



Nitrite dynamics and associated feedback processes in the Benguela oxygen minimum zone

Thulwaneng Mashifane, Howard Waldron, and Marcello Vichi

Department of Oceanography, University of Cape Town, Cape Town, South Africa (thulwaneng@gmail.com)

Understanding nitrite dynamics in the Benguela oxygen minimum zone (OMZ) is a challenge as it represents an intermediary nitrogen species with a short turnover time. Nitrite is also reduced to nitrogen in some OMZs, preventing its accumulation. This creates difficulties in detecting nitrite with colorimetric methods as concentrations occur below the detection limit in some regions. Nitrite concentrations are key to understanding dominant nitrogen loss mechanisms through modeling studies in the Benguela OMZ. The coupled physical–biogeochemical model for eastern boundary upwelling systems (BioEBUS) using the Southern Africa experiment (SAfE) nested configuration is applied in the Benguela to study nitrite dynamics. Model results show nitrite maxima associated with the Angola–Benguela front region. The maxima are linked to poleward nutrient rich, oxygen–depleted south Atlantic central water (SACW) from the Angola gyre which favour denitrification on the shelf during summer to autumn. Ventilation of the shelf during winter to spring by the equatorward well–aerated eastern south Atlantic central water (ESACW) results in depleted nitrite concentrations. In addition to local circulation, Hovmuller analyses suggest that both primary and secondary nitrite maxima are driven by shelf biogeochemical processes and offshore advection. Vertical depth profiles show nitrite maxima at 17°S and depletion at 23°S attributed to denitrification and anammox, respectively. Model results suggest nitrogen in the Benguela OMZ is lost to anammox, denitrification and offshore advection, with denitrification as the dominant loss mechanism rather than anammox as previously documented. These results are key to understanding feedback processes from nitrogen loss in the Benguela OMZ and its impact on related biogeochemical cycles.