Dear Dr Kirk-Davidoff,

Thank you for handling the review process of our manuscript. Please find below our detailed response (In green) to the request (In black) of minor revisions of our manuscript.

Best wishes,
Anders Levermann

Reviewer #1
The manuscript has been significantly improved. However, there are still some parts not clear or partially incorrect. Some changes are still needed.

We thank the reviewer for their detailed feedback regarding the connection of the modulation of the Hadley cell and changes in monsoon rainfall. We adapted the paragraph In accordance with the valuable propositions. Detailed comments can be found below in green, changes in the manuscript are underlined.

Ln 59-62: " 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)."

This is too general statement.

First, the Hadley Circulation (HC) that is "transporting" precipitation from Indian Ocean to Asian Continent in JJA, is the cross-equatorial Hadley Circulation, i.e. the strongest one in the Southern Hemisphere (SH). Second, the advection of moist static energy and moisture within the SH HC depends on atmospheric net energy input contrast (and not simply thermal contrasts: that is why the orbital forcing is much stronger driver of monsoons than GHG. See D'Agostino et al., 2019, 2020 where you have mid Holocene and rcp8.5 net energy input maps!).

The observed reduced Indian rainfall since 1950 as suggested by Roxy et al., might be due to:
decadal-to-multidecadal-centennial variability
SST/ surface fluxes over the Indian Ocean
compensating effect between GHG and Aerosols over land but more likely…
… (and this has been not explicitly mentioned) to a squeezing of the rain belt around the equator. The rain belt under GHG forcing and global warming is expected to be narrower and precipitation more intense (Byrne et al., 2015). So the reduced precipitation over the Indian continent might be simply due to a shift of the rainfall pattern from land to ocean (D'Agostino et al., 2019, 2020).

As also Roxy et al., 2015 said this somewhere "Furthermore, this enhanced upward motion over the ocean is compensated by subsidence of air over the subcontinent (10–20°N), inhibiting convection over the landmass and drying the region, through a modulation of the local Hadley cell (Fig. 5a). This suggests that though the warming ocean engenders enhanced local rainfall due to increased moisture availability, it weakens the monsoon Hadley circulation and reduces the rainfall over the land, ultimately building up a competition among the land and ocean rainfall in the South Asian monsoon domain."

Try to rephrase here please.

Include Byrne, M. P., & Schneider, T. (2016). Narrowing of the ITCZ in a warming climate: Physical mechanisms. Geophysical Research Letters, 43(21), 11-350.

Following the propositions of including more details, we decided to rephrase here and included the reference of Byrne and Schneider (2016): "The Indian ocean warming has been linked to anomalies in the lower and upper troposphere due to enhanced latent heat uplift resulting from convection over the ocean (Danielsen, 1993; Dai et al., 2013). The warming of the Indian ocean could intensify the convection over the ocean which is compensated by the subsidence of air masses over land. By preventing the convection over the subcontinent,

the Hadley cell is modulated in such a way that a drying trend over the region is introduced (Roxy et al.,2015). Another significant aspect contributing to the rainfall decrease is discussed to be the narrowing of the ITCZ and correspondingly, the decrease of the associated belt of intense rainfall (Byrne and Schneider, 2016)

Ln 85: "… reduced monsoon circulation due to a weakened Walker circulation and an expected decrease of rainfall …"

Incorrect. Replace "Walker circulation" with "tropical overturning".

Replaced.

Reviewer #2:

Publish as It Is.