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Time scales of oxygen variability in the eastern tropical North Atlantic

Johannes Hahn, Peter Brandt, Johannes Karstensen, and Arne Körtzinger
GEOMAR Helmholtz Centre for Ocean Research Kiel, Kiel, Germany (jhahn@geomar.de)

The local oxygen concentration in the ocean is driven by various physical, biogeochemical and biological processes. The bulk effect of these processes is a certain oxygen supply and consumption which are not in strict equilibrium, thus causing local oxygen variability. Using multiyear oxygen records from moorings and ship surveys that cover the upper 800 m of the eastern tropical North Atlantic, the regional oxygen variability between the equator and 20°N is characterized.
Frequency and trend analyses reveal oxygen variability on intraseasonal to decadal time scales. However, also pronounced episodic variability is detected visually.
Between about 10°N to 20°N episodic low oxygen events occur associated with mesoscale eddies and baroclinic Rossby waves. Below about 500 m at the horizontal core position of the eastern boundary oxygen minimum zone, we observe weak intraseasonal variability but a well-defined seasonal cycle. The seasonal cycle calculated at the fixed depths of the moored instruments is mainly driven by horizontal transport variability along isopycnal surfaces, with vertical excursions of isopycnals representing only a minor contribution. A progressive vector analysis shows that a horizontal displacement of the mean oxygen field plays a substantial role in driving the seasonal variability at depth.
Decadal oxygen change in the oxygen minimum zone shows a well-defined oxygen decrease/increase above/below 400 m as been captured by repeat shipboard observations. Moored observations are ideal means to study processes and associated oxygen variability on intraseasonal to interannual time scales. Real-time oxygen data access has been recently implemented at selected mooring sites of the PIRARA T-Flex buoy network.