Reply to Anonymous referee #1

General comments.

The research is original, novel and considered as important to the field, so it is a good candidate to be published in CP. The structure is appropriate and, in my opinion, the used language is correct. The manuscript presents a substantial contribution to scientific progress within the scope of Climate of the Past. The scientific approach and applied method referring the clay minerals are valid, but some of the isotopic data are not fully reliable and they should not be used for palaeoclimatic interpretations. The results are discussed in an appropriated way and the references are appropriated. The scientific results and conclusions are presented in a concise, clear and well-structured way, and the number and quality of figures is correct. There are no major points of conflict, as it is a high quality palaeoclimatic study mainly based on the study of clay minerals reflecting an alternation of humid and semi-arid periods during the Late Sinemurian, comparing the data obtained in two boreholes drilled in western UK (Mochras) and northern France (Montcornet). However, the isotopic data, mainly obtained from the Mochras borehole, are strongly suspicious to be strongly affected by burial diagenesis, as the δ18O presented values are too low to reflect normal seawater values and cannot be used for palaeoclimatic studies.

We thank the reviewer for agreeing to review our manuscript and for providing relevant and detailed comments.

Yes, we agree with the reviewer that the oxygen isotopes are over interpreted, so we deleted this section.

Specific comments.

Line 96. This latitude is also corroborated by the palaeomagnetic data presented by Osete et al., 2011 (Tectonophysics, 502, 105-120).

The reference has been added.

Line 216.Reader has to wait until line 216 to confirm that the drill holes have recovered a supposedly continuous core of the drilled sections. That should be specified before in the text, including the core diameter and percentage of recovery of the core. Could some of the gaps found in the Montcornet hole due to the loses of core in some intervals? I assume that the hole was drilled using the wireline method, but it would be convenient to specify that in the manuscript. If the drilled section is dipping, were the thicknesses corrected respect to the depths?

The continuity of the cored sections has been specified line 103 for Mochras borehole and line 126 for Montcornet borehole. The core diameter is 85 mm in both cases and the recovery is excellent close to 100%.

Lines 129 to 146. It is quite singular to perform ammonite biostratigraphy in cores, due to their limited diameter, especially in the case of the Montcornet hole, were as said in line 129-130, some important

hiatuses occur, and the ammonites are relatively scarce. This does not support the “High resolution data ” mentioned at the beginning of the Abstract.

Yes, but the use of Yang et al 1996 and the additional determination of newly found ammonites (this study) allows to draw a suitable biostratigraphic scheme. However, the term "high resolution" has been removed. The text has been modified as in reality, the ammonites are not scarce but irregularly distributed.

Section 4.3.1. It seems clear that the isotopic data of the study are the weakest part of the paper. Values of δ18O up to -6.54‰ reflect the presence of strong diagenetic overprints. Also the δ13C carb curve is completely different respect to the δ13C org curve, confirming the presence of the strong diagenetic overprints. As a consequence, none of the isotopic data are useful in a palaeoclimatic study (see line 324) as it is supposed to be the present paper. A diagenetic study of the carbonates is essential to be sure that your isotopic data reflect the original Jurassic seawater conditions. Why this diagenetic study has not been performed?

Yes, we agree, and we were aware that the $\delta^{18}O$ values suffer of a diagenetic influence. δ18Ocarb and δ13Ccarb have been removed as paleoclimatic proxies.

The diagenetic study was not the objective of this work. δ18Ocarb and δ13Ccarb were not used as realistic values but as a trend, sometimes observed in other sites. The negative excursion of the *obtusum*/*oxynotum* zones transition is also observed in Copper Hill and Sancerre boreholes. The increase in δ18O is also an overall trend at the end of the Sinemurian. In our opinion the d18O curve is entirely shifted to low values, but the original trends are probably party preserved. However, we delete all paleoclimatic interpretations dealing with δ18Ocarb and δ13Ccarb in the new version.

Line 260. “Abundant smectite indicate a limited diagenetic influence”. In the paragraph above it seems that the diagenesis in the carbonates of the Mochras borehole is not negligible, but is it in the clays? Some additional justifications together with the shallow depth of burial would be welcome.

We modify the §. The occurrence of smectites indicates a weak clay diagenesis linked to burial. However the carbonate diagenesis is significant (nodulisation and siderite occurrence).

Section 5.1.2. Even of δ18O isotopic data from the Montcornet borehole are not included, it seems that diagenetic overprints are also present, showing numerous indications in the lithology. However the δ13C org curves show similar trends in both localities, indicating that this data could be reliable. The main concern is to be sure that the climatic fluctuations are not the result or are influenced by the diagenetic processes.

Yes we assume that the δ13C org curves in the two boreholes can be confidently used as climatic indicator. Contrary to δ13C carb, δ13C org seems to be less/not influenced by the diagenesis assimilar trends are observed at many other sites. We added a new figure (fig. 10) showing the correlations based on $\delta^{13}C_{org}$.

Line 399. The ammonites zone or Zone should be uniform. Better obtusum Zone. Please check the rest of the text.

Done

Line 407-408. Obtusum and the oxynotum zones.

Done

Line 412. “Low δ18O values consistent with warm conditions”. In previous sections it has been established that δ18O values cannot be used as a palaeoclimatic criteria, so it should not be used here as indicative of warm conditions, and this is contradictory with the stated in the following lines of the manuscript.

Ok we deleted this assumption.

Lines 416-417. Reference(s) supporting the interpretation of Classopollis as an indicator of warm climate is needed. Clasopollis is a long-term pollen showing a distribution probably from the Triassic up to the beginning of the Paleogene (Vakhrameyev, 1980) surviving lots of climatic changes. So taking it as a good indicator of warming could be at least very risky, if it is not supported by more reliable data.

We agree. Correlation between *Classopollis* abundance and warm climate is risky however trends may be more suggestive. The interval corresponding to a significant increase of Classopollis in the Cleveland basin shows a potential warmer climate, supported by clay mineralogy.

Line 417-418. “Surprisingly this negative δ13C org excursion is less clearly recorded in inorganic carbon at Mochras than in the Copper Hill drillhole”. This could be another indication of the strong diagenetic overprint at Mochras. That could be an indication that the multiple papers based in the isotopic signal of the Mochras borehole are values affected by the diagenetic overprint, reflecting local conditions and no global ones.

The differences can be explained by the origin of the organic matter. Higher proportion of marine organic matter during SPBE may have accentuated the negative excursion at Mochras.

Line 425-438. It would be a nice explanation but, has been compared the age of the SPBE δ13C sift with the absolute ages of the CAMP emissions? This data should be incorporated into the manuscript and supported with more data.

We agree, that a source of light carbon enrichment in relation with the correlation with CAMP is theoretical. However this relationship has been discussed in detail by Ruhl et al. (2016) using an extensive bibliography on the more recent U-Pb and Ar-Ar dating available. This has been clarified in the ms.

Line 461-462. “Hot and humid interval ….. expressed by low values of δ18O”. Again, this δ18O values cannot be used for palaeoclimatic interpretations.

Ok, done.