Clim. Past Discuss., 11, C3230–C3235, 2016
www.clim-past-discuss.net/11/C3230/2016/

Climate of the Past Discussions
Open Access
EGU

Interactive comment on "Climate variability and long-term expansion of peat lands in Arctic Norway during the late Pliocene (ODP Site 642, Norwegian Sea)" *by* S. Panitz et al.

S. Panitz et al.

sina.panitz@northumbria.ac.uk

Received and published: 22 March 2016

We would like to thank Maria Fernanda Sanchez Goñi for her very constructive review. We have addressed her comments as detailed below.

Reviewer #1 (M.F.Sanchez Goñi): Panitz et al. present a pollen analysis of the late Pliocene interval, Piacenzian, from ODP site 642 collected off northern Norway. The results are original and the resolution of the analysis is high, up to 800 years between 3.29 and 3.16 Ma, approaching the temporal resolution performed in Pleistocene records. In contrast with previous low resolution studies, they show for the ïňĄrst time that Piacenzian warmth was not as stable as previously thought but punctuated by

cooler episodes. These cooler episodes, allowing the development of tundra and peat lands, could contribute to an increase in albedo and atmospheric CO2 capture, both feedback mechanisms contributing to ice build-up leading to the major Pleistocene glaciations. This manuscript deserves publication in Climate of the Past after moderate revision. My main concerns are manuscript length and descriptions of the pollen results. I suggest to the authors delete section 4.2 (description of the raw pollen data) and 4.3 (description of the quantitative climate reconstructions) and draw a new table synthesizing these raw data. Climate of the Past is not a palynological journal. Moreover, section 5 nicely describes the pollen results already along with their interpretation in terms of vegetation and climate. Now, there are many repetitions between sections 4.2 and 4.3 and sections 5.2 to 5.6 and 5.7.

R1: We will merge section 4.2 and 4.3, but would prefer to keep Sections 4 and 5 separated. We are aware that this produces some repetition, but a separate presentation of results and interpretation avoids circular arguments and allows a higher accuracy if compared with data from other records. This style is not necessarily specific to palynological journals and has already been published in CP (e.g. Andreev et al. 2014. Clim. Past, 10, 1017-1039).

Reviewer #1 : Below I have listed the points that the authors should also modify or further discuss: Page 5757, Line 11: Please clarify what you mean by “As the mPWP exceeds orbital timescales. . .”.

R2: Changed to: As the length of the mPWP exceeds orbital timescales...

Page 5762, Line 24: Why did the authors sieve the samples with a sieve at 63 μm? I guess that the reason is because this sieving is the common procedure used by paleoceanographers to collect the foraminifera. However, the size of Picea pollen is commonly bigger than 63 μm reaching nearly 100 μm (e.g. Lindbladh et al., 2002, American Journal of Botany). Please argue that the potential bias in the pollen data related with the underrepresentation of Picea would not affect the interpretation and

CPD
11, C3230–C3235, 2016

conclusion of the manuscript.

R3: Reviewre#1's assumption is correct and the following changes were made to clarify (p. 5762, line 23): "All samples were pre-sieved through a 63 μm mesh to retain foraminifera for oxygen isotope analysis in Bergen, Norway (Risebrobakken et al., 2015). In order to identify a potential bias in the pollen data resulting from larger Pinaceae pollen grains exceeding 63 μm, we compared sieved and unsieved samples, and no difference in the overall pollen count has been found."

Page 5763, lines 25-26: ". . ., following the same preparation protocol." The same protocol in comparison with what other protocol?

R4: Changed to: ..., using standard palynological techniques.

Page 5763, lines 9-10: How many pollen grains do you count per sample excluding Pinus pollen and how many taxa?

R5: Changed to (p. 5763, line 10): An average of 510 pollen grains was counted per slide, or 185 grains excluding Pinus. On average 23 taxa were identified per sample.

Page 5763, lines14-19: Please cite the reference of the paper that validates the criteria used to identify the reworked pollen (dark orange to brown colour, high degree of compression. . .).

R6: The following references will be added: de Vernal and Mudie (1989a), Proceedings of the Ocean Drilling Program (Site 645); de Vernal and Mudie (1989b), Proceedings of the Ocean Drilling Program (Site 646 and 647); Willard (1996) Proceedings of the Ocean Drilling Program (Site 910 and 911).

Page 5763, lines 20-25: Add how the percentages of Pinus pollen have been calculated.

R7: Added p. 5763, line 23: Percentages of Pinus pollen was calculated based on the total pollen sum including Pinus.

CPD
11, C3230–C3235, 2016

Page 5765, lines 13-14: How can the authors discriminate Cupressaceae from Juniperus-type pollen? In Quaternary sediments, this discrimination is not possible. We use Cupressaceae pollen morphotype as synonym of Juniperus-type morphotype.

R8: We have added the following sentences to clarify the discrimination between Cupressaceae and Juniperus-type pollen (p. 5763, line 14): The group Juniperus-type only contains pollen grains that are split open whereas Cupressaceae contains those that are still closed or have a papilla (see e.g. Demkse et al. (2002), Quaternary International).

I suggest to the authors to replace “Modern surface samples” by “Modern and mid-Holocene samples” throughout the manuscript.

R9: Done.

Page 5770, lines 5-22: could the authors please further discuss the type of transport by wind or rivers that brought the pollen to the ODP site. If the pollen grains from deciduous trees are transported by rivers, they would not necessarily be deposited closer to the source area. I guess that the model of Mudie and McCarthy is valid for pollen transported by winds. Is this correct?

R10: We thank reviewer#1 for this important comment and will expand the discussion including the following section (p. 5770, line 22): The pollen spectra are predominated by wind-pollinated taxa. Low abundance of deciduous trees can also be found in other marine records from the North Atlantic (Mudie and McCarthy, 2006). There is no evidence for large rivers in Norway during the Pliocene, which makes rivers as a significant transport medium for pollen to the site highly unlikely. Today, plumes of cold fjord water enter the Norwegian Sea in spring, but only extend less than 100 km offshore (Mork, 1981, Transactions of the Royal Society of London). However, during the Pliocene fjords and glaciers which trigger such plumes likely did not exist.

May I suggest including in Figure 6 the δ18O curve of Lisiecki and Raymo for the

CPD

11, C3230–C3235, 2016

Piacenzian interval in order to better follow the Discussion section?

R11: We fully agree and have added the δ18O curve of Lisiecki and Raymo to Figure 6. Minor comments

Please write the names of species and genus in italics

R12: Done

Page 5760, line 11: replace “is” with “are”

R13: Done

Page 5762, line 23: add a coma after “Norway”

R14: Done

Page 5764, line 15: replace “analyse” with “document”

R15: Done

Page 5771, line 24: add “s” to “zone”

R16: Done

Page 5764, line 25-27: delete the meaning of MAT, CMT, WMT and MAP. This is already mentioned in section 2.2

R17: Done

Page 5767, line 2: replace “is” with “are”

R18: Done

Page 5775, line 8-9: This sentence is not clear.

R19: Changed to: “Considering the present-day average minimum elevation of glaciers (c. 1000 m) in northern Norway and a lower height of the Scandinavian mountains during the Pliocene, mountainous glaciation during the warmer-than-present Piacenzian

CPD
11, C3230–C3235, 2016

seems highly unlikely (Andreassen et al., 2012; Sohl et al., 2009)."

Page 5779, line 2: add "northern" before "Norway"

R20: Done

Figure 2: Could you add the latitudes?

R21: Figure 2 will be provided with latitudes.

Interactive comment on Clim. Past Discuss., 11, 5755, 2015.