Climate of the Past Discussions

Clim. Past Discuss., referee comment RC1
https://doi.org/10.5194/cp-2021-79-RC1, 2021

Comment on cp-2021-79

Anonymous Referee #1

Referee comment on "Clumped isotope evidence for Early Jurassic extreme polar warmth and high climate sensitivity" by Thomas Letulle et al., Clim. Past Discuss., https://doi.org/10.5194/cp-2021-79-RC1, 2021

Letulle et al

This is an interesting paper that adds to the debate on the problematic nature of apparent polar warmth during at least some intervals during the Mesozoic greenhouse. In this context, the data from Siberia are particularly valuable, particularly as a number of workers are insisting on the presence of substantial Jurassic and Cretaceous ice to explain sea-level changes and cold-climate phenomena such as glendonites in high-latitude sites. The fact remains, of course, that the present work offers only a snapshot of geological time, in the Toarcian case during a well-established hyperthermal, and extreme extrapolation to much of the Mesozoic would probably be unwise. Given the importance of the Arctic data, I think it would be preferable in parts of the text (e.g. Results and Discussion) to separate out the Pliensbachian and Toarcian data sets in separate sub-sections rather than running them together, which can become confusing to the reader.

In terms of fidelity of the paleotemperature records, much depends on the preservational state of the aragonitic fossils, and the authors have made some obvious moves to determine the integrity of their material. I must say, however, that, from the photographs, the Arctic specimens have a white 'powdery' look to them, which is typical for partly degraded aragonite. As another test of alteration, strontium-isotope data would be useful, since the Toarcian global curve has particularly low values around the OAE interval and the presence of more radiogenic $^{87}Sr/^{86}Sr$ ratios would be a fingerprint for alteration. Ideally, of course, there would be some accompanying TEX86 data, which should be obtainable given the relative lack of maturity of the sediments and at least a modest amount of organic material in the sediment.

Line 24: change to ‘These data highlight the risk . . .’

Line 59: should be ‘as well as isolated’

Line 60: has undergone

Line 101: commonly flattened

Line 18: described by Daëron et al. (2016).

Line 120: CO_2

Line 132: need subscripts

Line 144: values, respectively (insert comma)

Line 157: well-preserved

Line 217: say where in the mid-latitudes

Line 227: high-latitude

Line 233: hence recording . . .

Line 241: near-shore

Line 243:should not have exceeded

Lines 247–248: relative to SMOW standard

Line 244: can ‘only a few degrees’ be more specific? Estimates of the temperature drop across the thermocline from some localities during the Jurassic and Cretaceous, based on belemnite delta-18O values and TEX 86, come in at about 14°C (Mutterlose et al., *Earth and Planetary Science Letters*, *298*, 286-298 and Jenkyns et al., C*limate of the Past*, *8*, 215-226). So, presumably the bivalves were living in the mixed layer? As noted above, it would be useful to have some TEX86 values for the accompanying sediments.

Figure 4, text figure explanation. Please explain what the different symbols mean and the shorthand for the zones. Should *falciferum* not now be *serpentinum*?

Line 276: mid-paleolatitude

Line 314: references required

Line 519: reference is incomplete

Fig 5, text-figure explanation is not comprehensive enough, making this diagram difficult to decipher. Make clear what grey bands signify. References should be given here, not in

Supplementary data.