Interpolator Grid: Testing thinning of 50 m and 100 m segments

BORG meeting
April 20, 2025

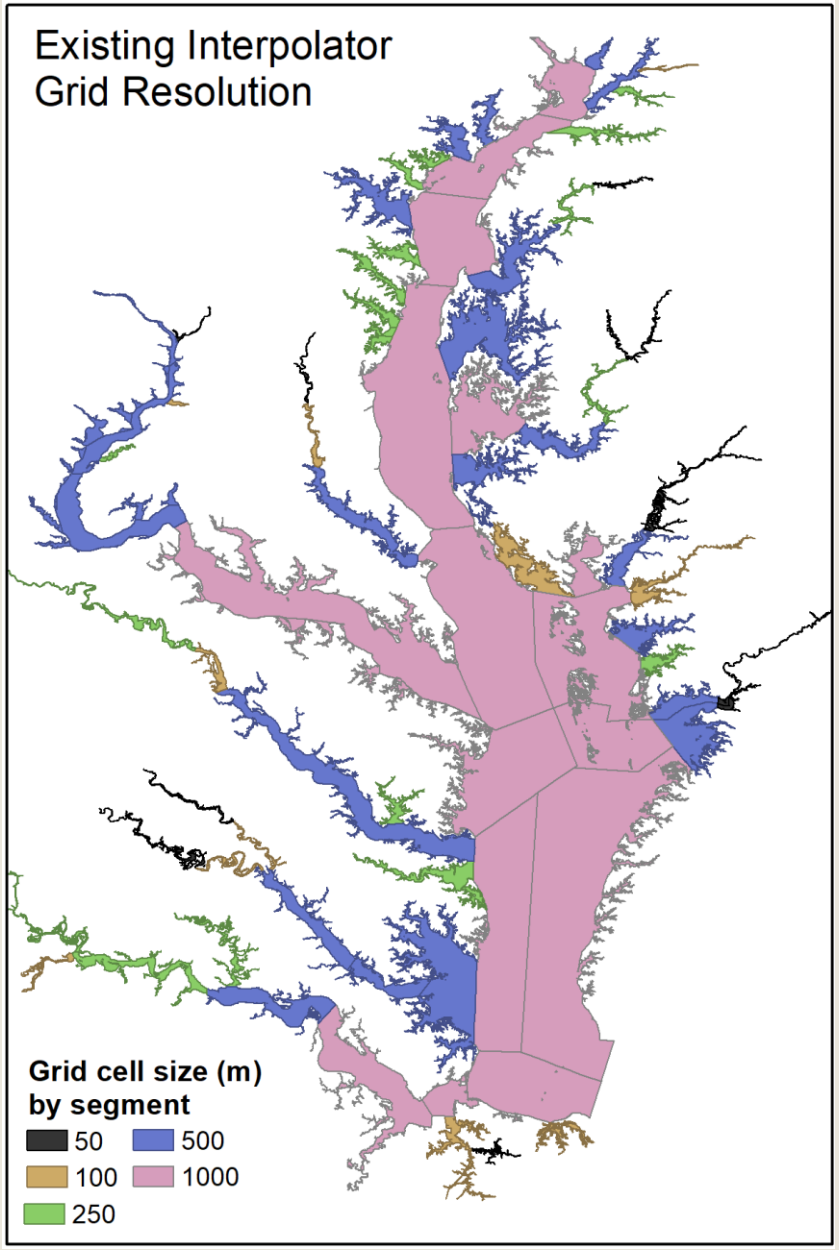
Rebecca Murphy[1], Jon Harcum[2], Elgin Perry[3],
Breck Sullivan[4], and Peter Tango[4]

[1]UMCES at CBP, [2]Tetra Tech,[3]Statistics Consultant, [4]USGS at the CBP

Background

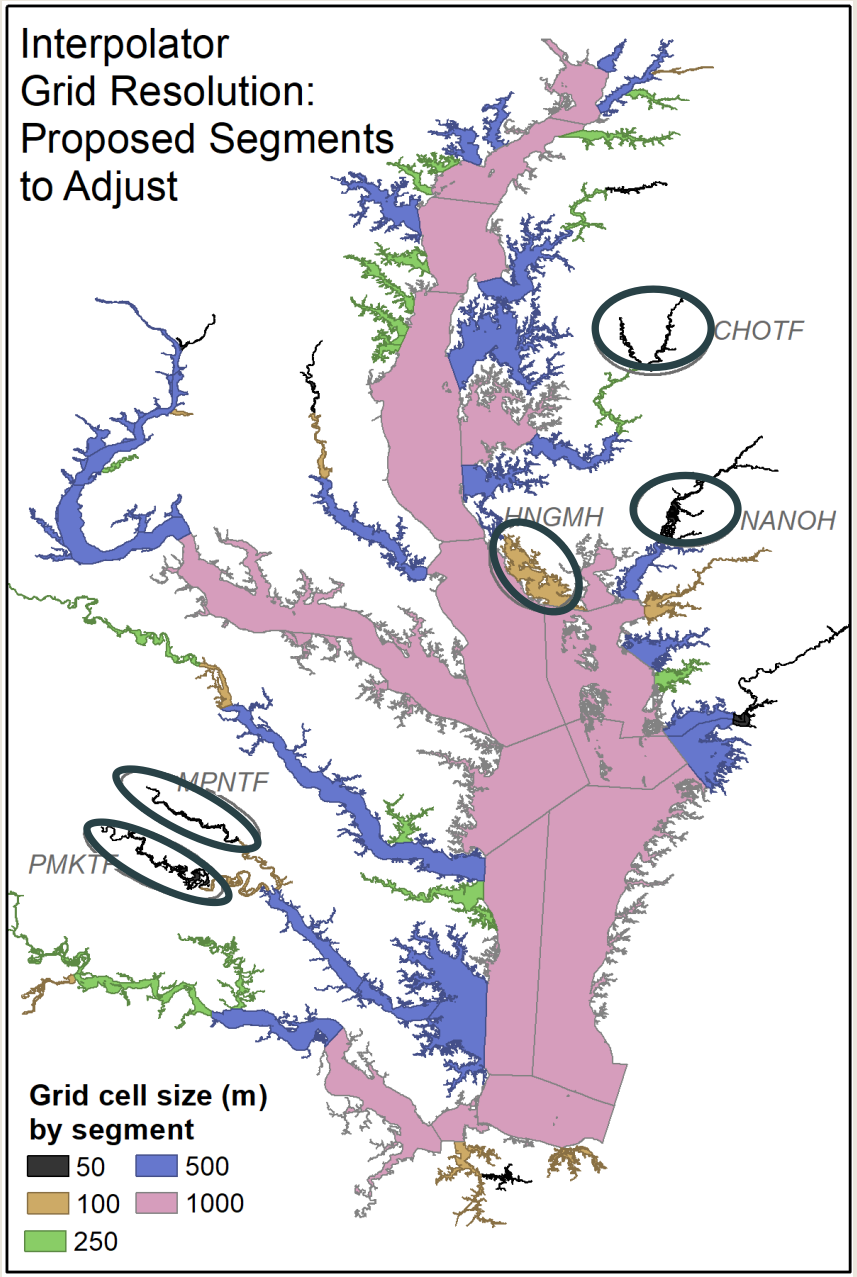
- For criteria assessment purposes, DO data is interpolated to a grid that fills the volume of each segment.
- A spatial grid exists that has been used for the 3-D interpolator:
  - *Vertical resolution = 1m layers*
  - *Horizontal resolution = cells ranging from 50m x 50m to 1km x 1km*
- For consistency, we intended to use that same grid for the 4-D spatial output.

Cell size	Number of segments	Area (km^2)
50 m	15	91
100 m	15	265
250 m	19	497
500 m	26	2,467
1 km	17	8,341



Background

- At our meeting in Nov. 2025, we discussed whether five segments could be thinned to make runs more feasible on personal computer (memory requirements get large with more grid points).
- We looked at maps and DO distributions with and without thinning from the interpolation results.
- BORG team agreed results were acceptable to thin these segments, and also requested analysis for remaining 50 m resolution segments.
- Subsequent analysis led us to also test all originally 100 m grid cells (also count = 15) to see if any of them could be thinned to 200 m.



Segment lists

Originally 50 m segments

segment	state	description	count at 50m	count at 100m	discussed previously
ANATF_DC	DC	Anacostia River, DC	4,971	1,247	
NANTF_DE	DE	Upper Nanticoke, DE	1,307	340	
ANATF_MD	MD	Anacostia River, MD	69	15	
CHOTF	MD	Upper Choptank River	5,767	1,473	yes
CHSTF	MD	Upper Chester River	1,345	331	
NANOH	MD	Middle Nanticoke River	17,995	4,482	yes
NANTF_MD	MD	Upper Nanticoke, MD	1,339	348	
PAXTF	MD	Upper Patuxent River	4,406	1,105	
POCOH_MD	MD	Middle Pocomoke River, MD	4,161	1,066	
POCTF	MD	Upper Pocomoke River	1,788	454	
WBRTF	MD	Western Branch Patuxent River	45	14	
EBEMH	VA	Eastern Branch Elizabeth River	2,584	652	
MPNTF	VA	Upper Mattaponi River	7,203	1,813	yes
PMKTF	VA	Upper Pamunkey River	11,452	2,864	yes
POCOH_VA	VA	Middle Pocomoke River, VA	3,039	775	

Originally 100 m segments

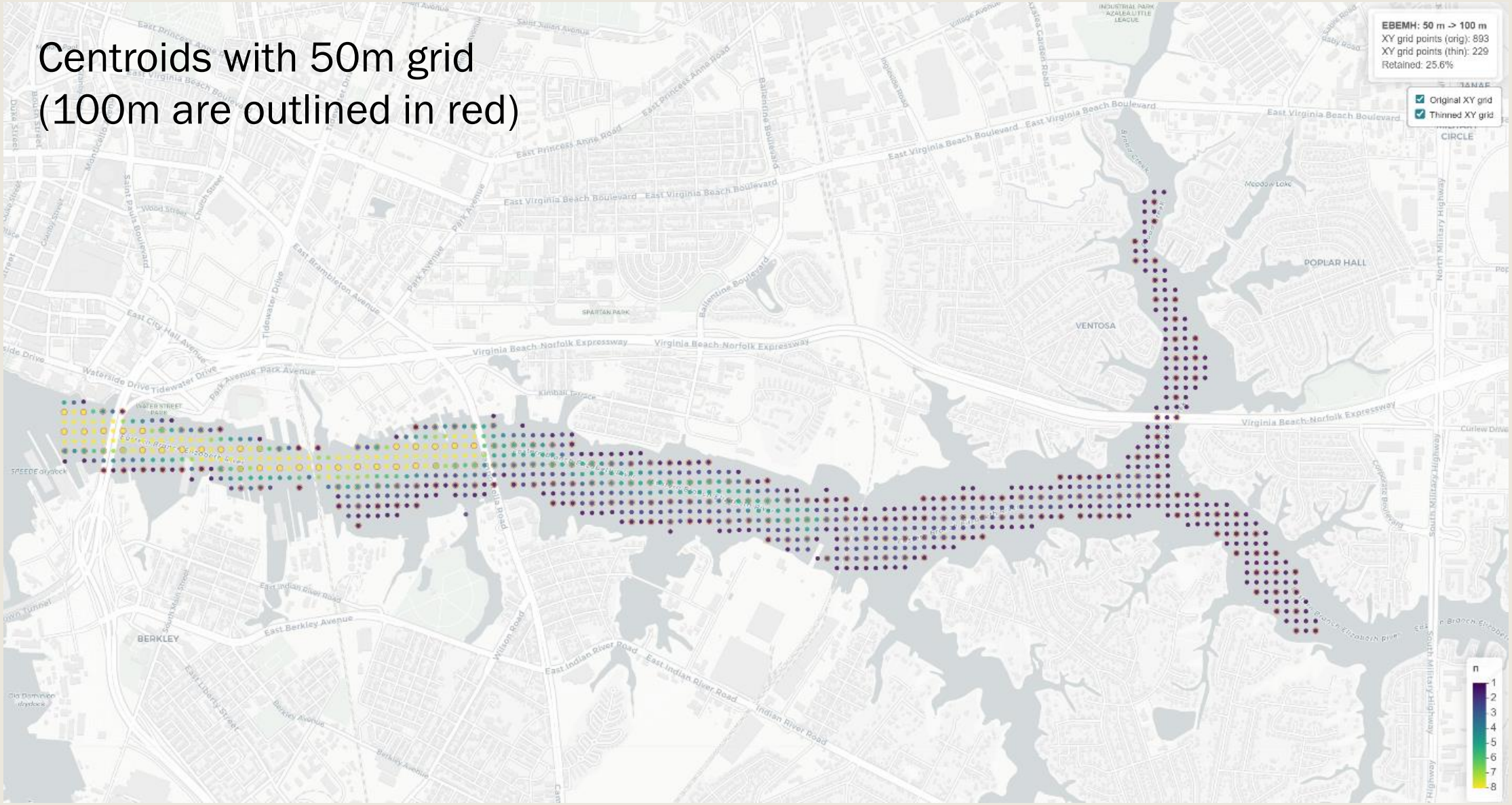
segment	state	description	count at 100m	count at 200m	discussed previously
C&DOH_DE	DE	C&D Canal, DE	790	177	
C&DOH_MD	MD	C&D Canal, MD	1,623	421	
HNGMH	MD	Honga River	18,568	4,654	yes
PAXOH	MD	Middle Patuxent River	2,718	669	
PISTF	MD	Piscataway Creek	285	71	
WICMH	MD	Wicomico River	5,642	1,450	
APPTF	VA	Appomattox River	151	36	
ELIPH	VA	Mouth to mid Elizabeth River	11,753	2,945	
LAFMH	VA	Lafayette River	339	85	
LYNPH	VA	Lynnhaven River	1,676	406	
MPNOH	VA	Lower Mattaponi River	3,341	844	
PMKOH	VA	Lower Pamunkey River	6,668	1,634	
RPPOH	VA	Middle Rappahannock River	5,355	1,328	
SBEMH	VA	Southern Branch Elizabeth River	2,773	682	
WBEMH	VA	Western Branch Elizabeth River	631	162	

Maps of grid difference

- All maps are available on this meeting's website (two sets of zip files):

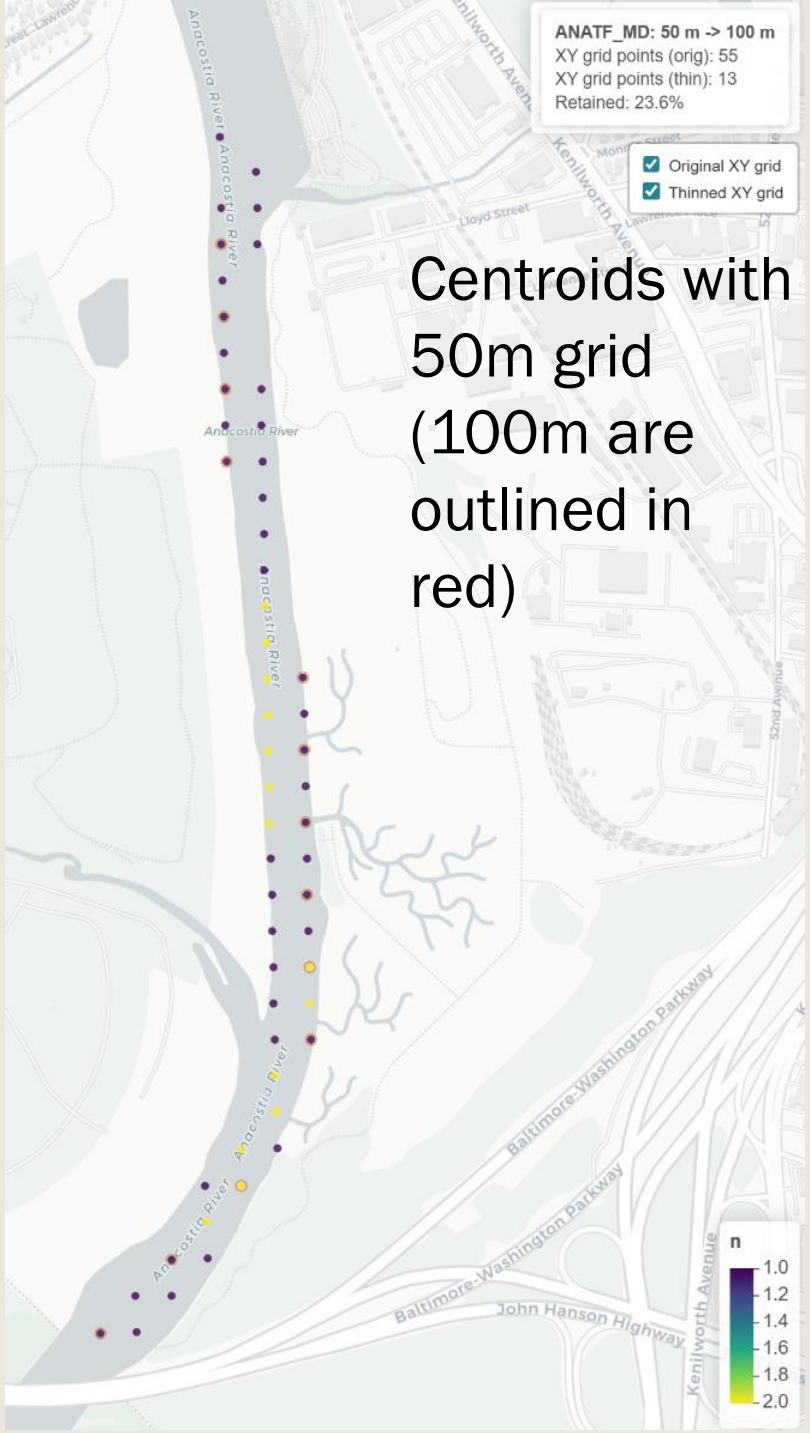
https://www.chesapeakebay.net/what/event/bay-oxygen-research-group-monthly-meeting-april-2026

Virgina’s Eastern Branch Elizabeth River (EBEMH)

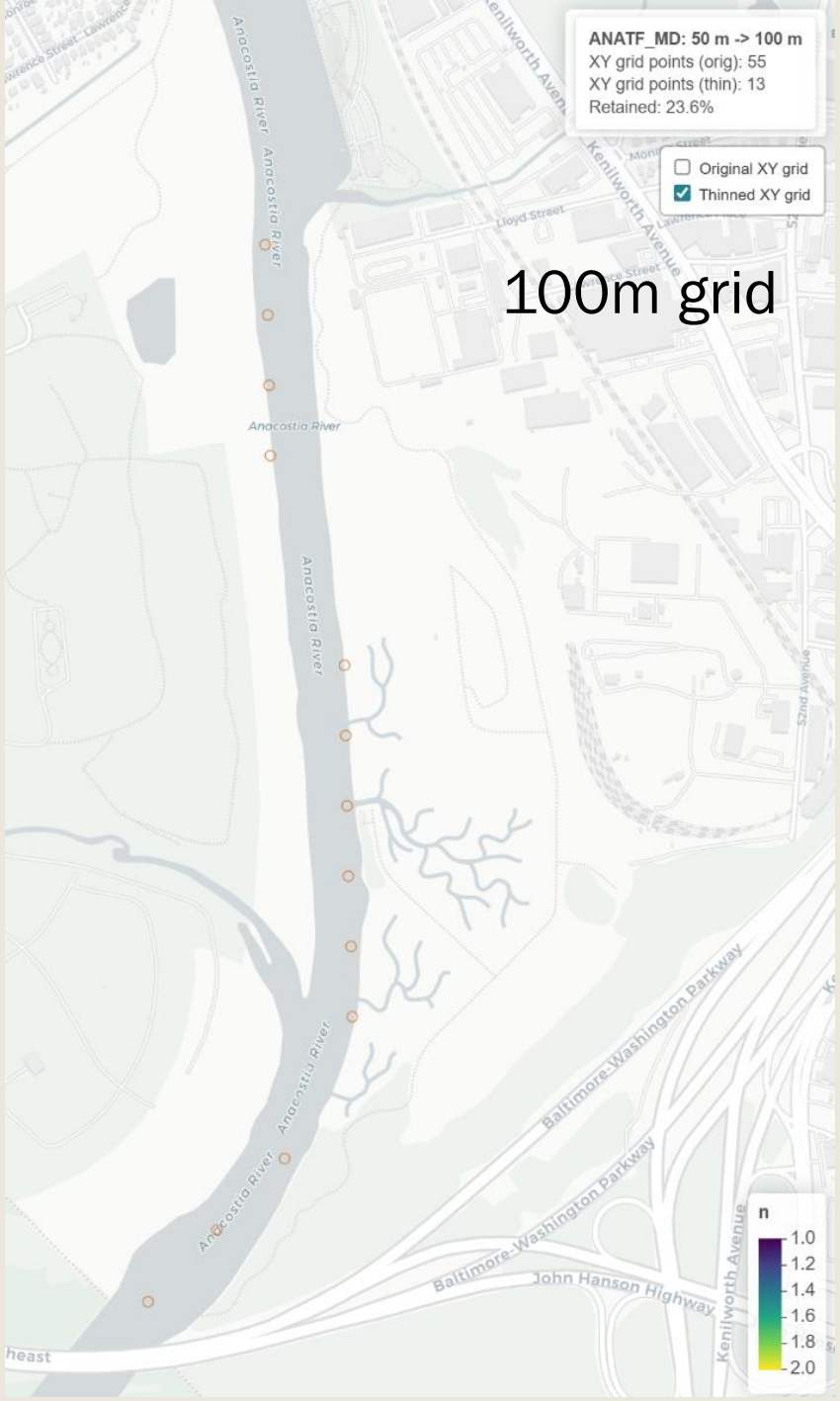


Virgina’s Eastern Branch Elizabeth River (EBEMH)

Maryland's Anacostia Tidal Fresh segment (ANATF_MD)



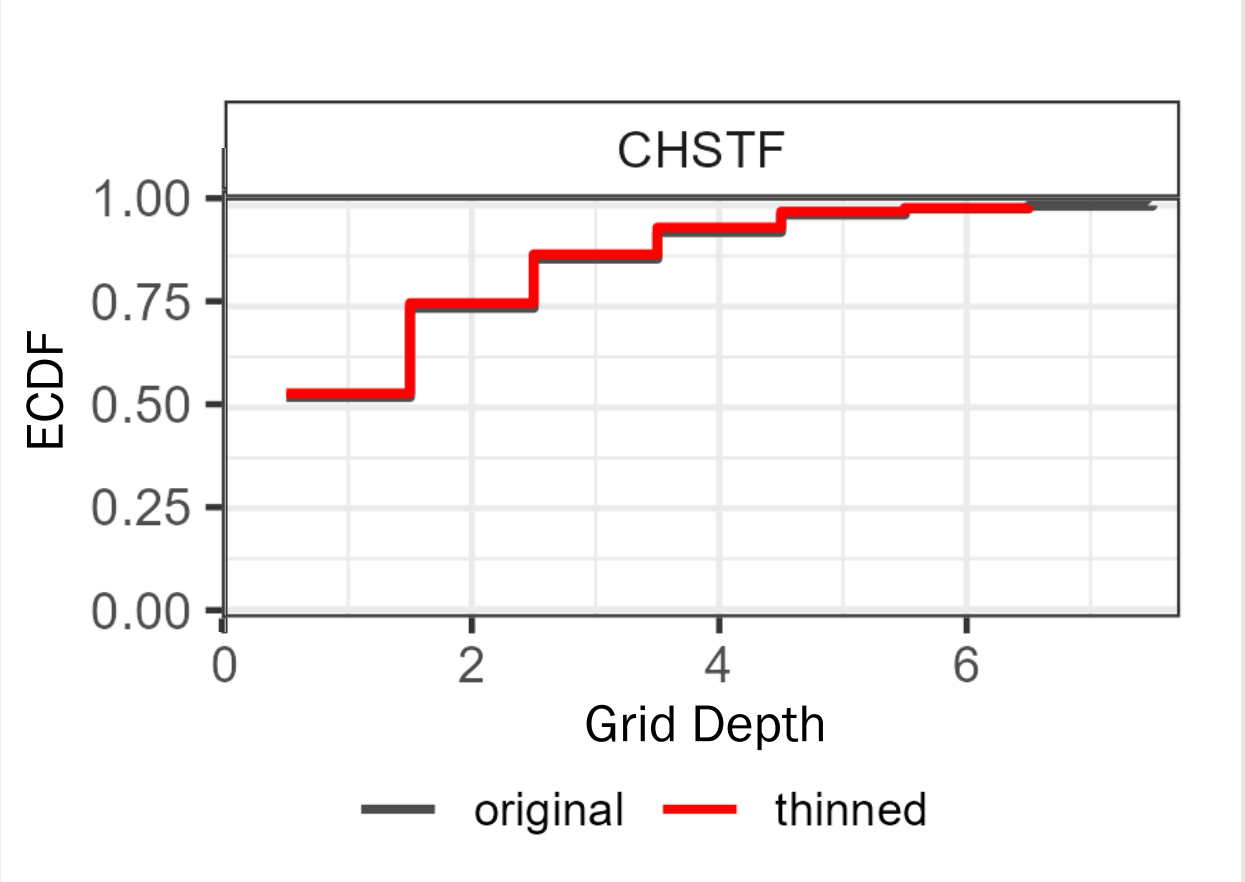
Centroids with 50m grid (100m are outlined in red)

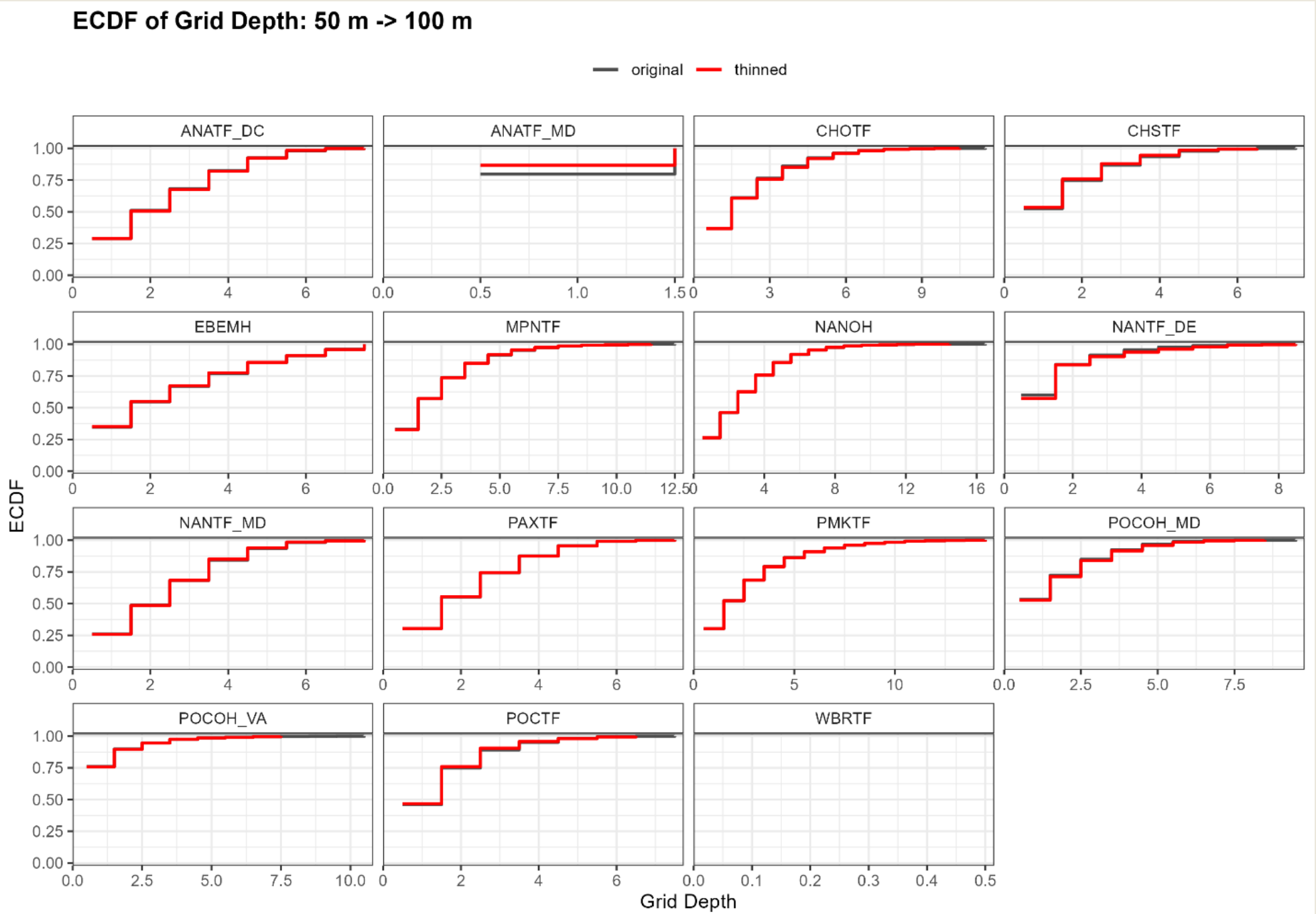


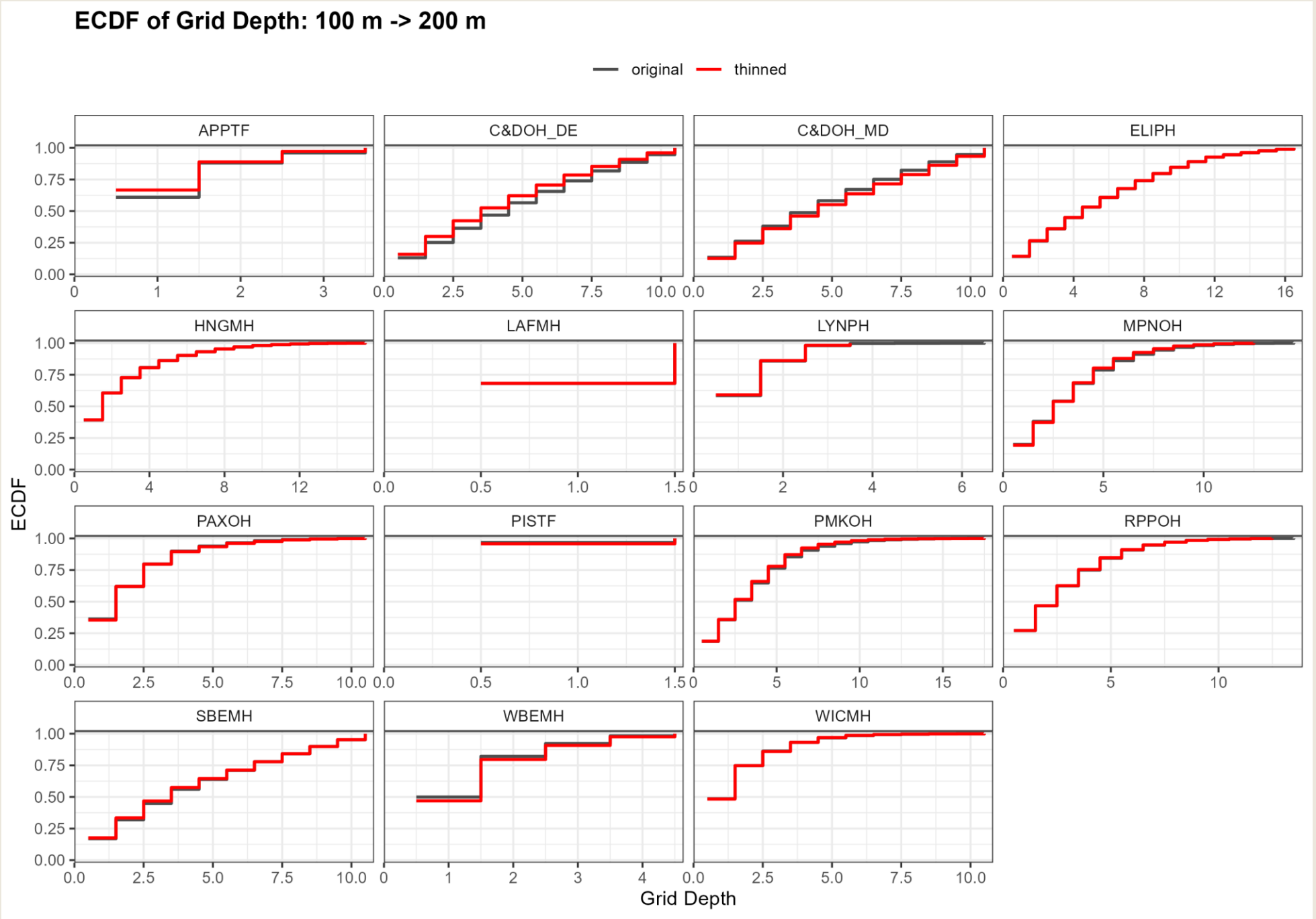
100m grid

Results: Depth distribution changes

- Examined distribution of grid cell depths for each segment with original vs. thinned grid cells.
- Question: Does thinning the segment grids result in a change in the vertical representation of the segment?
- Generated empirical cumulative density function graph (ECDFs) for each segment with black lines for the original grids and red lines for the thinned grids.

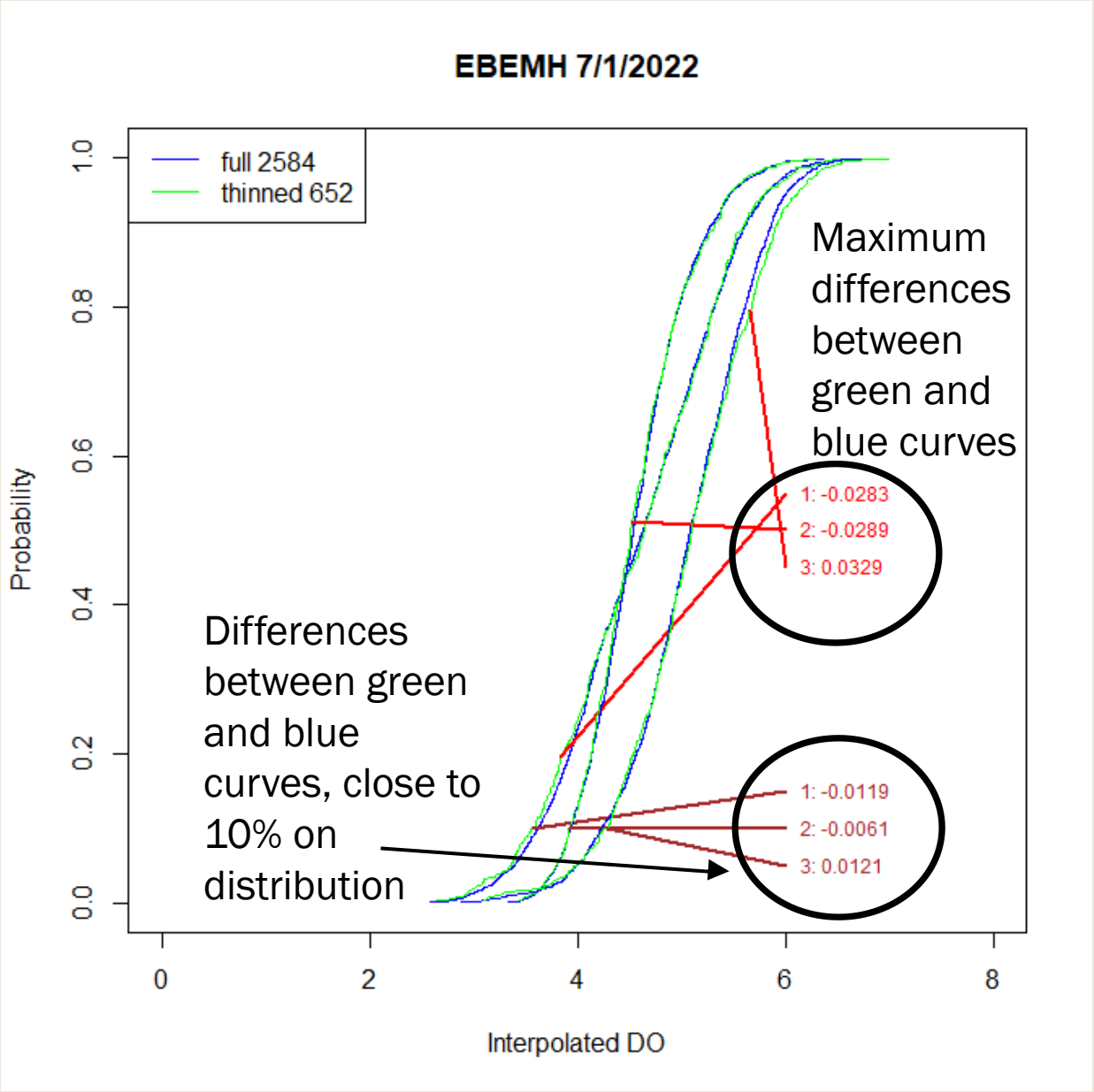



ECDF of Grid Depth: 50 m -> 100 m
original
thinned
ANATF_DC
ANATF_MD
CHOTF
CHSTF
EBEMH
MPNTF
NANOH
NANTF_DE
NANTF_MD
PAXTF
PMKTF
POCOH_MD
POCOH_VA
POCTF
WBRTF
ECDF
Grid Depth


ECDF of Grid Depth: 100 m -> 200 m
original
thinned
APPTF
C&DOH_DE
C&DOH_MD
ELIPH
HNGMH
LAFMH
LYNPH
MPNOH
PAXOH
PISTF
PMKOH
RPPOH
SBEMH
WBEMH
WICMH
ECDF
Grid Depth

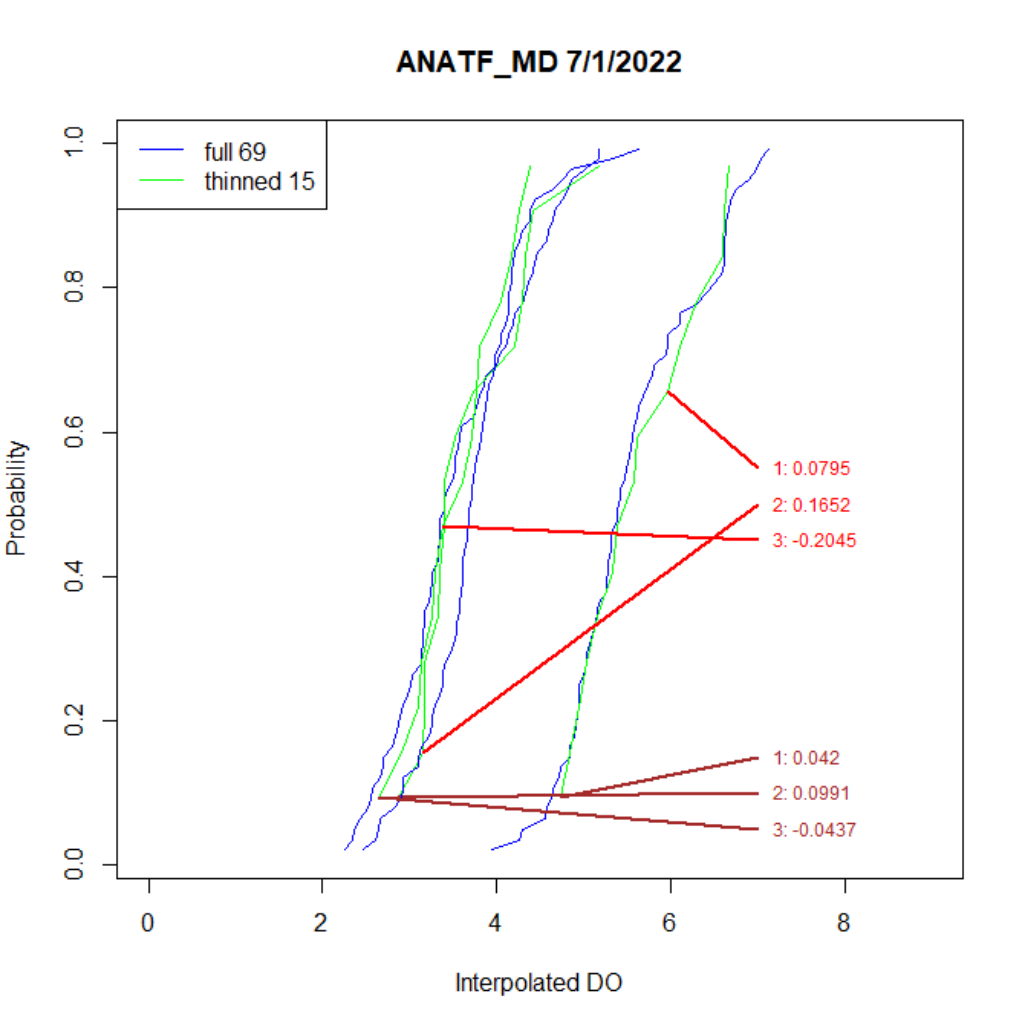
Impact: DO analysis

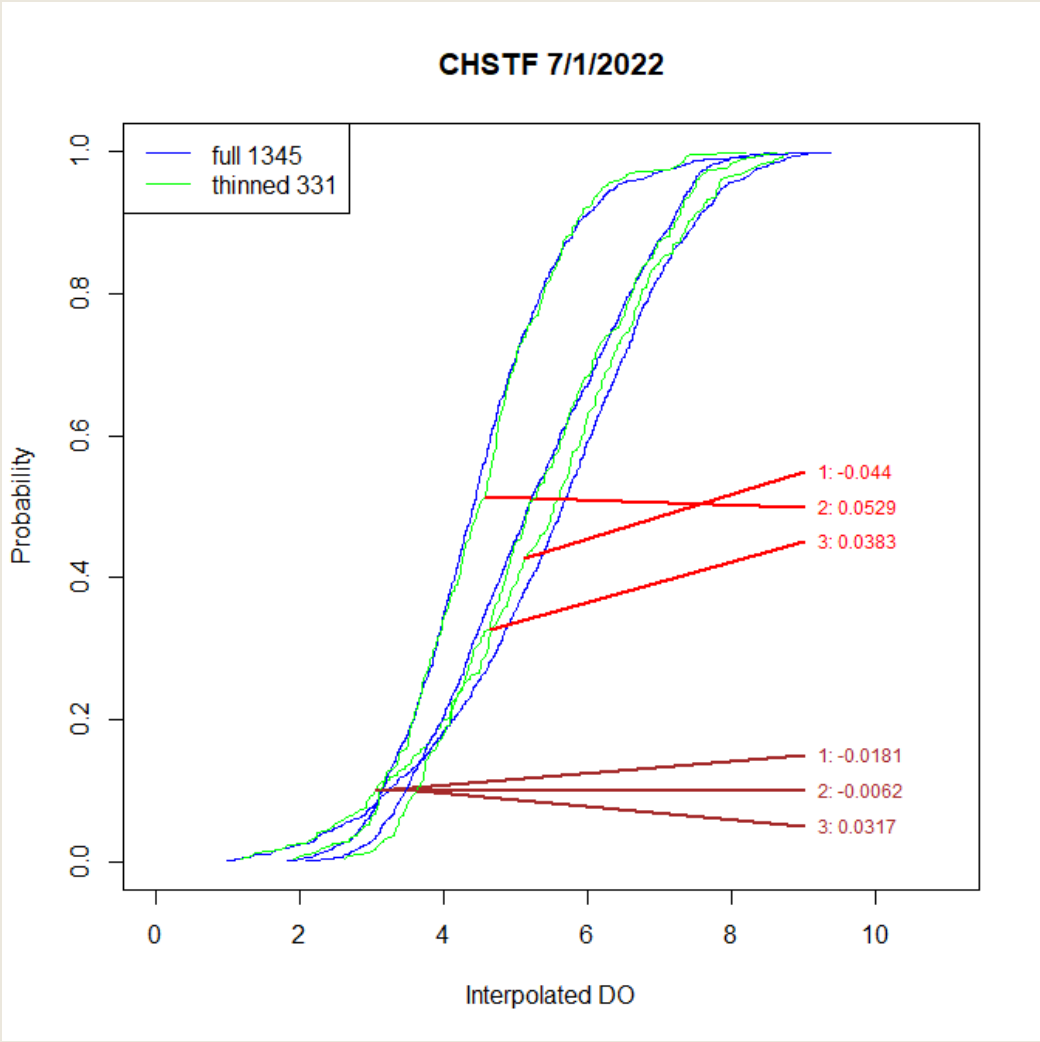
- Interpolation results were compared between the original grid and thinned grid.
- We superimposed empirical distribution functions (EDFs) of 4-D interpolator simulation results for the two grid resolutions.
- 12 months of comparisons were done for all of the segments (email me for all files).
- Three simulations.
- Many results, so we pulled out a few values for each.



*EDF is from DRAFT 4-D simulation results and exact values and range of simulations could change.

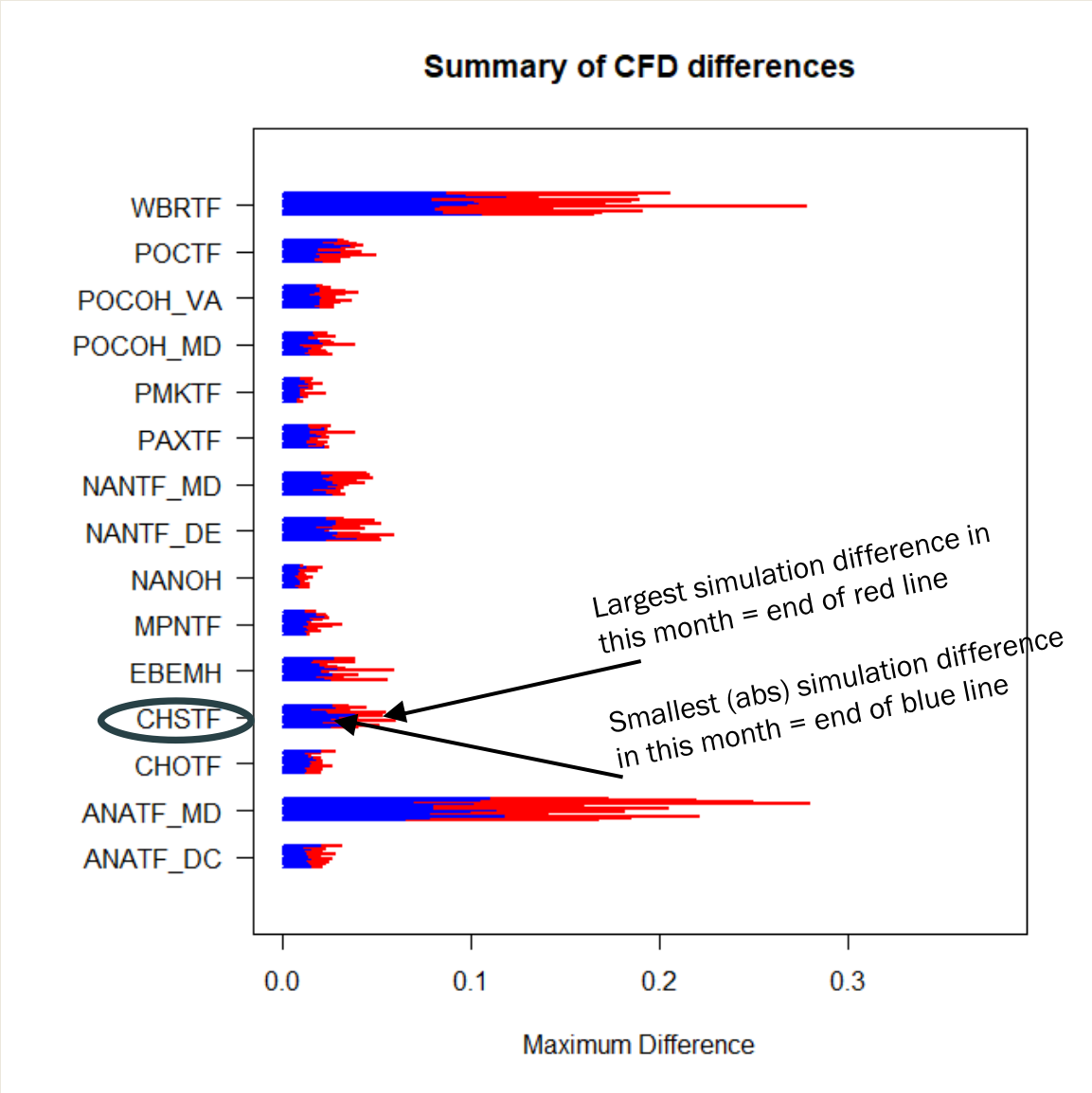
Impact: DO analysis 50m-to 100m

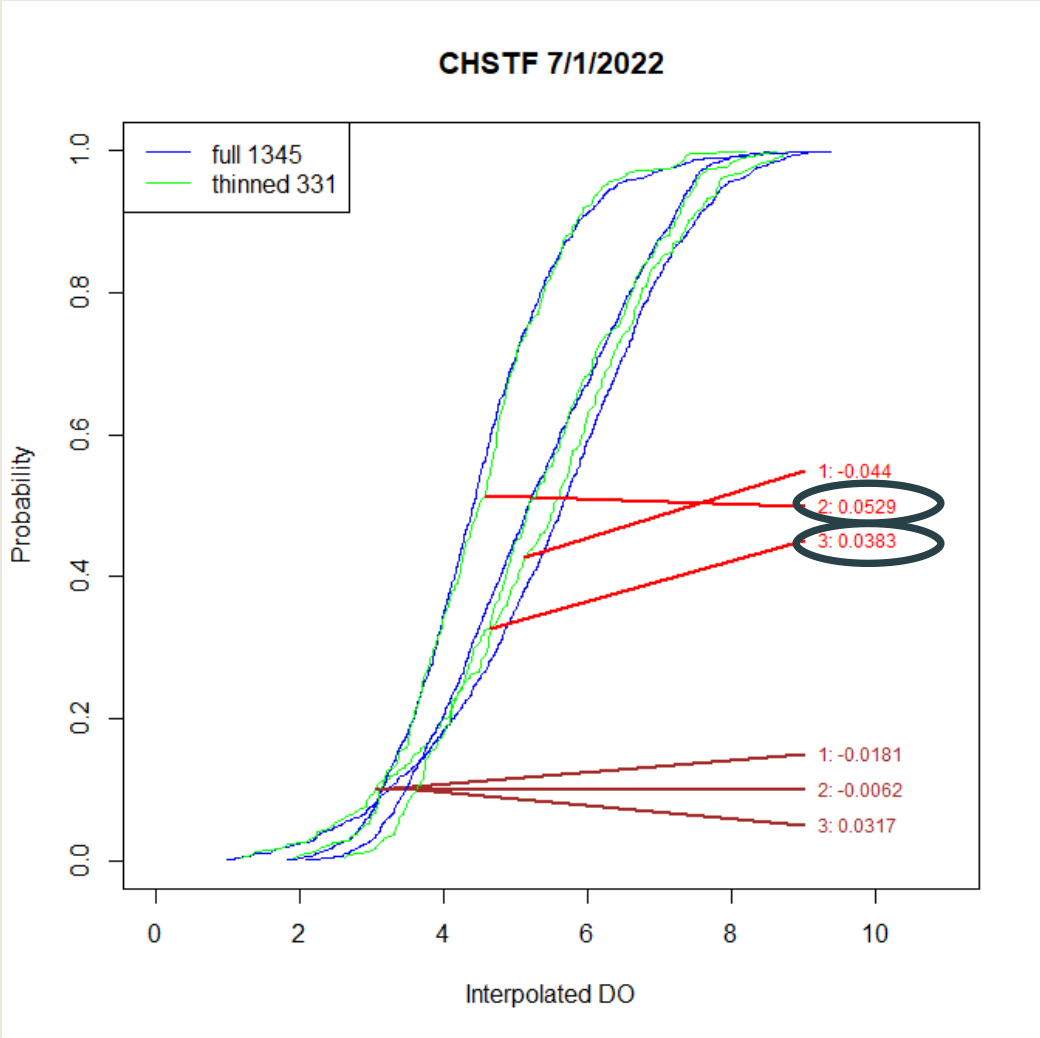




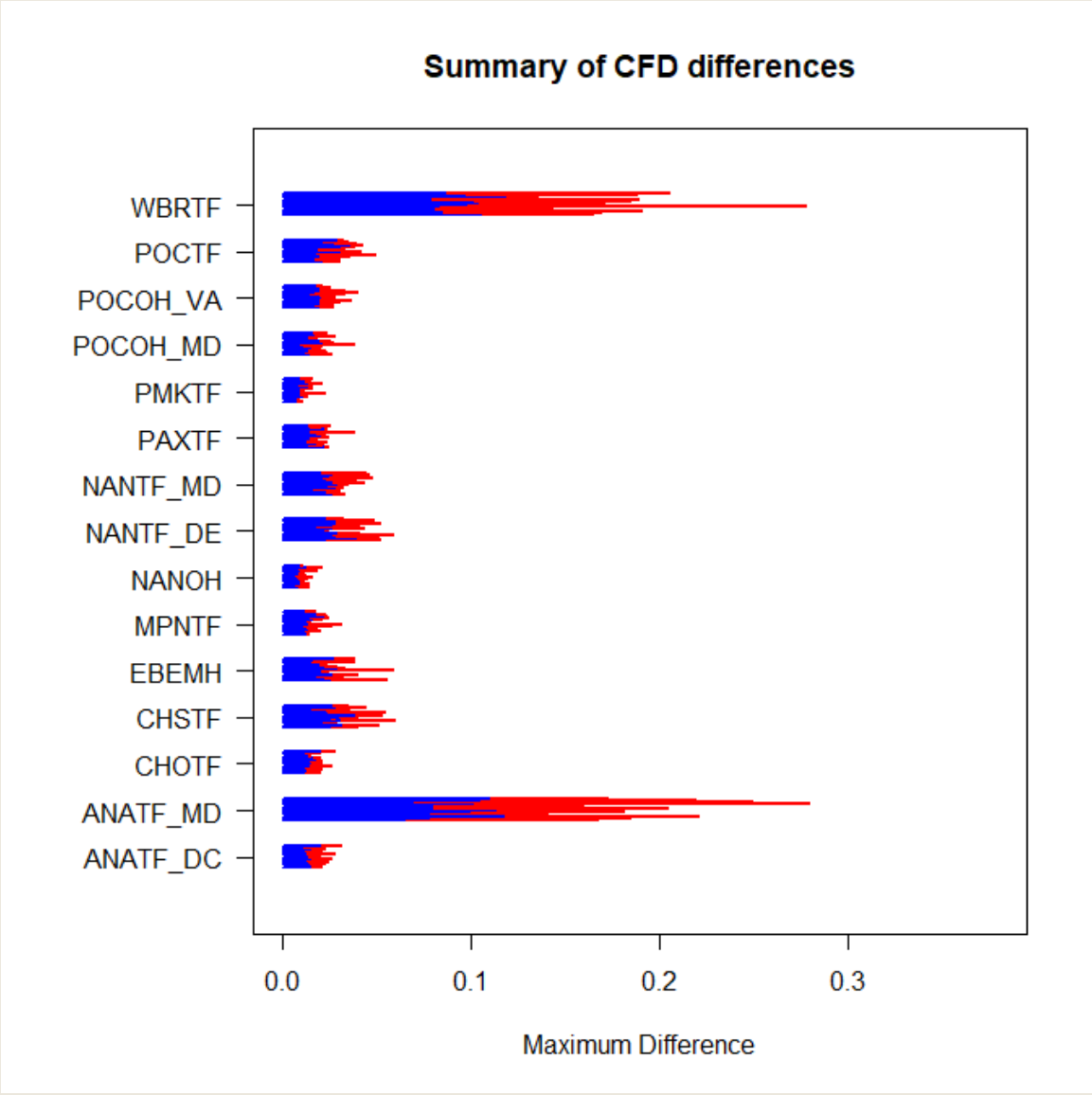
*EDFs are from DRAFT 4-D simulation results and exact values and range of simulations will likely change.

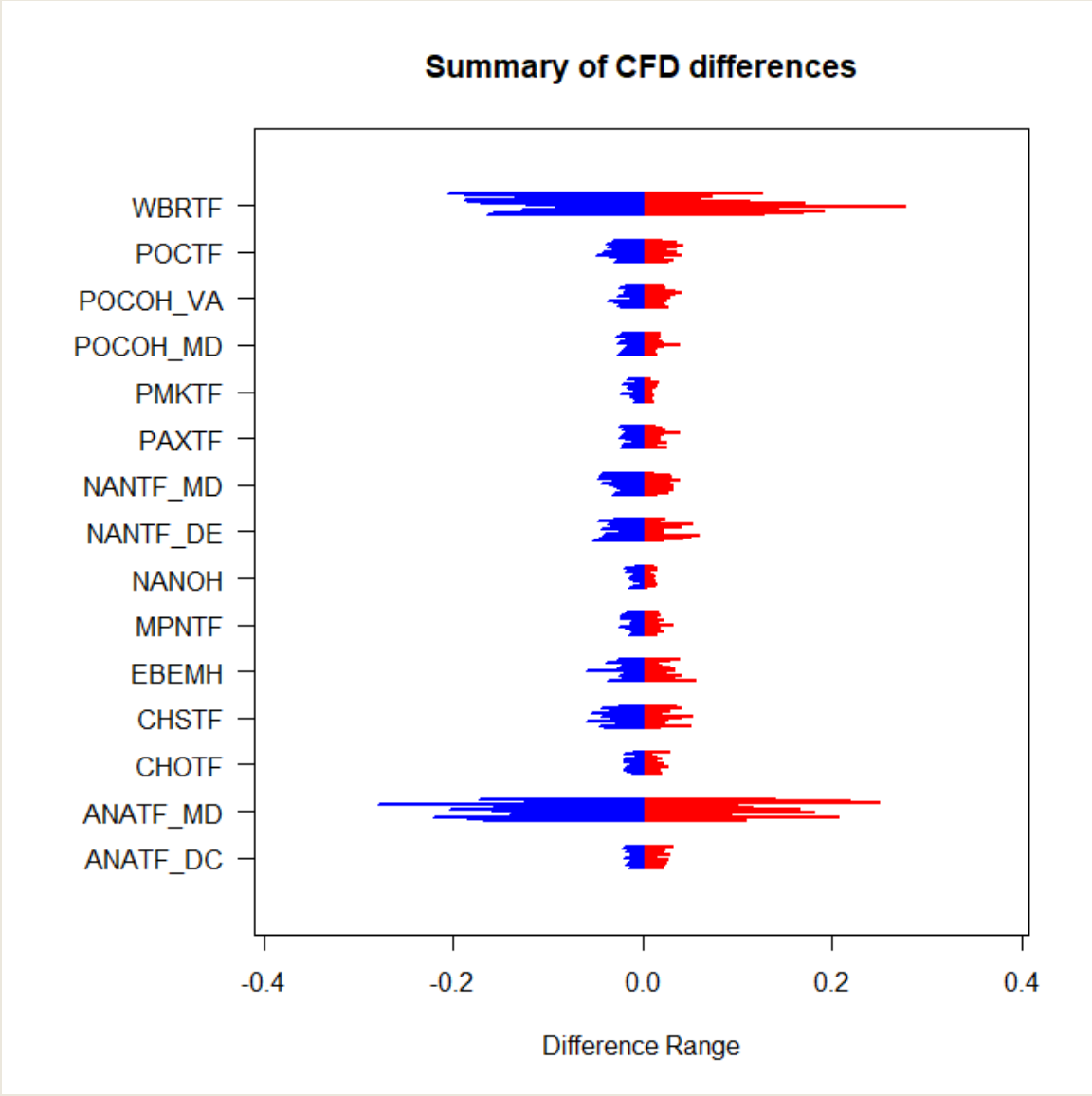
Impact: DO analysis 50m-to 100m



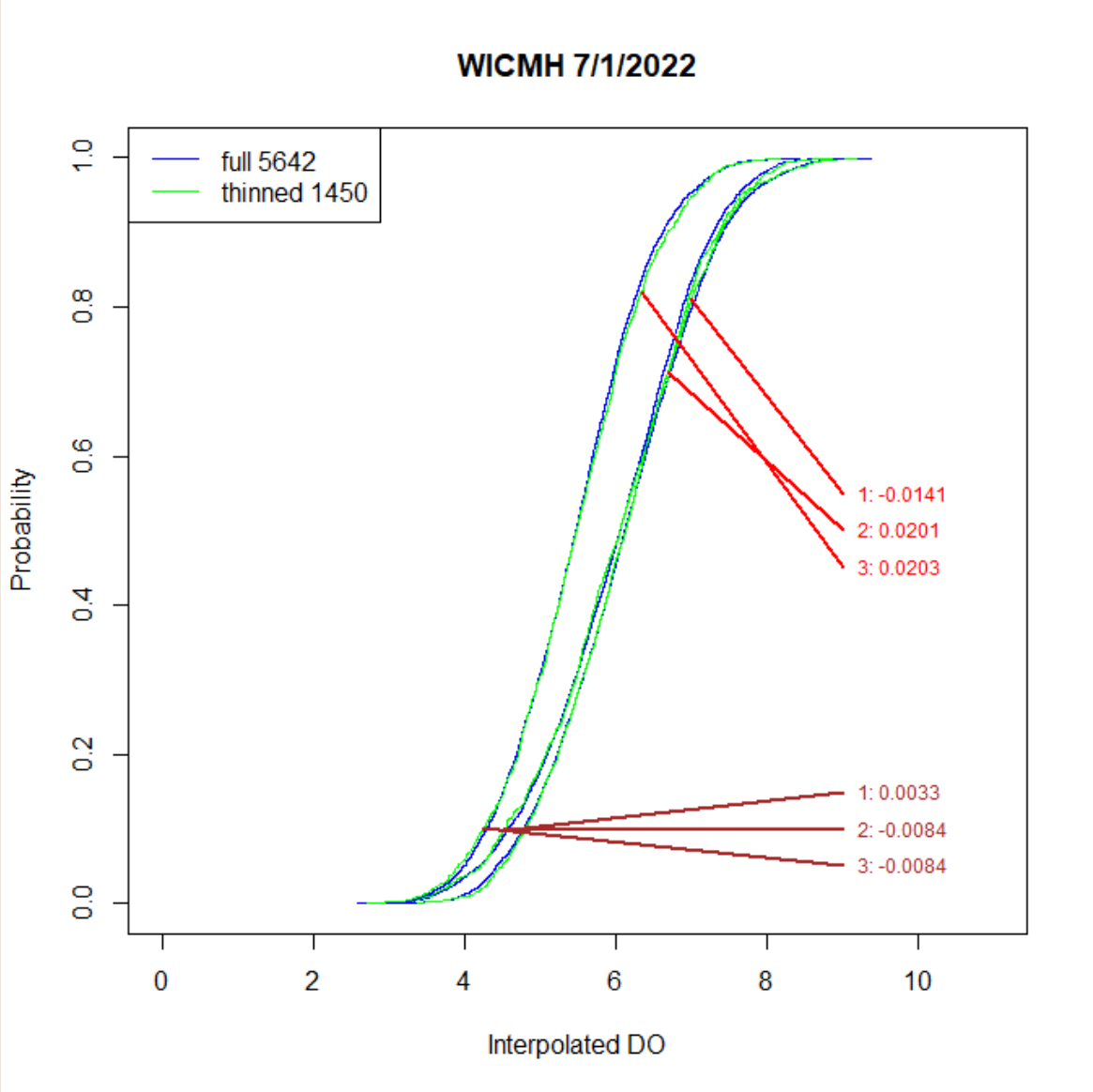


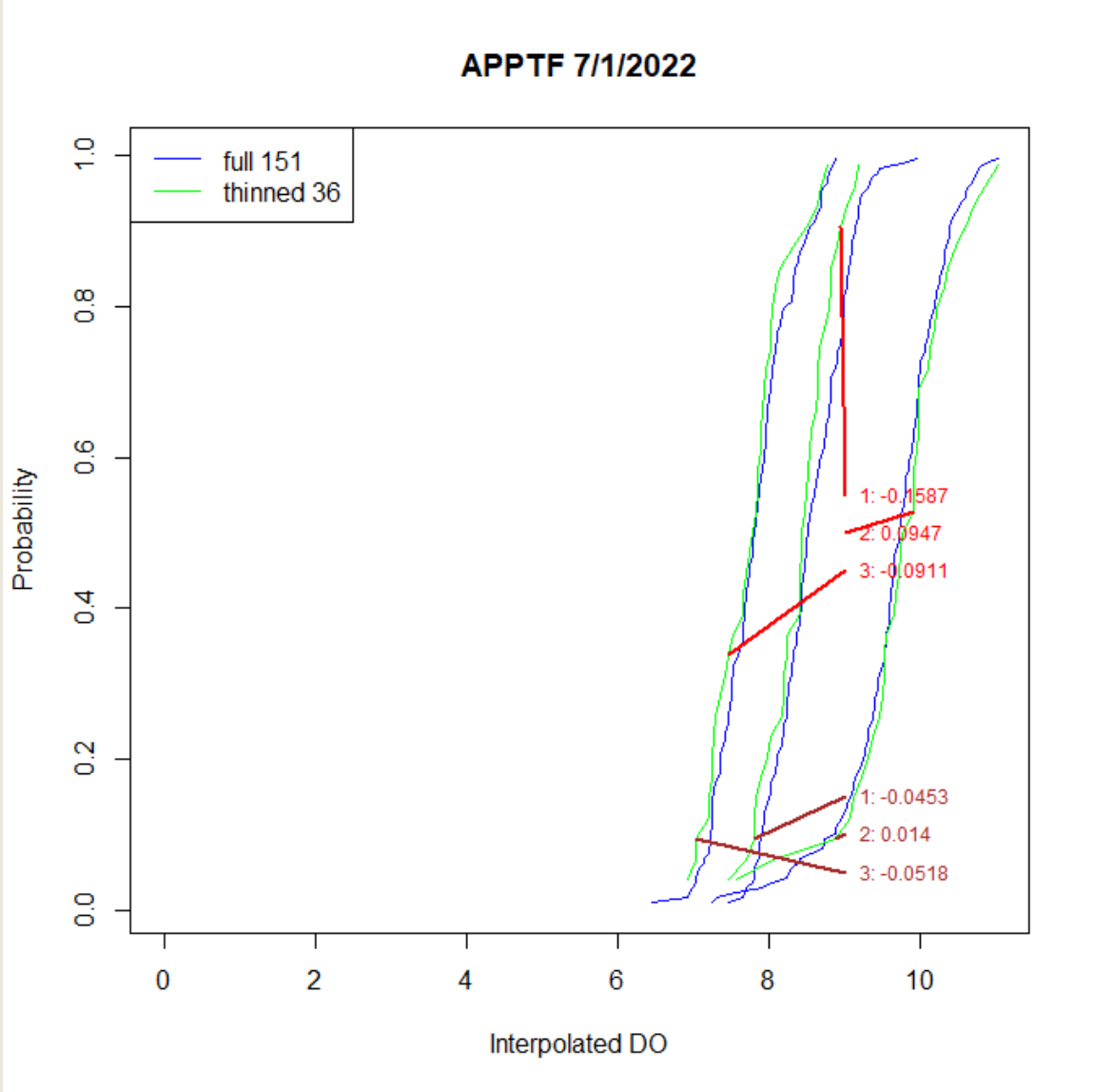
Impact: DO analysis 50m-to 100m





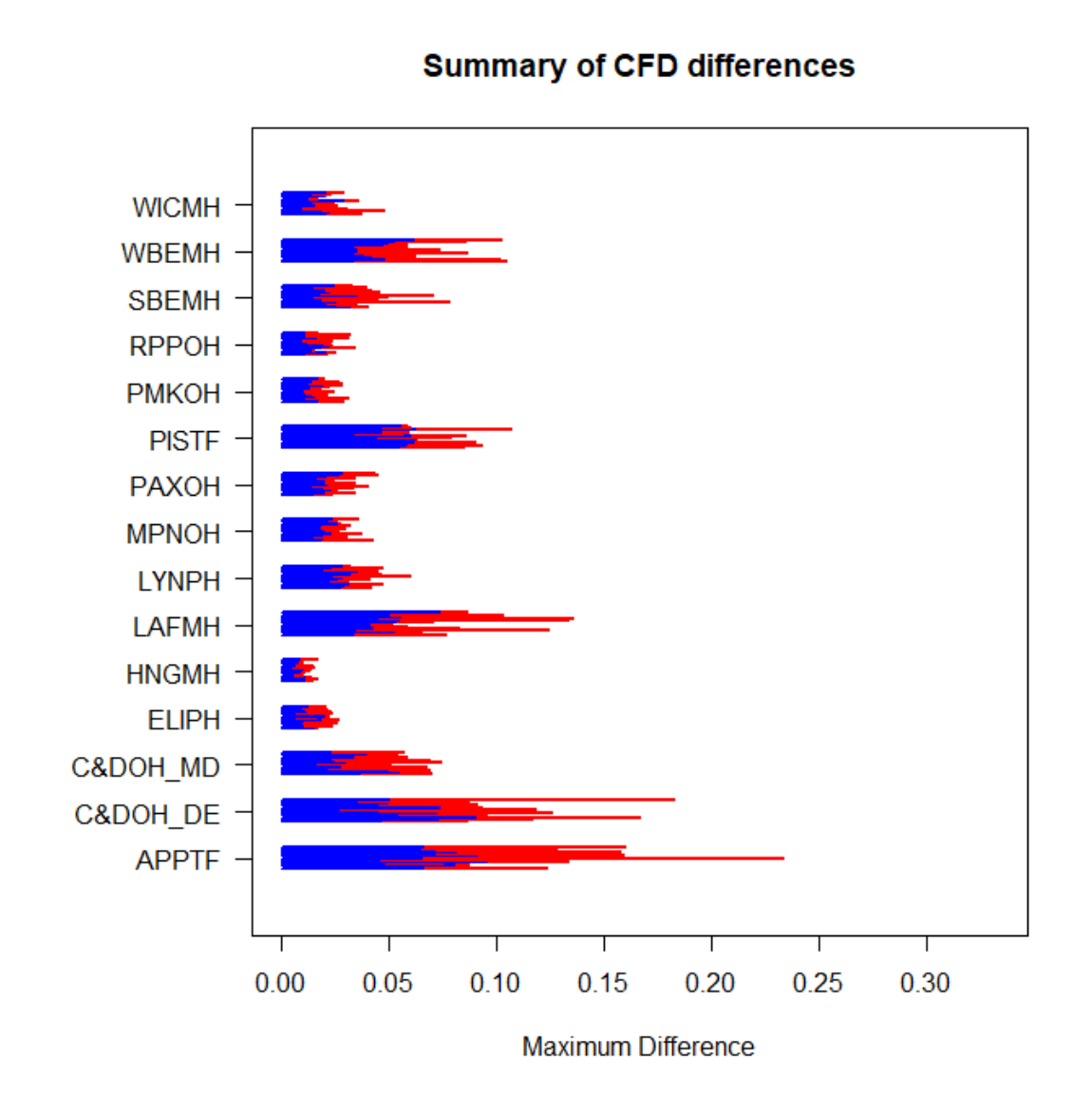
Impact: DO analysis 100m-to 200m

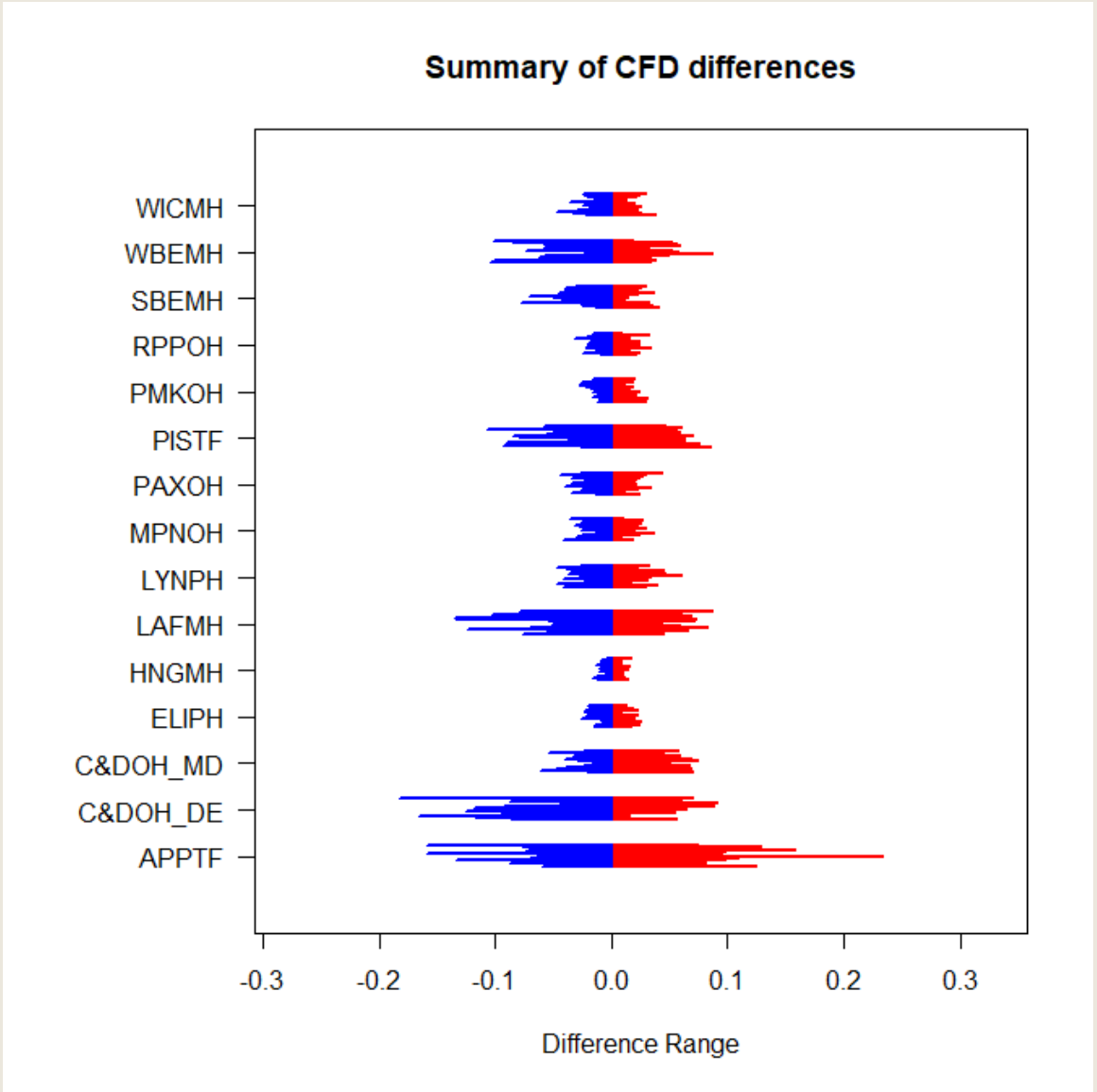




*EDFs are from DRAFT 4-D simulation results and exact values and range of simulations will likely change.

Impact: DO analysis 100m-to 200m



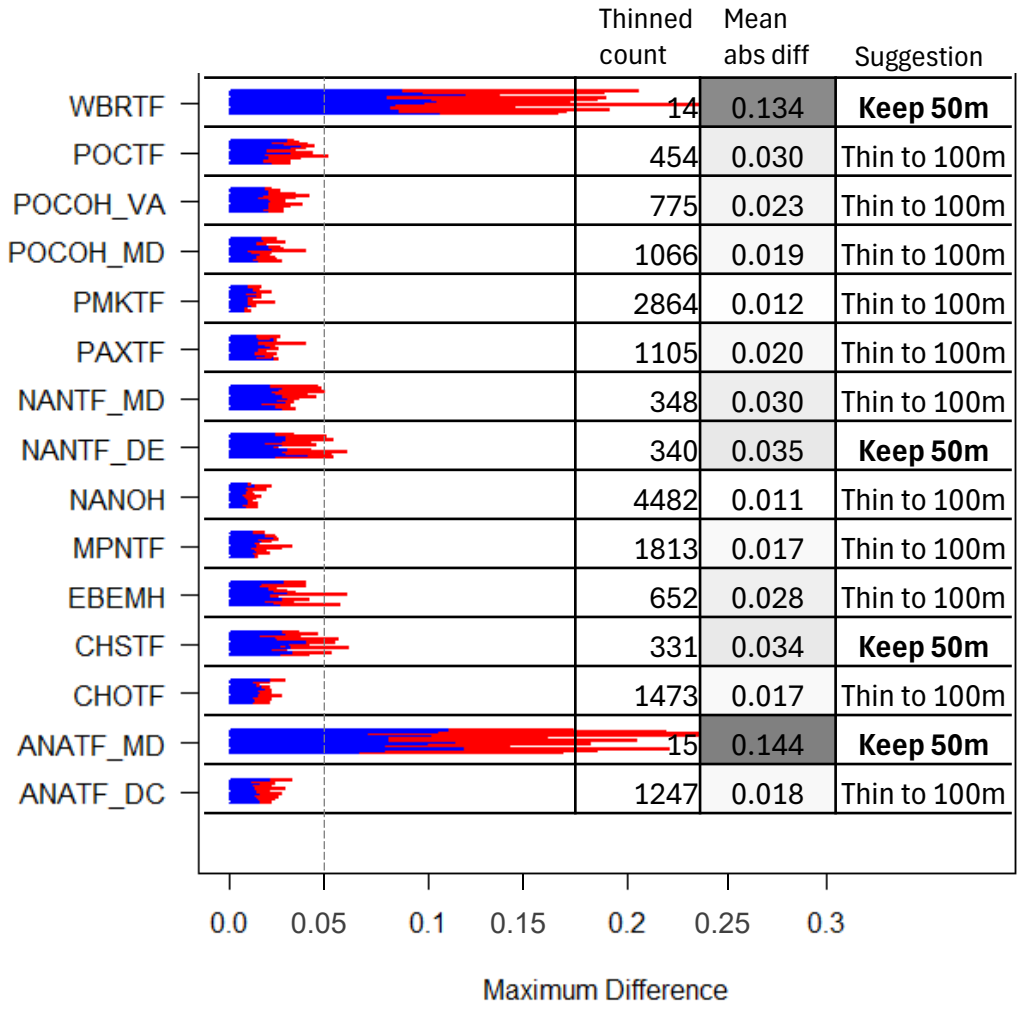


Considerations

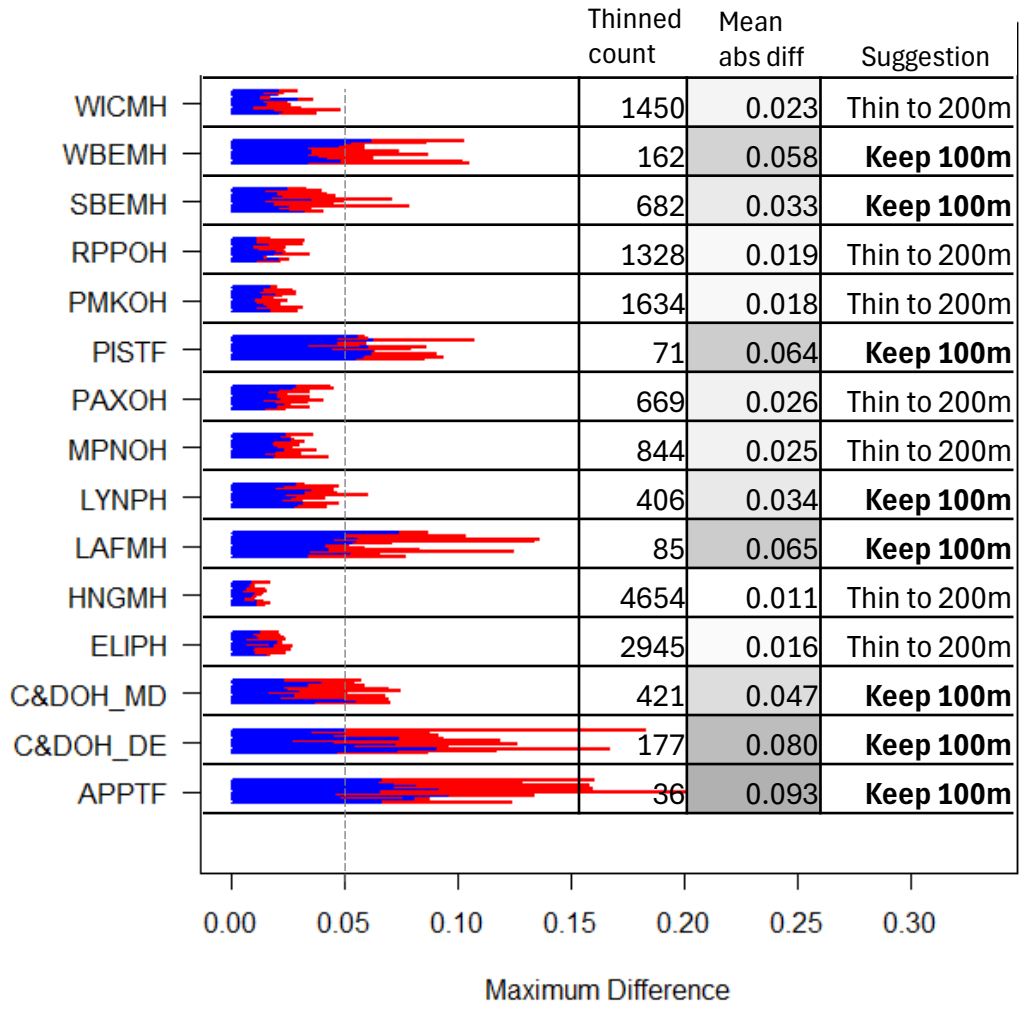
- Depth distributions do not change too much with these thinning options.
- We took a close look at every map of grid cell centroids, original and thinned. Some do get sparse due to segment size and/or narrow tributaries.
- Comparing DO interpolation results suggest no major changes in conclusions are likely with any of the thinning, but we can identify which ones have largest difference.

- Summary of results and some first-cut suggestions →

50m-to-100m Comparison Summary



100m-to-200m Comparison Summary



Summary

- The changes would be only to the horizontal grid resolution in these segments. There are no adjustments proposed to boundaries of segments.
- We'll have this on the agenda again on May 18.
- Please feel free to comment or reach out of us. Plus look on the meeting website, or email Rebecca for full sets of files:

segment	state	Discussed previously
Originally 50m, keep at 50m		
NANTF_DE	DE	
ANATF_MD	MD	
CHSTF	MD	
WBRTF	MD	
Originally 50m, thin to 100m		
ANATF_DC	DC	
CHOTF	MD	yes
NANOH	MD	yes
NANTF_MD	MD	
PAXTF	MD	
POCOH_MD	MD	
POCTF	MD	
EBEMH	VA	
MPNTF	VA	yes
PMKTF	VA	yes
POCOH_VA	VA	

segment	state	Discussed previously
Originally 100m, keep at 100m		
C&DOH_DE	DE	
C&DOH_MD	MD	
PISTF	MD	
APPTF	VA	
LAFMH	VA	
LYNPH	VA	
SBEMH	VA	
WBEMH	VA	
Originally at 100m, thin to 200m		
HNGMH	MD	yes
PAXOH	MD	
WICMH	MD	
ELIPH	VA	
MPNOH	VA	
PMKOH	VA	
RPPOH	VA	

https://www.chesapeakebay.net/what/event/bay-oxygen-research-group-monthly-meeting-april-2026

rmurphy@chesapeakebay.net