

## ***Interactive comment on “Interglacial and glacial variability from the last 800 ka in marine, ice and terrestrial archives” by N. Lang and E. W. Wolff***

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The authors provide an extensive discussion of marine, ice and terrestrial records covering the last 800 ka, which satisfy a number of criteria such as continuity, resolution and length. They concentrate on the strengths of glacial and interglacial periods according to the usual MIS nomenclature, but they also partly critique this nomenclature, based on a more thorough discussion of the dynamics of MIS 7, 13 and 15.

The authors are generally very lucid about the potential caveats of their analyses (for example, the synchronisation of records). The resulting article is well balanced, well documented and, I believe, will constitute a high value reference to scientists interested in modelling the past state of the atmosphere and ocean with general circulation models, as well as those more interested in the dynamics of glacial-interglacial cycles.

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Hopefully, the authors will be able to release this compilation in the public domain in the form of a digital file.

There is just one thing that really annoyed me. The paper mentions at places 'estimated uncertainties', 'analytical uncertainties', 'pooled uncertainties' and these refer to intervals (e.g. :  $\pm 1$  ka); a statistician would prefer to speak about a 'confidence interval' (frequentist) or 'credible interval' (Bayesian). For example, rather than analytical uncertainty, the statistician would mention "an error on the measure with a credible interval (66 %) of  $\pm 1$  ka ". The purpose of this comment is to draw the attention of the authors about the fact that the language used to express uncertainties is very loose in palaeoclimatology and any effort to get closer to standard practices in statistics will make our life easier in the future.

Apart from this point which, I concede, cannot entirely be addressed within the context of this paper, I have no major comment. However, there are editorial weaknesses at a number of places. In the following, 'Edit again' means that I estimated the language to be too informal/not enough specific for a scientific paper.

p. 2224, l. 15 : show some tendency : edit again

p. 2224, l. 1 : The climate of the recent third of the Quaternary : the saw-tooth pattern is only really obvious over the last 4 glacial-interglacial cycles. Before the mid-Brünhes, cycles were more sine-like.

p. 2225, l. 10: "model glacial cycle" : do you mean a 'typical' glacial cycle?

p. 2225, l. 16 : the *Antarctic* ice core record

p. 2225, l. 21 : in Antarctic temperature every glacial is different : edit again.

p. 2225, l. 28 : the global pattern of response:

This is an interesting point. Response implies that there is an identifiable cause, such as the astronomical forcing. Yet, it is reckoned that a certain level of stochasticity exists

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in climatic dynamics, even at glacial-interglacial time scale. This stochasticity may explain, in part, differences among different interglacials. Consequently, definite causes of a given climate state at a given time cannot necessarily be identified in a deterministic fashion. One possible recommendation is to speak about 'climate signatures', or 'patterns of climate changes' rather than 'climate response'. The same remark applies for the conclusion lines.

p. 2226, l. 5 : 'state-of-the-art model' : well; we, modellers, all pretend to be at the state of the art of our discipline, don't we? but we chose to model different things. I would therefore recommend to be more explicit and speak about 'general circulation models of the ocean and atmosphere'

p. 2226, l. 20 : 'discover' : I do not understand the use of this word in the present context. p. 2227, l. 14 : 'parameters' : 'variables' is to be preferred. p. 2227, ll. 21-24 : ideally the resolution should be reasonably homogeneous throughout the record to avoid biases in the intercomparison of different interglacials. Can you briefly comment on this?

p. 2228, l. 16 : are precession and obliquity also taken from Laskar ? If yes then the Laskar reference should best come after 'precession'.

p. 2229, l. 5 : tuned 'by' -> tuned 'to' p. 2230, l. 9 : analysed 'from' -> analysed 'in' ? p. 2230, l. 11 : saturates at high sea-ice extent. Is it the proxy saturating at high sea-ice extent, or sea-ice saturating at high continental ice volume, or both?

p. 2231, l. 1 : 'very interesting' seems superfluous. The following discussion is enough to communicate to the reader that you indeed found it interesting.

p. 2232, l. 8: 'use these records in conjunction with other climate proxies from the same record' : edit again. Do you mean : 'these proxies in conjunction with other climate proxies from the same archive' ?

p. 2232, l. 23 : 'ka-averaged' : please explain p. 2232, l. 28 : 'mid-transitions' : are

these the mid-points of the terminations?

p. 2233, l. 4 : 17  $\delta^{18}\text{O}$  records : are these those of the LR04 stack? p. 2233, l. 21-23 : is the linear interpolation needed because there are planktic data at depths for which there is no benthic data, and thus no LR04 age? Could you please clarify/confirm this?

p. 2236, l. 9 : some garbage left. p. 2229, l. 16 : a section of data with a small deviation from a constant level. I do not understand this. RAMPFIT requires a data section in which there is a ramp, so a large deviation from a constant level.

p. 2229, l. 23 : 'blue for glacial, and purple for amplitude' : edit again

p. 2237, l. 12 : 'more sensitive proxies' : same remark as for sea-salt : is this that the proxy is more sensitive to SST, or is this that SST is more sensitive to... to what in fact? To changes in ice volume, astronomical forcing, or to a sort of natural variability among interglacials (see my earlier comment)

p. 2241, l. 14 : 'collective view in the community' : I would recommend to be a bit more neutral; for example: SST records contrast with the perception emanating from the isotopic records, according to which MIS 16 is a particularly strong glacial.

p. 2242, l. 12 : 'Again with this pattern TVII somewhat breaks the pattern' : edit again

p. 2243, l. 15 : well resolved -> well-resolved. p. 2243, l. 16 : 'if 7.3 had been taken as the true interglacial at Baïkal, then its strength would be greater than MIS 19' : is this a complicated way of saying that in the Baïkal record 7.3 is stronger than MIS 19, or did I miss something?

l. 2254, Table 1 : give the unit of the resolution in the legend (ka) and briefly explain what 'ka-average' is.

l. 2255, Table 2 : based on... what ?

Figure 4 does not read very well. Some better-positioned legend could increase its legibility. Think this is the kind of graphic one would like to insert in a slide-show: it has

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to speak by itself.

Final remark: experts recommend to use 'astronomical forcing' rather than 'orbital forcing' because obliquity is not an orbital element.

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Interactive comment on Clim. Past Discuss., 6, 2223, 2010.

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