Climate of the Past Discussions

Clim. Past Discuss., referee comment RC2
https://doi.org/10.5194/cp-2021-144-RC2, 2022

Comment on cp-2021-144

Anonymous Referee #2

Referee comment on "An Intertropical Convergence Zone shift controlled the terrestrial material supply on the Ninetyeast Ridge" by Xudong Xu et al., Clim. Past Discuss., https://doi.org/10.5194/cp-2021-144-RC2, 2022

General comments:

Xu et al. present a very interesting and useful sediment record from Ninetyeast Ridge with measurements of clay mineralogy and Sr-Nd isotopes. Although the time frame of the record is somewhat limited, it does provide some constraints on orbital variation of terrigenous sediment fluxes. The data are of good quality and the interpretations are reasonable. The paper is well within the scope of Climate of the Past and provides another helpful record of the South Asian monsoon, which drivers are important geological questions. Broadly, I think the paper would be improved by clarifying the uncertainties in the interpretation of the proxies, more information about methods, and interpretation of the driving factors (ITCZ versus other influences on precipitation intensity, weathering and sediment transport).

Specific Comments:

Please add more perspective on disentangling the transport limitations (trapping of sediments on the shelf) and weathering (ITCZ migration and rainfall intensity).

How might the transport conditions mask the ITCZ record (e.g. lower smectite transport is interpreted as lower rainfall). It's great that both factors are mentioned, but I think the text needs to be clarified as to how these factors may result in different interpretations of the same record. This would give more confidence in the rainfall/ITCZ related interpretations.

I think it is important to discuss the potential factors on rainfall and weathering other than north-south ITCZ migration. For instance, Gebregiorgis et al. 2016 QSR suggest that

drivers off the South Asian monsoon may be more complex than migration of the ITCZ. There has been recent work regarding exposure of the Sunda/Sahul Shelves on Indian Ocean hydroclimate (DiNezio and Tierney, 2013 Nat. Geosci; DiNezio et al., 2020 Sci. Adv.; Pico et al., 2020 Paleoc. Paleoclim.), cross-equatorial moisture transport and influence on the monsoon (Clemens et al., 2021, Sci Adv.), the effect of stratification on the monsoon (Tierney et al. 2015, Nat. Geosci), and even a potential El Nino-like mode in the Indian Ocean during the LGM (Thirumalai et al., 2019 Paleoclim. Paleoc.). These are all factors that can influence precipitation that are not necessarily related to just the position of the ITCZ. There is mention of some potential other factors on lines 235-242, but this is not clear and not discussed directly related to your record. It would be good to consider your smectite record in regard to the timing of these other processes; a clearer discussion of these factors would improve the relevance of what sediment flux records like this are actually recording the Indian Ocean.

Technical corrections:

Line 16: "millennial" instead of "millennium"

Line 18: Maybe "supply" or "transport" is better than "supplementation"

Line 20: exposure of Sunda Shelf?

Line 21 "millennial" instead of "millennium"

Line 23 "millennial" instead of "millennium"

Line 30: It would read better to replace "the paleoclimate and paleo-ocean" with "paleoclimate and paleoceanographic conditions"

Line 38: "important" might be a better word than "nonnegligible"

Line 53: I don't think statements like "discussed as a hot topic" add much to the context. Better to state which studies have discussed provenance in the BoB and the collective contribution of these studies.

Line 65-66: Please explain more about why Ninetyeast Ridge is an ideal location-

appropriate sed rates for a gravity core? And only receiving fine-grained hemipelagic sediments because it is bathymetrically above fan sedimentation?

Line 83: Centrifuged? What rpm and duration?

Line 84: hydrochloric acid

Line 86: Were the slides treated with ethylene glycol? Were clay mineral standards used? Or just the Biscaye method?

Line 92: Are these bulk sediments or a specific grain size fraction?

Line 96: How were the Sr and Nd isolated? Info on columns, etc.

Line 137: "cannot" is a strong word, but yes, kaolinite transport can be limited, but some regions of open ocean have substantial aeolian kaolinite

Line 148: I suggest "abyssal plain" instead of "the normal seafloor"

Line 149: turbidity currents

Line 169-170: Not just the narrowing of the straight but exposure of the continental shelves including the Sunda Shelf and all the way up to Myanmar. The relative exposure of 200 km from the current Irrawaddy delta can affect how sediments are trapped on the shelf or delivered to the deep ocean.

Line 182: "transport" is a better word choice than "importation"

Line 229: Please highlight any information about how far northward the ITCZ may have shifted before and after the LGM. Would this bring noticeable change to the Indo-Burma area?

Line 245: Himalayas, mention the G-B transport.

Figure 5. Label the name of your core on the map.