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Ocean Science Discussions

Interactive comment on "Seasonality of intermediate waters hydrography west of the Iberian Peninsula from a 8-yr semiannual timeseries of an oceanographic section" *by* E. Prieto et al.

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Anonymous Referee #1

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Firstly, we would like to thank the valuable and constructive comments provided by two anonymous referees. We agree with their views and we feel that their concerns can be addressed and clarified in a reviewed version as we explain in the discussion response. Besides suggestions about the contents, both reviewers have detected some technical

corrections and typos that will be corrected in a following version. The main issues raised by Reviewer 1 (R1) concerns the discussion section. The only remark within the analysis section is the consideration of two regions in figure 4, one at the slope and the other at the outer ocean, while the inspection of the figures suggests that there are 4 regions with alternate behaviors:

" By inspection of figure 4a,b and even 4e, it looks rather like there are 4 regions, one on the slope, one in the channel between the continent and the Galicia Bank, one east of the Bank and one west of it. These 4 regions have alternate behaviors. This should be described and analysed in more detail in the text."

We agree with his/her concern and we propose to expand the second paragraph on p.3403 in order to clarify the analysis we have made. These four regions appear to be linked to the recirculation system that develops in the surroundings of the Galician Bank, which seems to yield a differentiated response to the seasonally varying background flows. We could easily apply the methodology of splitting isobaric changes that latter generate figure 5 to the four regions instead of the two (slope and outer ocean). The reason for keeping only two regions is that some of the sub-regions are narrow and involve very few stations. For instance the anomaly at the eastern flank associated with warmer/saltier waters in summertime is confined to stations 15-17. Therefore we prefer to keep a larger number of stations by region in order to get more reliable results from a statistical point of view, while keeping in mind that there are biases in the thermohaline seasonal signature in the outer and inner regions of the Bank due to its influence on the dynamics. Our approach assumes that, for the purpose of providing an overall view of the hydrographical variability of the outer ocean, the local anomalies caused by the Bank circulation should compensate. We will explain further this issue in the next version. R1 feels that the discussion section resembles more a review article than a specific discussion based on our new results. We acknowledge the reviewer feeling and agree with him/her so we propose to rework the section trying to lighten the 'review' paragraphs and to discuss more deeply the implications of our results. However, we would like to note that there are many different dynamic processes that may imprint seasonality to the deep ocean, so we think that is needed to review the available information in order to properly interpret our measurements. The reviewer requests to make the section more quantitative and suggests two specific ways of addressing the task:

In order to make the discussion more quantitative, two solutions were offered:

1) compare values of temperature, salinity anomalies, currents, advective and diffusive times, between the reviewed work and the present work. We agree that a concise quantitative comparison of seasonal amplitudes derived from our data set and the reviewed literature was not properly presented. We have prepared extra sentences in order to provide a further comparison, however many of the revised works just provide qualitative insights of seasonality or quantitative fluctuations of properties in a limited timeframe, but rarely estimates of seasonal amplitude. We have prepared also the next schematic figure joining all the available quantitative data we have collected.

[Fig.1 here]

Fig. 1. Magnitude of the amplitudes of hydrographic properties at depth at the Finisterre section (from Fig.5) compared to other magnitudes of seasonality previously reported in literature:

(+) Chidichimo et al . 2010 ; Kanzow et al. 2010. Subtropical Eastern Boundary (26.5°N). Seasonal amplitude estimate from the EBH - RAPID mooring array (4-year continuous record).

(o) Machín et al. 2010. Subtropical Eastern Boundary at the Canary Basin (Lanzarote Passage). Seasonal amplitude estimate from EBC4 mooring at 28°46'N 13°28' W (9-year continuous record).

(*) Ambar et al. 1999. Northern coast off Portugal (41°N). Shift observed from summer to winter from a specific mooring at 41°N,9°44' W.

(×) Varela et al. 2005 . Galician Shelf/Slope. Shift observed from summer to winter in a yearlong series of weekly hydrographical profiles at fixed location 42.13°N 9.5°W.

(square) Bray, 1982. Bay of Biscay (2-20°W, 42-52°N). Seasonal amplitude estimate from a series of 11 cruises along 3 years.

2) use available ARGO float data to extend geographically the findings of the hydrological section or to support one hypothesis or the other. The main issue with this approach is to determine whether the spatio-temporal coverage of the Argo fleet is enough to solve the seasonal signature as our in-situ data set does. We used the Data viewer interface provided by the Argo site http://www.argo.ucsd.edu/index.html to retrieve the winter (January-February-March) and summer (June-July-August) salinity maps averaged for the Mediterranean water influence levels (1000-1250 dbar) in the region [30°-50°N,0°-20°W] (Fig.2). It appears difficult to evidence a recurrent seasonal pattern from such horizontal sections. The inspection of the available profiles that support each of these interpolated fields (supplementary file 1) show that there use to be large areas without profiles, and specially the slope region is strongly undersampled (currents are stronger at these areas so floats are quickly advected). Nevertheless, we have computed the summer minus winter anomaly map (Fig.3). The overall general view indicates less MW content in the open ocean of western Iberia in summertime (until 16°W), which is consistent with our results from the section, and a higher MW content patch at the Northwestern corner, which could be interpreted in a very speculative manner as a signature of enhanced northwards MW slope flow in summertime. However the patchy character of the fields raises suspicions on its representativeness and the increase of MW in summertime west of 16°W seems quite odd. Figure 4 provides the timeseries from interpolated fields at some locations along the 42.5°N. Tough there are periods when there appears to be a seasonally oscillating behavior, the timeseries yields much less clear insights of seasonality as the timeseries derived from the hydrographical section do. In summary, we do not feel that we can draw firm conclusions about seasonality of the Western Iberian margin hydrography from the Argo

buoys, especially at the slope. We propose to discuss these new analyses from Argo buoys in the new version of the ms.

[Fig.2 here]

Fig. 2. Winter and summer salinity fields at 1000-1250 dbar level from Argo floats for the period 2004-2011.

[Fig.3 here]

Fig. 3. Summer-Winter average salinity field at 1000-1250 dbar level from Argo floats for the period 2004-2011.

[Fig.4 here]

Fig. 4. Timeseries of salinity field along the 42.5°N section from the interpolated field at 1000-1250 dbar level from Argo floats for the period 2004-2011.

Please also note the supplement to this comment:
http://www.ocean-sci-discuss.net/9/C1524/2013/osd-9-C1524-2013-supplement.pdf

Interactive comment on Ocean Sci. Discuss., 9, 3393, 2012.

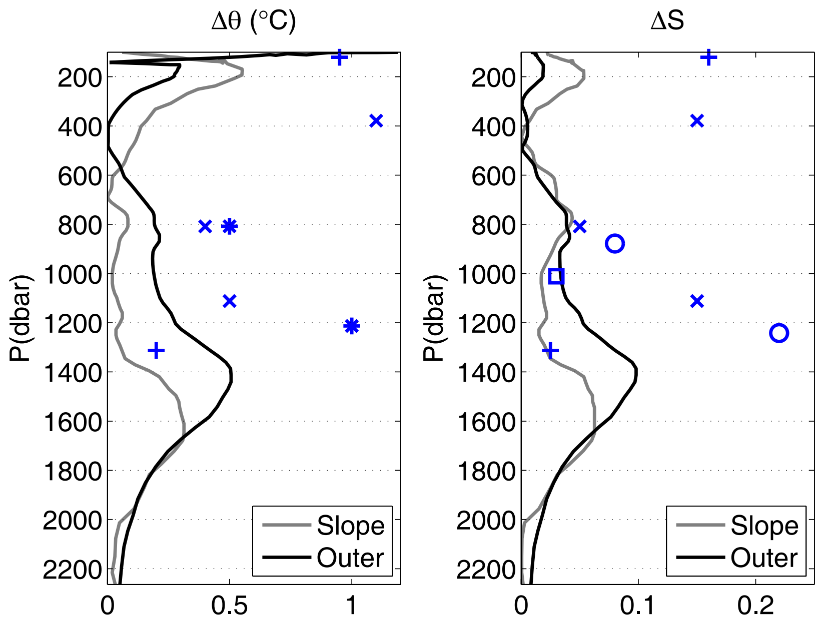


Fig. 1. Magnitude of the amplitudes of hydrographic properties at depth at the Finisterre section (from Fig.5) compared to other magnitudes of seasonality previously reported in literature

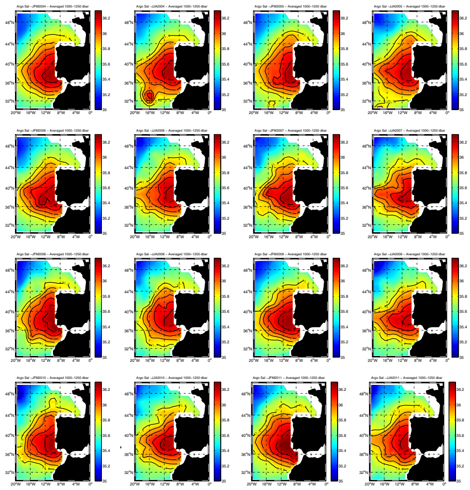


Fig. 2. Winter and summer salinity fields at 1000-1250 dbar level from Argo floats for the period 2004-2011

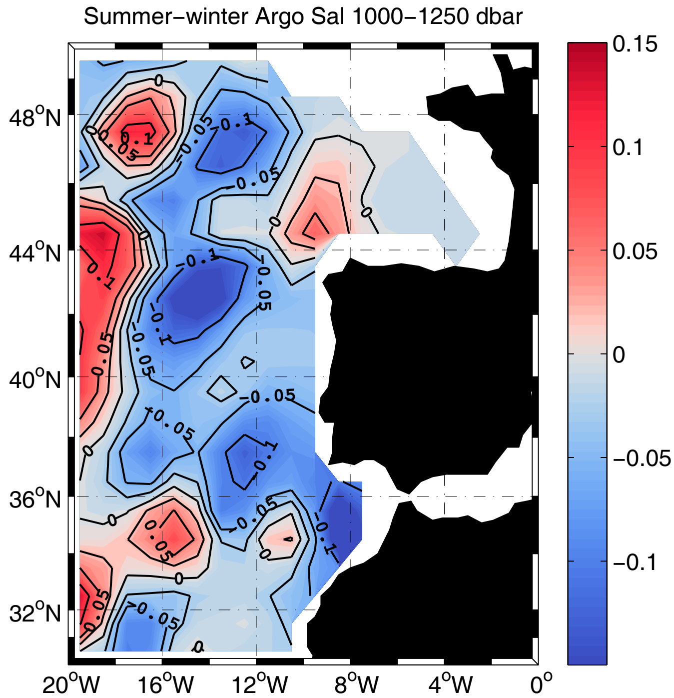
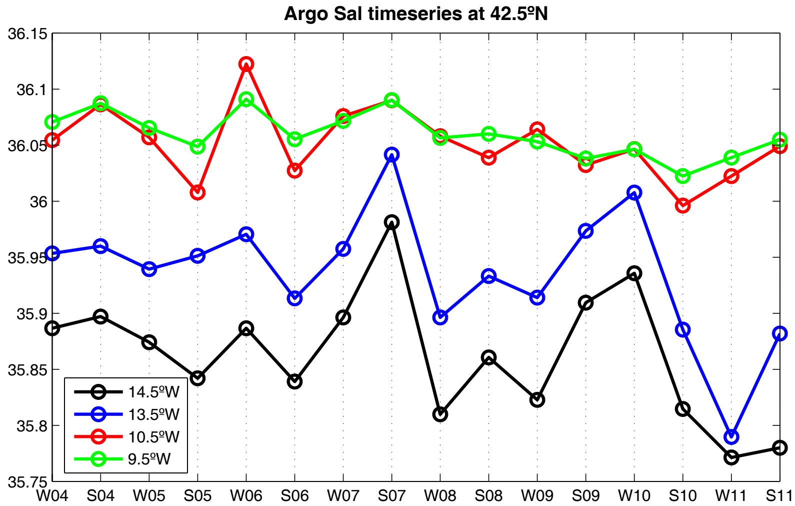


Fig. 3. Summer-Winter average salinity field at 1000-1250 dbar level from Argo floats for the period 2004-2011



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