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Climate of the Past Discussions

Interactive comment on "Sub-decadal- to decadal-scale climate cyclicity during the Holsteinian interglacial (MIS 11) evidenced in annually laminated sediments" *by* A. Koutsodendris et al.

Anonymous Referee #1

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Koutsodendris et al. present and discuss detailed paleoclimatic records that were established by means of a great, almost unique analytical effort: They measured layer thickness and counted 5728 fine sediment layers with a petrographic microscope on thin sections at 100-fold magnification in a varved, almost 5 m long section of North German lake deposits. The resulting cyclic and non-cyclic variations of layer thickness were evaluated according to modern standards of time series analysis, on this way revealing a number of intriguing similarities to the variability found in Holocene climate records.

In particular, the authors focus on generating separate records of dark winter and light summer sublayers from the varved sediment section (Fig. 4). Notwithstanding the authors report (Figs. 2B - C) that most boundaries between the top of a light layer and the overlaying dark layer are diffuse. For this reason the present version of this study suffers from a major problem, that is the precise definition of the individual thickness of both the black and light sublayers under the microscope on a routine basis. The methods section lacks any explanation, how this problem of boundary definition was overcome varve-by-varve; moreover, I miss a clear definition of the uncertainty ranges of sublayer thickness involved and their variability.

A further but minor scientific problem may be linked to the proper assignment of the broad band of subdecadal periodicities that were deduced separately for both light- and dark-sublayer records and compared to specific ENSO and/or North Atlantic Oscillations (NAO) as reported for the last 150-200 years. In particular, the problem of a proper assignment may apply to the NAO originally described as a decadal-scale periodicity (Hurrell and van Loon, 1997) that possibly may even be linked to the 10.5-yr solar cycle (e.g., T. Landscheidt, various publ.; Gray, Beer, et al., 2010). Possibly, the deductions may gain from employing a low-pass filter of – say – four years to the records of layer thickness prior to employing spectral analysis.

Finally I suggest some purely technical corrections listed below:

(1) The clearness of the paper may gain from a consistent use of the term (dark or light) 'sublayer' instead of 'layer', in contrast to the varved layers that consist of two sublayers each.

(2) Discussion of the Holsteinian as terrestrial analogue to MIS 11: First absolute age estimates of Holsteinian sediments were published as evidence for MIS 11 by Sarnthein et al. (1986) (p.1396, last paragraph).

(3) The methods section (p. 1398, l. 16) needs to name the laboratory, where analyses at the micro-X-ray fluorescence spectrometer Eagle IIIXL were performed.

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In summary, the discussion paper of Koutsodendris et al. is recommended (#1 - #2) for publication after minor revisions, *however, just in case* the crucial question about the quantitative routine definition of the boundaries between light and dark sublayers and thus, about the derivation of sublayer thickness can be answered to full satisfaction.

References

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Hurrell, J.W., and van Loon H., Decadal variations in climate associated with the North Atlantic Oscillation, Climatic Change, 36, 301–326, doi:10.1023/A:1005314315270, 1997.

Sarnthein, M., Stremme, H., and Mangini, A., The Holstein Interglaciation: Time-stratigraphic position and correlation to stable-isotope stratigraphy of deep-sea sediments. Quater. Res. 26, 283-298, 1986.

Interactive comment on Clim. Past Discuss., 7, 1393, 2011.