GORDON AND BETTY MOORE FOUNDATION

**Team Karl Highlight**

# Annual net community production in the North Pacific Subtropical Gyre from *in situ* $O_2$/Ar measurements

Submitted by: Sara Ferrón, Matthew Church and David M. Karl

In the euphotic zone of the oceans, net community production (NCP) is the balance between photosynthesis and microbial respiration. It is a critical term in the oceanic carbon cycle as it influences the amount of atmospheric carbon dioxide that can be trapped by the surface ocean and exported to the deep sea. NCP occurs when photosynthesis is larger than microbial community respiration, that is, when the euphotic zone is net autotrophic and on an annual basis, NCP is believed to equal the organic matter flux that escapes the upper ocean. Calculating NCP in situ over an annual cycle is difficult to achieve due to the logistical constraints and therefore little is known about the controlling mechanisms, the relationship to other productivity measurements ($^{14}$C assimilation, particle flux), and long-term interannual variability.

Since November 2013, near-monthly samples for $O_2$/Ar analysis have been collected in the mixed layer at the Hawaii Ocean Time-series monitoring station (Station ALOHA), in the oligotrophic North Pacific Subtropical Gyre, to determine NCP. Surface seawater samples are collected throughout a 24-hour period, to account for short-term changes in $O_2$/Ar. The mixed layer $O_2$/Ar values to date were in all cases above atmospheric equilibrium, indicating net autotrophy at Station ALOHA throughout the year, even during the winter months (Figure). The results show significant seasonal variability, with highest saturation values in the summer and fall, due to higher primary production during these months. These values will be used to quantify NCP over an annual cycle and will be compared to the physical, biochemical and microbial data collected as part of the HOT program, to understand the controls on NCP at this oligotrophic site.

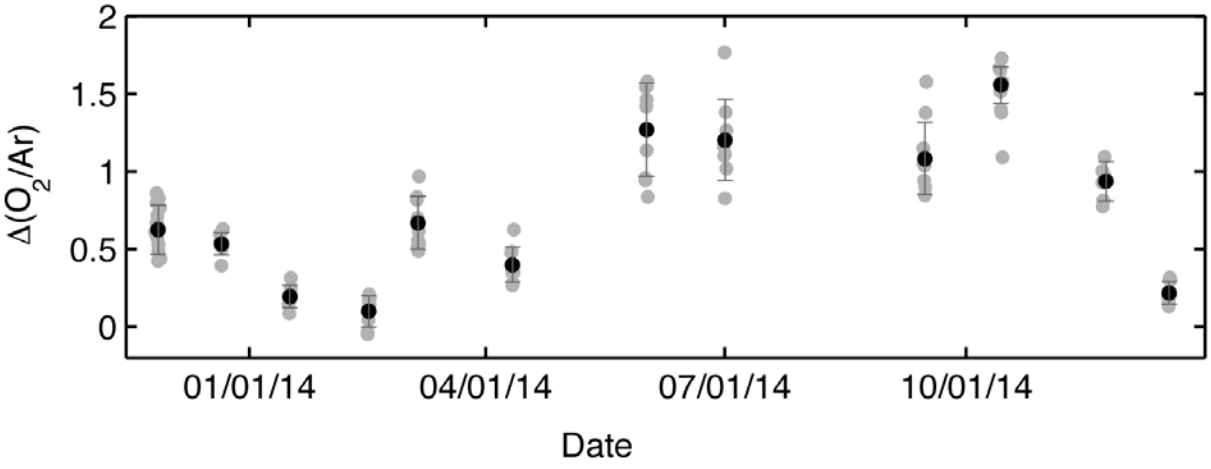


Figure. Evolution of the $O_2$/Ar anomaly, $\Delta(O_2/Ar)$ (%) at Station ALOHA with time. Gray dots represent the individual measurements over 24-h cycles, and black circles are the average of the individual samples. The error bars are the standard deviation for each dailiy cycle.