# Oxygen in the OMZ: *In situ* measurement and biological transformations

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The oxygen concentration is one of the most relevant parameters to be measured in Oxygen Minimum Zones (OMZs). OMZs are defined by having water masses at intermediate depths containing less than 20 $\mu$M $O_2$. Until recently, it was not possible to determine whether OMZs contain 1-2 $\mu$M $O_2$ or are totally anoxic. The introduction of the STOX (Switchable Trace Oxygen) sensor improved the in situ detection limit by 2-3 orders of magnitude, so that concentrations down to about 3-10 nM can be detected and quantified. While being attached to conventional CTDs, the STOX sensors have been used to define the core of the OMZs, where the oxygen concentration goes sufficiently low to be considered functionally anoxic (below 20 nM). Drift on the zero signal from standard $O_2$ sensors mounted on CTDs can to some extent be corrected with STOX data, so that concentrations down to 50-100 nM can be detected.

In vast areas of the upper and lower OMZ oxycline, $O_2$ is present at concentrations below 1$\mu$M. At such low values, the $O_2$ concentration is controlling both the types of microbial processes taking place and the transformation rates. The STOX sensors and - more recently developed - high sensitivity optrodes can be used for the measurements of $O_2$ during laboratory incubations. The time evolution of $O_2$ concentration during lab incubations was used to study the respiration kinetics and rates of the poorly studied oxyclines of the OMZ. The upper part of the OMZ may exhibit a secondary chlorophyll peak. Our high resolution measurements of $O_2$ metabolism in the secondary chlorophyll peak have demonstrated how this community is photosynthetically active under almost anoxic conditions with a tight coupling between the $O_2$ production and consumption, resulting in a cryptic $O_2$ cycle in the upper part of the OMZ.