

*We thank **Anonymous Referee #4** for his time and effort to review our manuscript and for his highly helpful comments and encouragement.*

This manuscript presents two new high resolution Sea surface Temperature (SST) records based on the alkenone ratio UK'37 measured in two North Atlantic sediment cores and a new pollen record from the North Western Mediterranean Sea. The records cover the 4.2 event and serve as the base to discuss ocean-atmosphere changes in the North Atlantic Ocean and their impact in the Mediterranean region. The discussion is complemented with a compilation of previously published marine and terrestrial records. The two new SST records are consistent with a dipole structure in the subpolar region during the 4.2 event, which authors argue that was associated to a weakening of the sub polar gyre and an atmospheric blocking that also had consequences in the Euro-European region. The new data set provides key new information to understand changes in the North Atlantic region during the 4.2 event, the manuscript also produces a rigorous compilation of existing records that allows a interesting and well argued discussion to connect patterns in remote regions. Therefore, I recommend its publications in climate of the Past. Nevertheless, I add few comments that I recommend to consider in order to improve the final version.

The information of the new pollen records should be more integrated in the manuscript. Abstract and introduction ignore this new record. Material section does not include the core location and any age model description is dedicated to it. This record appears mentioned by first time at the end of the methodological section.

[A more detailed description of the pollen dataset is provided in the revised manuscript. Information about the KSGC-31 core, including core location and age model, is also added to the material section.](#)

As referee 2 already mentions, the impact of the C37:4 alkenone in the application of the UK37 should be considered. At least, to mention the C37:4 concentrations and discuss whether there exist significant differences between UK37 and UK'37 SST estimations. C37:4 concentrations above 5% of the total alkenone content can introduce significant biases in the UK37 SST-estimation in relation to the UK'37 one.

[As stated in the manuscript very few samples contain non C37:4 alkenones in MD95-2015 and only minor amounts of C37:4 and present in some samples as expected from the temperature range in both cores. We are not aware of any paper that has shown the value of using Uk37 instead of Uk'37 even when C37:4 is present in significant abundances, which is not the case here. We follow the recommendation to use the calibration published by Prahl et al. 1988. The origin and role of this compound is unclear.](#)

Line 161: the right reference there should be Mjell et al 2015

[The reference has been changed to the correct one.](#)

Line 165: Establish a link between arctic freshwater export, wind stress and SPG and Labrador deep convection by using a reference of paleo-study. Such a connection would be more solid in base to actual observations or model assimilations. Does not exist a better reference for it?

We have added reference to “Langehaug et al., 2012” and “Born and Stocker, 2014” as suggested by Moreno-Chamarro (reviewer 1).

Line 177: It is argued that weaker SPG induced stronger IC inflow waters into the SE Greenland/NW Iceland, this is warm water. How can this situation fit with the cooling recorded in core MD99-2275 during 4.2?

We did not say weaker SPG means stronger IC but higher influence, due to the westwards displacement of the SPG allowing warm waters into the SE Greenland/NW Iceland (see Hatun et al., 2005 or Andresen et al., Nature Scientific Report, 2017).

Line 220: Combourieu-Nebout is already one of the co-authors of the manuscript, it does not need to be referenced here since, as co-author, the whole manuscript is part of her contribution.

Done

Line 231: On the discussion of the Asuil Cave record. This record is the composite of two independent speleothem records connected right at the 4.2 event and with almost no overlap between them for this event. That brings serious doubts on the interpretation of any structure related to this particular event. I would actually indicate on Fig 4d the limit between the two speleothems and indicate in the discussion that some uncertainties exist on the interpretation of the intensity of the drought. Both records agree in describing the 4.2 event as a rather dry event but the intensity of the event could be over or under-estimated as an artefact of the composite record.

After looking in details in the chronology issue, we decided to remove this record. This does not however affect the conclusion of our study.

Paragraph starting at 239: this is the ending paragraph of a section dedicated to climate in the Euro-Mediterranean region, but this text does not fit well in it. It aims to make an integration/summary of the manuscript, that should be done in the next section (summary/conclusions). The paragraph ends more like a figure caption without any actual discussion, this provides a rather weak ending to a very nice manuscript. I recommend to change it. This paragraph focuses on Figure 5. This figure should be actually cited previously in the paragraph starting at line 137 and thus, I would recommend to re-label it to Figure 4. I would rather integrate this figure more along the whole discussion rather than leaving it as a separate paragraph at the end of the discussion.

We opt for removing the figure 5 and the last paragraph of the discussion from the revised version of the paper as one of the options suggested by anonymous Referee 6. The conclusion has been improved.

Figure 2 is not really needed since all the information is clearly shown in Figure 3. It could have some interest if the SST estimation using UK37 is shown.

We will keep this figure in the manuscript to which we added the concentrations of  $C_{37}$  alkenones as suggested by reviewer#3.

Figure3: where strong and weak appears with the grey arrow, indicate strong SPF/ weak SPF

It is used to indicate inferred weak/strong SPG based on surface-subsurface density difference, ISOW and winds intensity.