Goldschmidt 2024 Abstract
https://doi.org/10.46247/gold2024.23733

The impacts of climate drivers on biogeochemical cycles in oxygen deficient zones

ANNIE BOURBONNAIS[1], CLAUDIA FREY[2], SHEA WYATT[3], CAROLINE P. SLOMP[4], KAREN LYNN CASCIOTTI[5], CHRISTINA M. RICHARDSON[6], ADINA PAYTAN[7], TINA SANDERS[8], DIANA VARELA[3] AND VANESSA HATJE[9,10]

[1]University of South Carolina
[2]University of Basel
[3]University of Victoria
[4]Radboud University
[5]Stanford University
[6]University of California Santa Cruz
[7]University of California, Santa Cruz
[8]Helmholtz-Zentrum Hereon
[9]CIENAM, Dept de Química Analítica, UFBA
[10]IAEA

Presenting Author: abourbonnais@seoe.sc.edu

Oxygen minimum zones (OMZs), areas of the ocean where oxygen consumption exceeds supply, can be economically and ecologically impactful. OMZs often develop in association with the eastern boundary upwelling systems in the Pacific and Atlantic Oceans where nutrient inputs and productivity are high and circulation is slow. The largest OMZs are in the Pacific Ocean, where waters tend to be older and have accumulated the products of respiration. Other major OMZs are located in the Arabian Sea and the Bay of Bengal. OMZs can also be found in coastal zones, such as the Black and Baltic Seas. Climate change has both direct and indirect effects on the oxygen content of seawater that are contributing to deoxygenation in global ocean basins. Deoxygenation owing to climate change and ongoing anthropogenic stressors will in turn impact marine biogeochemical cycles (i.e., nitrogen, phosphorus and silicon). In this review, we discuss the impacts of climate change on OMZs in eastern boundary upwelling systems in the Pacific and Atlantic Oceans. Additionally, climatic impacts on coastal dead zones are also discussed. These areas of low oxygen can be permanent (e.g., the Black Sea and the Baltic Sea) or seasonally developed (e.g., the Gulf of Mexico and restricted fjord and basins). Climate impact drivers expected to affect marine OMZs and associated nutrient cycles include changes in wind speed and global warming. These climate impact-drivers will result in OMZ-relevant changes in marine processes, such as increased sea surface temperatures, which reduces gas solubility and increases stratification and respiration, as well as circulation-driven changes, which increase upwelling intensity, with positive feedback on greenhouse gas production and atmospheric emissions. As a result, OMZs have increased in size and are expected to expand further and develop in new marine areas, with socio-economic and ecological consequences.