

Dear editor,

We thank the two anonymous referees for evaluating our manuscript. We are pleased to learn that both referees have found our work interesting. Their comments and suggestions helped us to improve the manuscript. Below are our replies to the referees' comments in blue. Page numbers mentioned here refer to the original manuscript published on Biogeosciences discussions.

Anonymous Referee#1

Referee's comments (RC) - This is a very detailed assessment of the sinking dynamics and depth distribution of marine GDGTs and associated proxy indices at two high latitude locations. Particularly, I find it remarkable that OH-GDGT may be a promising alternative temperature proxy to GDGTs in these regions. I have a couple of mostly minor comments/suggestion below. I am, however, a bit concerned about leaving out data points, without reasonable justification (see comments below: [please see 8. Referee's comments \(RC\) and Author's responses \(AR\)](#)).

Specific comments

1. **Referee's comments (RC)** - P1-12 remove 'the'
Author's responses (AR) - Corrected
2. **RC** - P1-13 'proxies' and 'proxy index'
AR - Corrected
3. **RC** - P1-15 '... where the original TEX86 proxy calibration shows a larger scatter.'
AR - Corrected
4. **RC** - P1-21 remove 'during transport', it's redundant
AR - Removed from the sentence
5. **RC** - P2-10 '... a logarithmic calibration of TEX86L, excluding the Crenarchaeol regio isomer, was suggested ...'
AR - Corrected
6. **RC** - P4-20 'stratification' instead of 'stability'?
AR - Corrected. Yes, 'stratification' is the proper term in this context rather than 'stability'.
7. **RC** - P5-05 'Afterwards'
AR - Corrected
8. **RC** - P8-12-15 Why were these samples excluded? Is there reason to believe that something is wrong with the analyses? If not, the statistics should include all samples.
AR - When all samples are considered, the relationship between GDGT and opal fluxes does not seem well correlated ($R^2 = 0.44$). However, by visual inspection it is evident that the changes in GDGT fluxes have a similar trend with the ones in opal flux. Moreover, the episodic GDGT pulses we excluded for the correlation occurred when carbonate (late September 2007 and March 2008), coccolithophore (late September 2007), and terrestrial biomarker (late September 2007) fluxes were enhanced. Therefore, we believe that the episodic GDGT pulses occurring at these times might have been a consequence of enhanced GDGT flux exported by those transporting materials (carbonate, coccolithophore, terrestrial matter) rather than by opal, simply because during these times a very high particle flux prevailed, enhancing the export of every material from the surface waters.
Author's changes in manuscript - we added the sentences in the discussion section in P10 line 16-18 "Those two episodic GDGT pulses occurred when carbonate, coccolithophore, and terrestrial biomarker fluxes were enhanced, potentially resulting in the enhanced GDGT flux."
9. **RC** - P9-25 check subscript
AR - Corrected
10. **RC** - P10-6 '... vary depending on their composition...'

AR - Corrected

11. **RC** - P10-10 '... preferentially incorporated into ...'
AR - Corrected
12. **RC** - P10-20-22 Again, please provide reasoning for excluding samples from correlation analyses, or revise.
AR - Please see 8. AS
13. **RC** - P12-21-22 What evidence do you base this statement on? Include explanation, or reference to figure.
AR - The reflection of SSTs based on the TEX_{86}^L calibration shows evidence that GDGTs are mainly derived from surface waters. Figure 3f is referred to.
Author's changes in manuscript – We refer to Figure 3f.
14. **RC** - P12-23-24 This argument is not quite clear to me. Which 'result' are you referring to?
AR - To make the sentence clear, we rephrased it and inserted the reference. 'The result' means that GDGTs transported by diatom and fecal pellet reflect the SSTs based on the TEX_{86}^L proxy and there is a good correlation between GDGTs and opal as well as Appendicularian fecal pellet fluxes.
Author's changes in manuscript - 'The reflection of SSTs based on the TEX_{86}^L calibration and correlations of GDGTs with opal and Appendicularian fecal pellet fluxes agree with the finding.(Lalande et al., 2016).'
15. **RC** - P14-25-28 How exactly (over which nutrient) do you think Thaumarchaeota compete with phytoplankton? Does phytoplankton use ammonium as a N source?
AR - Thaumarchaeota as ammonia-oxidizer compete with phytoplankton for ammonia, which use ammonia as a N source. To make the sentence clear, we rephrased it.
Author's changes in manuscript – 'Austral winter blooms of planktonic Archaea.' is changed to 'Photoautotrophic phytoplankton, which use ammonium as a N source, would outcompete Archaea for ammonia in spring and summer time. In contrast, in winter time when phytoplankton's productivity is limited due to the lack of light, ammonia availability for Archaea is higher (Pitcher et al., 2011; Wuchter et al., 2006). This explains the winter bloom of ammonia-oxidizing Archaea.'
16. **RC** - P15-7-10 At which depth die Fischer et al. observe similar patterns? It is also not clear, which location are you referring to. Therefore, the conclusion you make is not clear either.
AR - Fischer et al., (2002) reported mass fluxes in sinking particles, which were collected in the following years after the collection of PF3 almost at the same location. Each mooring system (PF5, PF7, PF8) was deployed at two similar depth traps to the PF3. 'a location further to the south' is referred to site Bouvet Island (BO; 54.50° S, 3.33° W, Fischer et al., (2002)), which was located further to the south compared to site PF3. To make the sentence clear, we rephrased it.
Author's changes in manuscript – 'Fischer et al., (2002) observed a similar seasonal flux pattern in the following years measured almost at the same depths and at the same location as site PF3. At site BO (54.50° S, 3.33° W), which was located further south than site PF3, the authors also found a period of almost no flux in July-December for four years approximately at 2200 m depth.'
17. **RC** - P16-30 This statement should be stronger (remove 'potentially'), because water T has an effect on GDGTs, and not the other way round.
AR - We agree on it. 'potentially' is removed.
18. **RC** - P17-2 'Larger scatter towards colder temperatures ...'
AR - Corrected.
19. **RC** - P17-4 '...relationship of maSSTs AND TEX_{86}^L values ...'
AR - Corrected.
20. **RC** - P18-7 'similar range as'
AR - Corrected.
21. **RC** - P18-13 'Warm biases AS with the ...'
AR - Corrected.

22. **RC** - P19-16-17 '... or OH-GDGT-based calibrations ... the limitations of a single global TEX86L calibration...'
AR - Corrected.