

Reply to Anonymous Referee #1

Thanks to the referee 1, we have followed his/her suggestions by taking into account the comments that have improved the quality of the manuscript.

Overview

In their discussion paper "Paleohydrology reconstruction and Holocene climate variability in the South Adriatic Sea", Siani et al. discuss isotope and foraminifer-based temperature data analyzed for samples from a marine core (MD90-917) retrieved from the southern Adriatic Sea, covering partly the Lateglacial and the Holocene. Due to the intermediate position of the Adriatic Sea between the Eastern and the Western Mediterranean region and between different climatic zones, I regard this paper as an important contribution to the understanding of the Mediterranean climate. It is generally well written and based on a solid dataset. Most of the conclusions are convincing to me. There are several points, though, which I think have to be dealt with.

Scientific Significance: Fair

While some of the data have already been published (Siani et al. 2010), increased resolution allowed the identification of periodicity. Furthermore, the manuscript has different foci than Siani et al. (2010). However, it should be put clearer what is really new in this manuscript, and what was already found earlier by other authors. Furthermore, some previously published proxy data from the same core as analyzed herein is not discussed, which seems a little ominous.

Scientific Quality: Good

Reply 1# :

The innovating aspect of this study is to provide a detailed reconstruction of the Holocene hydrological changes and their link with the climate variability in the Adriatic Sea. This is the first study that presents the sea-surface water oxygen isotope record in the South Adriatic basin. These reconstructions are derived by combining planktonic stable oxygen isotope values ($\delta^{18}\text{O}$) and sea surface temperatures (SSTs). Part of the oxygen isotopic data on the planktonic foraminifera *Globigerina bulloides* and paleotemperatures estimations have been already published in Siani et al (2010) and 70 new data points have been presented in this article. The reconstruction of the oxygen isotopic composition of the surface waters, that represents an ideal proxy for salinity changes, requires the use of both planktonic $\delta^{18}\text{O}$ and SSTs. In addition, the oxygen and carbon isotopic composition of the epi-benthic foraminifera *Cibicidoides pachyderma* and the carbon isotope composition of the planktonic foraminifera *Globigerina bulloides* are presented for the first time in the South Adriatic basin. We believe that our dataset is quite considerable in order to be published, and there are no redundancies with the previous work that was focused, however, on a time interval much larger i.e. the late glacial period since about 24 ka and on bio-event changes in the planktonic foraminifera assemblages.

Concerning the lack in the reference about previously published pollen record in core MD90-917 (i.e. Combourieu-Nebout et al., 1998), we extensively considered this manuscript for discussion in Siani et al. (2010) especially for the Early to Middle Holocene period. For what concerns the middle to upper Holocene the low pollen concentration in core MD90-917 precludes any robust comparisons with our dataset. Nevertheless, we recognize that this reference provides important insight for the discussion about our new results especially for the Early Holocene and the Sapropel period. This point should have been considered in our

manuscript, so we will take into account the suggestions of the referee 1 in the revised version.

The applied methods are generally valid, the discussion considers most of the relevant literature as far as I am aware, and the conclusions are convincing.

Presentation Quality: Good

I have made some suggestions how the presentation could be improved, but generally the figures are of high quality, the English is good, and the manuscript is well structured.

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General points

The publication by Siani et al. (2010) on foraminifera from the South Adriatic Sea deals with samples from the uppermost 7 m of core MD90-917. The current manuscript focuses on the uppermost 3 m of the same core. It is thus probably unavoidable that some sections seem redundant, particularly when it comes to area, methods, age model, etc. Still, it should be avoided to use almost the same sentences, e.g. in the material and methods section. Additionally, it should be pointed out clearly which results are new compared to Siani et al. (2010).

Reply 2#

We have taken into account these remarks. Concerning the new data published compared to those of Siani et al. (2010) we have already answered in the previous paragraph (Reply 1#).

One aspect which surprised me is that the results of Combourieu-Nebout et al. (1999) are not mentioned anywhere in the current manuscript, although this publication is based on the same core and contains results from the marine and terrestrial realm which could easily be compared with those presented here. This issue seems even a little ominous because most of the authors of the manuscript are also co-authors of Combourieu Nebout et al. (1999). In this context, it is also slightly irritating for me that in the acknowledgements the support to N. Combourieu Nebout is mentioned (see below). I also think that some other works from the Aegean region should perhaps be mentioned (see respective sections).

Reply3#

We have already answered about this point in the previous paragraph (Reply 1#). The corrected reference is Combourieu Nebout et al. (1998).

General Language

I think the English is generally good, but could still need some improvement. Several sentences are difficult to understand, and there are spelling and grammar mistakes.

Some examples from the first pages:

P4360, L 9: ... a high detailed... : highly

P 4360, L 11: Past circulation dynamics has... : have

P 4361, L 7: from the northeast... : Northeast

P 4361, L25: either... either... : I don't think either can be used twice this way.

The use of certain expressions is irritating:

P4360, L1: ... is an area presenting... : An area cannot "present" s.th.

P4360, L8: ... the North Atlantic one... : (Circulation is meant, but it is confusing.)

I am not a native speaker myself, thus some of my problems may be rather due to my limited knowledge of the English language, but on the other hand, even if so, it would be better to use clearer, simple sentences in some cases. It would probably be good to let a native speaker go through the manuscript.

Reply4#

We have taken into account these corrections about spelling and grammar mistakes.

Abstract

While each point mentioned may be of some importance, I would suggest to shorten the abstract and leave out some aspects of lesser importance.

The first sentence concerning the SI interruption is confusing to me (P 4358 L 13).

You can either see the SI interval as one phase or as two phases. Generally, I am not so sure if the interruption is such a strong point of the paper that it deserves that many lines, since the interruption of SI due to the 8.2-kyr event was already suggested/discussed by Rohling et al. (1997) and Siani et al. (2010) for the Adriatic Sea and by e.g. Kuhnt et al. (2007), Kotthoff et al. (2008) and Marino et al. (2009) for the Aegean Sea.

Reply5#

We have taken into account these remarks by removing this part in the abstract.

1 Introduction

I generally find the introduction convincing and well-written.

I would remove the comma in L 4 (P4359).

The sentence in L 24 to L 26 (P4359) is confusing. While it may be problematic to get reliable chronologies for some terrestrial records, there are examples for records with reliable chronology for the Aegean (e.g. Kuhnt et al., 2007, Kotthoff et al., 2008a,b, 2011, Marino et al., 2009), and the comparison of terrestrial (pollen) and marine proxies (foraminifers, dinocysts) was demonstrated e.g. by Combourieu-Nebout (1998) for the Adriatic and by Kotthoff et al. (2011) for the Aegean Sea.

Reply 6#

Our comment is essentially based on the reservoir ¹⁴C age offset that is generally not taken into account in the oceanic and continental records (hard water effect in the lakes for examples). This is not a criticism of the age models presented in the previous works, but only a message to be awareness for land sea correlations. This point has not been likely well explained in the introduction of the manuscript and we have made the requested changes.

P4360, L 9: ... a high detailed... : highly (see above)

P4360, L10: ... less than a century... With your temporal resolution of 40/75 years, why not just write "decadal-scale"?

P4360, L18: ... benefits of... : benefits from

P4360, L21: This sentence sounds odd, like it was necessary to compare own results to marine and continental climate records because of forcing by the resolution...

Reply7#

We have taken into account these remarks.

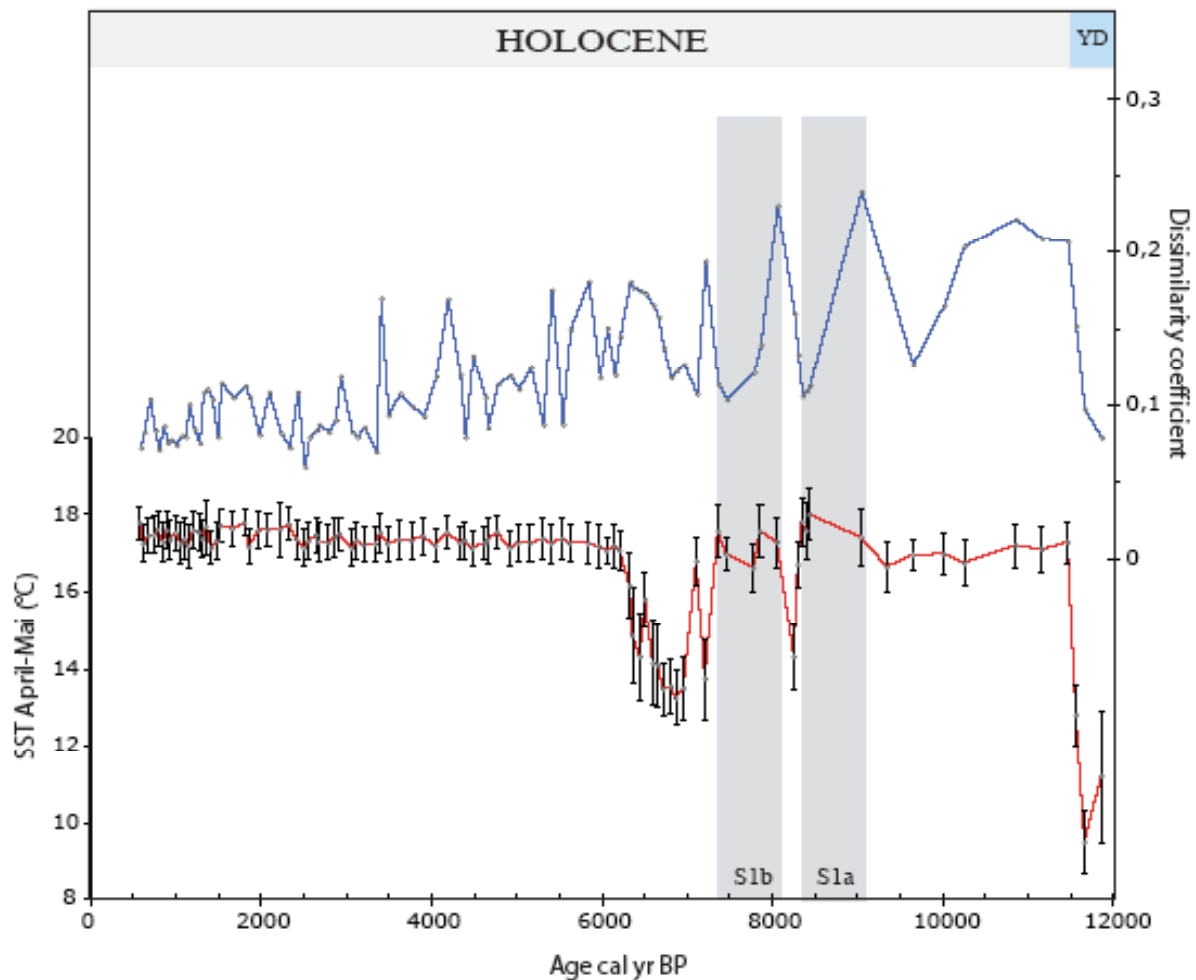
2 Studied area and modern circulation pattern...
No comments.

3 Material and methods

As mentioned earlier, in this sections partly identical sentences are used as in Siani et al. (2010) which should be avoided. I am not an expert on foraminifers and can thus not judge on the foraminifer-based methods. I think the uncertainties of the SST and SSS reconstructions are adequately discussed. However, since you have 35 additional samples, you should show the dissimilarity coefficient, e.g. in Fig. 4 P4364, L22 et seq.: I think this can be shortened, particularly the first sentences. If the method was not useful, it would probably not have been used...

Reply8#

We have taken into account these remarks. We show in the figure below, the SST estimations with the corresponding uncertainties and the dissimilarity coefficient. Results show good dissimilarity coefficients generally < 0.25 . In the submitted version of the manuscript we did not show the dissimilarity coefficients to not overload the figure 3 even though we already presented at slightly lower resolution these results in Siani et al. (2010).



4 Chronological framework
No comments

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5 Results

5.1 Sea surface temperature record

P4366, L16: *The impact of the 8.2 event on the Aegean region (and the S1) is also discussed in Kuhnt et al. (2007), Kotthoff et al. (2008) and Pross et al. (2009). While the records from the northern Aegean Sea (SL148, SL152) are probably not as directly connected (via currents) to the Adriatic as LC-21 from the southern Aegean, they are worth mentioning here and in the discussions since they are on almost the same latitude as MD90-917 and on a direct line to terrestrial records mentioned later in the manuscript (section 6.2).*

Reply 9#

We have added these references in the manuscript.

P4366, L22: *This sentence is confusing. It implicates that *N. pachyderma* causes the cooling. It is probably meant that high percentages of *N. pachyderma* indicate cooling and that the MAT-based reconstructions reveal low temperatures due to that fact. Maybe it would also be wise to give a citation how *N. pachyderma* “right coiling” is systematically used here, since some foram experts may mention that there are also “right-coiling” *N. incompta* (as far as I know, this is an old debate among foraminiferologists).*

Reply 10#

Lately, several authors use the term *Neogloboquadrina incompta* as synonym of *Neogloboquadrina pachyderma* right coiling in the Atlantic Ocean. In my opinion, this represents a taxonomic confusion between the authors rather than a species difference. Anyway, a very interesting paper of Darling et al. (2006) provides all the explanations about this terminology divergence by focalizing on the differences among Neogloboquadrinid morphotypes. For what concerns our study, being a conservative planktonic foraminifera taxonomist, it is preferable for me to keep the former classifications. Anyhow, this does not change the interpretations provided by our results.

6.1.1

The discussion in 6.1.1 is generally convincing. Maybe it should be considered to show at least some of the relative foraminifer data. Though Siani et al. (2010) already discuss the assemblages, it may be helpful to have a figure showing at least important marker species., not least since there are additional samples considered in here.

Reply 11#

The aim of the paper is essentially based on the hydrological variability in the South Adriatic Sea with a focus on the last 7 ka after the period of the sapropel S1. According to a previous study by Piva et al. (2008) in the same basin, we considered the abundance distribution of the oligotrophic, shallow water dweller planktonic foraminifera *Globigerinoids sacculifer* to restore the hydrological optimum conditions in the South Adriatic Sea. The other planktic foraminifera species do not provide information pertaining to local hydrological conditions. For these reason the other species has not been taken into account.

P4370, L7: *... according to... : in accordance with (?)*

P4370, L23: *I think it is noteworthy that not only the Soreq record indicates a phase of increased rainfall, but also numerous pollen records from the region (compare comments*

to 5.1). Particularly the pollen-record of Combourieu-Neobout (1998) from the same core MD90-917 indicates increased rainfall during S1 (starting at the onset of the Holocene) and the rapid changes in the dinocyst record indicate the salinity drop. It is irritating that this is not mentioned here.

Reply 12#

We have taken into account these referee's comments in the revised version of the manuscript in the section 6.1.1 and 6.2 respectively.

6.2 Holocene land-sea climatic comparisons

The discussion particularly of the "event" around 7.3 to 6.3 is well done. I generally miss some reference, though, of the discussion of the impact of these and other events on the Eastern Mediterranean in Schmiedl et al. (2010), particular since some statements of the authors fit well with the results of Schmiedl et al.. Additionally, it may be noteworthy that the decrease in precipitation around 6.5 kyr BP is also reflected in the northern Aegean region (between the Xinias and Gölhisar records; Kotthoff et al. 2008a, b).

Reply 13#

We have added these references in the section 6.2 of the present manuscript.

Again, I wonder why the data of Combourieu-Neobout (1998) is not discussed here. It would be easy, I assume, to apply the newer age model to the pollen and dinocyst dataset and see how well the foraminifer/isotope-based results fit with the palynomorph data.

Reply 14#

The new age model of the pollen dataset will be published in CP Discussion in the same "Lama Special Issue" by a new contribution of Combourieu-Neobout et al. (this issue). This paper will present new pollen data with a sensibly higher resolution than in Combourieu-Neobout et al. (1998).

6.3

I find some of the statements here speculative. The comparison shown in Fig. 8 is not very convincing. However, I think it may still be legitimate to discuss the linkage to the North Atlantic climate as done here.

Reply 15

It is possible that our interpretations may be considered speculative. However, it should be noted that a recent published study from the Mont St Michel Bay Holocene coastal sedimentary record reports evidence for enhanced storminess during the past 6.5 ka (Sorrel et al. 2012 Nature Geoscience). These authors showed the recurrence of high storm activity that occurred periodically with a frequency of about 1,500 years, closely related to cold and windy periods registered in the North Atlantic. This is a further study that overall confirms our conclusions.

7 Conclusions

The conclusions drawn are generally convincing and differ enough from the focus of Siani et al. (2010) to justify another publication based on partly identical data. P4380 L9 et seqq.: This sentence is confusing. Additionally, the 8.2-kyr event and the related S1 interruption occurs less interesting to me (since it has been discussed by several

authors for the Aegean and also the Adriatic Sea) than the deterioration around 6.5 kyr. Maybe you should mention this aspect in the conclusions.

Reply 16

We have taken into account these remarks.

REFERENCES :

Combourieu-Nebout N., Paterne M., Turon J.L., Siani G. (1998). A high-resolution record of the last deglaciation in the central Mediterranean Sea: palaeovegetation and palaeohydrological evolution. *Quaternary Science Reviews* 17, 303-317.

Combourieu-Nebout N., Peyron, O. Dormoy, I., Sadori, L., Joannin, S. Central Mediterranean vegetation and climate changes during the Holocene through pollen records around the Adriatic Sea. To be submitted to *Climate of the Past Discussion*.

Darling, K. F., M. Kucera, D. Kroon, and C. M. Wade (2006), A resolution for the coiling direction paradox in *Neogloboquadrina pachyderma*, *Paleoceanography*, 21, PA2011, doi:10.1029/2005PA001189.

Philippe Sorrel, Maxime Debret, Isabelle Billeaud, Samuel L. Jaccard, Jerry F. McManus and Bernadette Tessier (2012). Persistent non-solar forcing of Holocene storm dynamics in coastal sedimentary archives. *Nature Geoscience*, 5(12), 892 – 896, doi:10.1038/ngeo1619

Piva, A., Asioli, A., Trincardi, F., Schneider, R. and Vigliotti, L. (2008). Late-Holocene climate variability in the Adriatic Sea (Central Mediterranean), *The Holocene*, 18, 153-167.

Siani G., Paterne, M., Colin, C. (2010) - Late Glacial to Holocene planktic foraminifera bioevents and climatic record in the South Adriatic Sea. *Journal of Quaternary Science*. 25 : 808-821. ISSN 0267-8179.