

## ***Interactive comment on “Sedimentary organic matter variations in the Chukchi Borderland over the last 155 kyr” by S. F. Rella and M. Uchida***

### **Anonymous Referee #1**

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The authors examined biogeochemical parameters such as TOC, C/N, CaCO<sub>3</sub> concentration from a piston core retrieved from the northern Northwind Ridge. The authors built a preliminary age model mainly based on the comparison of the CaCO<sub>3</sub> data to the global benthic d18O data of Lisiecki and Raymo (2005). They try to interpret the TOC, C/N, CaCO<sub>3</sub> variation in terms of the major source(s) of organic matter-terrestrial vs. marine- and the mode of transport – currents vs. ice rafting or icebergs. They further relate the discernable peaks recorded in sediment to the variability of atmospheric temperature variability in the northern hemisphere recorded in the Greenland ice core. The authors provide very high resolution data going back to 155 ka. Data to reconstruct the paleoenvironment dating back to 150 ka are rare in the Arctic Ocean. The high resolution data will be potentially helpful to the scientific community to better understand the time evolution of the Arctic Ocean and possibly the response of the Arctic

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Ocean to the current atmospheric temperature rise.

### General comments

The authors obtained high resolution data from an over 7 meter long piston core, which enable the authors to try to correlate the oceanic events to the atmospheric ones. The authors provide feasible explanations for the observed variabilities of CaCO<sub>3</sub> content, TOC, C/N. However, I am concerned that the authors do not seem to have a robust age model. Their assignment of the appearance of laminated layers between 600 and 700 cmbsf to the MIS6 glacial will be probably right. But the allocation of the distinctly low CaCO<sub>3</sub> horizons to the occurrences of increased d<sub>18</sub>O in LR04 stack seems somewhat arbitrary. Further discussion on the correlation of the peaks in CaCO<sub>3</sub>(%), TOC(%) and C/N and Dansgaard-Oeschger Stadials and Heinrich events all based upon this preliminary age model. In my opinion, a more robust and rigorous age model needs to be established first before this kind of analysis.

Also, it would be helpful if the authors try to compare the results with those of the cores collected at other locations such as Mendeleev Ridge. For example, Yamamoto et al. (Global and Planetary Change, 2009, Vol. 68, 30-37) reported TOC variation and other biomarker results from a core retrieved from the Mendeleev Ridge in the similar time period.

### Specific comments

P2264 L1-3: The observed TOC (%) were very low, lower than 0.5%. So the outliers of 1-7% of TOC can be a serious problem. The authors need to re-run those samples and clarify this issue before the submission of a revision.

P2264 L9-12: as the authors admit, the low concentration of TOC (<0.5%) may cause problem in using Corg/N<sub>total</sub> value instead of Corg/N<sub>org</sub>. One method to test the relative contribution of inorganic nitrogen to C/N is to plot nitrogen concentration with respect to TOC, and obtain y-intercept from a linear regression. There are a few pa-

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pers that have done this kind of analysis and demonstrated that inorganic nitrogen was not a problem.

P2264 section 4.1: As mentioned above, obtaining a reliable and robust age model may hold a key to strengthening the interpretation of the data suggested in this paper. The authors may obtain radiocarbon dating of forams. But the problem with radiocarbon dating, as the authors must know too well, is that it can trace back to only 40-50ka. The authors will need other methods for establishing an age model.

P2265 L13-16: The high concentration of CaCO<sub>3</sub> during the warm period may not be caused by enhanced biological productivity. In this sense, it seems risky to correlate the high CaCO<sub>3</sub> concentration to warm intervals, and furthermore to use this assumption to establish an age model. It should be rather that the authors establish an age model first, and then try to interpret the cause(s) of the high concentration of CaCO<sub>3</sub> in the warm periods (if they exhibit temporal correlation).

P2265: The allocation of the distinctly low CaCO<sub>3</sub> horizon to increased d18O in LR04 stack seems somewhat arbitrary. For example, is there reason why the ending of MIS6 was correlated to the younger laminated layer while there were two laminated layers between 600 and 700 cmbsf? There is another peak in CaCO<sub>3</sub> at about 450 cm that was not included into the interglacial warm period, and why? The authors will need to provide an uncertainty in this preliminary age model, and from this information, consider whether further correlation of the peaks with the NGRIP data discussed in Section 5.2 are meaningful.

Technical corrections

P2262 L20: provide reference(s).

P2263: Information on how the core was subsampled (thickness of the subsamples) should be provided in the methodology section.

P2263 L9: change "has been" to "was".

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P2264 L1: change "by CHN" to "by a CHN analyzer".

P2264 L22: 902 should read 602?

Fig. 4: Spell out DOS.

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Interactive comment on Biogeosciences Discuss., 8, 2259, 2011.

**BGD**

8, C596–C599, 2011

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