Light in the Chester River

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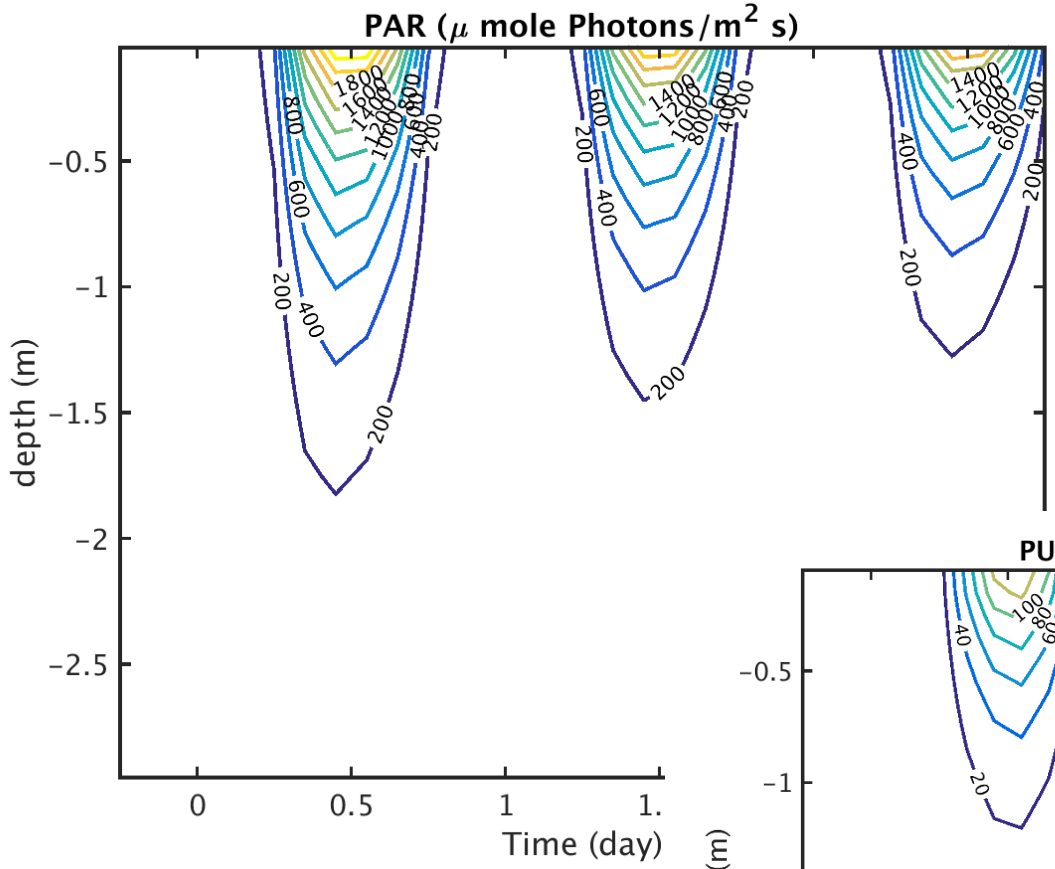
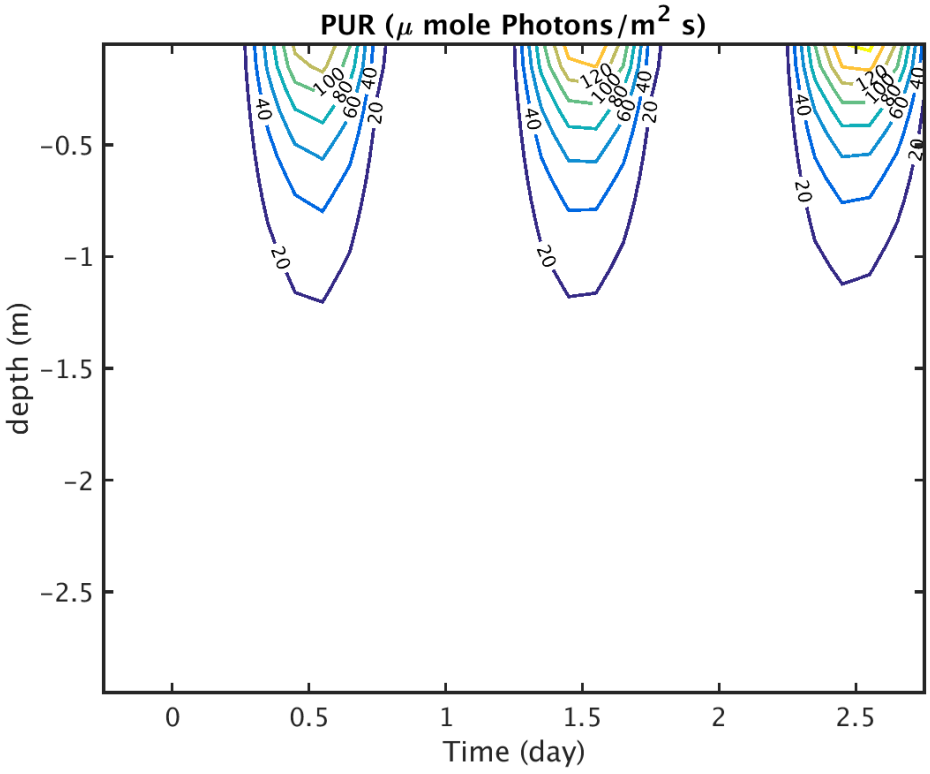
OUTLINE

- Vertical-Time bio-optical test model (in ROMS)
- Upper Chester River test simulation

Basic Bio-optical Interactions

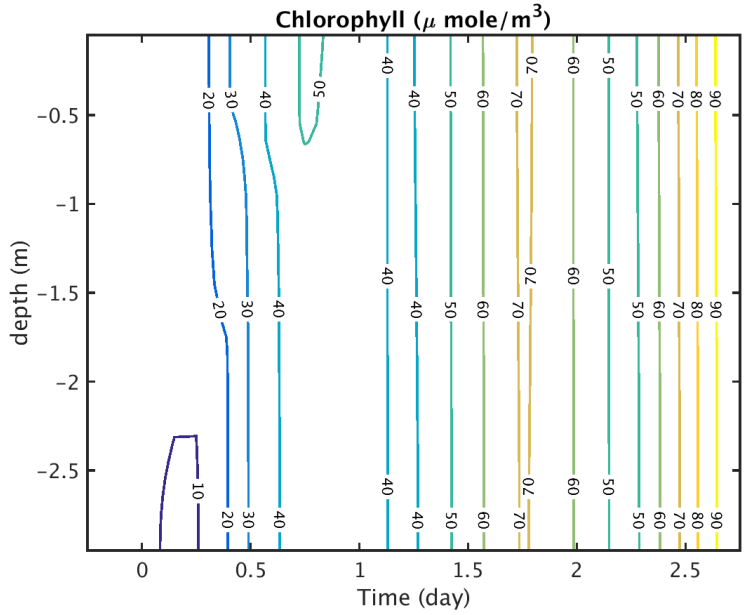
- Vertical-time dependent test model in ROMS
- (Same structure as matlab model just presented)
- Spectral light based on GrassLight (1 nm resolution)
- Single species primary producer with internal pools of carbon, nitrogen and phosphorus.
- Nitrate, Ammonia and Phosphate nutrients
- Noncohesive sediment (suspended and benthic)
- Constant vertical mixing ($K = .001\ m^2/s$)
- 3 day test simulation starting June 1

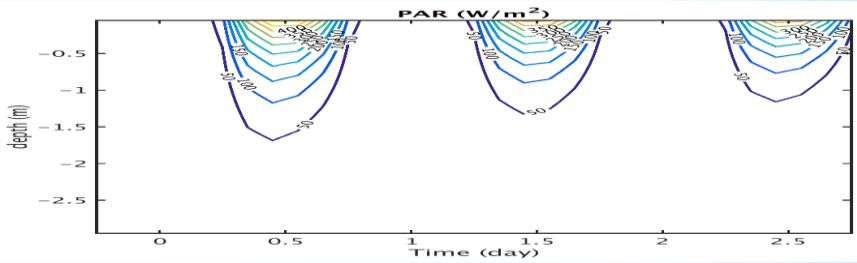




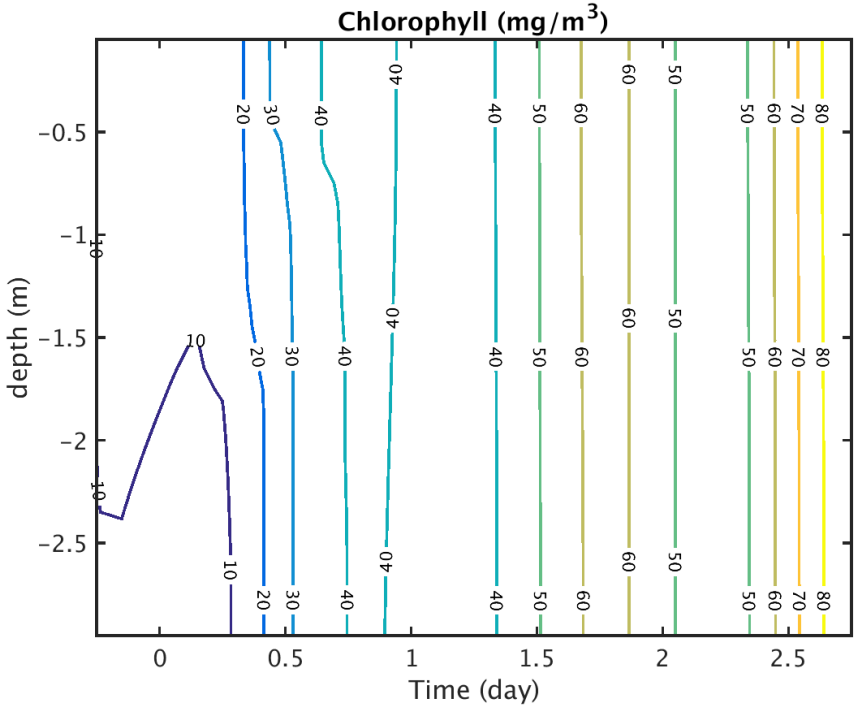
PUR = photosynthetically utilized radiation

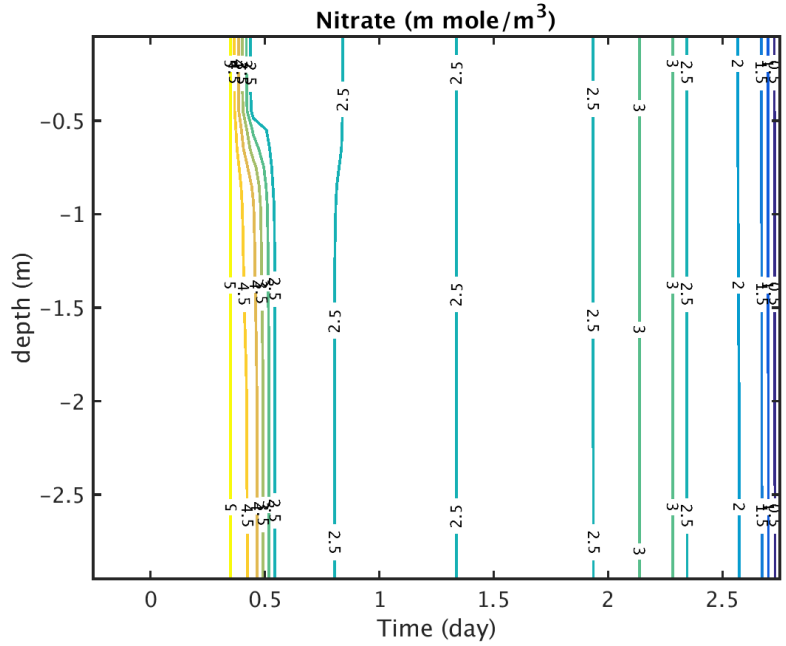
Chlorophyll

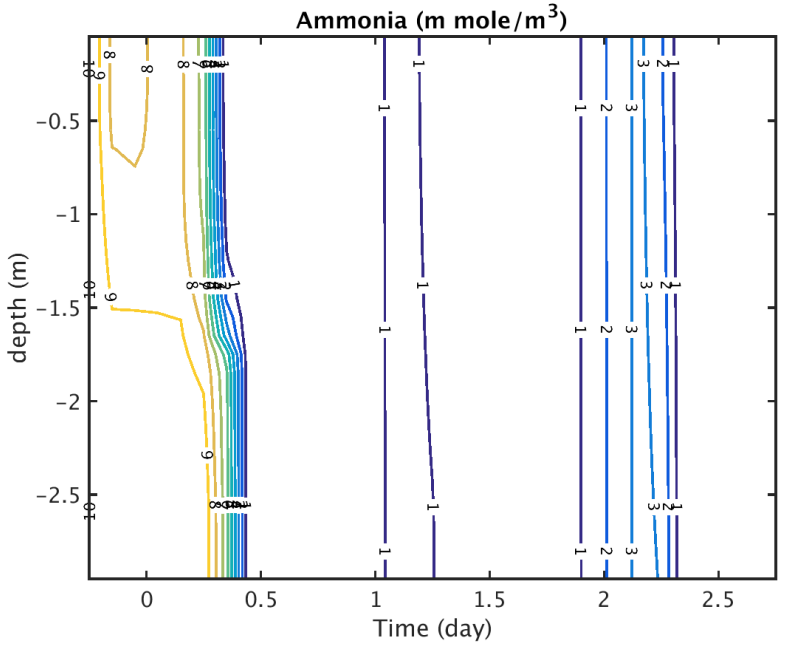


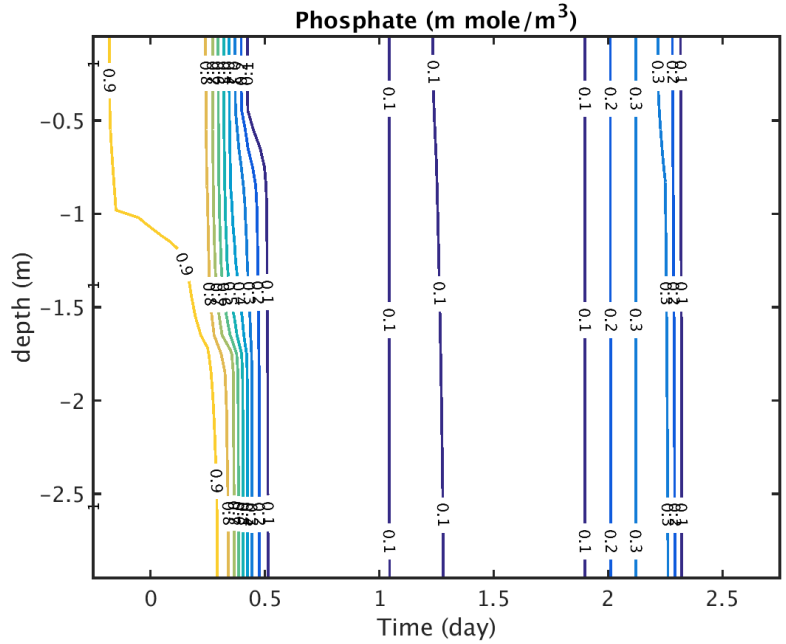


- First day shows strong growth
- Shallow water and mixing removes vertical gradient
- Nutrient limitation not working well





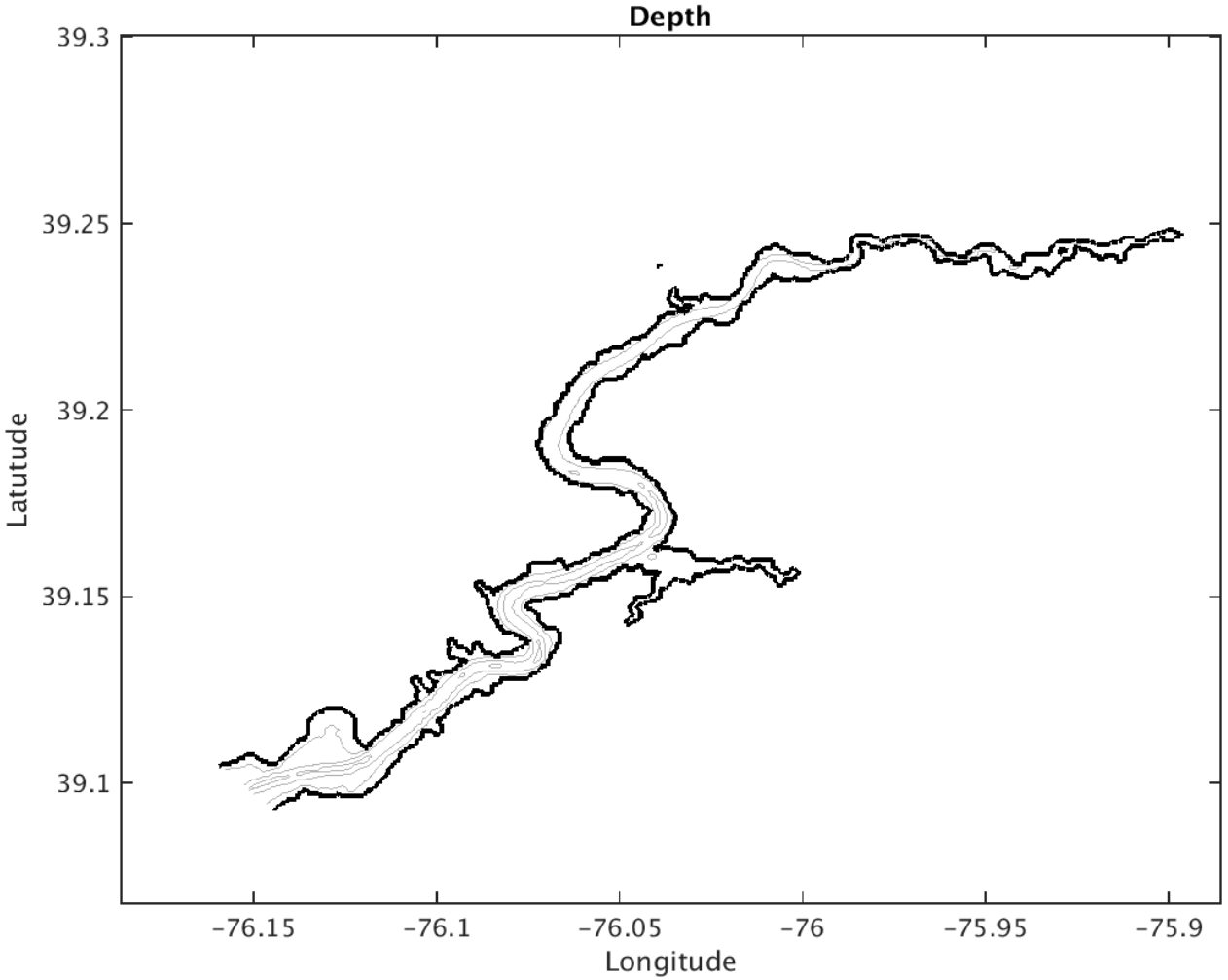




Nutrients

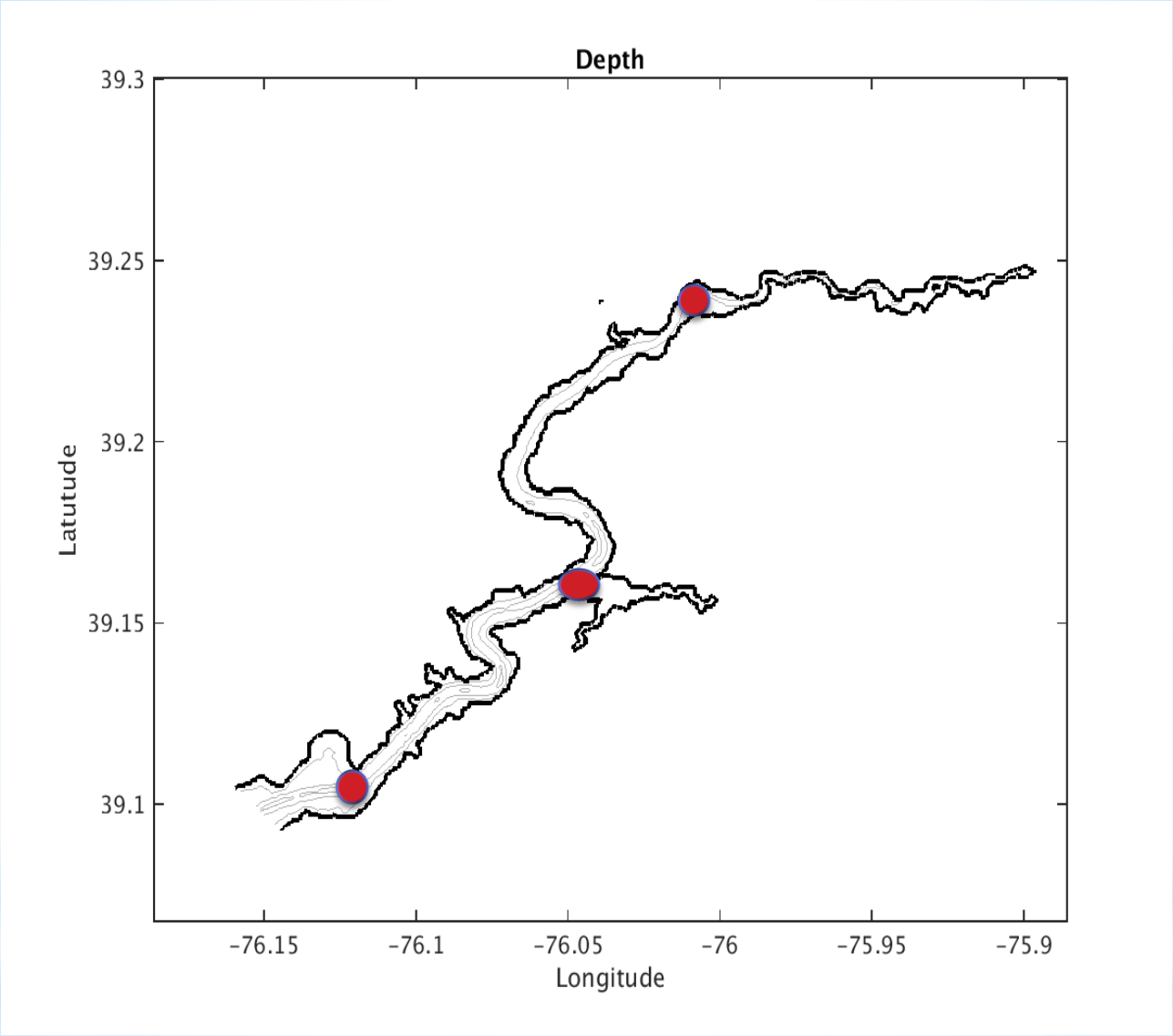
- removed in the first day
- growth rate is too fast

Upper Chester River

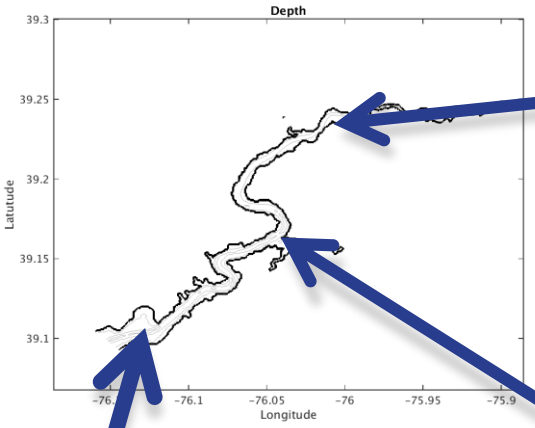


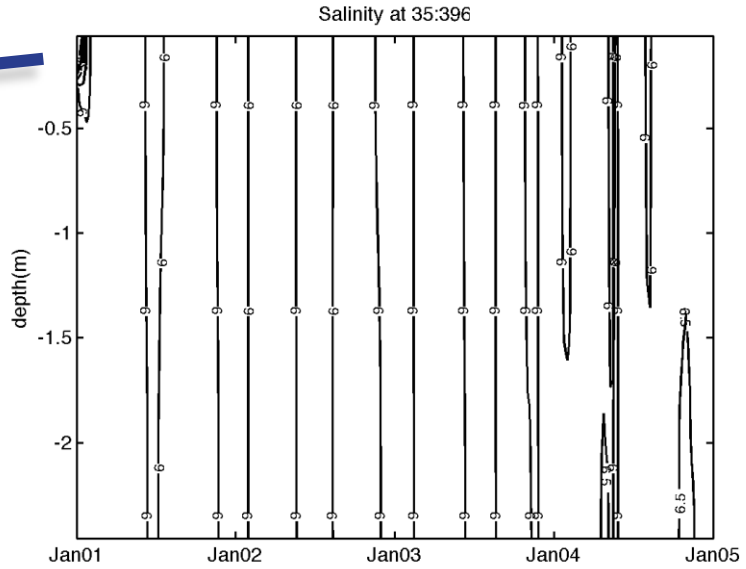
Upper Chester River

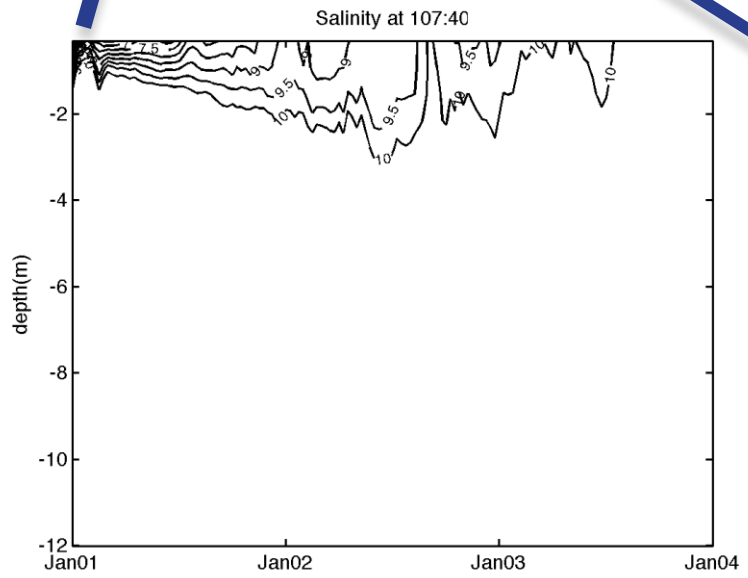
- River upstream of Corsica River
- 30 km reach with 50 m uniform grid
- Depth interpolated from 25 m DEM
- Initial constant T, linearly declining S
- Imposed (constant) temperature and salinity at entrance
- Winds and surface heat flux
- No precipitation or runoff
- M2 tide variation
- 4 day simulation

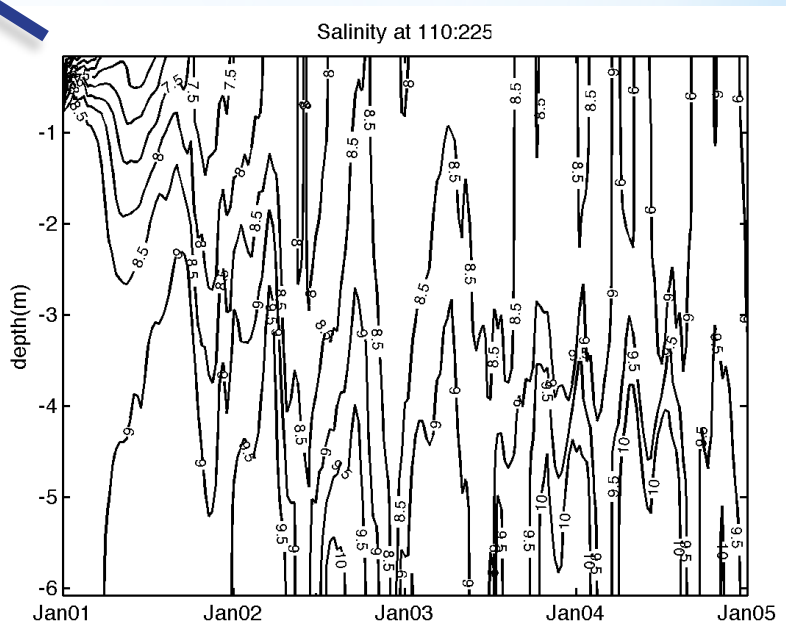


Solution Display Locations

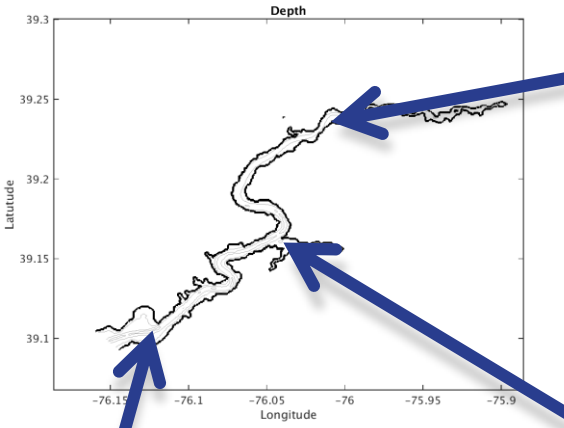

Depth
Latutude
Longitude
39.3
39.25
39.2
39.15
39.1
-76.1
-76.05
-76
-75.95
-75.9

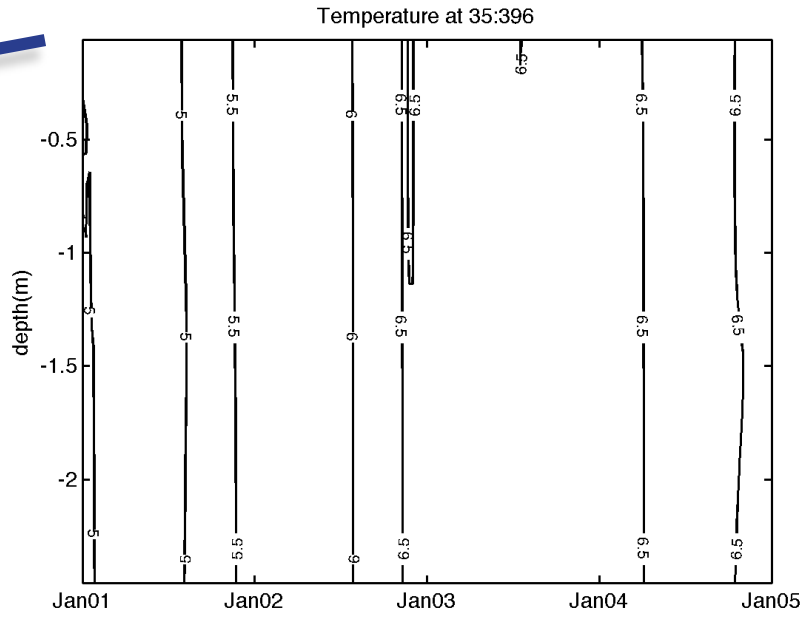

Salinity at 35:396
depth(m)
-0.5
-1
-1.5
-2
Jan01
Jan02
Jan03
Jan04
Jan05

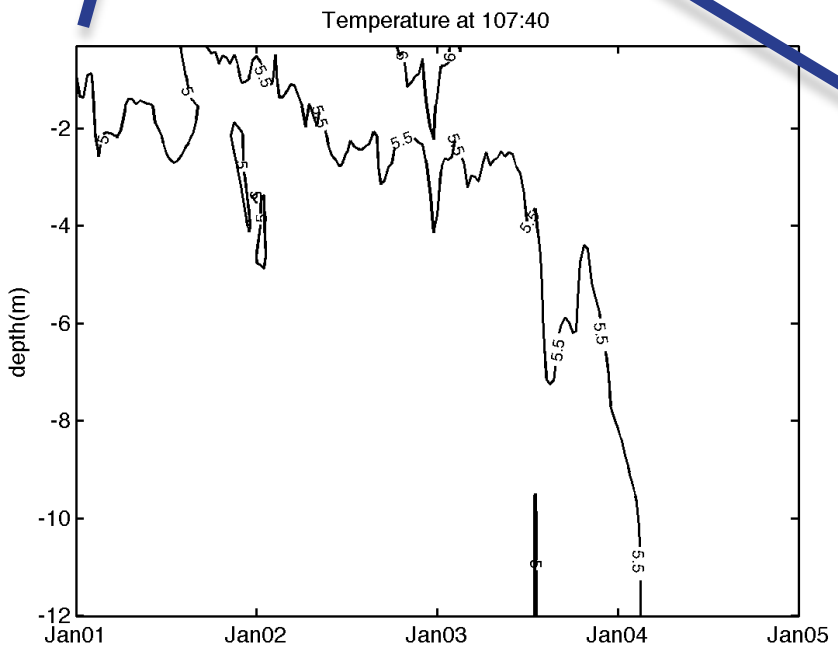

Salinity at 107:40
depth(m)
-2
-4
-6
-8
-10
-12
Jan01
Jan02
Jan03
Jan04

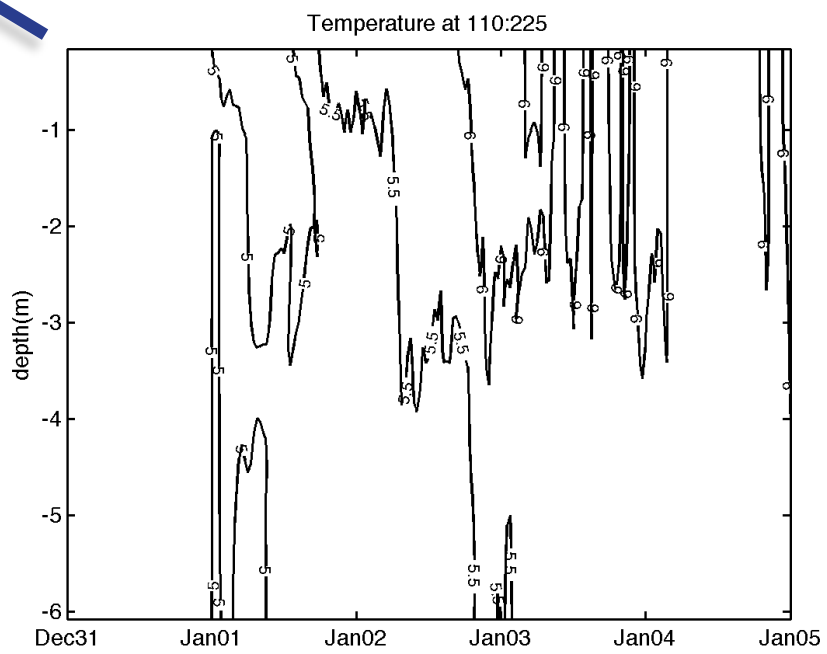

Salinity at 110:225
depth(m)
-1
-2
-3
-4
-5
-6
Jan01
Jan02
Jan03
Jan04
Jan05

Salinity

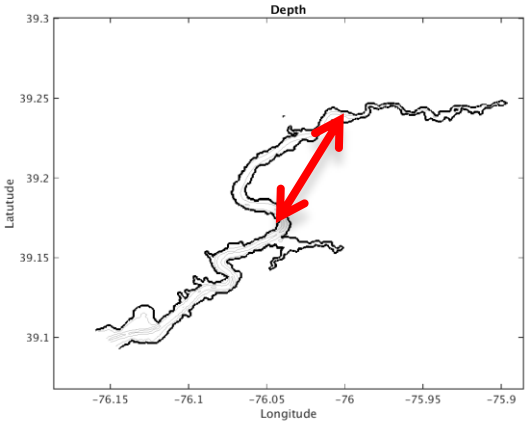






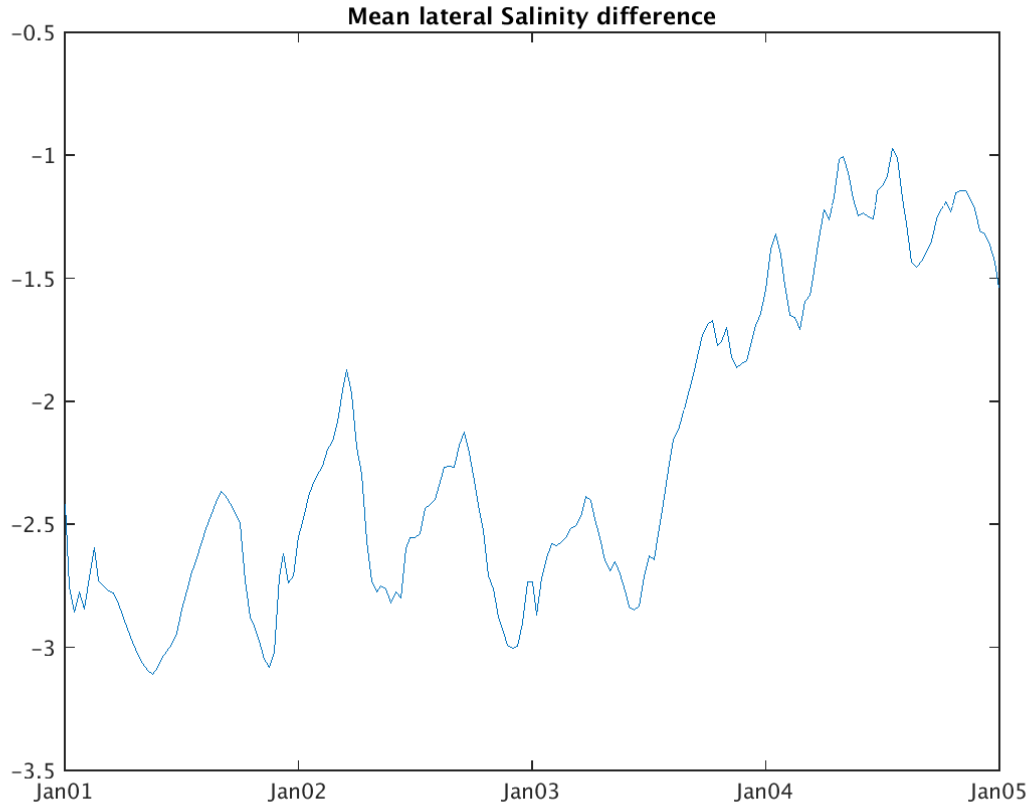


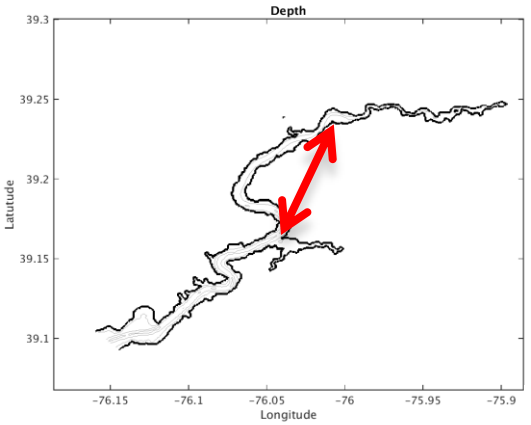
Temperature



Difference in vertical mean salinity

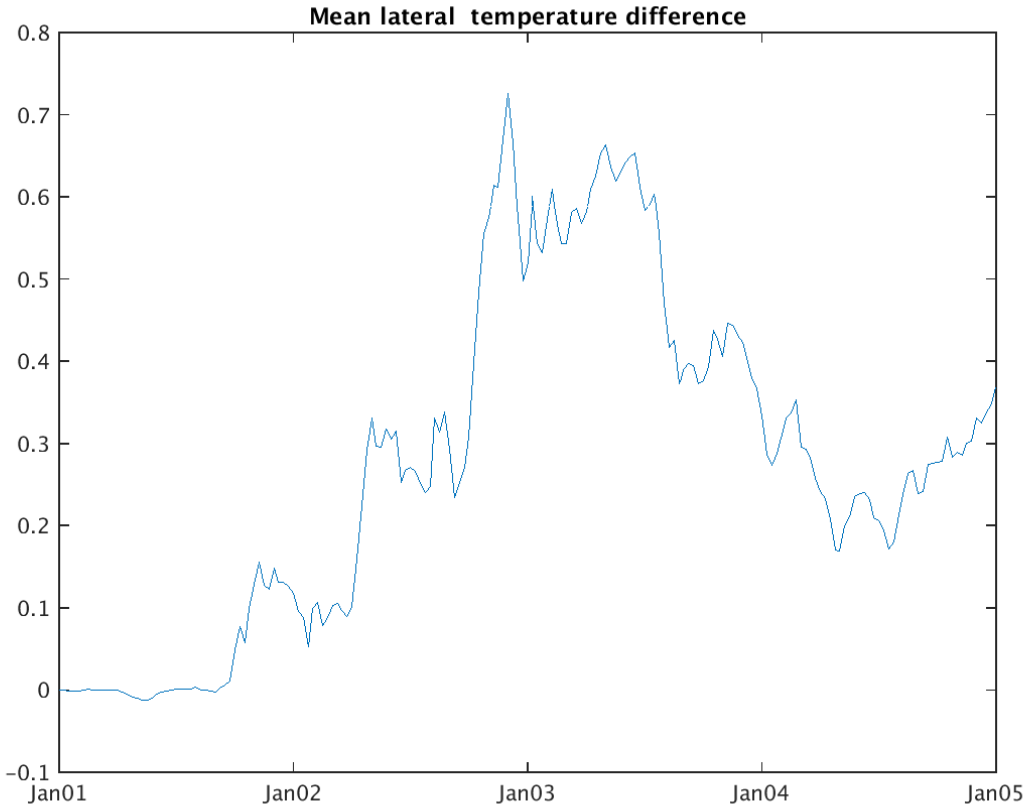
Lateral difference declines (no freshwater flux to restore salinity difference)





Difference in vertical mean temperature

Surface heat flux warms shallower areas first



Conclusions

- Bio-Optical model almost ready
- Chester River needs initial conditions and realistic surface and boundary forcing
- Inorganic, non-cohesive sediment characteristics need to be set
- Simple primary production – oxygen model is ready to tune for Chester simulation to compare to observations

Thanks

Are there any questions?

Basic Bio-optical Interactions