Ocean Sci. Discuss.,
https://doi.org/10.5194/os-2019-8-RC1, 2019
© Author(s) 2019. This work is distributed under
the Creative Commons Attribution 4.0 License.

Interactive comment on "Seasonal variability of intermediate water masses in the Gulf of Cadiz: implications of the Antarctic and Subarctic seesaw model" *by* David Roque et al.

Anonymous Referee #1

Received and published: 12 May 2019

General comments The main goal of this paper is to explain and relate the seasonal variations of the presence of Antarctic and Subarctic intermediate water masses in the Gulf of Cadiz and adjacent Atlantic region and their implications on the morphology and sedimentation along the local continental slopes. The gathering of a large set of observational data in the region complemented by climatological fields from the World Oceanographic Atlas allowed an analysis of the seasonal variability of intermediate water masses relevant in the region. As the authors are convinced that the results might contribute to a better understanding of the role, in the geological past, played by those intermediate water masses, the present results are worth to be published, after some corrections. In general, the text is clearly written and most of the figures

complement it.

Specific comments Page 1, Title: "Antarctic and Subarctic seesaw model". The reference to a "seesaw model" in the title but nowhere else in the text should be avoided. Page 1, Abstract: The sentence "the seasonal variability for the predominance of these intermediate water masses is explained by a novel model based on the concatenation of several wind-driven processes acting during the different seasons", overrates somehow the importance of the methodology used in this work. Page 2, lines 28, 29: Since MW is characterized by low nutrients, its interaction with AAIW, (characterized by high nutrients) can only cause an increment on the MW nutrients (and not the other way around as expressed in the manuscript). In what concerns the dissolved oxygen, as both AAIW and MW have low concentrations, it is not clear how can their interaction increment the AAIW concentration. Page 7, line 1: in fact, the AAIW penetration in the GoC seems "more accentuated and closer to the African coast" in autumn if we look at the salinity distribution; however, from the oxygen distribution this seems to happen in summer. Page 7, line 3: It is not clear that the monthly distributions shown by the WOA data always agree with the observed data behaviour Page 7, line 7: Although the oxygen concentration shows the major entrance of the AAIW close to the African coast occurring in November, this is not clear from the salinity distributions. Page 7, line 8: "…restricted during the spring months". In fact, this is shown only in March by the salinity distribution and only in April by the oxygen distribution. Page 7, lines 16, 17: the salinity and temperature sections are not discussed in the text but only the oxygen distribution. Page 7, lines 24-26: The SAIW shows its lowest percentages (less than 10%) in boxes closer to the Iberian coast (from E to I) during autumn, while the highest values are found in winter in these boxes. The ENACW in the closer to coast boxes (G, H) shows its highest values in spring and summer… Page 9, lines 24, 25: looking at Fig. 11, the referred latitude values, 50° and 30°N, could perhaps be substituted by 48° and 36°? Page 11: this is the only page in the text where NAO is referred as a cause for the N Atlantic gyre' displacements. The rest of the text mentions only seasonal variations of the gyres position. Attention should be made to the fact that NAO is not a seasonal process and so NAO and seasonal effects should not be confused. Page 32: Figure 12 seems to be considered by the authors a good illustration of the processes referred in the text. It shows the seasonal (summer versus winter) displacement of the North Atlantic gyres and the paths of water masses (not all relevant in the text) but there are other depicted processes, like “upwellings”, ITCZ displacement (July versus January), which are not even mentioned in the text. I wonder how relevant and helpful this figure is in the present context.

Technical corrections Page 1 and following: in the general oceanography literature, the water mass found in the North Atlantic and originating in the Mediterranean basin is called Mediterranean Water (MW) and not Mediterranean Outflow Water (MOW). In the present manuscript, the acronym MOW is used in the whole text but is MW that appears in the figures (1, 5, 6, 7, 8, and 9). Page 2, line 16: Michael and McCartney 1992 Page 2, line 17: Brogueira (use only the surname) and Gonçalves 2002 Page 2, lines 19, 29: van Aken (use only the surname) Page 2, line 23: define what is meant by “upper MOW core” Page 2, line 24: Bellanco and Sánchez-Leal (use only the surnames) Page 2, line 25: westward (?) branch Page 3, lines 4, 5, 6: (use only the surnames) Page 4, line 15: linear equations Page 6, line 19: best characterizes Page 7, line 5: those maps Page 7, line 14: “was already reported (Tsuchiya…)” Page 7, line 23: Only boxes G (the closest…) and C (the farthest…) show always AAIW percentages… Page 7, line 27: On one hand… Page 7, line 31: zonal section at a latitude… Page 8, line 1: water mass has been Page 8, line 4: percentages of AAIW for… Page 8, line 21: ENACW Page 8, line 23: interpretation of these results Page 9, lines 5 and 6: ïĄšin the symbols for density and Coriolis parameter, the index o should be written in lower case Page 9, line 8: Figures 10 and 11 show, respectively, … and the Ekman pumping… Page 9, line 16: 35.5°N Page 9, line 23: … the zone where convergence (negative Ekman pumping) is more important within the subtropical gyre… Page 9, line 27: a displaced towards the south gyre… Page 9, line 28: divergence (positive Ekman pumping) … Page 10, line 8: decrease significantly Page 10, line 31: resolution of 1° Page 11, lines 1, 2: Velez-Belchi et al., 2017 Page 11, line 5: why referring to Fig. 12 when “NAO and

other atmospheric regimes” are mentioned in the text? In Fig. 12 only summer and winter positions of the gyres are represented. Page 11, line 16: from high latitudes and low latitudes? Both AAIW and SAIW come from high latitudes. Page 11, line30, 31: Ekman pumping within the GoC and in the zone of the subtropical gyre closest to GoC Page 12, line 18: margins have not… Page 13, lines 8 and 34: Stow et al., 2013 (not 2013b) Page 13, line 19: Muratli et al. 2009? or 2010 (as in the References)?; Jung et al., 2011? or 2010 (as in the References)? Page 13, line 20: among others Page 13, line 22: 1270 m Page 13, line 25: significantly warmer Page 14, line 13: why reference to Fig. 12 for the minimum intensity in autumn? Page 18, line 1: sédimentaire Page 18, line 5: undercurrent sandy Page 19, line 17: quantitative assessment Page 21, line 14: Clarke

References: Papers referred in the text or in the figure’ legends but not present in the References: Ambar and Howe, 1979 Hernández-Molina et al., 2003, 2011, 2016 Lebreiro et al., 2018 Sánchez-Leal et al., 2018 Stramma and England, 1999 Vandorpe et al., 2014, 2016

Papers present in the References but not referred in the text: Pérez et al., 2013 Schlitzer, 2018

Figures and legends: Figs. 2 and 3 legends: at density 27.5 Fig. 4: ïĄ■mol/kg (and not ïĄ■mol/Kg) Fig. 5 legend: 36°N; I would suggest to swop places between the map and the percentage distributions. The text along the axes of the graphics with the percentages should be clearly seen. Fig. 6 and 7: explain the meaning of the numbers and figures just above the colour scale Fig. 8: why the arrows for the AAIW along the African coast are wider in autumn and summer? Fig. 9: why -10°W instead of 10°W? ; “in two zones: …” Fig. 10 legend: mention the zoomed region; in the scale, Sverdrup Transport (and not Trasnport) Fig. 11: the graphics should have the same dimension as in Fig. 10; units of Ekman pumping should be m/s. Fig. 12 legend: Iorga and Lozier; Peliz et al., 2005; Pérez et al, 2013 (and not Fiz et al.); ENACW (instead of ENCW)

Interactive comment on Ocean Sci. Discuss., https://doi.org/10.5194/os-2019-8, 2019.