

Interactive comment on “The Mediterranean Outflow in the Strait of Gibraltar and its connection with upstream conditions in the Alborán Sea” by Jesús García-Lafuente et al.

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Interactive comment on “The Mediterranean Outflow in the Strait of Gibraltar and its connection with upstream conditions in the Alborán Sea” by Jesús García-Lafuente et al. Anonymous Referee #1 Received and published: 19 January 2017 General comments: The main goal of this paper is the study of the possible connection between the composition of the Mediterranean outflow and the strength of the Gyre in the western Alborán Sea. The authors’ hypothesis is that the stronger presence in the outflow either of the Western Mediterranean Deep Water or of the Levantine Intermediate Water is, respectively, correlated with a stronger or a weaker gyre. To detect the presence of the water masses and their fluctuations, they used two sets of in situ data, a shorter set

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(about 3 months) obtained with moored lines in the Camarinal Sill channels, and a historical long-term (almost 10 years long) dataset obtained at Espartel Sill. To estimate the strength of the gyre, sea level anomaly data were used. In general, the text is clear and is well complemented by the figures. As the subject of the Mediterranean outflow composition and respective time variability is still not completely solved, all the contributions helping to have a better perception of this subject, especially those grounded on in situ data, are quite valuable and worth to be published, as happens with the present results, after some minor corrections.

Thank you for your opinion and the points raised in your review, which we address below.

Specific comments - There is evidence of seasonal variability in the Mediterranean outflow outside of Gibraltar, namely in the Gulf of Cadiz, as reported in previous published work. Could any link be established between the process identified in the present work and the seasonal fluctuations of the outflow farther downstream? Please comment on that.

Yes. There is. Recently, Bellanco et al., (2016) found a seasonal signal in the Gulf of Cádiz consisting of a cooler, saltier and denser MOW (Mediterranean Outflow Water) flowing in winter (March), which seems to coincide with the salinity signal in May-June showed previously in Fusco et al., (2008); authors attribute the signal to the maximum outflow, which occurs around this period (Sammartino, et al., 2015) and also to the less stratified Eastern North Atlantic Central Water (ENACW) overlying the Mediterranean Outflow Water (MOW). Both facts together result in an enhancement of the salt injection that finally originates the winter salinification of the MOW residing below 250m in the Gulf of Cádiz (Bellanco et al., 2016). Regarding the second part of your remark, the signal analyzed in this manuscript brings interannual variability to the MOW, whether or not these signals have an effect downstream in the Gulf of Cádiz. Strictly speaking, the answer to your point should be no in the sense that it is not possible to get an unquestionable conclusion about the suggested link with the data at hands. However,

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the question remains open and deserving further study (which would imply a synoptic experiment like the one presented here but adding some moorings in the MOW path in the Gulf of Cádiz), so that in the new version we have made a short mention to this possible link in the Introduction, citing the abovementioned authors (lines 10-11, pag.3) and, again, in the Discussion (lines 27-32, pag.14) a bit more extensively.

- What is the relative importance for the Mediterranean Outflow composition of the Alborán Gyre influence as compared to the influence of the annual process of the Western Mediterranean Deep Water formation (e.g., Garcia-Lafuente et al., 2007)?

Certainly, besides the proposed influence of the Western Alborán Gyre strength there are other processes leaving a signal in the outflow water, one of them is the mentioned in García-Lafuente et al., (2007) as you commented. We had already made a discussion on the issue in page 15 (lines 7-13) and also in the Introduction (page 3, lines 24-30).

– Page 10, lines 20 – 23: clarify the paragraph starting with “These fluctuations . . .” (too many options in brackets). Perhaps a clearer version could be: These fluctuations are explained in terms of local enhanced (reduced) mixing with the overlying NACW and, to a lesser extent, with higher (lower) WMDW aspiration driven by the enhanced (reduced) tidal currents over the sill in spring (neap) tides.

Ok, we have now changed the paragraph as recommended, thanks for your suggestion.

Technical corrections Page 1, line 25: that include years Page 1, line 25: Vargas-Yáñez et al., Page 2, line 8: García-Lafuente et al., Page 3, line 5: with regard to CSN Page 3, line 11: Sammartino et al. (2015) Page 3, line 12: has been analysed Page 5, line 12: with regard to CS Page 6, line 12: Wesson and Gregg, 1994 Page 9, line 2: should specify which interface Page 11, line 11: of July and of August Page 11, line 32: inducing changes in X ESP Page 12, line 5: changes in ESP with regard to Page 12, line 8: by the temperature difference Page 12, line 23: The opposite would happen or actually happens? Page 12, line 25: lagged correlation (R) Page 13, line 7: Lagged

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correlation (R) Page 14, line 7: mean difference in SLA Page 14, line 9: with regard to CSS Page 14, line 10: which precludes drawing Page 14, line 12: the expected weaker Page 14, line 20: proxy with a 6-day lag Page 14, line 21: with regard to this piece Page 15, line 3: which uplift Page 16, line 9: properties at ESP, Page 16, line 17 3xstd(SCSS)= Page 17, line 10: Eq. (1), (A.1) and (A.2) Page 17, Figure A1: should be NACW instead of NAC Page 18, line 9: with regard to S* Page 18, Figure A2: in the temperature and salinity axes: Temperature (Salinity) at ESP.

All technical corrections were modified in the text, thanks for the detailed revision and the suggestions.

Please find in the supplement file the formatted document of these comments and the new version of the manuscript with corrections highlighted.

Please also note the supplement to this comment:

<http://www.ocean-sci-discuss.net/os-2016-90/os-2016-90-AC1-supplement.pdf>

Interactive comment on Ocean Sci. Discuss., doi:10.5194/os-2016-90, 2016.

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