We thank the reviewer for their time spent to analyze the manuscript and the constructive criticism. Particularly, we thank the reviewer for sharing his/her impression of the confusing paragraphs in the introduction which motivated us for a clearer structuring of contents in the introduction in the revised manuscript.

This study analyses change in Indian summer monsoon in a set of models from different CMIP6 scenarios. Authors found a long-term increase of Indian summer monsoon precipitation and an increased of its interannual variability. The paper is quite a description of Indian summer monsoon model results from newest generation of CMIP. The paper confirms the increased long term trend in Indian monsoon precipitation already found by previous CMIP models, as well its interannual variability (with some differences). Authors did not investigate what drives the large difference found at regional scale on monsoon response in the different models, which I think it is quite interesting. They just mentioned that the resolution matters (still). Overall, the paper addresses the questions within the ESD scope. It shows some new results based on new data available and conclusions are reached. Only Introduction needs substantial revision because it is a bit chaotic. I recommend to publish the paper after major revision.

Ln 35-39: "Multi-millennial paleorecords indicate strong changes both in the Indian and East Asian summer monsoon (Wang et al., 2005b, a, 2008; Zhang et al., 2008; Li et al., 2017; Wang et al., 2017; Zhang et al., 2019; Ming et al.; Wang et al., 2020). While it is speculated (Schewe et al., 2012; Herzschuh et al., 2014; Wang et al., 2020), that there might be abrupt monsoon changes due to a moisture-advection feedback at play (Levermann et al., 2009), these are generally associated with either aerosol forcing or changes in the sea surface temperatures of the surrounding ocean waters."

This sentence is quite generic. What multi-millennial paleorecords are you referring to here? Are this changes related to orbital parameters during the Holocene?

Response: We agree that additional information might give the reader better understanding of the paleorecords and the underlying forcing which is why we added information to clarify which paleo-records we are referring to:

Multi-millennial paleorecords indicate strong changes both in the Indian and East Asian summer monsoon. These paleoclimatic changes have been revealed by e.g. oxygen isotope analysis from different caves in Asia for the past thousands of years (Wang et al., 2008; Zhang et al., 2008, 2019, Wang et al., 2005b), by analysing marine sediment records for the Neogene and Quaternary (Wang et al., 2005a), and other methods (Li et al., 2017; Wang et al., 2017, Ming et al., 2020, Wang et al. 2020). Most studies link the paleoclimatic changes of monsoon rainfall predominantly to solar insolation variations on the northern hemisphere affecting the ITCZ position due to orbital forcing changes (Wang et al., 2005a, b, 2008; Zhang et al., 2008, 2019; Ming et al., 2020).

And in particular this sentence " ... that there might be abrupt monsoon changes due to a moisture-advection feedback at play (Levermann et al., 2009), these are generally associated with either aerosol forcing or changes in the sea surface temperatures of the surrounding ocean waters." is totally misleading. Aerosol forcing on multi-millennial time scales? No-way. I warmly suggest to rephrase here. Do not mix too much. If you really want to refer to both past and future Indian monsoon changes, you might find useful this paper for both contents and recent literature overview.

D'Agostino, R., Bader, J., Bordoni, S., Ferreira, D., & Jungclaus, J. (2019). Northern Hemisphere Monsoon Response to Mid-Holocene Orbital Forcing and Greenhouse Gas-Induced Global Warming.Geophysical Research Letters,46(3),1591-1601.

Response: We thank the referee for raising the point that it might not be clear where we are referring to potential future and where to past changes. Thus, in the revised manuscript we focused in this paragraph on what was found in paleorecords excluding potential future changes. Besides, we think that the paper of D'Agostino et al. (2019) you proposed, contains information interesting and relevant for this publication but since we decided not to include future Indian monsoon changes in this paragraph, we included it later in the revised manuscript.

Especially to explain abrupt non-linear monsoon transitions as observed in the Holocene in the Tibetan Plateau, gradual insolation changes are not sufficient and thus, internal feedback mechanisms seem to be at play (Schewe et al., 2012; Herzschuh et al., 2014; Boos and Korty, 2016; Wang et al., 2020). The moisture-advection feedback (Levermann et al., 2009) might be such an internal mechanism that is able to provoke abrupt transitions and might be responsible for the abrupt Tibetan Plateau transitions in the Holocene (Herzschuh et al., 2014). Other amplifying effects might have occurred due to a water vapour and cloud feedback (Jalihal et al., 2019).

Ln 39-40: "Under future warming an overall strengthening of the monsoon rainfall is expected due to enhanced atmospheric moisture bearing capacity." Please add a reference here.

Response: This sentence has been removed in the context of restructuring the introduction. For reference, refer to:

Turner, A., G., Annamalai, H. (2012): Climate change and the South Asian summer monsoon. In: Nature Climate Change 2, 587-595.

Ln 42-43: "The resulting decrease in the land-sea thermal gradient over South Asia and the consequently subdued Hadley circulation have lead to a reduction of the rainfall amount during the summer period since the 1950s (Roxy et al., 2015)." Try to expand a bit here.

Response: We added further explanation in the revised manuscript:

The resulting decrease in the land-sea thermal gradient over South Asia opposes the pressure gradient driving the Hadley circulation and consequently subdues the Hadley circulation. Since the Hadley system is responsible for transporting the rainfall to the subcontinent, this is accompanied by a reduction of the rainfall amount during the summer period as observed since the 1950s (Roxy et al. 2015).

Ln 45-82: These paragraphs are totally confusing. You are trying to summarise in a chaotic way three decades of studies about Hadley Circulation and monsoons, meridional and land/sea temperature contrasts influence on monsoon dynamics, oceanic warming, ENSO, aerosols, vegetation, energy budget... too much, not effective and not focussed. I strongly suggest to rewrite the section trying to put things in a clear way. You can list the different monsoon response sorting by the type of forcing for example. E.g. GHG vs aerosols or envisaging monsoon response in terms of moist static energy budget and energy framework.

Refer to:

Allan, R., Barlow, M., Byrne, M. P., Cherchi, A., Douville, H., Fowler, H. J., ... & Wilcox, L. (2020). Advances in understanding large-scale responses of the water cycle to climate change. Annals of the New York Academy of Sciences

Boos, W. R., & Korty, R. L. (2016). Regional energy budget control of the intertropical convergence zone and application to mid-Holocene rainfall. Nature Geoscience,9(12),892-897.

D'Agostino, R., Brown, J. R., Moise, A., Nguyen, H., Dias, P. L. S., & Jungclaus, J. (2020). Contrasting Southern Hemisphere Monsoon Response: MidHolocene Orbital Forcing versus Future Greenhouse Gas-Induced Global Warming. Journal of Climate,33(22),9595-9613.

Jalihal, C., Srinivasan, J., & Chakraborty, A. (2019). Modulation of Indian monsoon by water vapor and cloud feedback over the past 22,000 years. Nature communications,10(1),1-8.

Seth, A., Giannini, A., Rojas, M., Rauscher, S. A., Bordoni, S., Singh, D., & Camargo, S. J. (2019). Monsoon responses to climate changes-connecting past, present and future. Current Climate Change Reports,5(2),63-79.

Response: We thank the reviewer for sharing his impression which motivated us to restructure the central paragraphs in the Introduction. In this context, we decided to emphasize the competing effects of GHG and aerosol forcing as proposed from the reviewer and structured the paragraphs according to different forcings present in multi-millennial paleorecords and observations since the 1950s.

Besides, we thank the reviewer for the recommended additional information, e.g. Seth et al. (2019) provides a valuable overview close to the content of our paragraph which is why we included this reference, but also Boos et al. (2016), Jalihal et al. (2019) and Allan et al. (2020). Since the introduction is becoming pretty long, we tried to keep it as short as possible. Since D'Agostino et al. (2020) analyses the monsoon responses on the Southern Hemisphere, we think that exceeds the scope of the introduction and might even create more confusion through opening a new topic which is why we decided not to include it in the revised manuscript.

Ln 101: ". . .onle. . ." Typo.

Response: Corrected.

Ln 104-105: "Also under SSP5-8.5, the amount of rainfall over India is projected to increase by 18.7% by the end of the 21st century compared to 1961-1999 (Chaturvedi et al., 2012)." I thought that SSP5-8.5 is the newest experiment under CMIP6. How can be the ref so old? Maybe a typo?

Response: Thanks for the careful checking and for drawing our attention to this typing error. Chaturvedi et al. use the older, but similar, RCP-8.5 scenario from CMIP5. We corrected the error in the revised manuscript.

Ln 107-108: about the thermodynamics vs dynamics add as ref D'Agostino et al., 2019 and 2020.

Response: We added the proposed reference D'Agostino et al. 2019 referring to the Northern Hemisphere since we think the explanation of the dynamic and thermodynamic component of the moisture budget is a valuable addition in this context. The additional information (underlined) is included as followed:

"This trend is expected to be the consequence of the warming of the Indian Ocean enhancing atmospheric moisture content and thus moisture flux convergence arising from changes in moisture which generally follow the Clausius-Clapeyron relation (Cherchi et al.,2011; Seth et al., 2013; Mei et al., 2015; Sooraj et al., 2015; Agostino et al., 2019). This so called thermodynamic effect dominates over the dynamic effect which refers to weaker winds and a reduced monsoon circulation due to a weakened Walker circulation and an expected decrease of rainfall (Vecchi et al., 2006; Mei et al., 2015; Sooraj et al., 2015; Agostino et al.,2019)."

Ln 111: "The uncertain role of . . ." Missing something here.

Response: Removed.

Ln 126: "67.5°0'0"E - 98°0'0"E and latitude 6°0'0"N-36°0'0"N". I do not think you need coordinates in minutes and seconds here.

Response: We agree and thus, minutes and seconds have been removed in the revised manuscript.

Ln 250-253: refer to aforementioned studies about thermodynamics vs dynamics.

Response: As above, we added the references of D'Agostino et al., 2019 since we think the quantification of the dynamic and the thermodynamic component of moisture budget is a valuable addition here.

"Agostino et al. (2019) quantified the increase of the thermodynamic component of the moisture budget for the Indian monsoon with about 0.7mm/day and the decrease of the dynamic component with 0.4mm/day using nine CMIP-5 models in RCP-8.5 determining the positive sign of the change in monsoon rainfall (Agostino et al. 2019, Sooraj et al. 2015)."

Ln 253: linear -> linearly

Response: Corrected.

Ln 213: Discussion. . . and Conclusions?

Response: For clarification, we separated the Conclusion paragraph.

Ln 283: "In this study, we used 32 CMIP-6 models to analyse the Indian summer monsoon's response to climate change." I would not repeat "in this study. . .".

Response: Removed.