comments (black font) and responses (blue font)

Reviewer #1

The topic of the paper appears suitable for CP. I consider both the overall scientific significance and quality to be good to fair and hence recommend minor to major revisions. A better understanding of latitudinal ITCZ migrations, both on orbital and millennial time scales is indeed desirable, and existing knowledge is either sparse or conflicting. The authors have worked extensively in the general area and topic before and provide sufficient evidence of a sound understanding on regional paleoceanographic change associated with shifts in the ITCZ.

To base their whole story around a single, short core (171106) and mainly one property (smectite) with the additional, occasional provenance data (Sr-Nd) is a little thin in my eyes. The chronology is sound and includes age modeling and uncertainty evaluation. The same appears to be the case for the clay mineralogy and provenance tracers.

Re：Thank you for your comment. The percentages of illite and smectite added up to 78.5% and these two clay minerals have a reverse-phase variation, which separately represents the sediment input of the G-B and Irrawaddy Rivers. Thus, smectite can represent the main characteristics of clay minerals. Sr-Nd isotopes are generally used for tracing sources of terrestrial sediment, especially during long-term analysis. Although core 17I106 is relatively short and the average resolution is approximately 256 yr/cm, it can be utilized to indicate paleoclimate and paleoceanographic condition changes on the millennial scale. In summary, clay minerals and Sr-Nd isotopes of the studied core are sufficient to distinguish sediment sources in the study area, and the clay mineral record is suitable to trace the ITCZ shift on the millennial scale, which has little influence on our main conclusions.

The whole discussion on smectite suffers, in my opinion, from the fact that the record is too short (MIS 3-1) and does not cover a full glacial-to-interglacial cycle. One cannot see how the response was, for instance, during MIS 6 and 5, which would be critical to know here. Any discussion of orbital variability is hence hampered. This is specifically true for any statement implicating changes in sea-level and and their effect on changing provenance and clay mineralogy (availability or lack of accommodation space on the shelves). The core is apparently only 162 cm long - why? Wasn't there a longer alternative to conduct such a study?

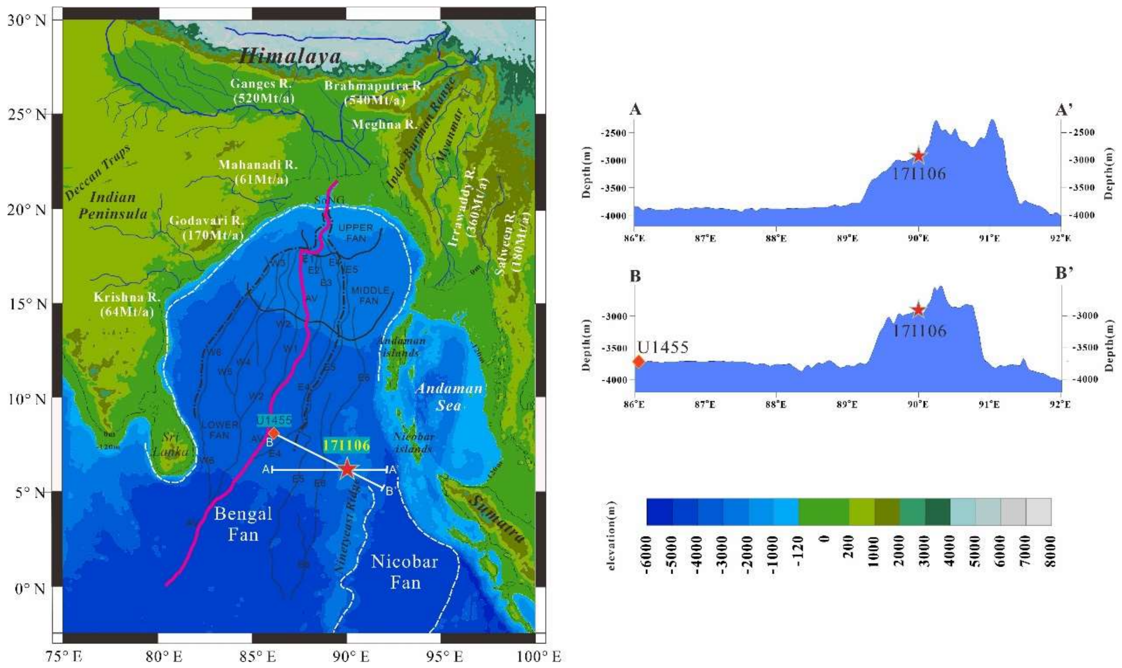
The same principal problem surrounds the discussion of the smectite peak around the LGM (21-18 ka). If there were a record for termination 2 (MIS 6/5 transition) one could see if there are common rules established during glacial maxima that are either regional or not. MIS 6 and termination 2 have comparable orbital configurations relative to the LGM and termination 1, hence possible shifts of the ITCZ – which are invoked in the discussion – should have been quite similar, at least from a global view, from which regional deviations could then be derived or discussed if present.

Re：Thank you for your comment. This advice is useful inspiration for us to plan future work; our group has collected core sediments annually in the Bay of Bangel since the first trip in 2010. However, thus far, on the Ninetyeast Ridge, we collect only two cores that were both shorter than 200 cm; in the next several years, we will focus on this area. The discussion of orbital variability is certainly critical for the mechanisms of South Asian monsoon evolution and sea level change, but unfortunately, it is impossible to continue the related work on this core due to the lack of longer gravity core(s). Certainly, MIS 6 and termination 2 have comparable orbital configurations relative to those of the LGM and termination 1, and similar orbital configurations may induce similar regional shifts in the ITCZ according to the view that orbital forces drive the thermal gradients. We also hope to perform more work on long time scales in the future and discuss shifts in the ITCZ on orbital time scales.

There is the complete lack of mentioning turbidity currents, which provide the vast majority of sediments from the river mouth of the Swatch of No Ground (SoNG) to the BoB and neighboring regions. Even though the short core presented here seems to show a rather steady deposition, plumes from turbidity currents will reach the site and affect the clay mineralogy. In this context, it is also odd that none of the IDOP-Expedition 354 studies, which are in close proximity to the core cite, have been cited ore discussed.

This is important and needs clarification and elaboration. How far above the surrounding is the core site? As mentioned above the authors completely ignore the possibility of turbidite deposition. Even if only the fine-grained upper sediment clouds of distal turbidites (those naturally contain a high percentage of suspended fine material, i.e., clay minerals) reach the sediment site, it would have a large effect on the clay mineralogy of site 171106. After all, the sites in not far from the channels on the eastern side of the BoB.

Re: Thank you for your comment. Turbidity currents can provide vast amounts of sediments from the river mouth of the Swatch of No Ground (SoNG) to the BoB and neighboring regions, especially near active channels, which is confirmed by geomorphological observations (Curry et al., 2003) and clay mineral studies of surface sediments (Sun et al., 2020). We modified Figure 1 and added two profiles to indicate the location of the core in relation to the channels. As the following figure shows, the study core is located above the central BoB seafloor at ~900 m and the channels on the eastern side (E6) of the BoB at ~700 m. The channel near core 17I106, named E6, is dead, has lacked massive landslides during the past 45 ka (Curry et al., 2003) and does not support that large turbidity activities have occurred there and provided a vast amount of clay minerals. Moreover, the ~900 m height of the seamount and the nearest 400 km straight line distance between the core and SoNG hindered the entry of fine-grained upper sediment clouds of distal turbidites into the core site and caused the turbidites be a minor provider compared to surface current input. IODP Expedition 354 studies provide very important background research. We mistakenly forgot to cite related references in the writing process, and we will add them in the revision.



New Figure. 1 Geographical setting of the BoB. The locations of cores 17I106 (red asterisks) and U1455 (orange diamond) are shown. The Bengal Fan diagram is modified from Curray et al. (2003). The white dashed lines outline the scales of the Bengal Fan and the Nicobar Fan. The solid gray lines and black letters represent the turbidity channel and the reference names of the principal channels, respectively. The pink solid line is the ‘active’ channel. The heavy dashed line represents the shelf edge and bathymetric highs. The dotted-dashed line is the outline of the most recently active subfan. The solid white lines represent the two profile positions, which are shown on the right along with the depth legend of Figure 1.

I also miss the discussion on the variability of the Oxygen Minima Zona (OMZ) when the authors invoke the connection to the Northern Hemisphere. What would be the consequences for the area of the core site? For the Arabian Sea, Schulz et al., (1998, Nature) clearly linked the millennial-scale coupling to Greenland to shifts in extent of the OMZ, pointing to changing water mass composition and oxygenation.

Also, the authors mark H1-H4 and discuss the relation to smectite variability. The data does not show that in my opinion. Even if slight shifts are employed to account for potential mismatches in the age model, there is no consistent relationship, i.e. the various clay minerals occur either at the highs, lows or transitions of H events.

Re：Thank you for your comment. We note that Schulz et al. (1998, Nature) suggested a lowered southwestern monsoonal intensity following low total organic carbon (TOC) percentages, which showed that weak summer monsoonal productivity is associated with intervals of high-latitude atmospheric cooling and injection of melt water into the North Atlantic basin. The oxygenation of bottom waters is directly influenced by summer monsoonal productivity, resulting in strong variations in the intensity of the OMZ during the last glacial period. However, in the Bay of Bengal, Zhou et al. (2021) suggested that during Heinrich Stadial 1 and the Younger Dryas, i.e., when the AMOC collapsed, weaker South Asian precipitation diminished stratification and enhanced primary productivity. Thus, the response of marine productivity to monsoons, which receive remote forces from the North Atlantic, was likely different between the BoB and Arabian Sea. Based on our understanding, the variability in the OMZ is mainly connected with the intensity of the summer monsoon. However, the consequence of OMZ variety on the Ninetyeast Ridge is an interesting idea that inspires us to take the next step in our work.

For the OMZ in the BoB and Arabian Sea, McCreary et al. (2013) suggested that the OMZ in the BoB is weaker than that in the Arabian Sea because this bay lacks a remote source of detritus from the western boundary. Although detritus has a prominent annual cycle, the model OMZs do not show a similar cycle because there is not enough time for significant remineralization to occur. Then, the OMZ in the BoB may not show the same variations as the OMZ in the Arabian Sea because lower biological oxygen consumption is also assumed to be responsible for a less intense OMZ in the BoB (Rixen et al., 2020).

Although clay minerals play important roles in organic carbon transport, as suggested by Blattmann et al. (2019), the connection between marine organisms that may influence the OMZ and clay minerals does not significantly impact on the transport and deposition of clay minerals. To explain the relationship between our clay mineral record and the Atlantic force, we note the inappropriateness of the intended meaning of out expression. We focus on the source area that is responsible for physical and chemical weathering due to decreased rainfall and temperatures during the North Atlantic cold-climate periods (Heinrich events and YD period, Figure 3h), specifically, the increasing (decreasing) trend of illites (smectites) just before Heinrich events and the decreasing (increasing) trend of illites (smectites) after Heinrich events.

Another lack of discussion surrounds the length of the core, which is only 162 cm. The sample resolution of 1 cm implies a 300-yr resolution, however, bioturbation should mix the sediment over several cms and smear according ages. What are the author's assessment of this effect and how would it affect their conclusions?

Re： Thank you for your comment. Indeed, bioturbation is a common phenomenon during the deposition of seafloor sediments, and we cannot exclude the disturbance of bioturbation absolutely. However, we think it is more likely that the shift in the ITCZ does influence the clay mineral addition than the bioturbated mixed clay minerals, and it is difficult for bioturbation from different periods to cause such a consistent and coordinated smectite percentage change. There is no significant mixing within the chronostratigraphic framework, and benthic foraminifera are less abundant compared to other cores in the BoB (unpublished); thus, the disturbance caused by benthic organisms may be relatively small.

More specific comments:

Fig. 3

Sr/Nd resolution is too low to determine temporal variations. The only real change happened at 14-15 ka, probably as a result to changes surrounding Meltwater Pulse 1A, which are indicative of a major re-organization of the global thermohaline circulation. However, the data shows that the glacial-to-interglacial and millennial-scale sources likely did not change. Why is that?

Re：Thank you for your comment. Certainly, the Sr/Nd resolution in our core is too low to determine temporal variations, especially before the LGM, and Sr/Nd isotopes do not fully represent glacial-interglacial and millennium-scale changes. In our record, the difference between clay minerals and Sr/Nd isotopes may be consistent with the viewpoint that clay minerals may be transported over long distances, while coarser terrestrial sediments indicated by Sr/Nd isotopes can be transported only to more proximate locations. We suggest that these nearby coarse sources are not significantly affected by climate and environmental driving forces, while clay minerals mainly from the larger G-B River and Myanmar source areas affected by climate driving forces are more likely to show glacial-interglacial and millennial-scale changes.

In this context, Fig. 1 is missing a depth legend for both the marine and terrestrial elevations. Figures 1 and 5 could potentially be combined into a single figure.

Re：Thank you for your careful review. We combined Figures 1 and 5 into the new Figure 1 above and added an elevation legend to it.

References

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