

Dear anonymous referee #3,

Thank you very much for your review and specific comments on the magnetostratigraphy part of our study.

Below we will reply to the comments.

*The manuscript describes an impressive effort to establish a coherent astronomically calibrated Ypresian time scale using new and previously published XRF, isotope, nannofossil and magnetic data from Walvis Ridge cores. I will restrict my comments to the paleomagnetic data and analysis, as this is my area of expertise. The processing of samples and data at the individual specimen level appears to be well done with no major issues. As previous workers have found, the interpretation of the data in terms of a magnetostratigraphy is more challenging. I don't necessarily object to the final interpretation, but my concerns lie in the lack of clarity in how the error bars were assigned and how the final magnetostratigraphy was selected. The authors are very vague on how this was done. There is no description of how error bars were placed on the beginning and end of each polarity interval (Fig. 2, Fig. 4). In some cases, the placement appears to be highly subjective. As one extreme example, it is stated in the text that there is no interpretable signal below 260 rmcd at site 1263, yet they identify polarity boundaries along with error bars within this interval (Fig. 2a). It is traditional to use a gray bar (instead of black or white) to denote intervals of ambiguous polarity. This might be helpful here to make it clear which parts of the record are truly unresolvable in the authors' opinion. It is also unclear how errors from each individual site were propagated into the final magnetostratigraphy and/or how this stratigraphy was decided upon. They merely say that it was "based on the integration of all data and evaluation of errors." I think you need to be more explicit.*

We are pleased to hear that referee 3 has no objection of the final interpretation. However, clarification in how the error bars were assigned and how the final magnetostratigraphy was selected is requested.

Unfortunately referee 3 did not request the supplementary data from the editor. All data used for this study will be available open access at <http://doi.pangaea.de/10.1594/PANGAEA.871246> by the time the manuscript will be accepted for publication. Simultaneously with the submission of the manuscript the dataset was also submitted and can be requested by the referees from the editor. Thus, we kindly ask the editor to confidentially provide the dataset to referee 3 to provide the chance for clarification how the final stratigraphy was selected. For example, Table S27 "Magnetostratigraphy ODP 1263" clearly expresses that the C23n.2n/C23r reversal below 260 rmcd is uncertain. Similar for ambiguous intervals at Site 1267. For a revised manuscript version, we will mark intervals of ambiguous polarity with a gray bar (instead of black or white) as recommended by referee 3. In doing so it will make clear which parts of the record are unresolvable.

The assignment of error bars, as with all magnetostratigraphic data, is a quite subjective endeavor. We identified reversed or normal polarity from carefully evaluating the inclination data as explained in the main text. The error bar for Leg 208 data marks the interval where the inclination shifts from clearly reversed to clearly normal polarity or vice versa. Poorer sample resolution and/or ambiguous or transitional inclination values across a reversal thus will increase the error bar. We did not apply an inclination threshold value to mark a shift in

polarity because the reversals occur in different seafloor depth at all sites. Drilling depth and compaction difference between sites might have affected the inclination at each site differently. A much sharper-defined length of error bars could be derived from higher-resolution data (e.g., by analyzing u-channels). However, this could be focus of a follow up investigation but is not the accomplishment in the context of our already data rich and complex manuscript.

The final combined magnetostratigraphy for the Ypresian at Sites 1258, 1262, 1263, 1265 and 1267 is given in Table S45 of the supplementary dataset. The individual reversals were all identified at one site and thus the error bars assigned in the individual site (as in tables S26 to S30) are transferred into Table S45. The definition for each reversal is described in the main text in chapter 3.3 *Magnetostratigraphic results and interpretation*. In combination with the detailed supplementary figures and the dataset tables we are confident that our interpretation can be followed appropriately. For a revised version we will add more details on the error evaluation and final magnetostratigraphy to chapter 3.3 *Magnetostratigraphic results and interpretation*.

*In (main text) tables 1 and 2, I think there is an issue with the age and time units. The ages are reported in millions of years, but the uncertainty is reported in what? I assume that 47.723 Ma +/- 118 Myr is not accurate?*

Thanks for pointing this out. We will add a note to the tables on that the error is given in kyr.