IOOS INTEGRATED OCEAN OBSERVING SYSTEM

NERACOOS

Long Island Sound Study

A Partnership To Restore And Protect The Sound

Using IOOS to Improve Water Quality Management in LIS

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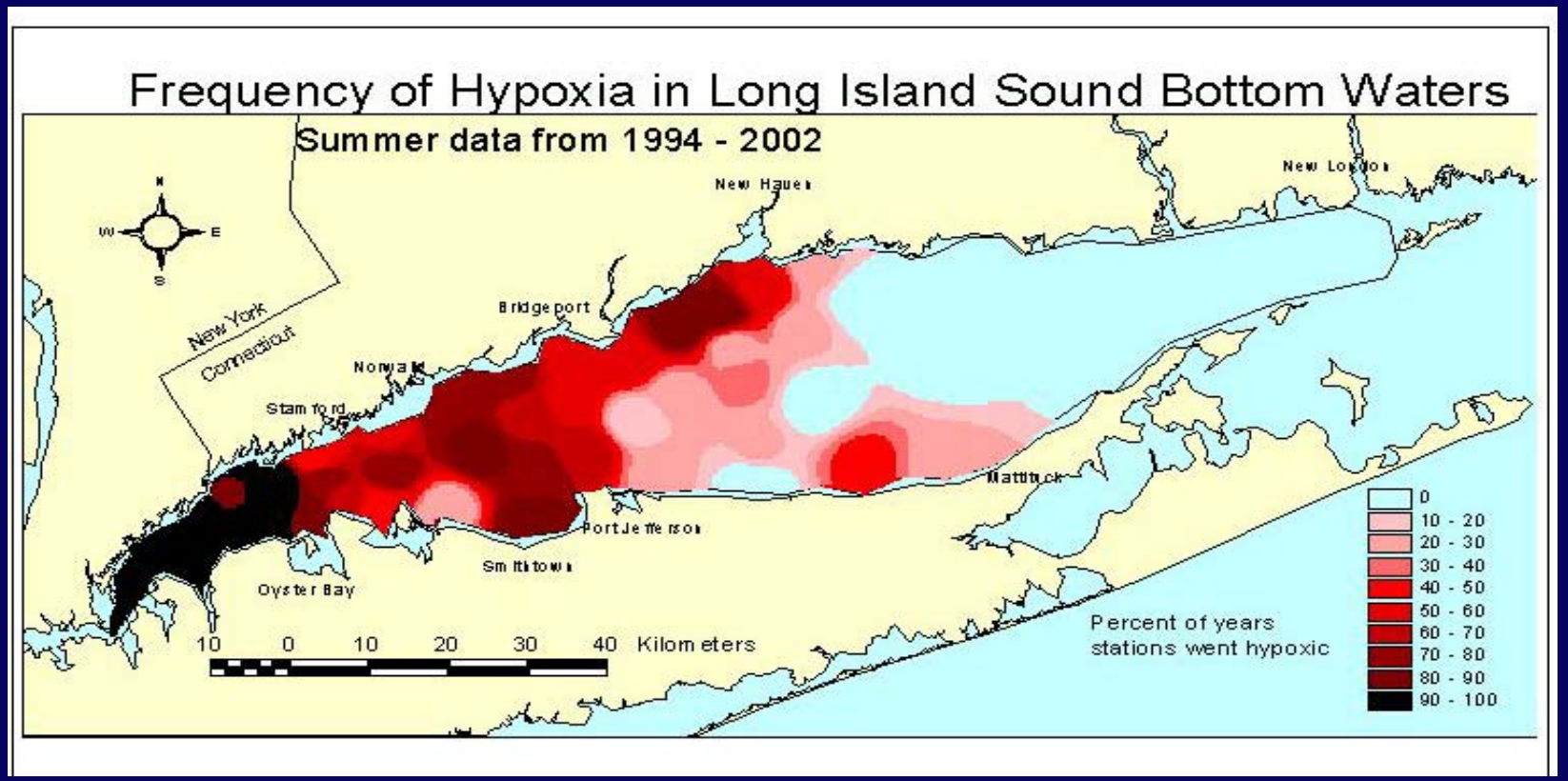
SUMMARY

- I showed you three quite different versions of the same model

- One with high mixing production and respiration and one with low rates.

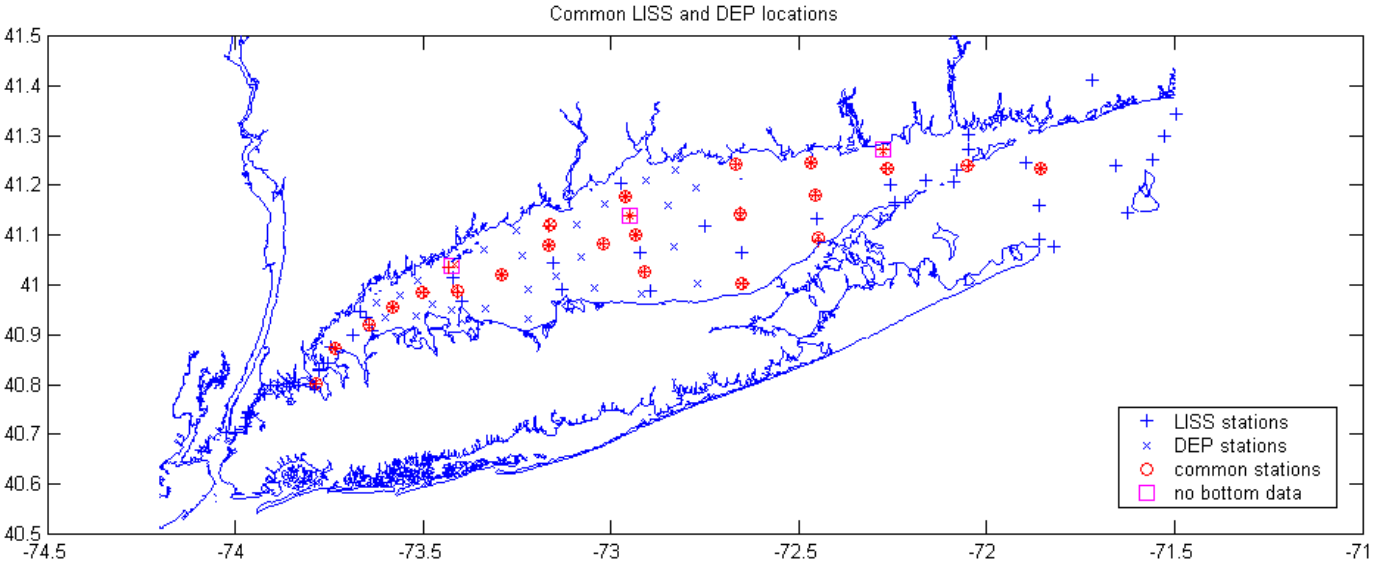
- Only the quantitative measures reveal the difference in performance using ship survey data

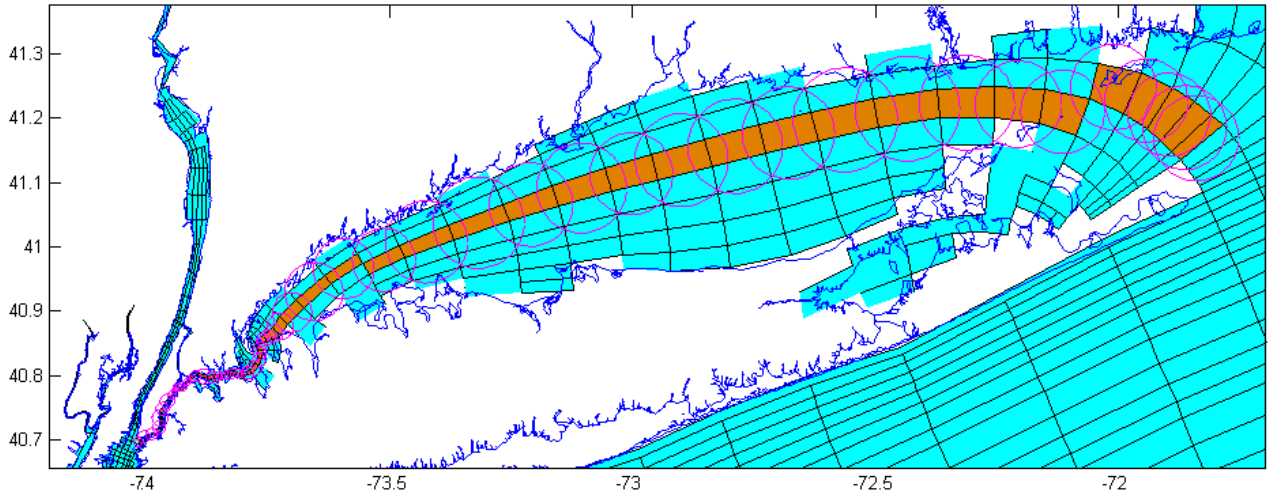
- Only the buoy data led us to the improvements



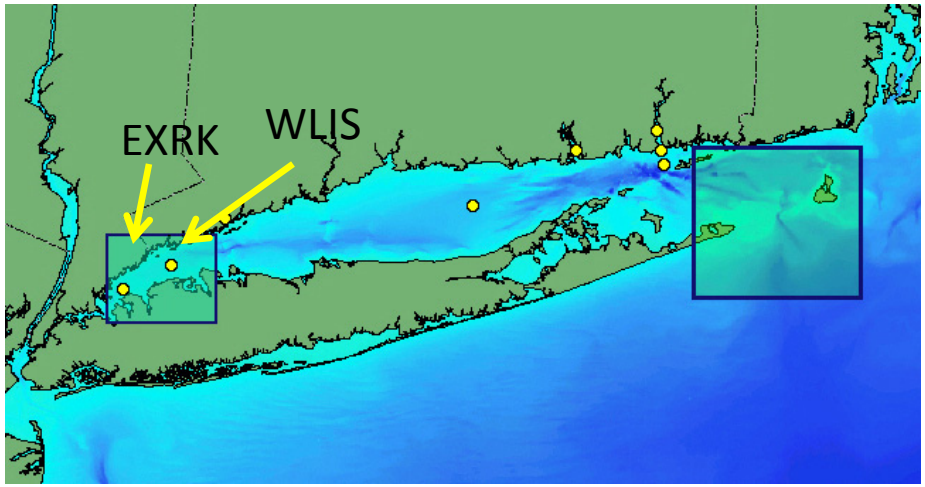
From M. Tedesco, EPA LISS

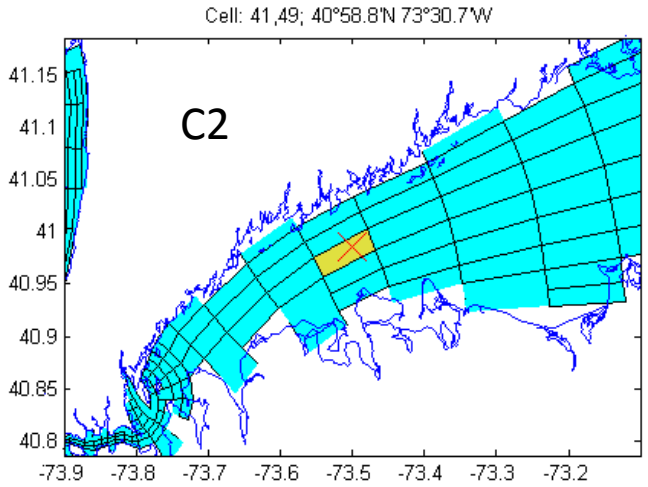
Data-Model Comparison

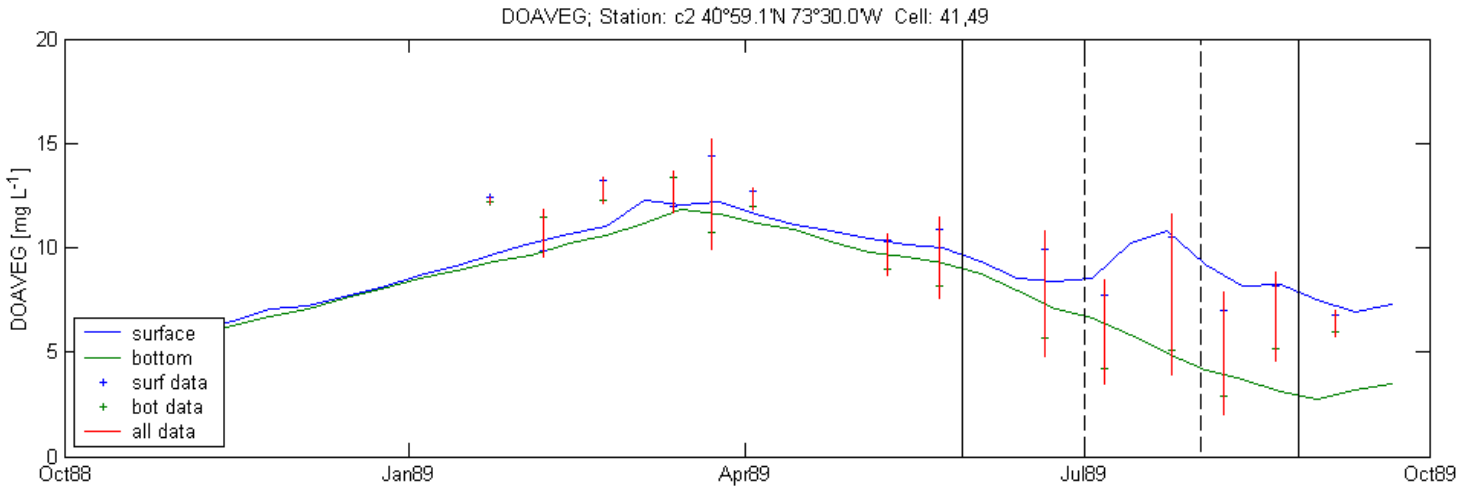




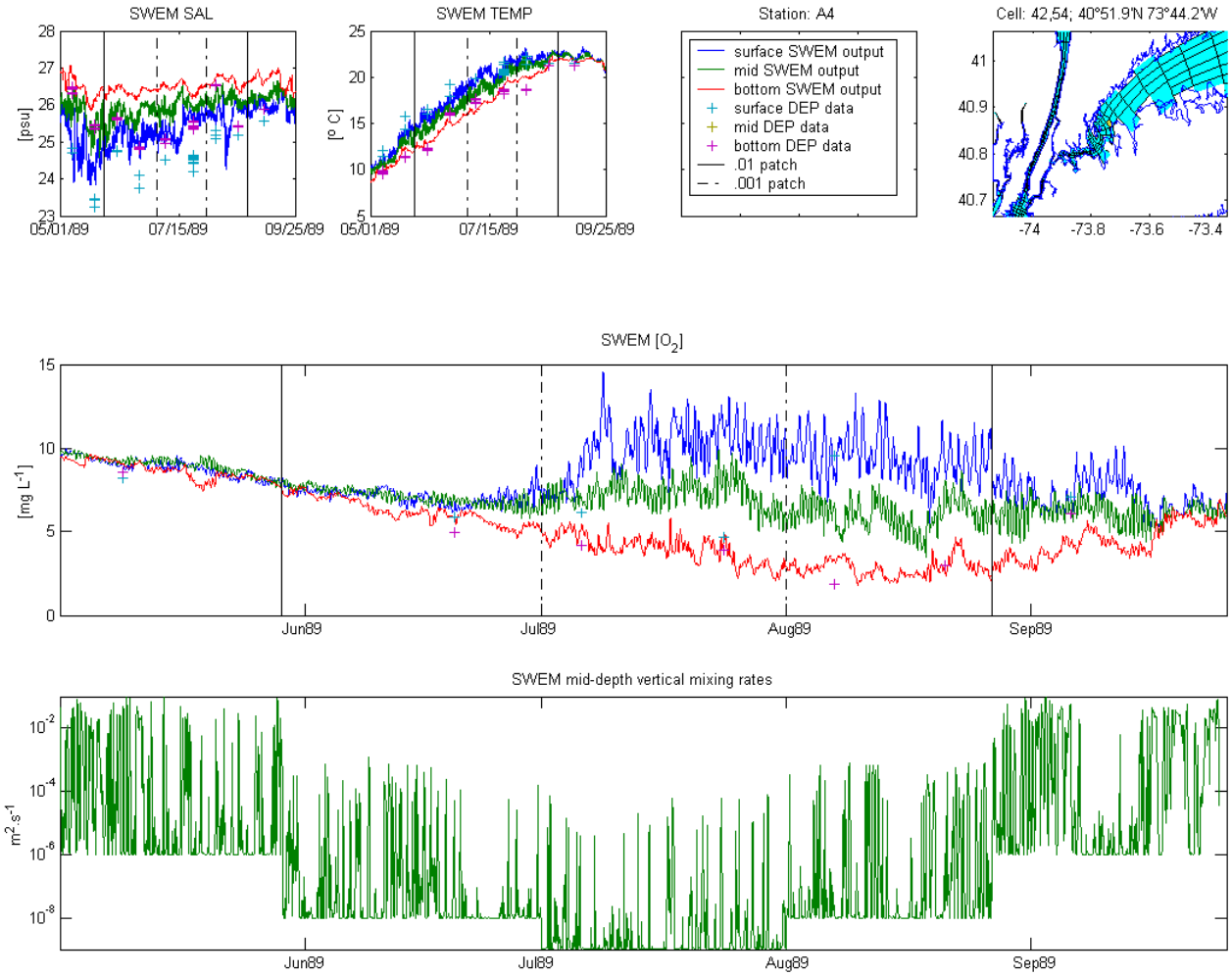
http://lisicos.uconn.edu/ or http://neracoos.org/



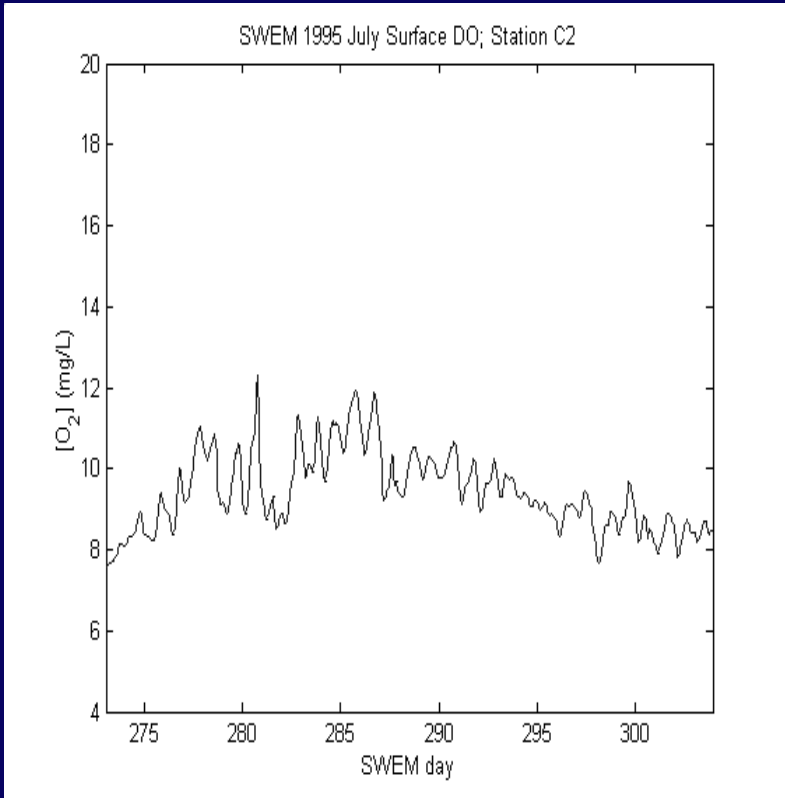


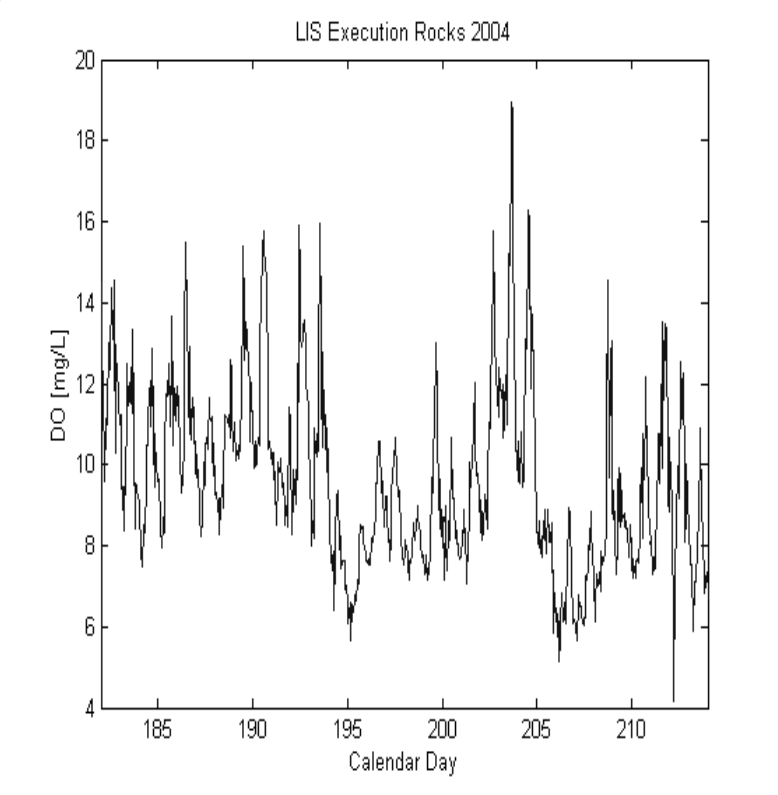


The major issues
- distortion of physics

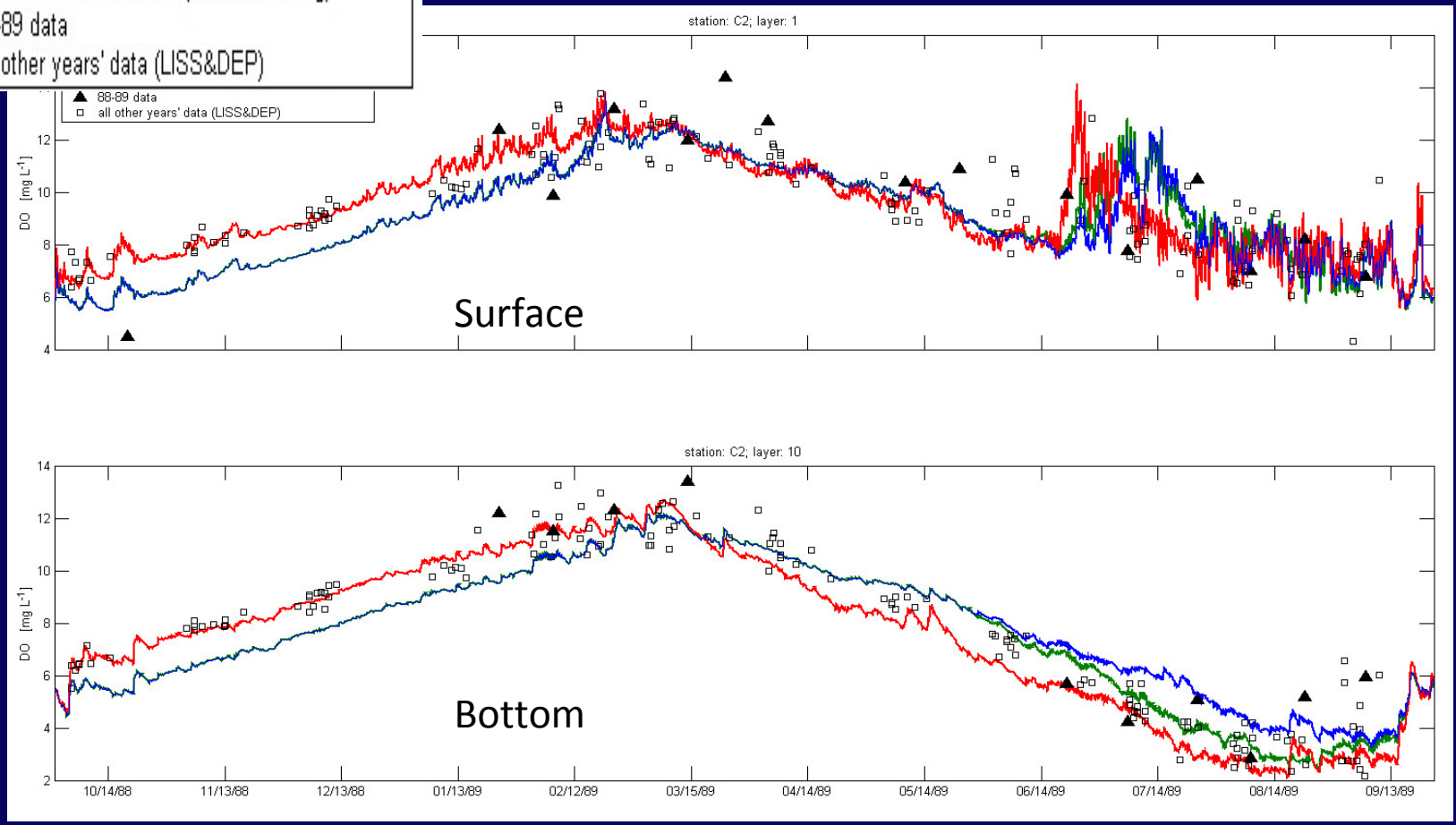


The major issues
- Under estimate production

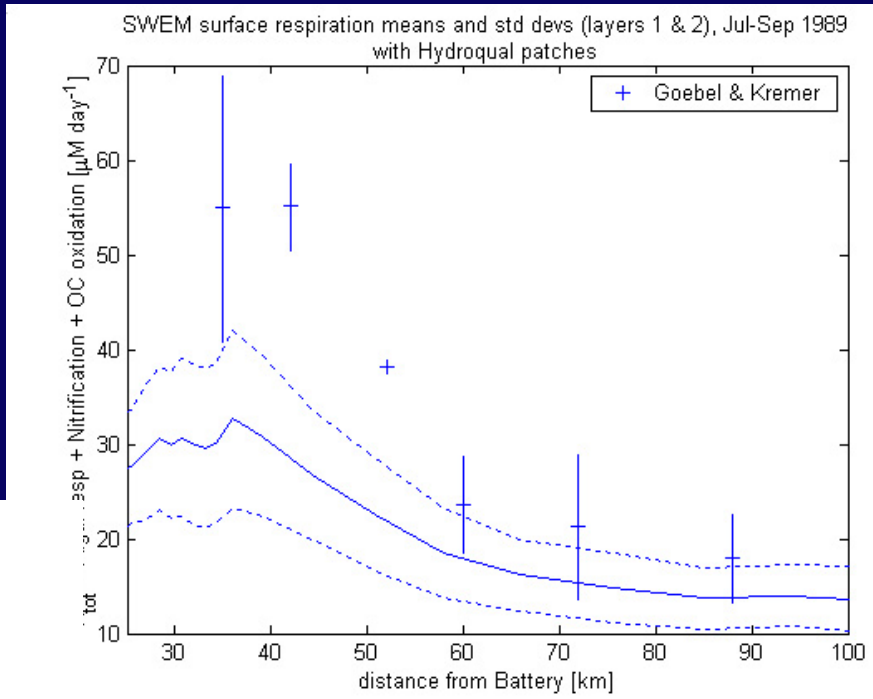


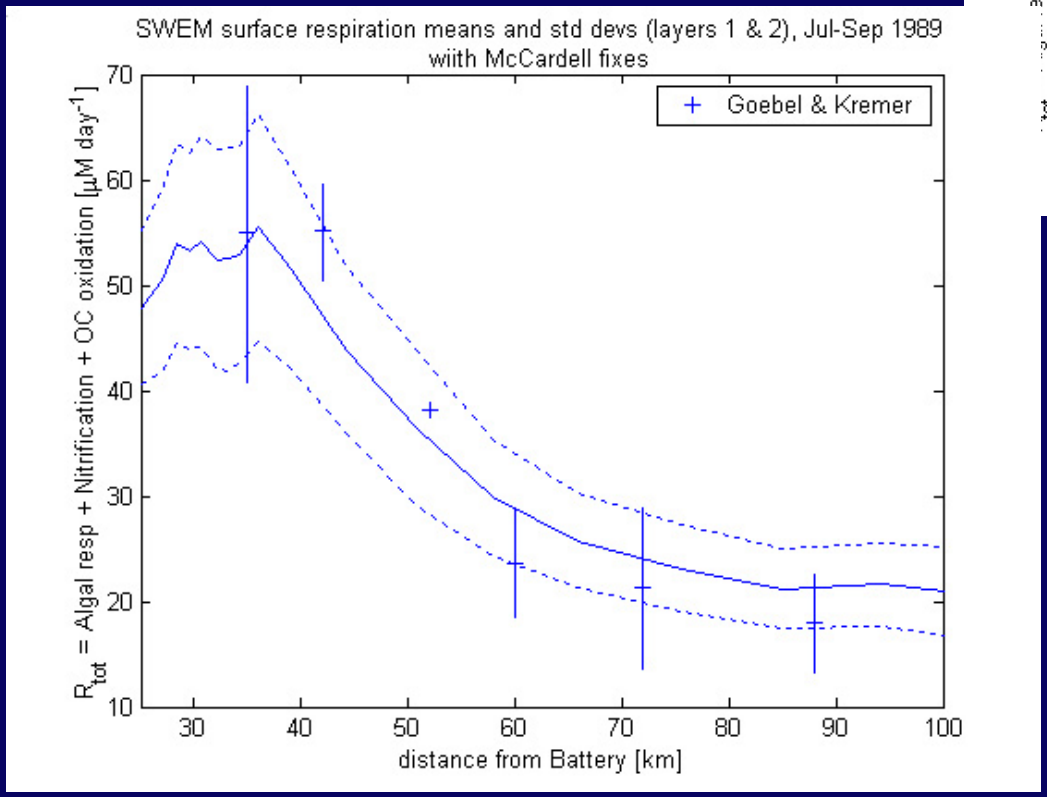


Performance of 3 Models: DO at C2

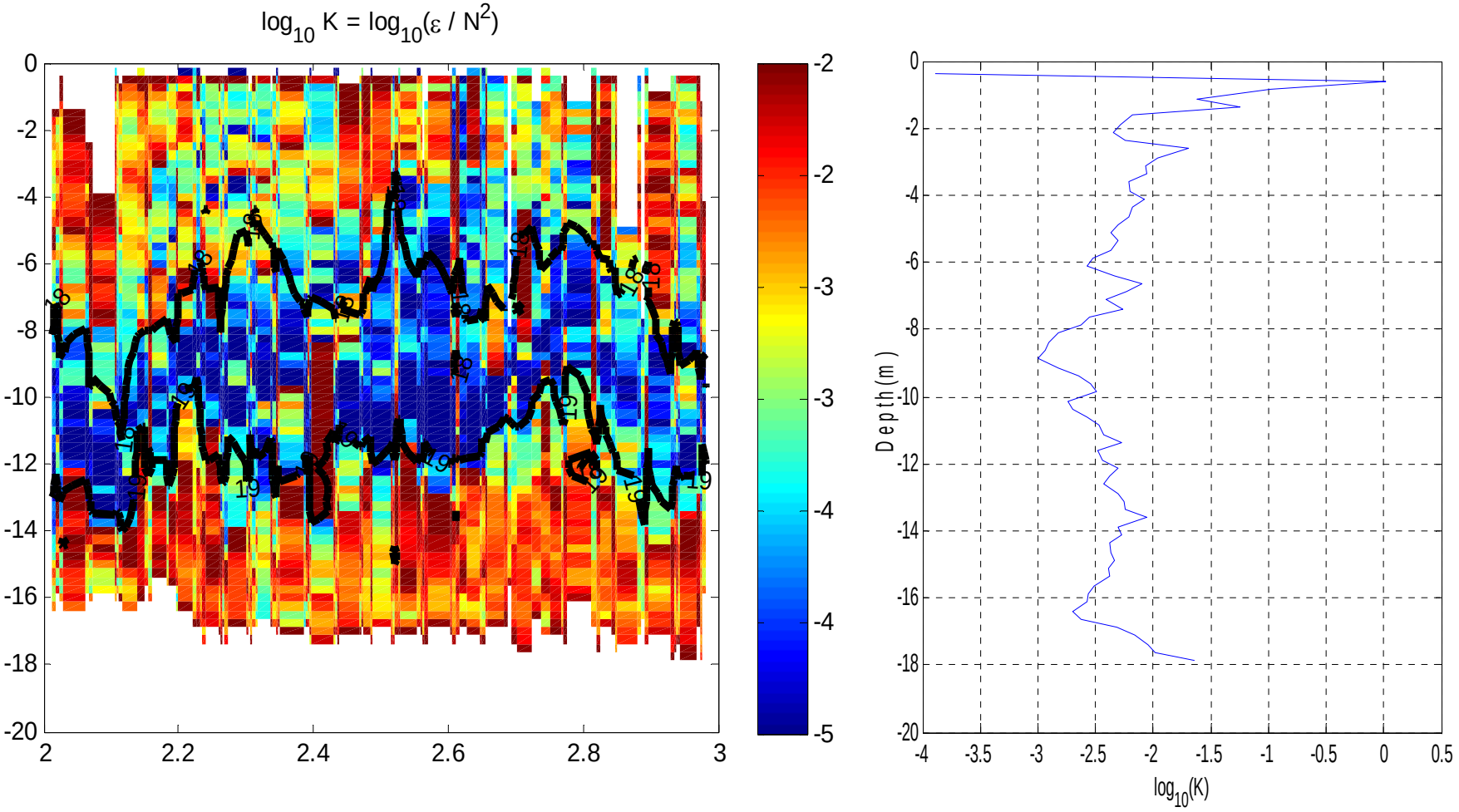


The major issues - Under estimate respiration





The major issues - under estimate respiration
Measured Vertical Eddy diffusion coefficient at WLIS (CTDEP C2) in 2006



Summary

- Mixing is distorted to counteract the underestimation of the production and respiration
- Formulation of DO and Phytoplankton C budgets make it difficult to adjust these to more realistic levels.

- Buoy data showed that the bottom DO is modulated by wind stress in the along-sound direction

EXRK filtered buoy data

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Intermittent ventilation in the hypoxic zone of western Long Island Sound during the summer of 2004

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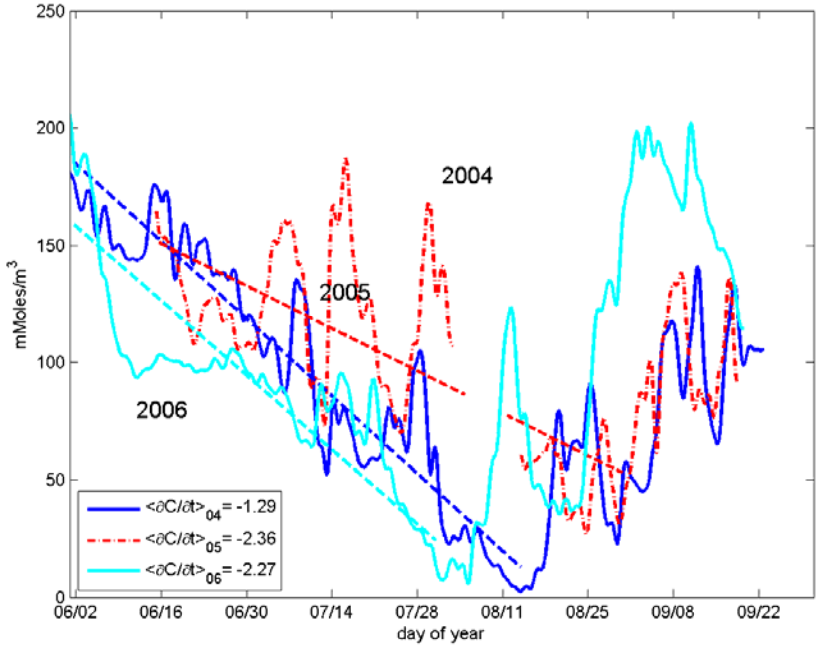
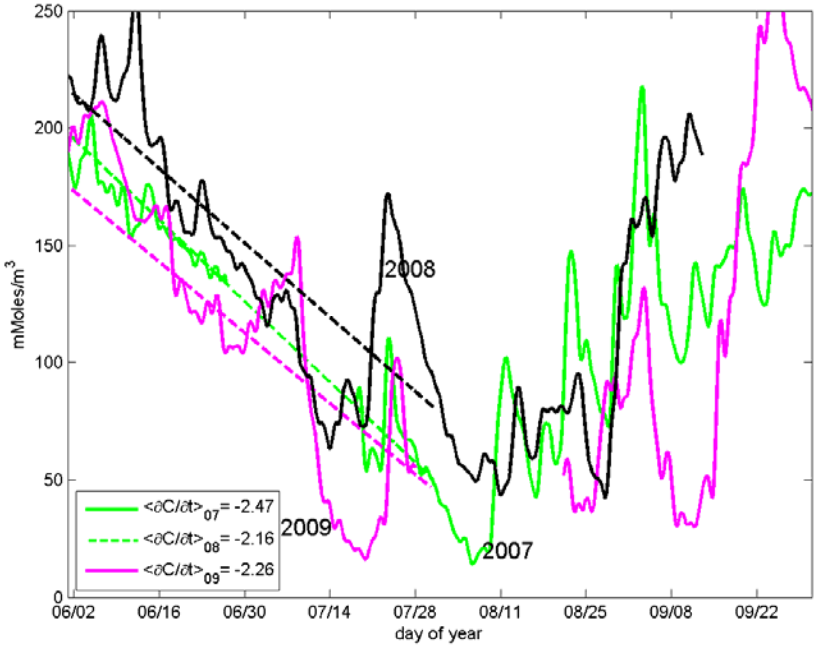
[1] Observations of dissolved oxygen (DO) concentration, salinity, and temperature, during summer of 2004, at three levels on two moorings in the area of western Long Island Sound that is prone to seasonal hypoxia are described. Ship surveys in the area reveal that the DO concentration below the pycnocline decreases at approximately 2.4 mM m^{-3} d^{-1} throughout the summer. We show that this is the net result of oscillations in the rate of change of the DO concentration with periods of 3 to 7 days. During intervals of declining DO concentration, the rate of change is consistent with previous estimates of the rate of community respiration. Since there is insufficient light for photosynthesis below the pycnocline, increasing DO concentration (ventilation) must

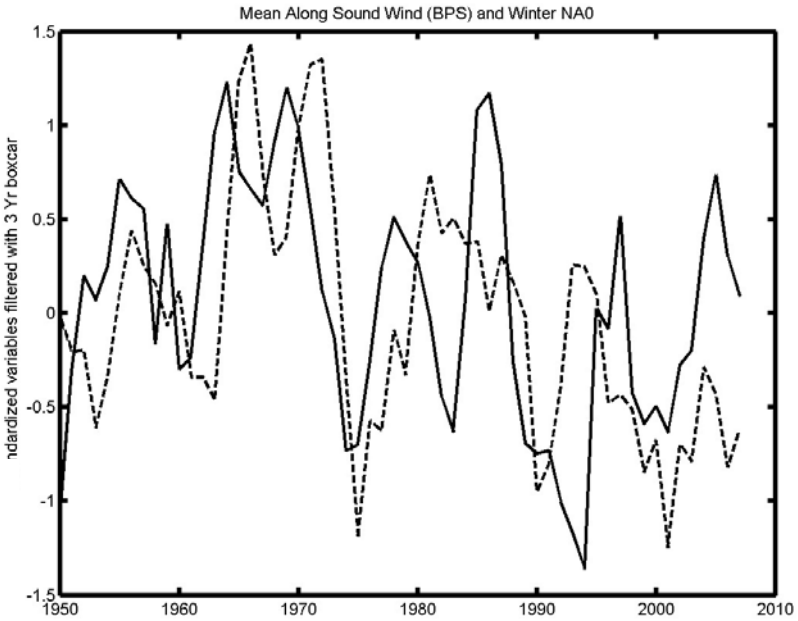


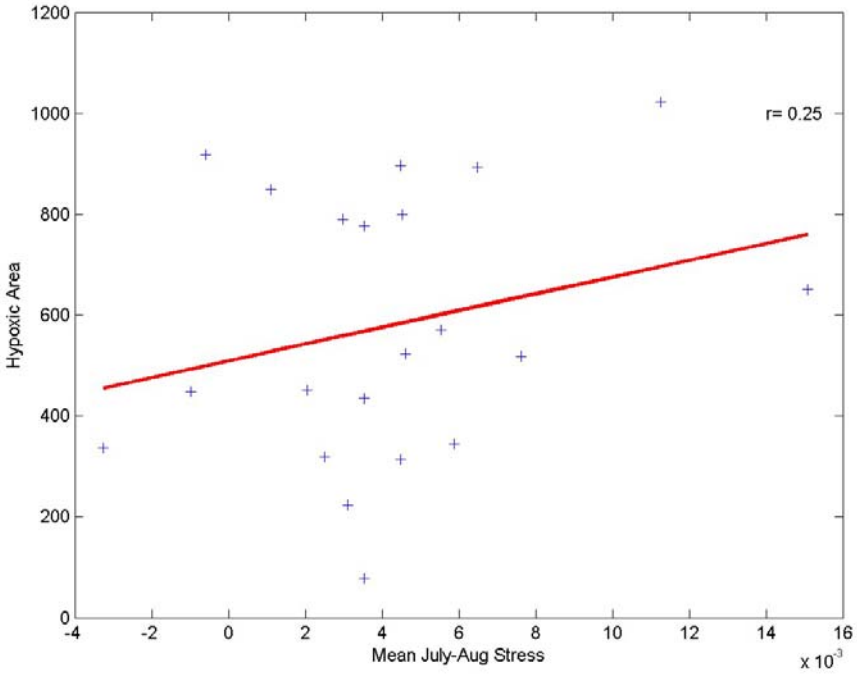


- East stress modulates area of hypoxia

Wind is controlled by NAO

25% variance of hypoxia controled by east wind





Lessons

1. Models can only be improved if shown inconsistent with observations and uncertainty estimates.
2. Quantitative measures of skill are essential
3. Ship surveys alias tidal and meteorological variability
4. Time Series of DO, S & T etc, complement ship surveys.
   a) They allow estimates of rates of production and respiration
   b) They establish the uncertainty due to aliasing
4. Buoys support MET and current measurements and allow estimates of surface exchange and vertical mixing
5. Long term trends can only be detected if measurements (and uncertainties) are sustained
6. Trends in forcing must be separated from trends due to management
7. Data sharing and standards are essential
8. Model sharing and standards are essential
9. Multiple models and model run allow uncertainty in predictions to be estimated
10. Basins should not be viewed in isolation