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Climate of the Past Discussions

Interactive comment on "Qualitative and quantitative reconstruction of surface water characteristics and recent hydrographic changes in the Trondheimsfjord, central Norway" *by* G. Milzer et al.

G. Milzer et al.

g.milzer@epoc.u-bordeaux1.fr

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We gratefully acknowledge the critical review and corrections by Lise Durantou (Reviewer 1) which certainly improve the reading of the manuscript and the understanding of the context. We will make sure to include all comments and suggestions into the revised version of the manuscript with regard to english editing. In addition, we want to answer specifically three questions asked by the reviewer, both related to the method (MAT) used for the quantitative reconstructions:

1. Reason for choosing a modern database of n=1207 sites (available under: http://www.geotop.ca/upload/files/babillard/congres_et_ateliers/Handout%20Dino9-Workshop.pdf) instead of the recently updated database n=1429:

The n=1429 database is still not available on the GEOTOP website, even if cited in several works (Durantou et al., 2012; Bonnet et al., 2012; de Vernal et al., 2013; Radi, T., et al., 2013). The most recent one posted contains 1297 data points. The database which has been used in this paper constitutes one step within the history of dinocyst database construction which has firstly started with the work of de Vernal et al. (2000). The illustration of this history is partly described on the GEOTOP website (http://www.geotop.ca/en/bases-de-donnees/dinokystes.html) but several steps are not available anymore since progresses are constant within this dataset which is permanently updated by a long list of contributors since nearly 15 years. For instance, the largest existing set for dinocyst modern data is now the one compiled this year by Zonneveld et al. (see http://dx.doi.org/10.1016/j.revpalbo.2012.08.003; or Review of Palaeobotany and Palynology, Volume 191, 15 April 2013, Pages 1–197). This data set could have been used as well. However, as explained in the introductory part of the manuscript, the Trondheimsfjord hydrology is mainly controlled by the NAC and NCC. For the purpose of SST, SSS and PP reconstruction in this study area, we therefore considered the step that was achieved in 2011 with the 1207 database (http://www.geotop.ca/upload/files/babillard/congres_et_ateliers/Handout%20Dino9-Workshop.pdf OR http://gizmo.geotop.uqam.ca/Gestion_Documents/Congres/data%20for%20R%20%28txt%20file%29/explanatory%20notes.pdf), especially because this database provides a comprehensive synthesis of PP data and sufficient analogues for our exercise.

Cited ref. :

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de Vernal, A., C. Hillaire-Marcel, A. Rochon, B. Fréchette, M. Henry, S. Solignac, and S. Bonnet (2013), Dinocyst-based reconstructions of sea ice cover concentration during the Holocene in the Arctic Ocean, the northern North Atlantic Ocean and its adjacent seas, Quaternary Science Reviews.

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2. Why are the Trondheimsfjord sites investigated in Milzer et al. (2013) absent from the modern database used in MAT reconstructions:

Two basic reasons explain this choice: Including these ca. 60 surface sediment sites was basically impossible since the environmental database in hand (such as NODC, etc...) does not cover the Trondheimsfjord at such a high spatial resolution, and therefore does not resolve the expected high spatial heterogeneity in surface water conditions (such as SSTs, SSSs, and PPs) across the fjord. We unfortunately did not manage to get data from national offices in Norway. In addition, adding these 60 sites to the ocean wide database would create an overrepresentation of the Trondheimsfjord conditions in the MAT-selected analogues and thus reconstructions.

3. Why didn't we reduce the number of analogues for the reconstruction of the sea-surface parameters in order to reduce the differences between minimum and maximum estimated parameter values for each fossil sample?

The choice of 5 analogues for dinocyst based MAT reconstructon is a standard procedure. Applying the dinocyst-based MAT method for the reconstruction of the sea-surface parameters in a Norwegian fjord is definitively not common (our study is unique in this regard). Our intention is therefore basically to test the reliability of reconstructions based on methods which were successfully developed for open ocean conditions, by comparing estimated values with instrumental measurements in the fjord. For this reason we strictly followed the standard method according to e.g. de Vernal et al., (2001), Radi and de Vernal, (2004), Guiot and de Vernal, (2007). Hence, so far we did not reduce the number of analogues sites as at this stage these methodic modifications are beyond the scope of the present work. Still, our future interest certainly is to figure out how the quality of the reconstructions and the RMSEP will change by modifying several parameters e.g. the number of analogues and the number of sites used for the reconstructions.

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Guiot, J., & de Vernal, A. (2007). Transfer Functions: Methods for Quantitative Paleoceanography Based on Microfossils. In Hillaire-Marcel, C., and de Vernal, A. (eds.) Proxies in Late Cenozoic Paleoceanography, Elsevier, 1(07), 523–563. doi:10.1016/S1572-5480(07)01018-4

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