Comment on cp-2022-60
Mariem Saavedra (Referee)

Referee comment on "Late Neogene nanofossil assemblages as tracers of ocean circulation and paleoproductivity over the NW Australian shelf" by Boris Theofanis Karatsolis and Jorijntje Henderiks, Clim. Past Discuss., https://doi.org/10.5194/cp-2022-60-RC1, 2022

In this manuscript, Karatsolis and Henderiks generated two calcareous nanofossil records from International Ocean Discovery Program (IODP) Sites U1463 and U1464, located in the NW Australian shelf, in order to reconstruct long-term changes in ocean circulation, seasonality and nutrient availability from ~ 6-3.5 million years ago (Ma). The authors characterised different periods of change in stratification and nutrient availability in the study area by analysing the shifts in the calcareous nanofossil dominant taxa and comparing them with palaeotemperature gradients between the NW Australian shelf and the eastern Indian Ocean.

Karatsolis and Henderiks found a marked regional change in the oceanographic conditions that affected the ecology of calcareous nanofossils across the Miocene to Pliocene boundary (5.4–5.2 Ma), which they attributed to an increase in seasonality and general intensification of the upper water column mixing. The authors also put the observed local variations in a more global context, considering events, such as the extinction of Sphenolithus spp. (~3.54 Ma) and the termination of the late Miocene to early Pliocene biogenic bloom in the eastern Indian Ocean (4.6-4.4 Ma).

General comments

This manuscript represents a substantial contribution to scientific progress within the scope of Climate of the Past and it is of interest for the coccolithophore, calcareous nanofossil, palaeoceanographic and micropalaeontological communities.
It is well written, logically structured, and presents a new calcareous nannofossil dataset.

The title reflects the contents of the manuscript and Karatsolis & Henderiks present an adequate summary of their work in the abstract. The state of the art and the main aims of this work are properly introduced in the first section.

The methods used in this piece of research seem adequate and are described section 2 of the manuscript. In my opinion, mathematical formulae, symbols, abbreviations and units are correctly defined and used through the text.

The interpretation and conclusions have been logically derived from their findings, and supported by the original data shown in section 3 (Results).

My main concern is that the authors should highlight more the variability between proxy types. They use different proxies, such as GDGT-based TEX86 temperature and alkenone-based U37k’ SST or Mg/Ca derived SSTs from *Trilobatus sacculifer*. I like that they use gradients, but in the manuscript, the uncertainty of working with different paleotemperature indicators need to be more clearly addressed. Perhaps adding some reference(s).

Figures and tables are in general clear (a very good example of this is Figure 7). I just have minor suggestions regarding the figures (see specific comments/technical corrections). I would recommend merging some of them (4 and 6).

I find that the references cited in the manuscript are adequate. I just found some typos.

The supplementary material is also adequate, but it could be improved (in some of the plots there are just too many wiggles). I would probably move some of the supplementary figures/plates to the main manuscript (see specific comments).

Please also note the supplement to this comment: https://cp.copernicus.org/preprints/cp-2022-60/cp-2022-60-RC1-supplement.pdf