Clim. Past Discuss., 10, C1284–C1290, 2014
www.clim-past-discuss.net/10/C1284/2014/

Climate of the Past Discussions
Open Access

Interactive comment on "A paleoenvironmental reconstruction of the last 15 000 cal yr BP via Yellow Sea sediments using biomarkers and isotopic composition of organic matter" *by* A. O. Badejo et al.

A. O. Badejo et al.

badejogoke@gmail.com

Received and published: 11 August 2014

We thank Referee #1 for his/her review. The comments help us to improve or manuscript

Reply to the comments made by Referee #1

General comments: Badejo and co-authors present an interesting data set of biomarker (n alkane and alkenone) concentrations and carbon isotopic compound specific compositions in a sedimentary record collected in the Yellow Sea. Through the

variations of different ratios, they investigate paleo-environment and -vegetation during the last 15,000 years. Although the dataset is of interest for the paleoclimatic community and the paper addresses relevant scientific questions within the scope of CP, the manuscript needs to be seriously reworked and reorganized in order to reach substantial conclusions and the English proof-checked. The outline of the discussion part of the manuscript is unclear (4. Results and discussion; 5. Alkenone abundance; 6. Monsoon variability, 7. Conclusions). Why not starting with a simple description of the results and then distinguishing the different lines of the discussions?

Reply: The referee pointed out two critical things. First English proof check. This is done to the revised manuscript. Second point raised is the structure of the manuscript. The structure of the manuscript is re-arranged as the referee suggested.

Specific comments: Comment 1: Title: the title does not fully reflect the content of the paper, i.e. the "paleo-environmental reconstruction" is not obvious from the conclusions and the abstract for example?

Reply: This was noted and paleo-environmental reconstruction is made obvious in the Abstract and Conclusion in the revised manuscript. This has written as follows for the abstract "This study is the first reconstruction of the paleoenvironment and paleovegetation during the Holocene (interglacial) and glacial periods of the Yellow Sea. Carbon isotope and biomarker (n-alkane and alkenone) compositions of organic matter (OM) from core 11YS PCL14 collected from central Yellow Sea recorded past changes in East Asian Monsoon (EAM) climates. The result shows the variability of the EAM affected the sedimentary profile of total organic matter (TOC), the stable isotopes of bulk organic carbon (δ13Corg), the atomic ratio of carbon and nitrogen (C/N ratio), and biomarker content. The oscillations of TOC along the sediment core might be associated with the paleoceanographic conditions (changes in the sea level) related to the contribution of the autochthonous and allochthonous OM input. Pr/Ph ratios and series of laminated thin, dark layers observed in the sediment lithology during the Bølling/Allerød interstadial indicated an anoxic conditions which could have

CPD
10, C1284–C1290, 2014

resulted from a lowered global sea level. The formation of the thin, dark layers is said to synchronize with the Dansgaard-Oeschger (D-O) cycles, attributing these layers to millennial-scale variations in the northern portion of the East China sea during the cold/dry periods. Two climatic conditions were distinguished (warm/humid and cold/dry) based on the n-alkane proxy, and the observed changes in δ13C of individual n-alkane (δ13CALK) between the Holocene and glacial periods were attributed to changes in plant distribution/type. A shift in vegetation type between climatic periods as a result of the difference between the C3 and C4 mode of photosynthesis led to a different photosynthetic response to CO2 and temperature among C3 and C4 plants. Alkenone derived sea surface temperatures (SSTs) showed no clear differences between those of the Holocene and Glacial periods. The variation in the alkenone SSTs is interpreted to indicate the paleoceanographic conditions of the growth of alkenone synthesized organisms. The variations in the intensity of the EAM could be the main mechanism accounting for the paleoenvironmental and paleoceanographic variation observed in the central Yellow Sea", and "Paleoenvironmental and paleovegetation reconstruction in the central Yellow Sea based on lipid biomarker proxies, carbon isotopes of sedimentary organic matter and compound specific of individual n-alkanes have been controlled mainly by the EAM. Based on the broad multiproxy data set we came to the following conclusions on paleoenvironmental and paleovegetation over the last 15,000 cal yr BP" for the conclussion.

Comment 2: L1-20. The abstract needs to be reorganized as it stands it is a catalog of proxies.

Reply: The revised manuscript contains a well reorganized abstract written as follows: "This study is the first reconstruction of the paleoenvironment and paleovegetation during the Holocene (interglacial) and glacial periods of the Yellow Sea. Carbon isotope and biomarker (n-alkane and alkenone) compositions of organic matter (OM) from core 11YS PCL14 collected from central Yellow Sea recorded past changes in East Asian Monsoon (EAM) climates. The result shows the variability of the EAM affected the

CPD
10, C1284–C1290, 2014

sedimentary profile of total organic matter (TOC), the stable isotopes of bulk organic carbon (δ13Corg), the atomic ratio of carbon and nitrogen (C/N ratio), and biomarker content. The oscillations of TOC along the sediment core might be associated with the paleoceanographic conditions (changes in the sea level) related to the contribution of the autochthonous and allochthonous OM input. Pr/Ph ratios and series of laminated thin, dark layers observed in the sediment lithology during the Bølling/Allerød interstadial indicated an anoxic conditions which could have resulted from a lowered global sea level. The formation of the thin, dark layers is said to synchronize with the Dansgaard-Oeschger (D-O) cycles, attributing these layers to millennial-scale variations in the northern portion of the East China sea during the cold/dry periods. Two climatic conditions were distinguished (warm/humid and cold/dry) based on the n-alkane proxy, and the observed changes in δ13C of individual n-alkane (δ13CALK) between the Holocene and glacial periods were attributed to changes in plant distribution/type. A shift in vegetation type between climatic periods as a result of the difference between the C3 and C4 mode of photosynthesis led to a different photosynthetic response to CO2 and temperature among C3 and C4 plants. Alkenone derived sea surface temperatures (SSTs) showed no clear differences between those of the Holocene and Glacial periods. The variation in the alkenone SSTs is interpreted to indicate the paleoceanographic conditions of the growth of alkenone synthesized organisms. The variations in the intensity of the EAM could be the main mechanism accounting for the paleoenvironmental and paleoceanographic variation observed in the central Yellow Sea"

Comment 3: L2 p1528. I would not state that glacial climate could be reconstructed in this sedimentary sequence given that the oldest samples date back to 15 kyrs. Reply: The last glacial period was the most recent glacial period with current ice age occurring in the Pleistocene epoch which began about 110,000 years ago and ended 15,000 years (Severinghaus, J.P and Edward, J.B 1999). So we revised it as the latest glacial climate.

Comment 4: L21 p1528. The introduction part needs to be reorganized. It misses a

CPD
10, C1284–C1290, 2014

presentation of the global implications of the questions addressed in the paper in order to capture a broad audience. Then the study area could be presented, but only after a description of its interest into the global questioning. At last the outline of the paper could be developed.

Reply: We agree with the comment made. We re-organize the introduction by talking about the Asian monsoon system representing the basic elements of the global circulation by controlling the atmospheric heat budget in the Northern Hemisphere.

Comment 5: L3 p 1531. Be careful “The age model for five selected depths” needs to be corrected by the “Radiocarbon ages for five : : :”. The language needs to be proof checked : “CalibrationS were : : :”, “The age-depth model was constructed: :

Reply: The comment are considered and reflected made are adhered to and included in the revised manuscript. “The age model for five selected depths” changed to “Radiocarbon ages for five selected depths” “Calibration were carried out” changed to “Calibrations were carried out” “In order to obtain age depth models” changed to The age-depth model was constructed” Comment 6: L20 p 1533. Results and discussion - The entire manuscript starting to this point needs to be reorganized (see above).

Reply: This is carried out in the revised manuscript by starting with a simple description of the results and then distinguishing the different lines of the discussions as suggested.

Comment 7:L20 p 1534. “The Yellow Sea was exposed sub aerially and covered by a network of river channels during the glacial period” is this a conclusion of the dataset produced or does it come from previous studies? The link between data and conclusion is weak.

Reply: The sentence was not based on the dataset produced, but from previous study in the region (Uehara and Saito, 2003). For the second point raised, this is the best way to discuss the reason why there is a terrestrial organic matter during the glacial as

CPD
10, C1284–C1290, 2014

a result in the reduction in sea level.

Comment 8: L23 p 1534. C/N values, the number of digits needs to be checked. Reply: This has been checked and corrections are made.

Comment 9: Unclear L27 p1535. "High TOC values were most likely caused by a reduction of marine productivity by an increase in the influx of terrigenous organic carbon from the surrounding environment (note the C/N and δ 13Corg values)

Reply: The lower marine productivity is expected during the glacial. However, TOC value was much higher than we expected, indicating a different source of sedimentary organic matter between the period, which is indicated by the carbon stable isotope ratio as well as C/N values.

Comment 10: Unclear L7 p 1536. "Pristane and Phytane ARE derived from the geological and microbial alteration of the phytol side chain of chlorophyll-a from algae, cyanobacteria and bacteria (Peters and Moldowan, 1993).

Reply: The sentence has been revised to Pristane and phytane are derived from the microbial and geological alteration of the phytol side chain of chlorophyll-a from algae,and cyanobacteria (Peters and Moldowan, 1993). We are trying to explain that the sources of these isoprenoid biomarkers in sediments are useful to understand the depositional environment of organic matter. We are trying to explain that the sources of these isoprenoid biomarkers in sediments are useful to understand the depositional environment of organic matter.

Comment 11 L24 p1536. "the corroboration of parallel laminated: layers with the Pr/Ph ratio at depths of 580 and 600 cm and 680 and 700 cm indicates a reducing condition.:" - meaning?

Reply: Pr/Ph ratio at these depths have lower values than 1 indicating anoxic environmental condition. Also laminated layers seen at theses depths are said to be as a result of lowered global sea level, resulting from anoxic environment caused by the

CPD
10, C1284–C1290, 2014

limited surface water exchange.

Comment 12: Fresh instead of Young.

Reply: Based on the reference used (Hedges and Prahl 1993), the word young was used but we revised it according to your comment.

Comments on the figures: Table 2. The legend does not correspond to the content of the table: it states “Individual carbon isotopic compositions of n-alkanes and bulk organic carbon isotopes” and the table contains the bulk organic carbon (%). Individual carbon isotopeS of individual n-alkaneS. Could the SD on the d13C be added in the legend? Figure 3. Best cHronological model Figure 4. Chromatograms of THE hydrocarbon (n-alkanes) and alkenone FRACTIONS in A sediment sample (90-92 cm). Figure 5. Age instead of Downward Figure 6. The legend needs to be rewritten. Figure 7. Define all the terms indicated on the figure: ACL for example. Why are the concentrations relative?’

Reply: The comment made is implemented in the revised manuscript. For figure 7 the concentrations were relative because nC27, nC29 and nC31 were more compared to the other long chain n-alkanes.

Interactive comment on Clim. Past Discuss., 10, 1527, 2014.