Field Observations

Siders Pond was sampled over a 24 hour period on 25-26 Jun 2015 from a single station located at the deepest location on the pond (Fig. FO-1). Samples were collected approximately every 4 hours at 0, 2, 3, 4, 6, 8, 10 and 12 m producing a total to 56 samples (Fig. FO-2). All samples were collected, processed and preserved on ice, dry ice or liquid nitrogen while on station using a peristaltic pump connected to tubing that was attached to a Hydrolab water quality sonde that provided real-time data on depth, temperature, salinity, dissolved oxygen, photosynthetic active radiation (PAR) and chlorophyll via in situ fluorescence (Figs. FO-3-7) To date, collected and preserved samples have been analyzed for particulate organic C (Fig. FO-8) and N (Fig. FO-9), C:N ratio (Fig. FO-10), NO_3^- (Fig. FO-11), NO_2^- (none detected), NH_4^+ (Fig. FO-12), PO_4^{3-} (Fig. FO-13), dissolved inorganic carbon (Fig. FO-14), SO_4^{2-} (Fig. FO-15), H_2S (Fig. FO-16) and Cl^- (Fig. FO-17). Biogeochemical samples that are in the queue to be analyzed include Chl a, Bacterio-Chl a, dissolved organic C and N (DOC, DON) and dissolved and particulate Fe and Mn. While verticle gradients dominate in Siders Pond, there are also diel oscillations, as evident by temporal dynamics in dissolved oxygen, PAR and NH_4^+ (Fig. FO-18).

These 2D data, along with the 2D data on metatranscriptomics and the 1D on metagenomics (see GenomisBacteria.pdf) will be compared to the 2D output of the MEP biogeochemistry model to test if microbial community function and organization can be explained by the Maximum Entropy Production (MEP) principle, as well as identify the temporal and spatial scales systems organize around.

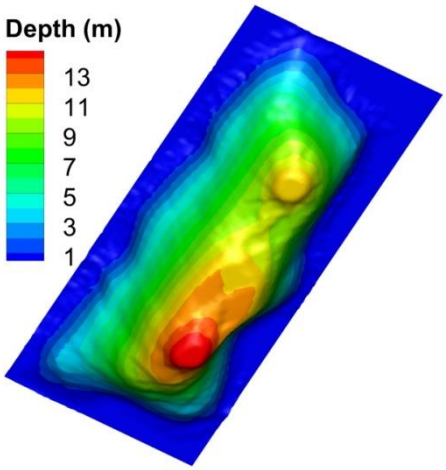

Fig. FO-1. Bathymetry of Siders Pond constructed from contour plot (Caraco 1986) and used for modeling (See GoverningEquations.pdf). Maximum depth: 15 m

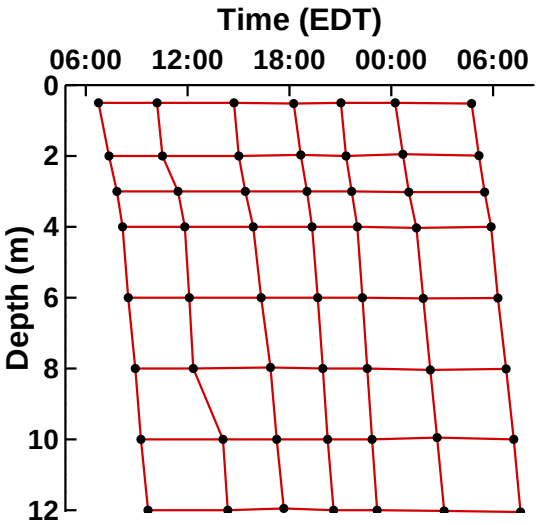

Fig. FO-2. Resulting 2D sample grid from Siders Pond sampling on 25-26 Jun 2015.

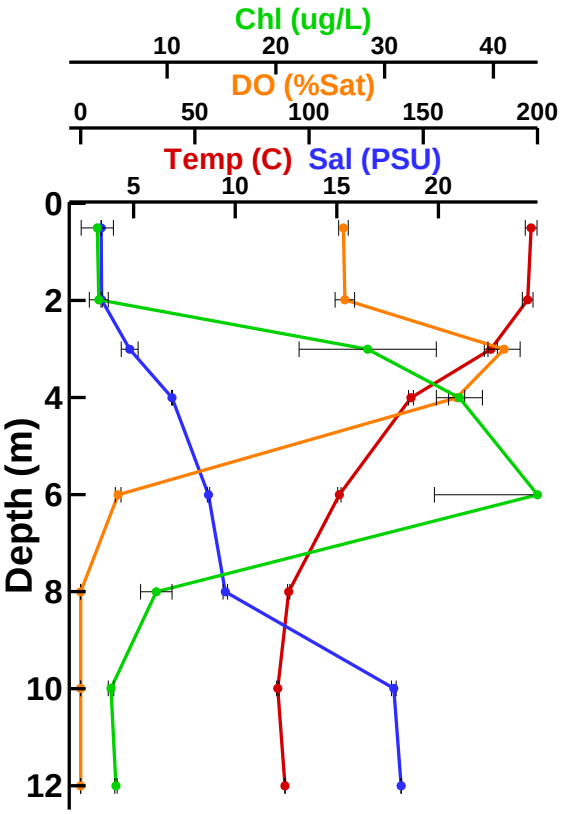

Fig. FO-3. Depth profiles of in-vivo Chl a fluorescence, dissolved oxygen, temperature and salinity from all Hydrolab casts with associated standard deviation between casts.

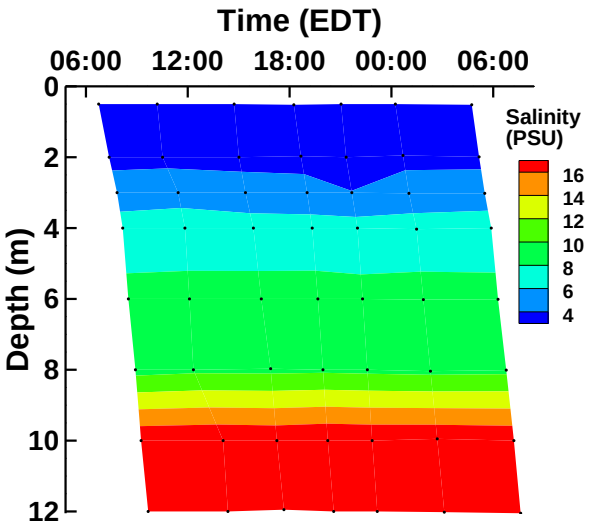

Fig. FO-4. Salinity over sample period from Hydrolab.

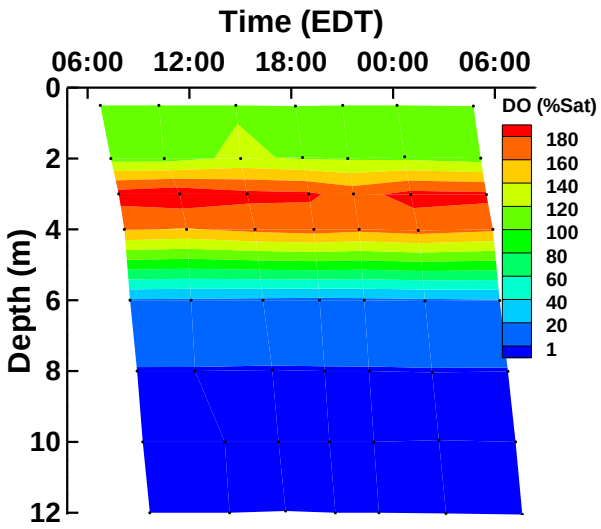

Fig FO-5. Dissolved oxygen (%) from Hydrolab.

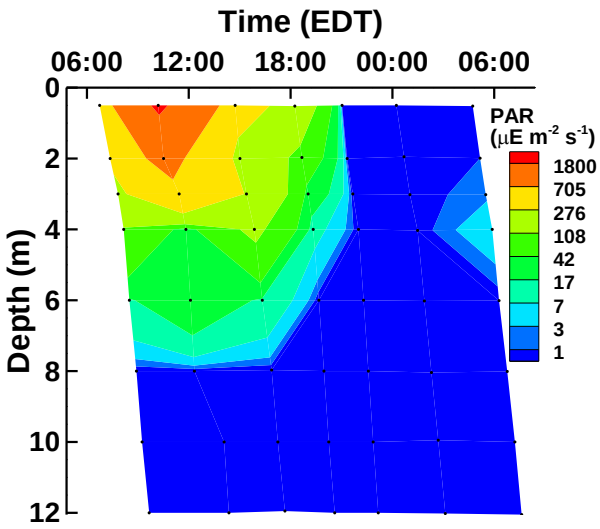

Fig. FO-6. 2D version of photosynthetic active radiation (PAR) measured by Hydrolab during samples collection. The morning of 26 Jun 2015 was overcast resulting in lower PAR at sunrise.

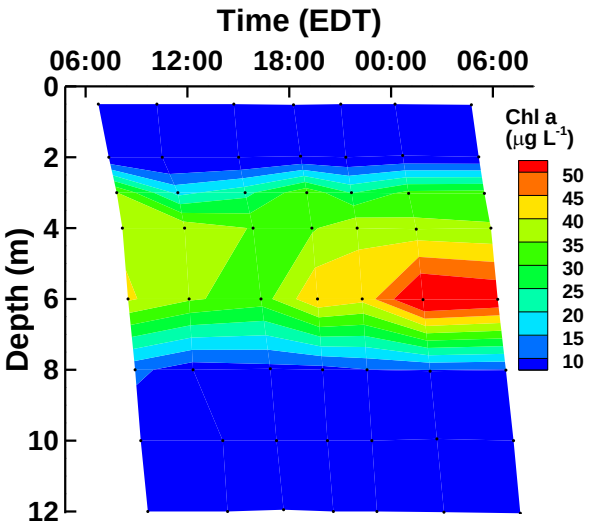

Fig. FO-7. In situ Chl a fluorescence from Hydrolab.

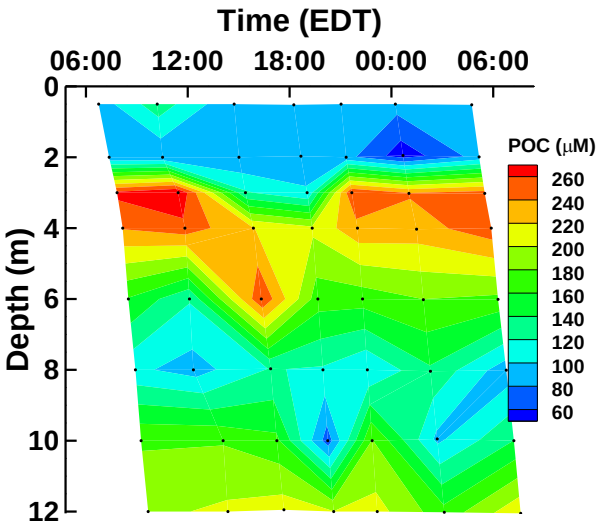

Fig. FO-8. Particulate organic carbon (POC). Highest values between 3-4 m correspond to maximum in dissolved oxygen and Chl a in situ fluorescence.

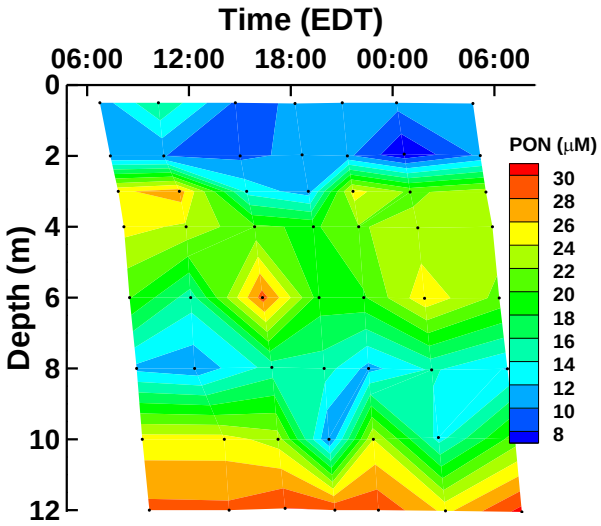

Fig. FO-9. Particulate organic nitrogen (PON)

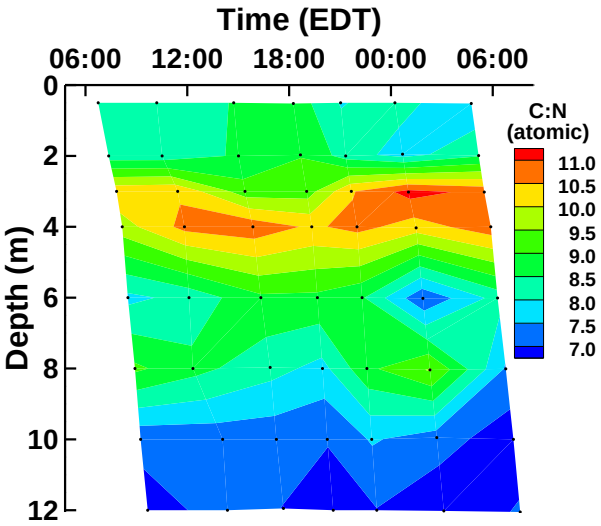

Fig. FO-10. Caron to nitrogen ratio calculated from POC and PON.

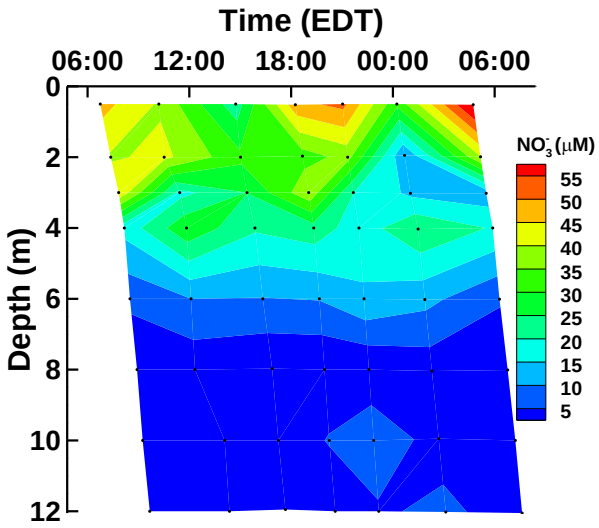

Fig. FO-11. Nitrate concentration from sample analysis.

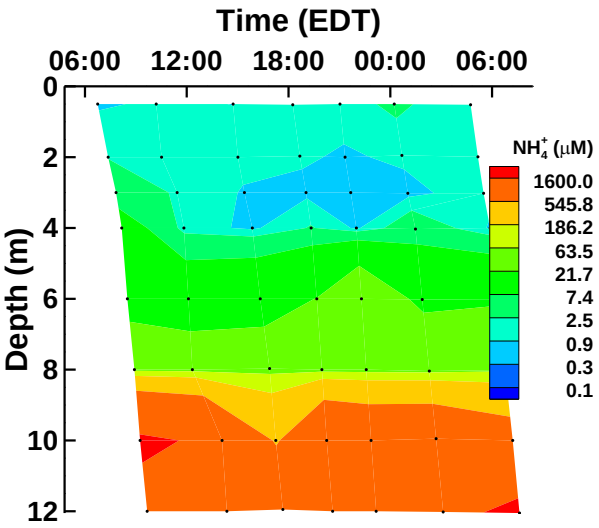

Fig. FO-12. Ammonium concentration.

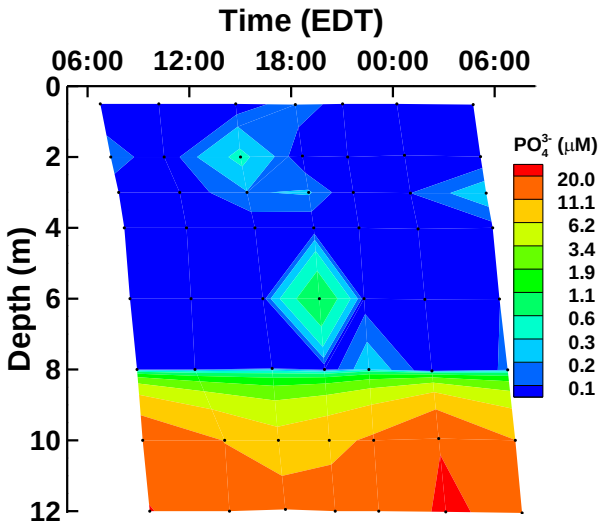

Fig. FO-13. Inorganic phosphate concentration, which is similar to ammonium with vary high values in the anaerobic zone of Sides Pond.

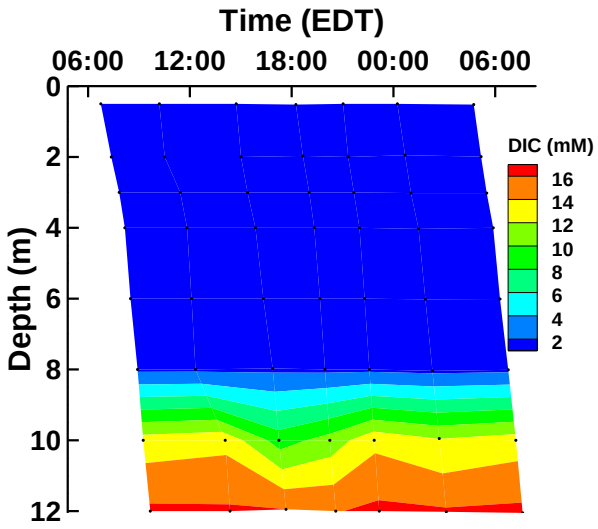

Fig. FO-14. Dissolved inorganic carbon (DIC).

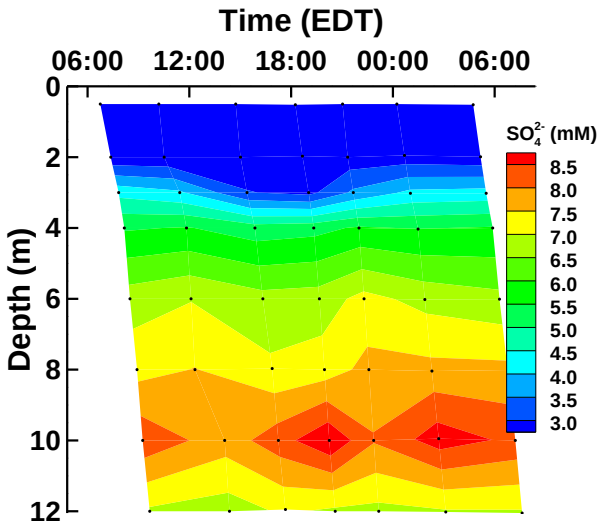

Fig. FO-15. Sulfate concentration.

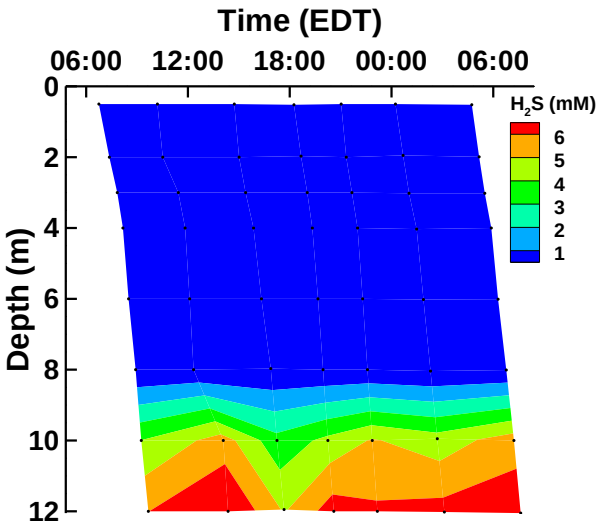

Fig. FO-16. Hydrogen sulfide concentration.

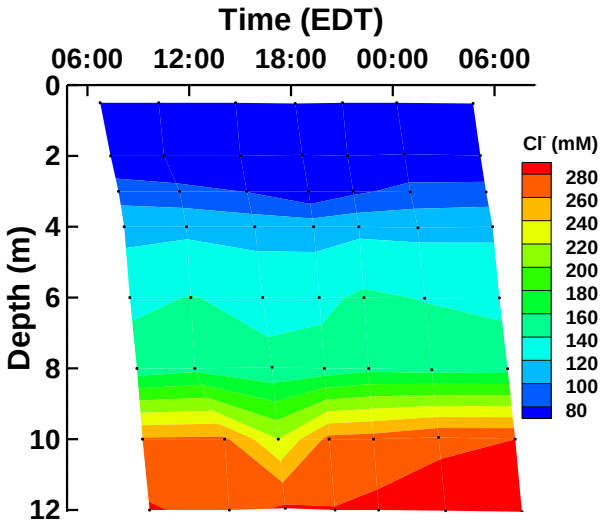

Fig. FO-17. Chloride ion concentration.

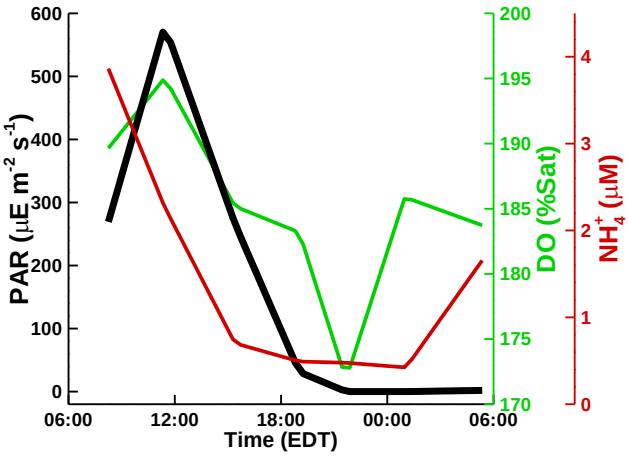

Fig. FO-18. Diel cycle in dissolved oxygen and ammonium concentrations at 3 m depth.

References

Caraco, N. 1986. Phosphorus, iron, and carbon cycling in a salt stratified coastal pond. Boston University, Boston.