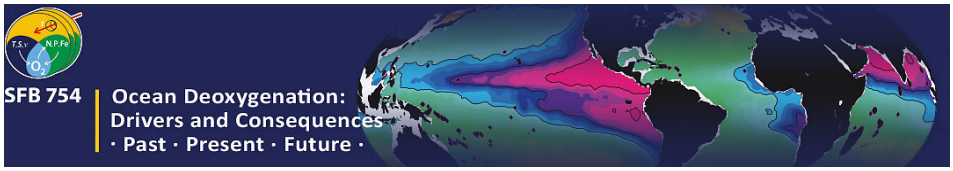

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A 12-years transient tracer time series to detect changes in ventilation in the Eastern Tropical North Atlantic Oxygen Minimum Zone

Significant decadal variability in ventilation has been documented from a time series of nine hydrographic surveys with transient tracer measurements in the Eastern Tropical North Atlantic Oxygen Minimum Zone (ETNA-OMZ) between 2006 and 2018. The changes in ventilation were identified by using transient tracer (CFC-12 and SF6) measurements and the mean age was calculated by using the Transit Time Distribution (TTD) method with standard parameterization.
The changes of the tracer concentrations were calculated on density surfaces in the OMZ core at ⊠⊠=27.0 kg m-3 as well as above and below at 26.8 and 27.2 respectively. The survey area was separated into four sub-areas (NE, NW, SE and SW) and each sub-area into 5 by 5 fields for statistical purpose to resolve the changes in a spatial perspective. Furthermore, the data was separated into specific salinity ranges to track the relation of the two main water masses in this density range.
The tracer distribution on density surfaces shows an overall trend of increasing tracer concentration throughout the water column over time. However, the concentration increase is non-monotonic and shows clear temporal variability on all density surfaces. The highest spatial variability is shown in the OMZ core with a clear north-south and west-east gradient from high to low concentrations. The mean age, on the other hand, appears to be relatively constant over time except for the last three years where the water masses got younger with most significant changes in the NW area on all density surfaces. The spatial variability shows a general trend of increasing ages from north to south and west to east. The water mass perspective by salinity ranges shows a more steady change in ventilation with less decadal variability. The increase in ventilation and thus the decrease in mean age is also most prominent for the Eastern North Atlantic Central Water (ENACW).
The oxygen distribution however is decoupled from the mean age distribution. A decrease in ventilation is not necessarily manifested as a decrease in the oxygen, and vice versa. The oxygen budget is thus not only related to the changes in ventilation. The variability in oxygen consumption within the OMZ or the oxygen utilization rates along the flow pathway modulates the oxygen budget independent of ventilation.

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