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Interactive comment on "Decadal oxygen change in the eastern tropical North Atlantic" *by* Johannes Hahn et al.

Anonymous Referee #1

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Review of the manuscript os-2016-102 Decadal oxygen change in the eastern tropical North Atlantic Johanes Hahn et al.

The manuscript present an study on decadal variability of Eastern North Tropical Atlantic (ETNA) Oxygen Minimum Zone (OMZ) from in situ measurement (including mooring and repeated shipboard section). The authors show decadal negative trend of dissolved oxygen (DO) within the upper OMZ (200-400 m), while increase of DO is shown within lower OMZ layer (400-1000 m). This is attributed to a southward shift of the wind-driven zonal circulation in the North Tropical Atlantic, which supplies the ETNA in oxygen enriched water including South Atlantic subtropical Waters. Isopycnal salinity/spiciness is also used as proxy to infer DO concentration variability (negative correlation in the ETNA) in the broader context of the upper South and Tropical Atlantic circulation.

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The manuscript presents an interesting multi-sensor approach to document the variability of last decade of the ETNA OMZ. This is a valuable contribution to better understand the complex variability and dynamics of the DO in this region, which as been intensively investigate since ten years by this group. However, the manuscript is a little bit too long and lack of concision. Some Figures are poor and not easy to read (that make them not convincing). Also some supplementary analyses could be valuable to strengthen the results (oxygen and salinity transports).

Suggestion of the reviewer: moderate revision.

Comments/Questions:

l.108: typo : 'Theta-S'

l.217: The advection which is the key mechanism is estimated as residual. Is it possible (why if not) to make an estimate of such a term from data at hand? (see comment below)

Section 3.2: This section could be more effective if restructured : The observations of interannual variability and decadal trend need to be first introduce (Fig3-4-5-8-9), then mechanism of passive advection and correlation with spiciness should be discussed (Fig. 6-7-10-11).

l.296-298: The DO increase of the lower layer may be barely significant. Figures 3 and 4 does not show such a tendency.

Fig.3-5: is it possible to group this figures to allow an better overview of the ship and mooring data set at hand. Also, please improve this figure to make them more readable (plot the time series in row panels for example to elongate them and improve the readability). Why it is it the mean isopycnal that is represented on the right panels and not the full isopycnal depth time series? Also, It seems that the seasonal to interannual variability may be important : discontinuity between mooring measurements and shipboard sections are questionable. Please better comment this point.

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l. 308-309: Maybe introduce that the ventilation process by passive tracer circulation appear to be a significant mechanism in the lower layer of OMZ. However, I would first introduce the Fig. 8 and 9 before trying to correlate between S and DO. Indeed, it seems that the link between spiciness and DO less robust, than the observed trends of both S and DO (Fig. 7 and 10), and need to be discussed in the larger context of the STC along with the Fig. 11.

Fig. 8-9: Try to group these figures

Section 3.3:

l.372-380: This is a striking results of the paper. It would be more convincing if DO and S transport were calculated. Also divergence of these transports between 23°W and African coast (if a good assumption) could help to estimate the variability of zonal advection of DO and S ?

l.381-402: What is the driver of such meridionnal shift of the surface currents ? (wind curl?)

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