Aug 3rd, 9:00 AM - 12:00 PM

Biogeochemical investigation of Soda Lake

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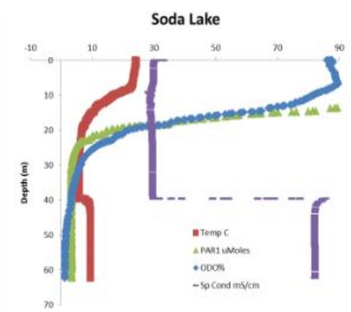
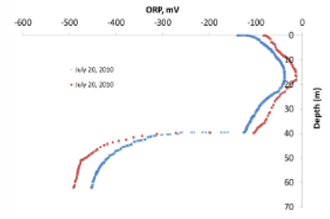
ABSTRACT Big Soda Lake, Nevada, is a terminal, volcanic crater lake whose water level is maintained exclusively by groundwater. The crater is composed of volcanic, basaltic sand and the lake is ~60 m deep (Rush, 1972). The lake is meromictic with a distinct chemocline (Kimmel et al. 1978). The chemocline currently rests at ~40 m and is reflected in both specific conductivity and salinity measurements. Below the chemocline a redox gradient develops with highly reducing conditions. The pH is consistent throughout the depth of the lake at ~9.5, proving that it is alkaline in nature. It is further stratified by both a thermocline and oxycline. The existing conditions at Big Soda Lake make it the perfect setting for studying a diverse array of microbial activities and their interactions within a varying geochemical regime. Our goal was to perform an observational survey of Soda Lake to infer the inherent biogeochemical processes.

RESULTS - PHYSICAL

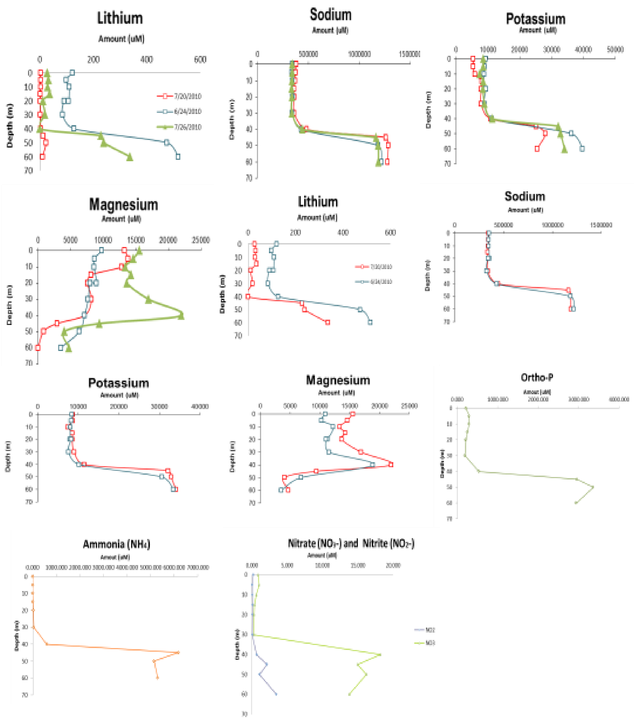


The data collected by YSI displays how temperature, light, dissolved oxygen and specific conductive strong stratification.

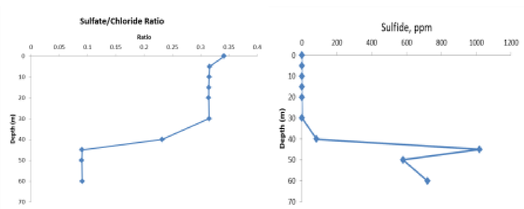


Coincident with the distinct chemocline at 40 m there is a dramatic increase in reducing potential.

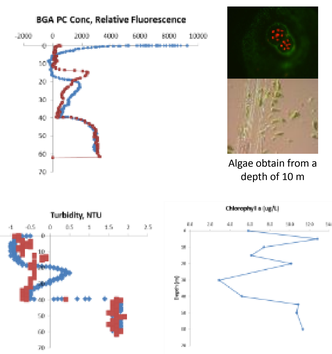
RESULTS - CHEMICAL AND NUTRIENT



There is a rapid increase at the monimolimnion of cations, anions and nutrients. And reduced compounds ammonia, sulfides and nitrite.

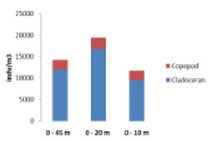


RESULTS - BIOLOGICAL

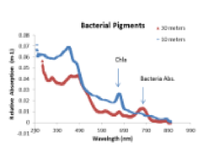


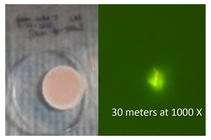
Algae obtain from a depth of 10 m

The upper region of the mixolimnion is dominated photoautotrophs and chemoorganoheterotrophs. The chlorophyll a, obtained by fluorometry, shows two peaks; one at 5 m and another at 20 m. BGA concentrations (relative fluorescence) peaks around 20 to 25 m. This is consistent with turbidity that shows a spike at 25 m.



The Zooplankton population is comprised of copepods and cladocerans. Cladocerans represent 81% of the population. Previous work shows that the cladoceran *Moina hutchinsoni* is most abundant in summer and the copepod *Diaptomus sicilisis* most abundant in spring (Cloern et al. 1983).





At 30 m we found evidence of purple non sulfur bacteria (likely Rhodospirillum).

SUMMARY In the stratification of Big Soda Lake there are varying biogeochemical processes. Within the numerous gradients there is a diverse array of microbial activities that likely follow the Winogradsky column model. Big Soda Lake provides an excellent opportunity to study this model in an active environmental system. Having a real environmental system to work with can raise unexpected questions such as; why does the cation and anion data show differences in some of the conservative parameters on a temporal scale? It also gives us the opportunity to investigate the system in greater detail. The oxic-anoxic interface and chemocline have fluctuating biochemical processes. Identification of the alkalophilic, halotolerant methanogenes and alkalophilic sulfate-reducing bacteria and their mechanisms would be well worth while to investigate.

LITERATURE CITED

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ACKNOWLEDGMENTS

We would like to give special thanks to Nevada NASA Space Grant Consortium, Desert Research Institute, Washoe County School District and Alfonso F. Davila. This work was supported by NASA Cooperative Agreement/Grant number NNG05G587H.

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