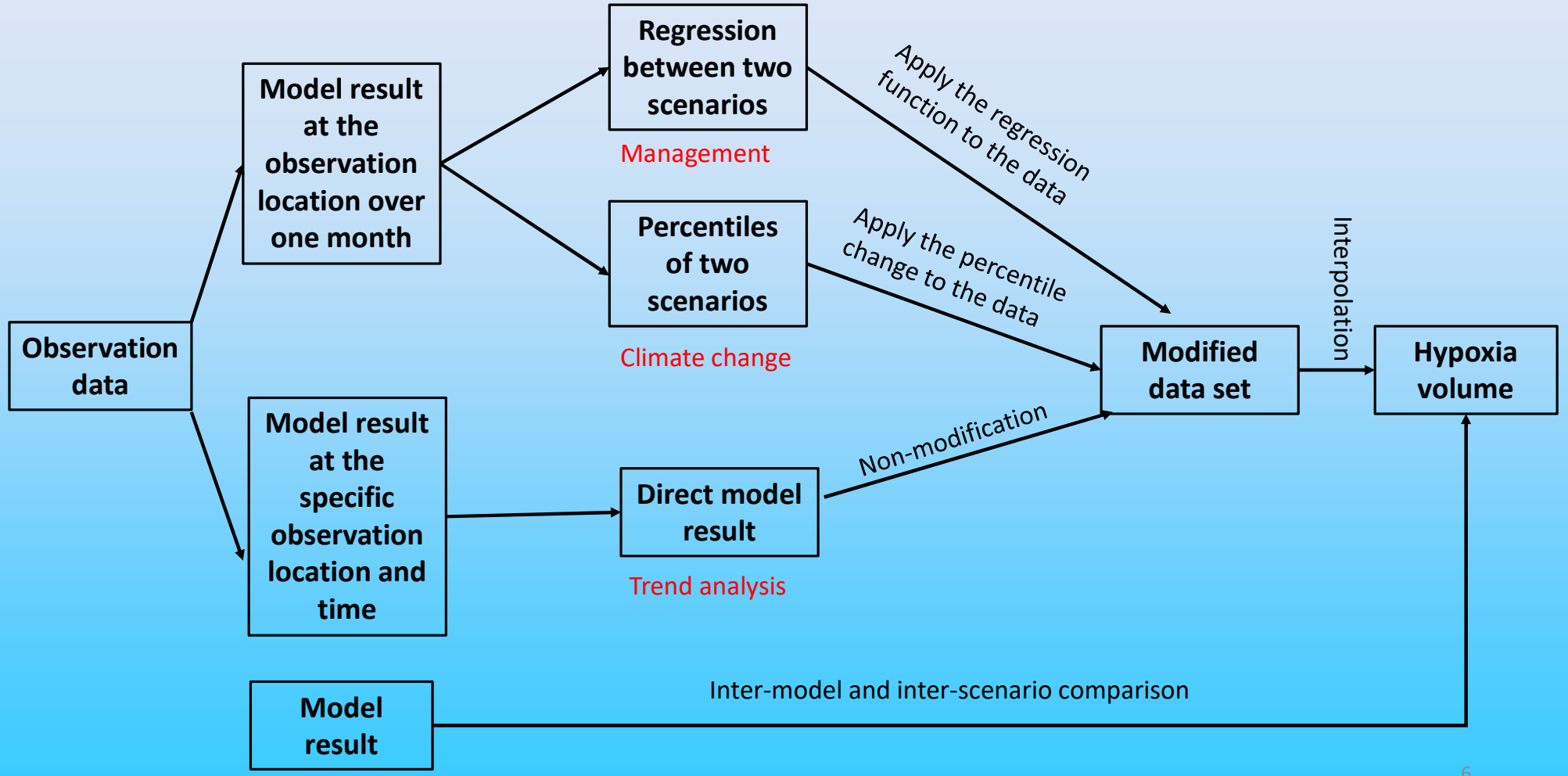
6. Calculate the cumulative probability distribution (CFD) for extent of exceedance for all cells within each segment



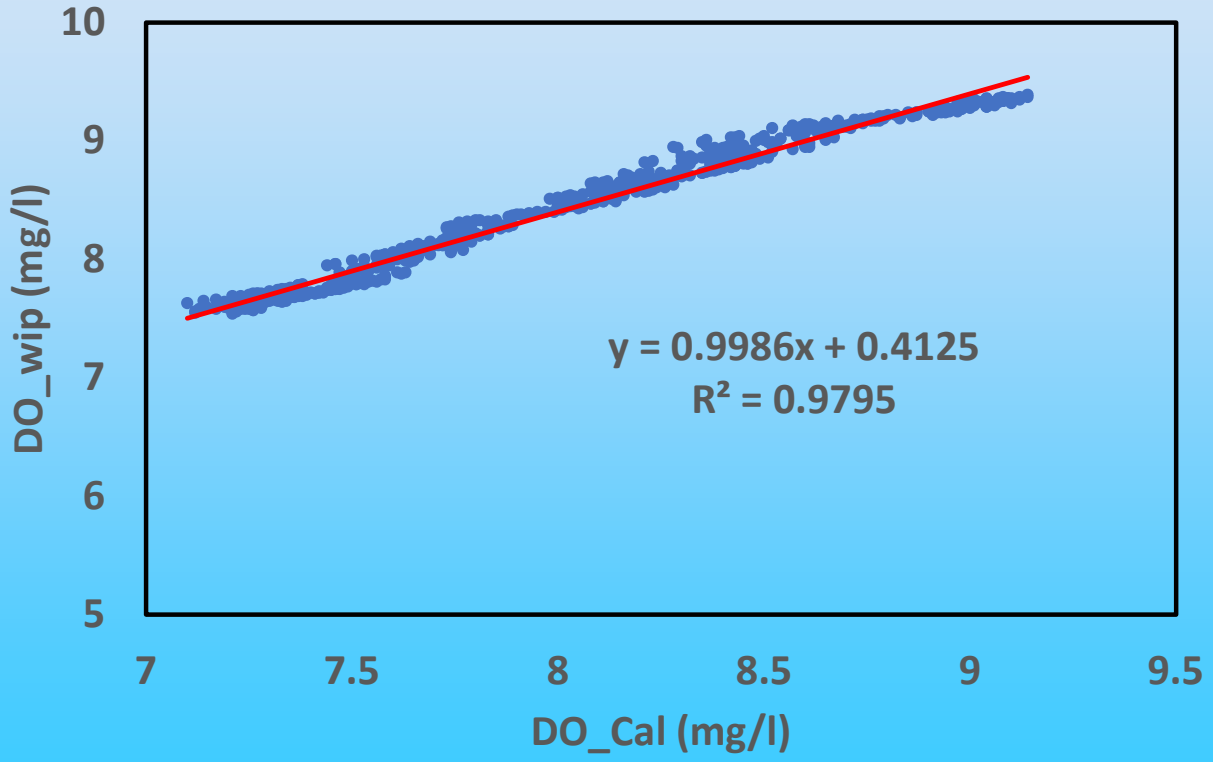
7. Quantify attainment status (attaining or not) for the 3-year period



Methods to modify the data based on model scenarios

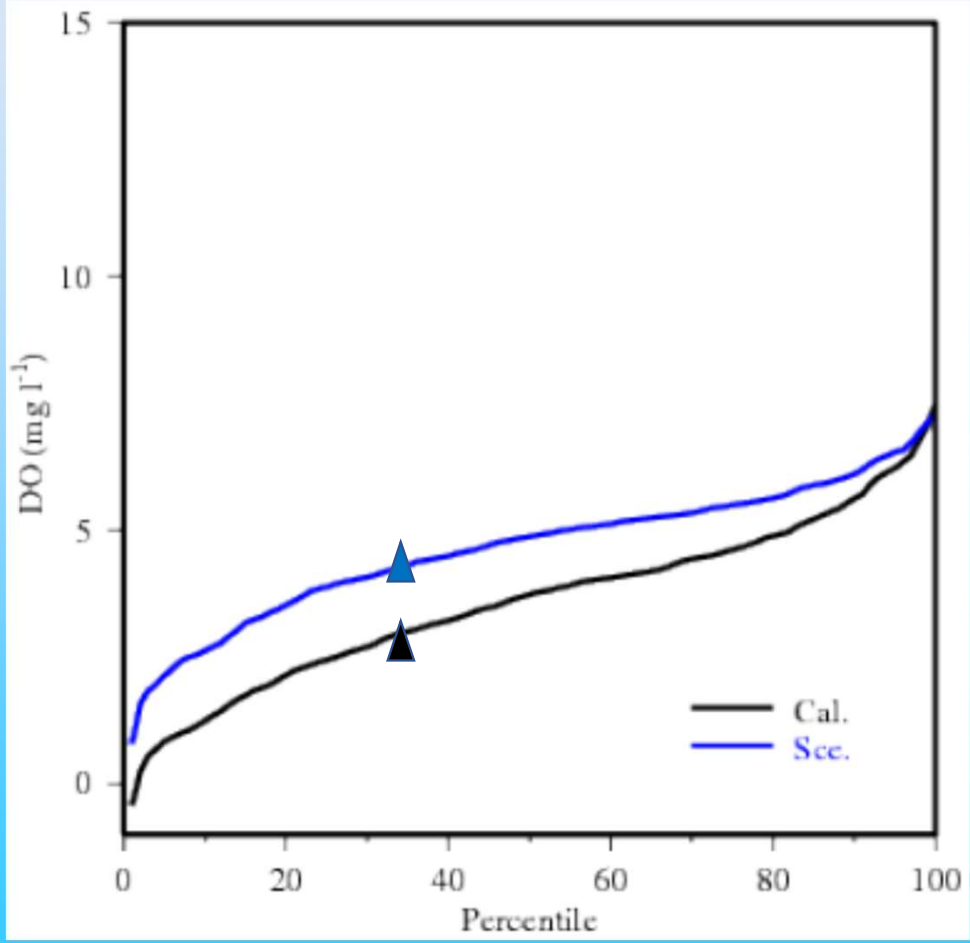


Regression example between the scenario and the calibration (CB4.2C 06/1993 surface)

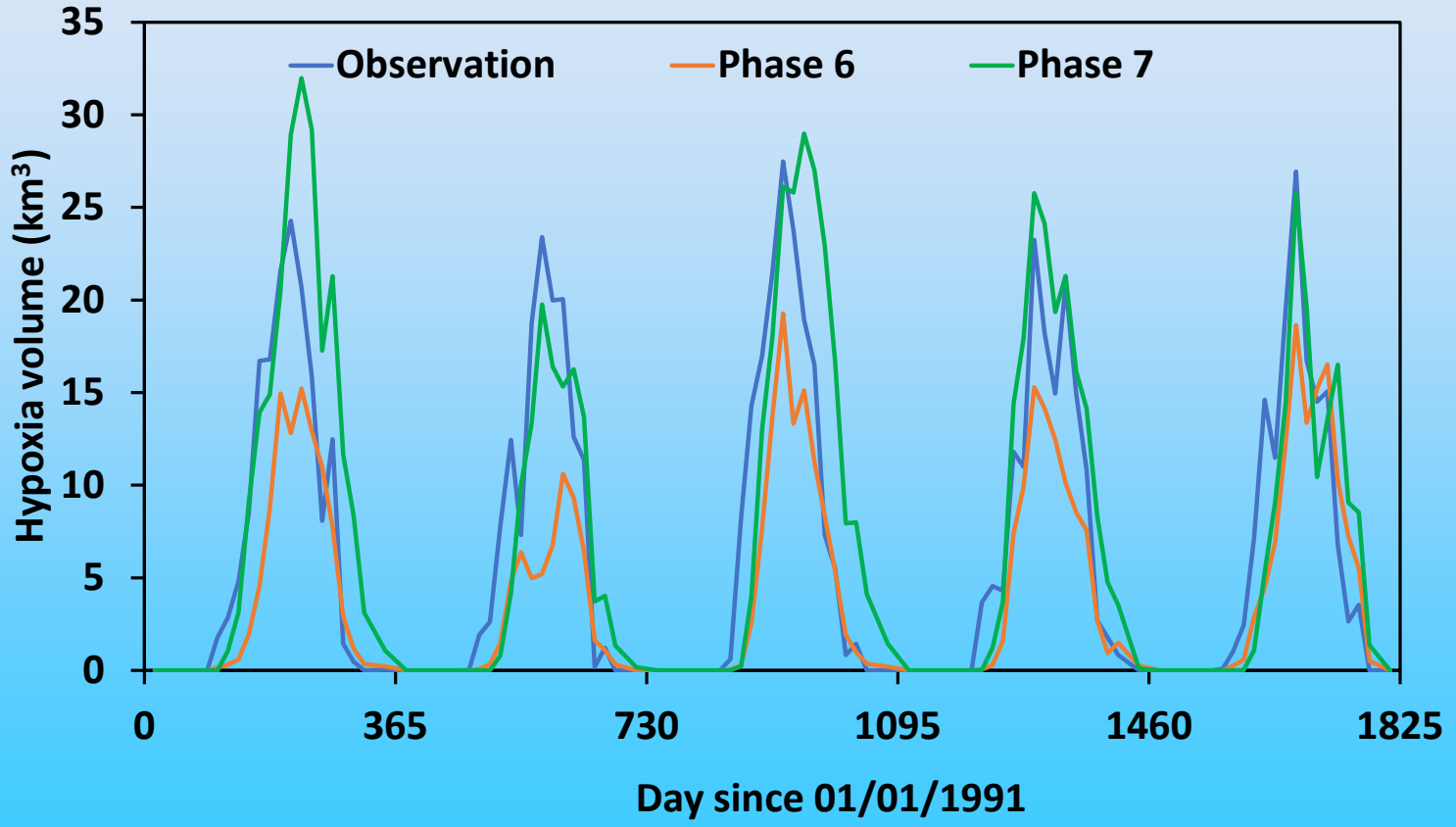


	Average correlation coefficients
Schism	0.97
CH3D	0.94

Percentile method

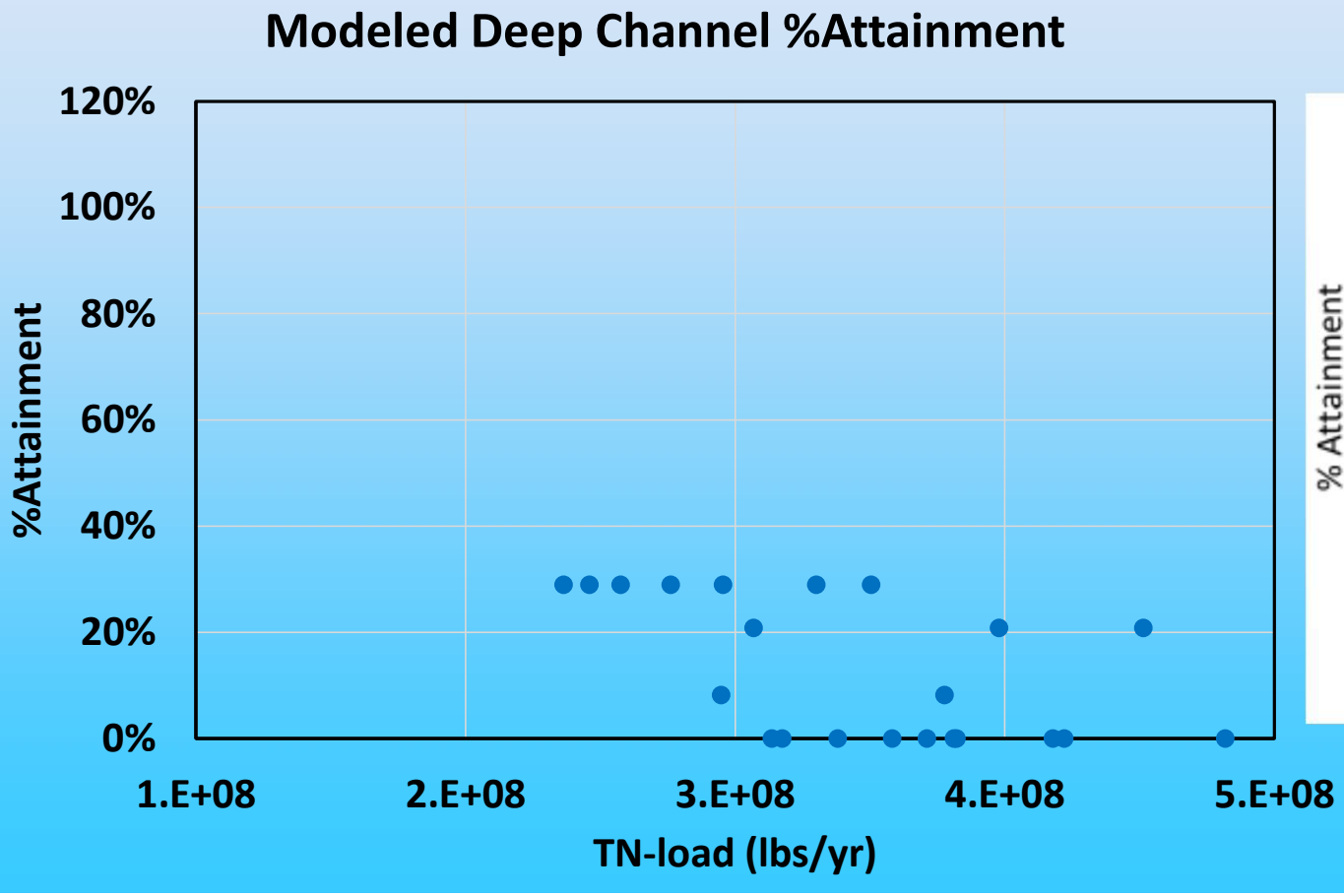


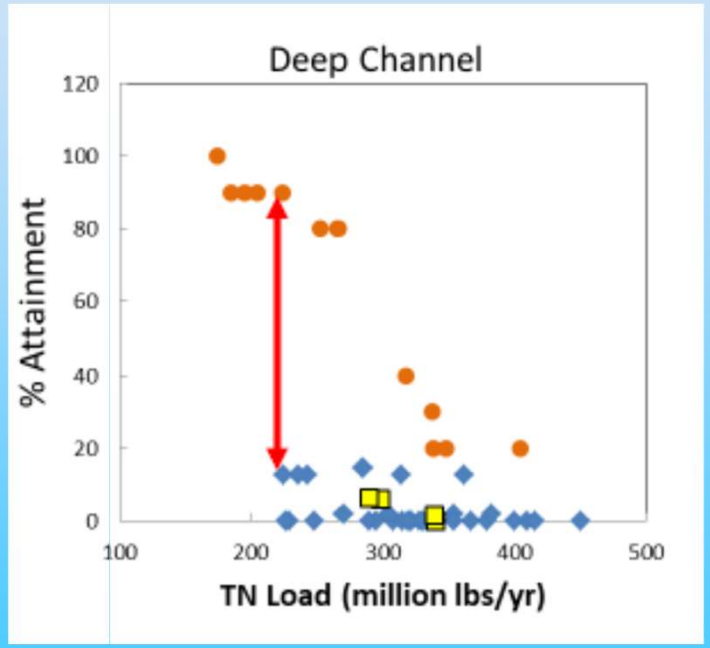
Comparison of Open-Water hypoxia volume between observation and calibration (< 5 mg/l)



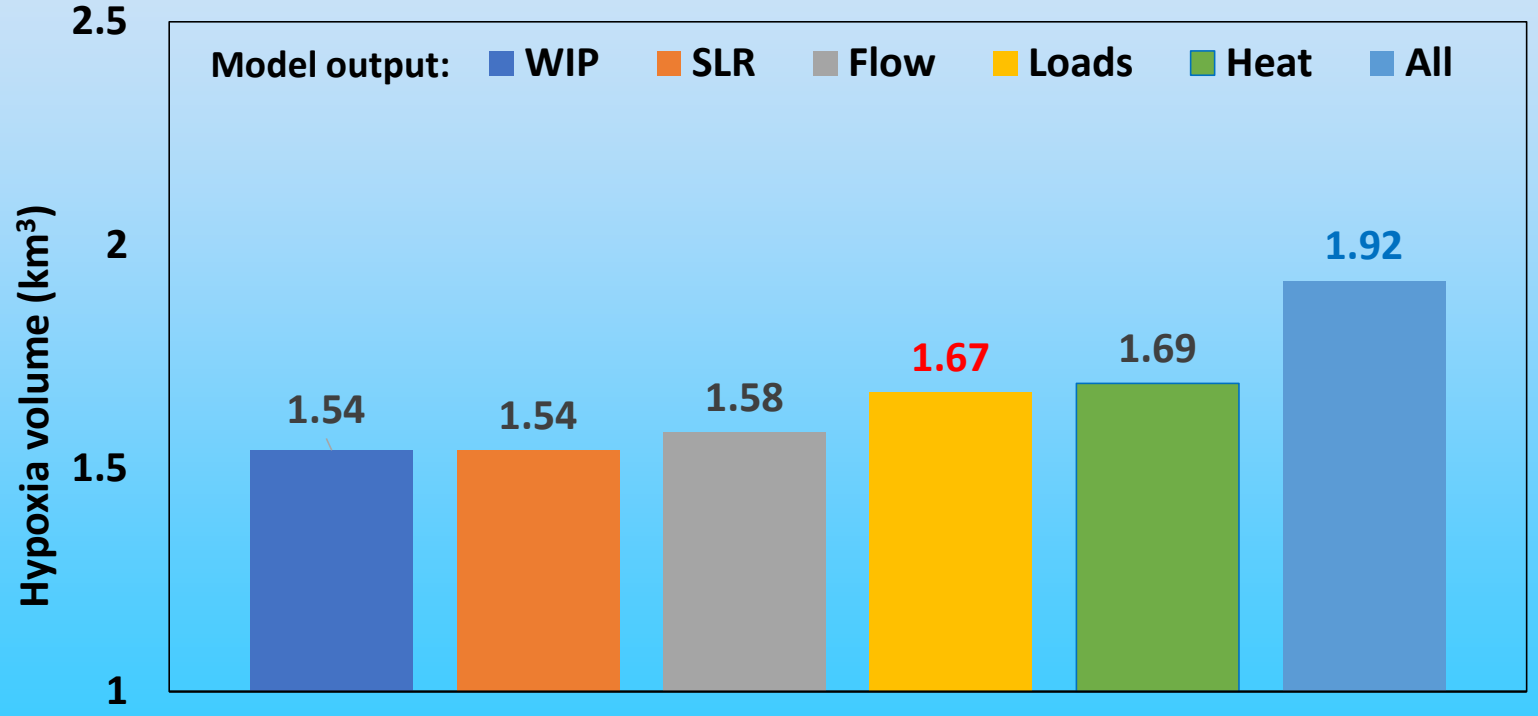
Example of Phase 6 applications-Trend analysis

Plot in CSER report
Orange = mode
Blue = observations





2035 summer (Jun.-Sep.) average hypoxia volume (<1 mg/l) in the Whole Bay under WIP condition



Deep Chanel Criteria Assessment

Scenario	name	CALIB	CH3D_WIP	CH3D_35WIP	CC2035	P7_WIP	WIP_2035
CB3MH	MD	7.23%	0.00%	0.00%	7.55%	0.06%	1.26%
CB4MH	MD	45.21%	5.02%	10.02%	47.08%	17.31%	27.26%
CB5MH_MD	MD	20.92%	0.00%	0.00%	22.49%	0.31%	5.65%
CB5MH_VA	VA	4.23%	0.00%	0.00%	7.19%	0.00%	0.00%
POTMH_MD	MD	15.75%	0.00%	0.00%	17.22%	0.00%	1.69%
RPPMH	VA	13.98%	0.00%	0.00%	20.26%	0.00%	1.73%
CHSMH	MD	16.92%	0.00%	1.09%	17.87%	0.00%	3.51%
EASMH	MD	18.26%	5.62%	6.51%	19.61%	5.09%	11.61%
PATMH	MD	22.41%	0.00%	0.00%	28.23%	0.00%	0.00%