Evaluations of Criteria Protectiveness Assumptions

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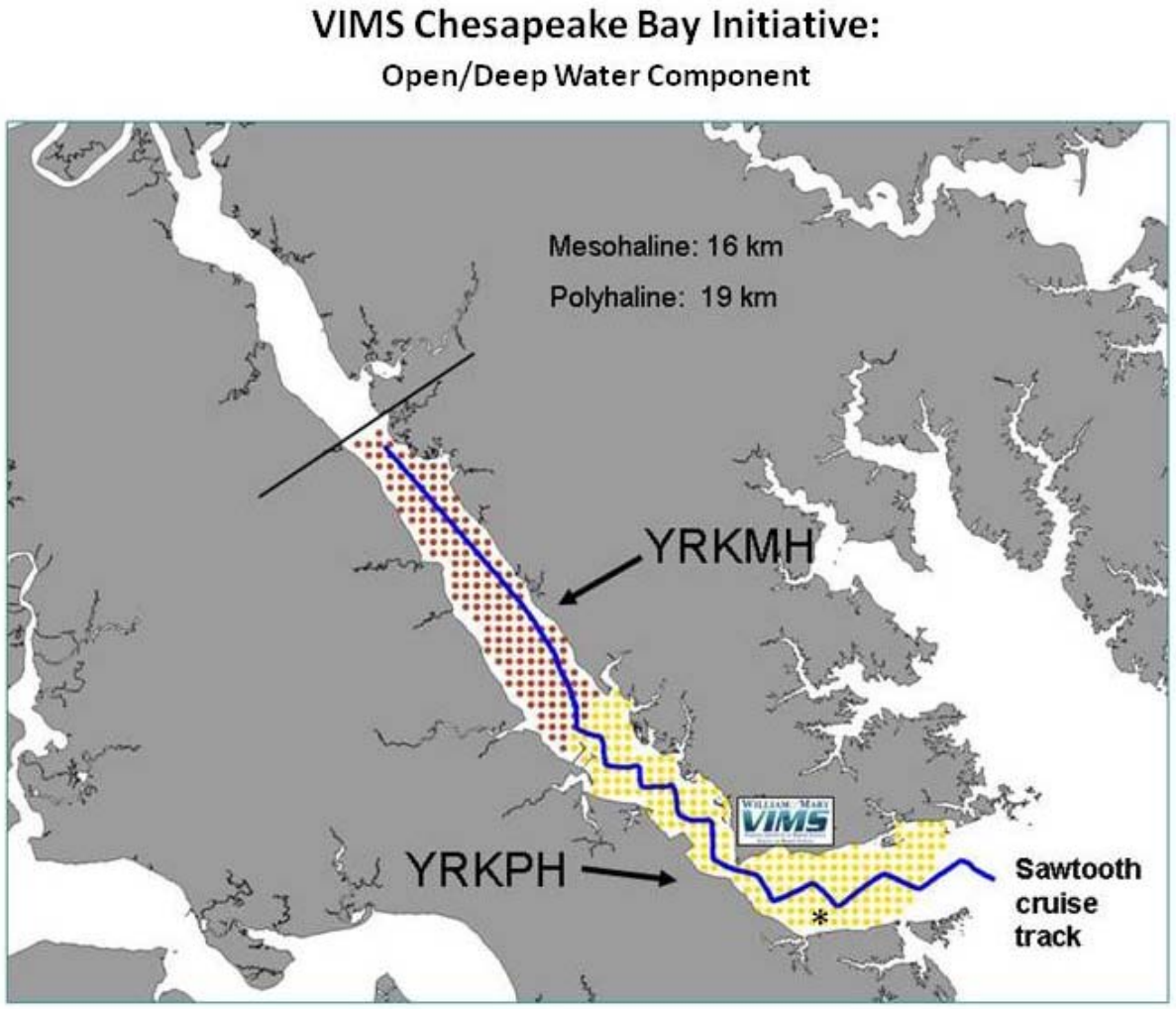
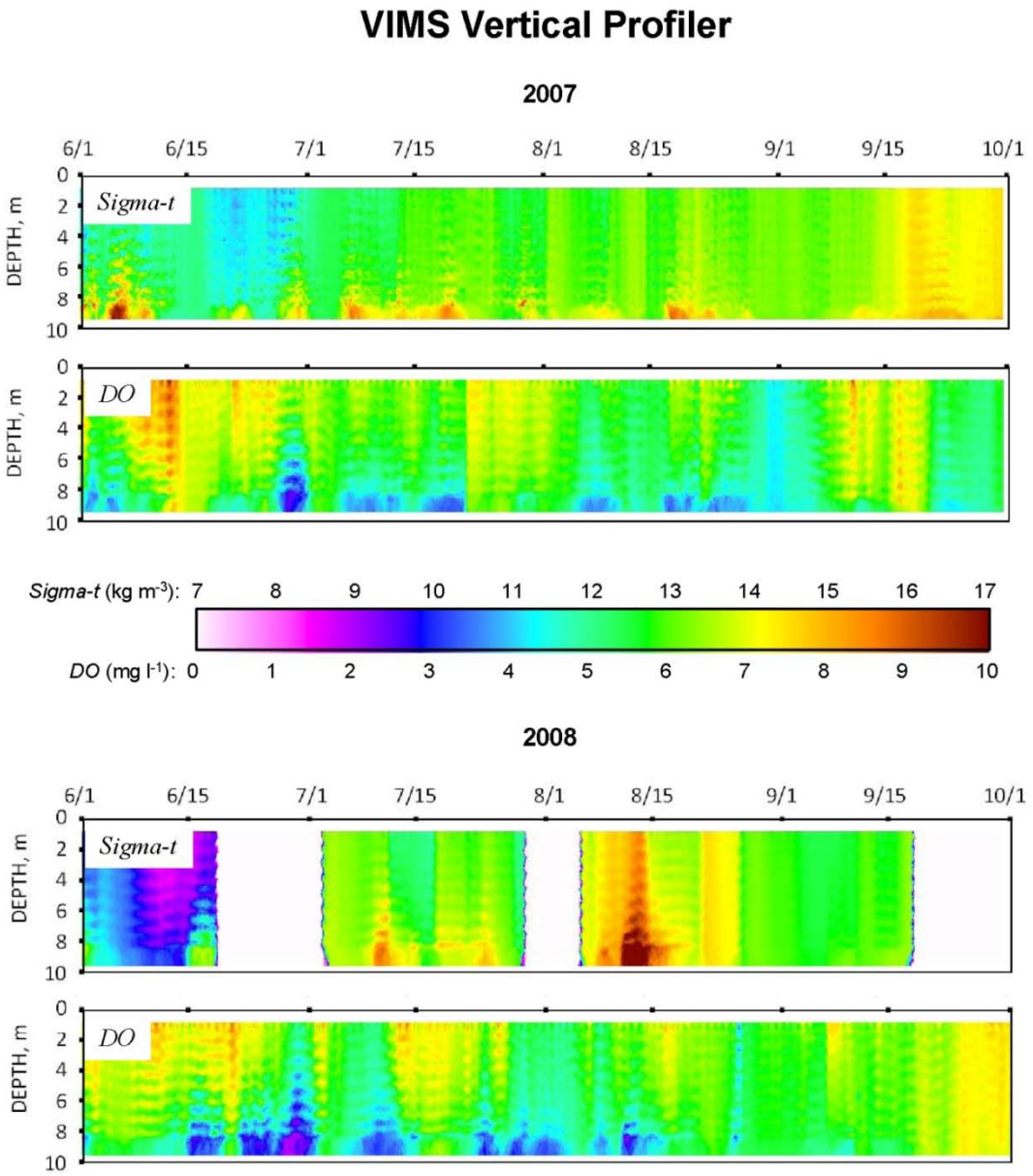
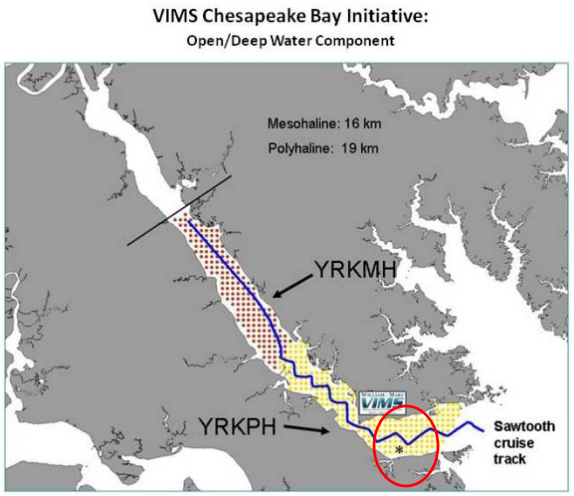
Comments on *Addressing Optimization Needs of the STAC Review: Optimization of the Chesapeake Bay Water Quality Monitoring Program toward meeting Management*

***Effectiveness needs in the Watershed* 9/17/2009.**

Fig. 1. Typical cruise track of the VIMS ACROBAT sampling in 2007-08 (blue line). Location of the VIMS vertical profiler is shown with the asterisk (*).

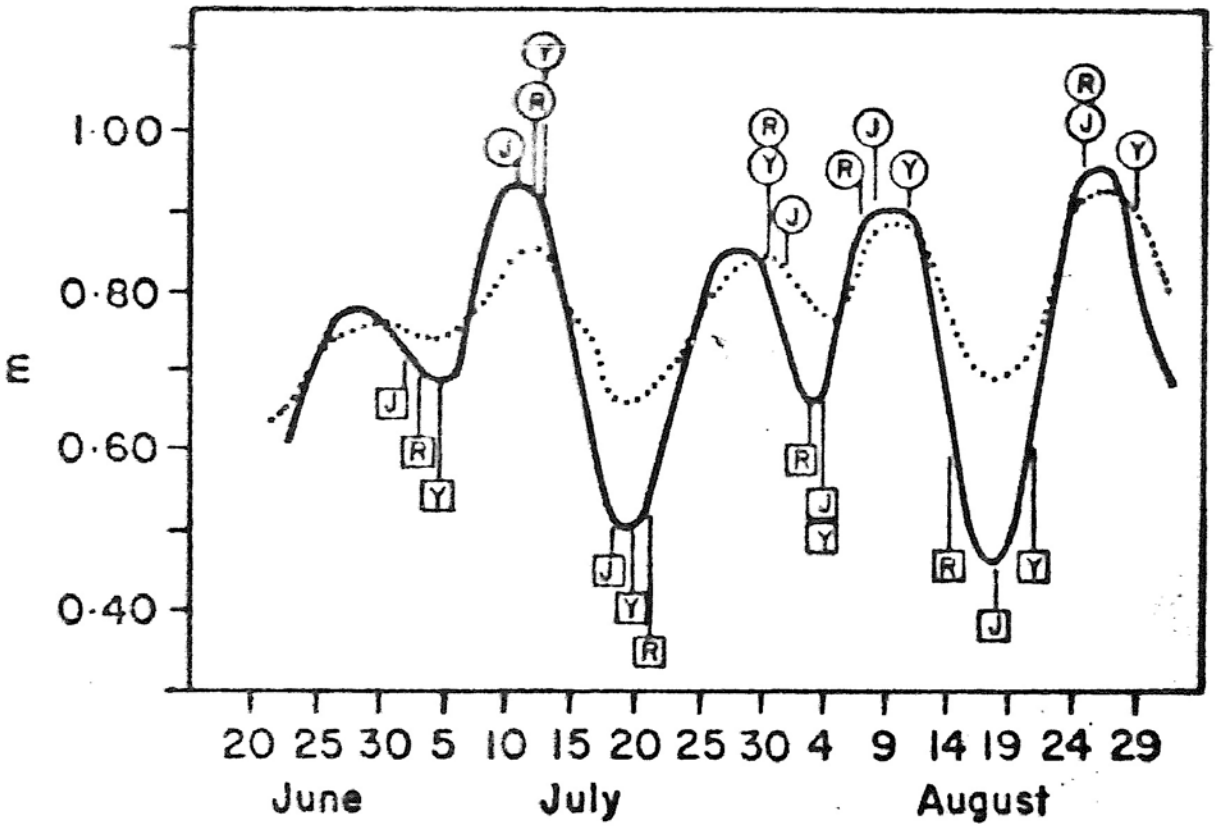






Time series illustrating the fluidity of the stratification in the lower York River

Fig 9. Figure 7 reproduced from Haas (1977, Est Coast Mar Sci 5:485-496). Predicted tidal range (solid line) and high tide height (broken line) at Hampton Roads, 1972. Circles and squares indicate the times of maximum observed homogeneity and stratification, respectively, in the James (J), York (Y), and Rappahannock (R) Rivers.



2-D cross-sections of DO in the York River from ACROBAT surveys over a two week neap-spring-neap tidal cycle in June 2007.

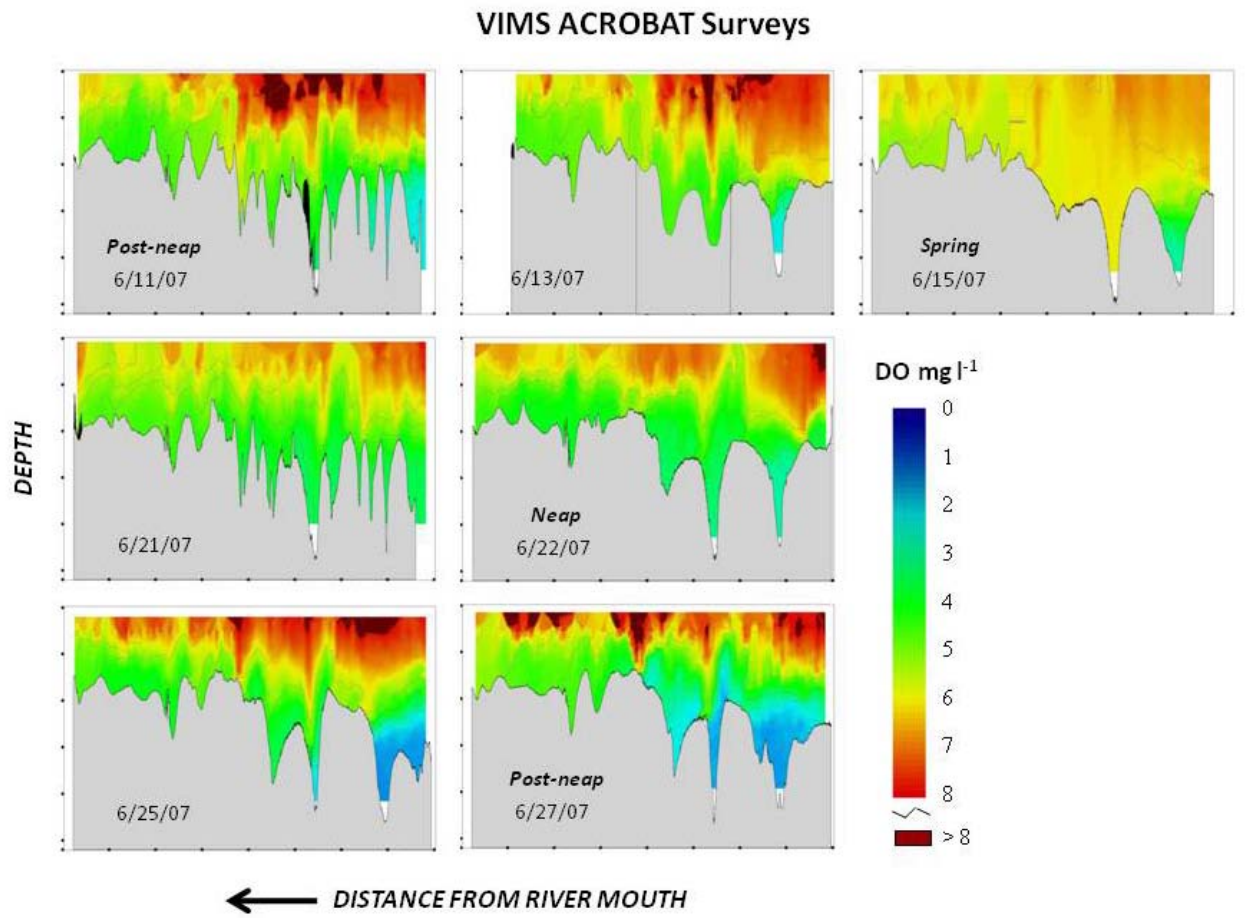


Fig. 3. Daily mean and minimum bottom DO readings from the VIMS vertical profiler in 2007 (top) and 2008 (bottom) and the corresponding daily tide range at the Yorktown Coast Guard Training Center (data from NOAA).

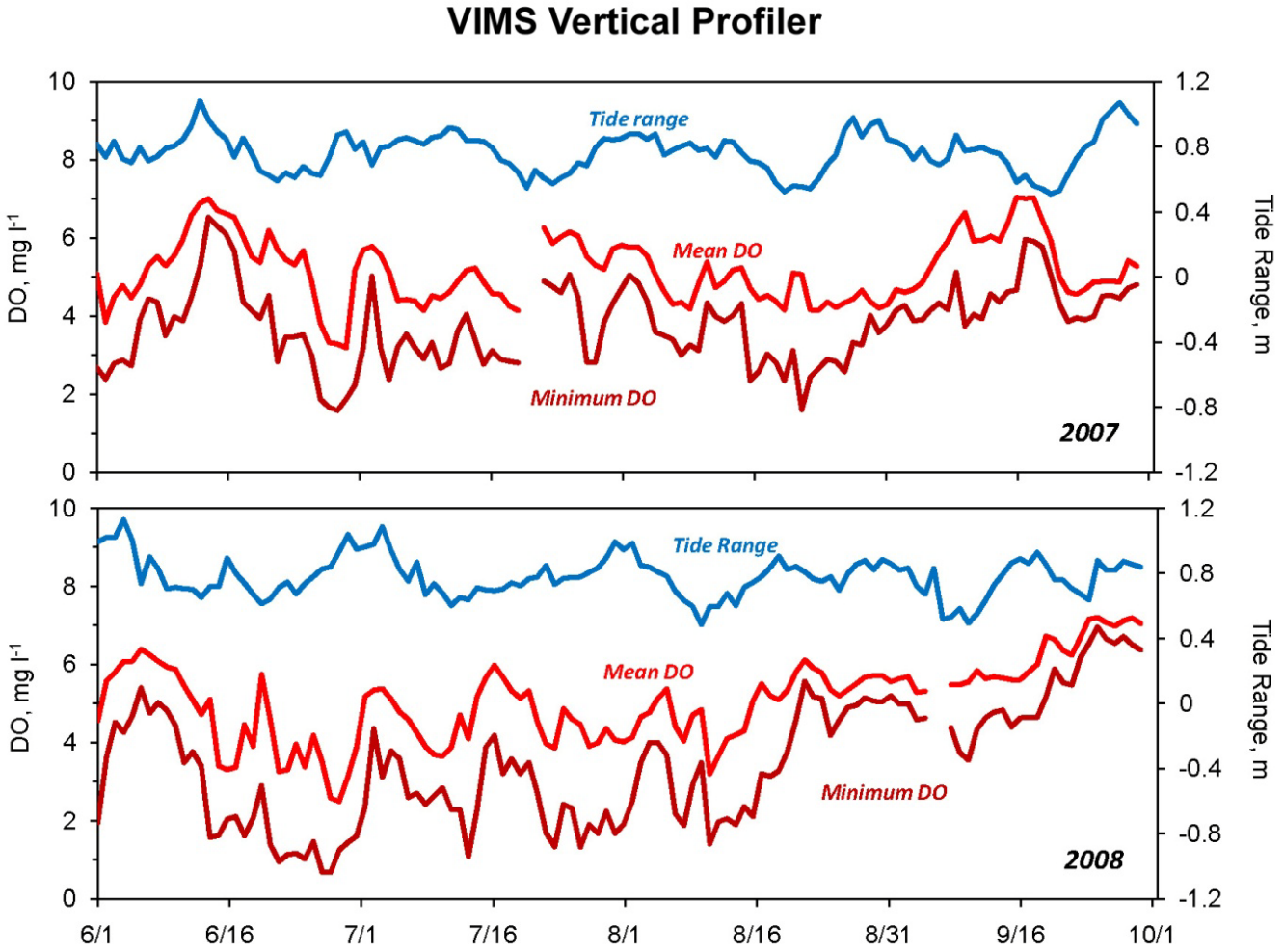


Fig. 4. VIMS vertical profiler DO record from 2007 (top) and 2008 (bottom) with running 1-day, 7-day, and 30-day mean values. Records were computed for the open water use zone by taking an average across each profile (left) and using only the bottom reading for the deep water zone (right). DO criteria are indicated with dashed lines of the corresponding color.

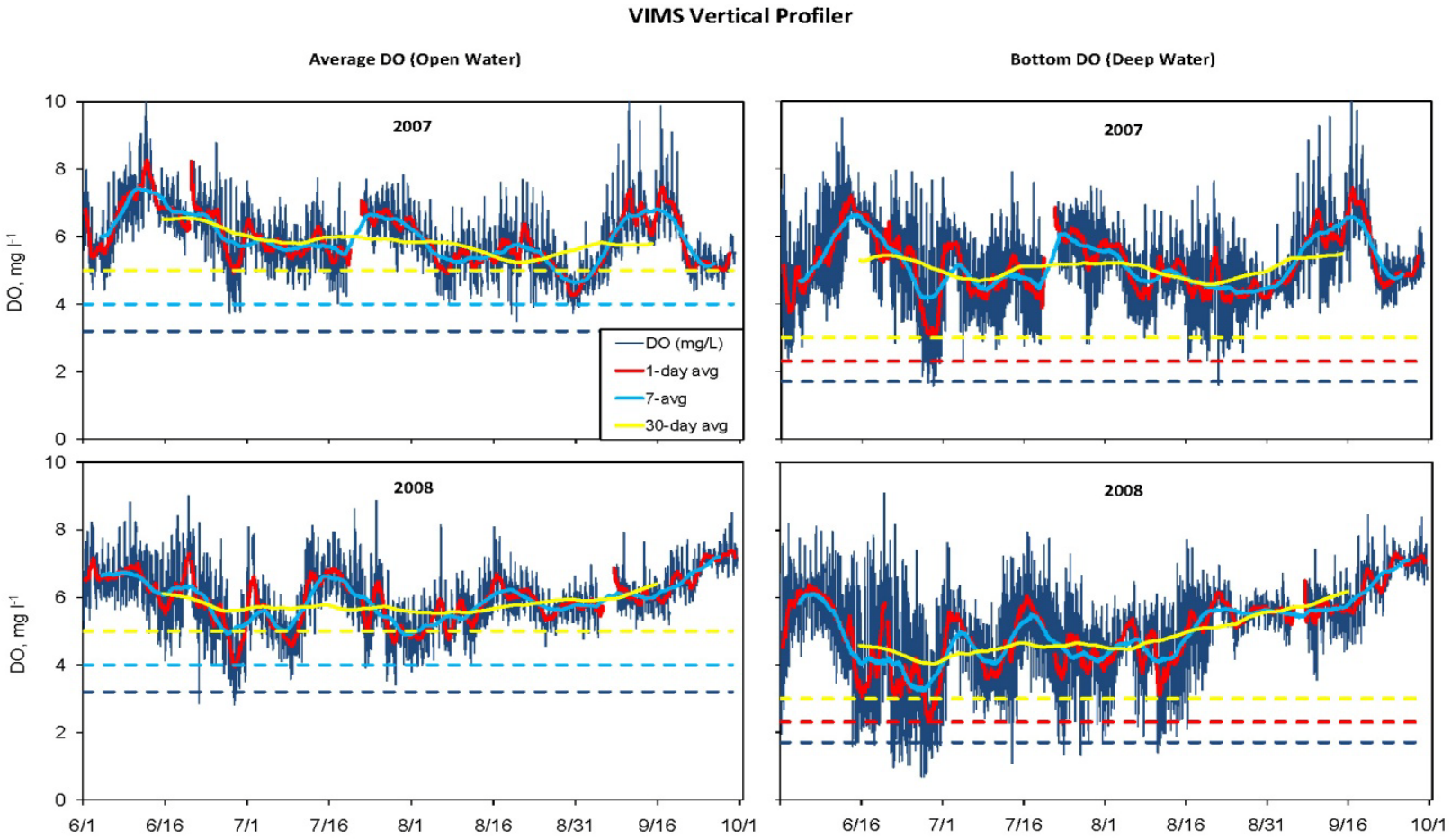
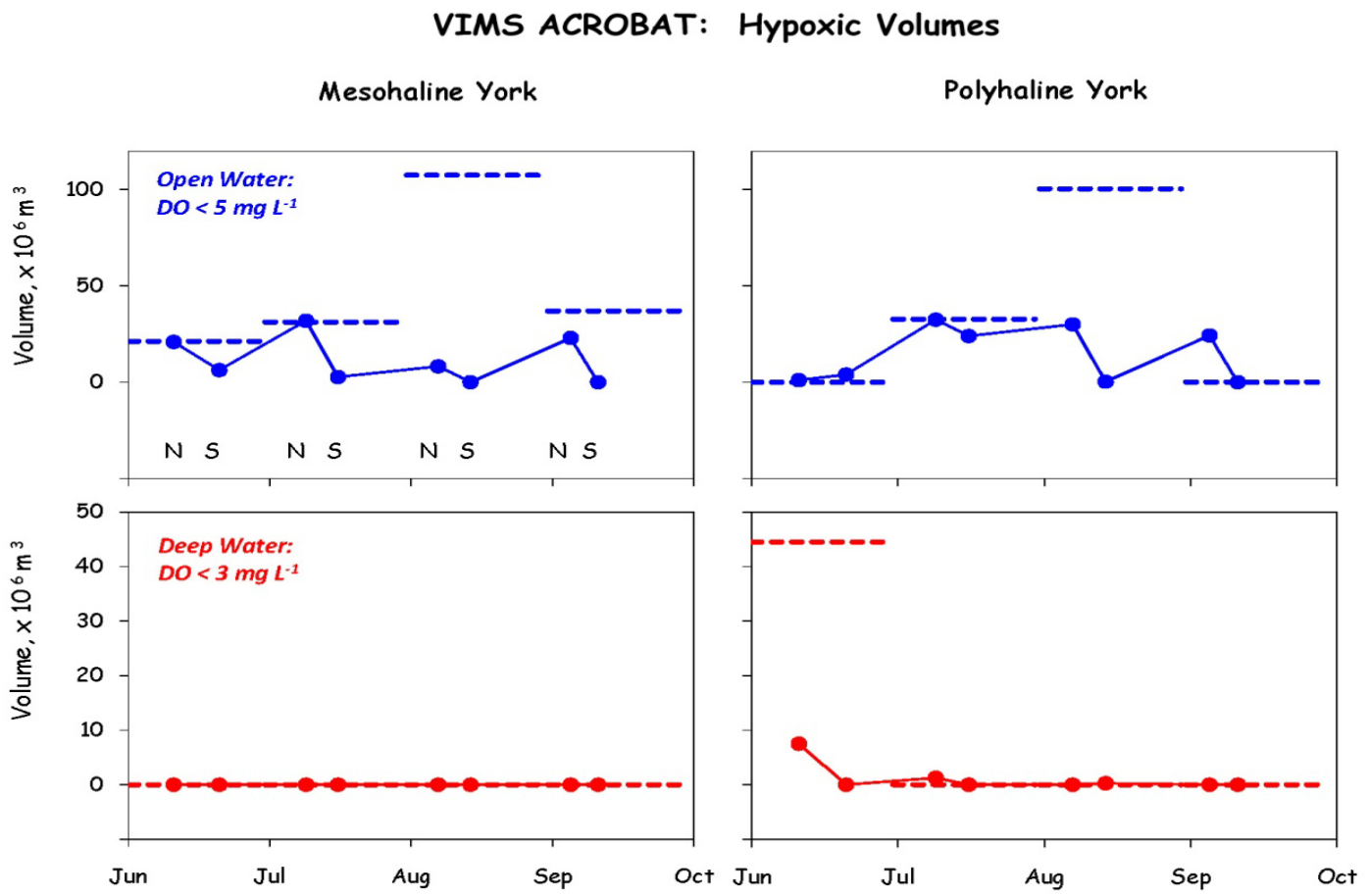


Fig. 7. Computed volume of water in the mesohaline (left) and polyhaline (right) York River in violation of the open water (top) and deep water (bottom) 30-day mean DO criterion based on 2007 ACROBAT surveys (solid lines) and Bay Program monitoring station data (broken lines).



York River Summary

- Observations highlight a major difference between the mainstem model of Chesapeake hypoxia/anoxia and the occurrence of hypoxia in at least some tributaries,
- Such dynamics could complicate attempts to evaluate DO criteria and make de-listing decisions in these segments with the existing monitoring program.

York River Summary

- Given the dominance of the spring-neap cycle in driving York River stratification and hypoxia, the existing fixed-station and ConMon monitoring data may not be adequate to assess the distribution of *sub-surface* DO in this system, and the 30-day mean criterion may not necessarily be protective of the other criteria for *sub-surface* waters.

York River Summary

- The fixed stations appear to usually overestimate hypoxic volume
- In some cases the 30-day mean may indeed be protective, but in other cases high frequency monitoring appears necessary to assess the criteria on higher-frequency timescales, especially in deeper waters.

Thank you

Fig. 8. Location of the Chesapeake Bay Program mid-channel fixed monitoring stations in the lower York River relative to DO concentrations on 6/11/07 measured by the ACROBAT. Color scale is the same as in Figure 6.

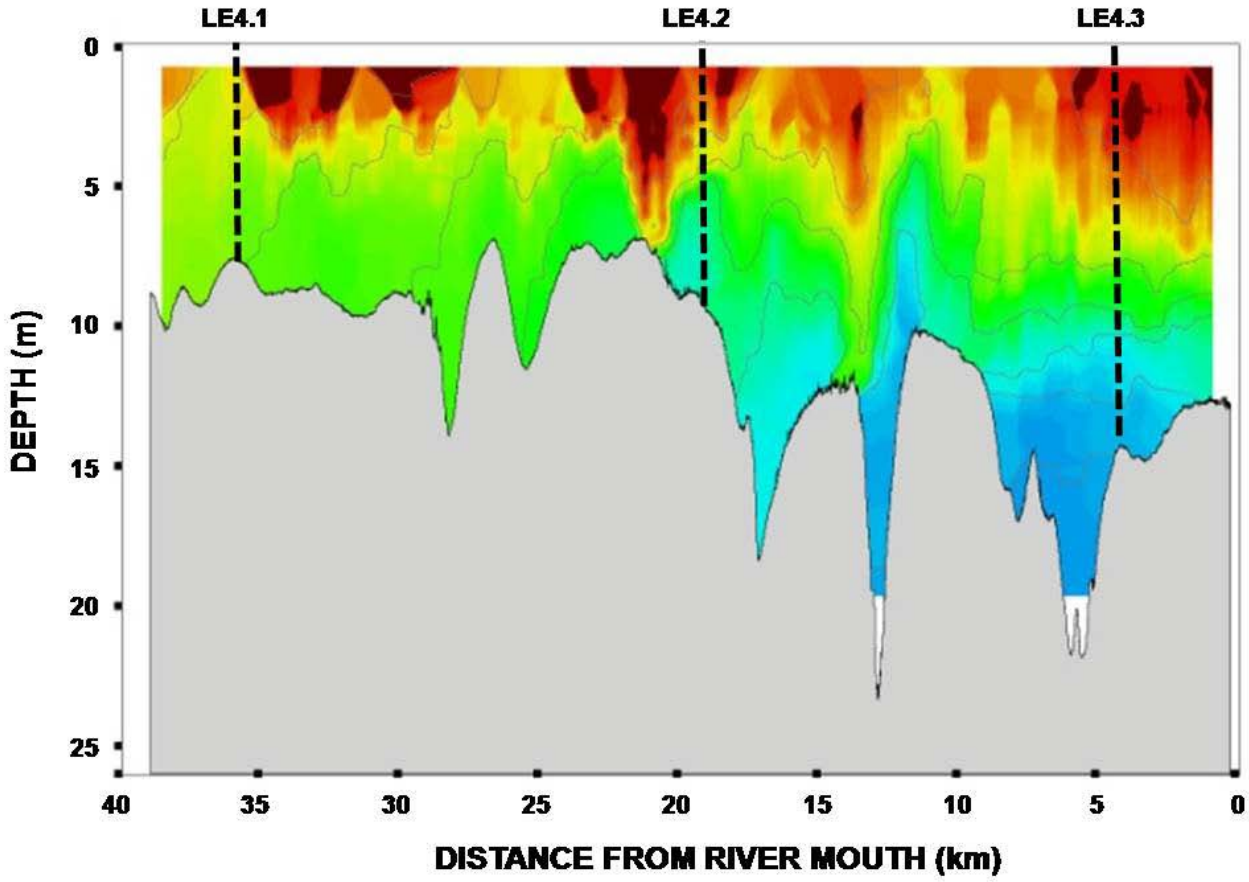


Fig. 5. DO record from the bottom of the York River, summer 2009, collected by VIMS graduate student Mr. Sam Lake, with running 1-day, 7-day, and 30-day mean values. DO criteria are indicated with dashed lines of the corresponding color.