Measuring the Ocean's Biological Carbon Pump Using Oxygen Data from Profiling Floats

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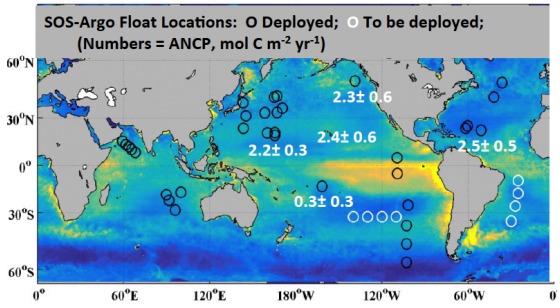

Biological carbon export from the upper ocean (the biological carbon pump or Annual Net Community Production, ANCP) helps maintain the levels of atmospheric pCO_2 and the oxygen concentration in the deeper ocean. The amount and geographic distribution of biological carbon export is presently estimated from models of satellite remote sensing and by ocean global circulation models. Verifying model results with observations in a variety of ocean areas is now possible using upper ocean oxygen mass balance, since we have learned how to calibrate oxygen sensors on profiling floats against atmospheric pO_2. We have deployed Argo floats capable of accurate oxygen measurements in ocean areas indicated in the figure. ANCP calculated from floats, which have at least one year of data (see the figure), indicate net carbon export is relatively uniform at a value of 2.0 - 2.5 mol C m^{-2} yr^{-1}. The latitudinal variability suggested by global models is not observed so far except by one float in the subtropical South Pacific Ocean. Soon there will be enough year-long data in different ocean areas to be confident in the experimentally-determined global distribution.