We thank the two reviewers for the careful reading of the revised manuscript and the constructive comments.
Please find below
1. Replies for Reviewer #2
2. Response Figures (RF)

Replies for Reviewer #2

Comments:

The major concern I have regarding this work is that the model does not include the equator. Instead the model uses a sponge layer along the equator, which was not obvious from the discussion paper.

My understanding is that equatorial Kelvin waves play a fundamental role in the variability of the intertropical Indian Ocean. It seems that the model does not include the equatorial forcing that leads to the creation of Wyrtki jets. It has been reported that Wyrtki jets induce coastal Kelvin waves and salinity anomalies in the Bay of Bengal. I cannot see a discussion of this important feature in the paper. Here a reference:

Jing WANG (2017) Observational bifurcation of Wyrtki Jets and its influence on the salinity balance in the eastern Indian Ocean, Atmospheric and Oceanic Science Letters, 10:1, 36-43, DOI: 10.1080/16742834.2017.1239506

I request from the authors a clarification as to whether or not the effect of Wyrtki Jets is included in their study model. If not, I insist that the authors declare the omission of equatorial processes that according to other authors play an important role in the variability of the eastern tropical Indian Ocean and the salinity budget in the Bay of Bengal. Are the missing Wyrtki Jets reflected by errors in the correlations?

The comparison to the IOD presented by the authors is interesting but incomplete. It seems that the model's variability is exclusively derived from the coastal wind forcing (generating coastal Kelvin waves). So, how is the wind forcing along the eastern coasts of the model domain correlated to the wind forcing along the coasts of Sumatra and Java that triggers positive IOD events? Please add more analysis of the underlying wind forcing and its relation to the IOD.

Replies:

The southern boundary of our model domain is the equator. The sponge layer used in our model is specifically implemented to damp disturbances arising from inconsistencies within the prescribed boundary condition. This sponge layer scheme does not block signals from the equator (the southern boundary). As can be seen in RF. 2, the salinity anomaly in EC2 (subareas are marked in RF. 1) shows a high correlation with the prescribed boundary condition of the equator (ESB, EC1). This confirms that the equatorial processes which due to the limitation of our model domain cannot be resolved in the model itself are indirectly introduced to the BoB through the prescribed open boundary condition provided by the MPI-ESM-MR. We clarify this in lines 85-90.

Since it could be shown that MPI-ESM-MR is able to reproduce the Wyrtki Jets reasonably well (Liu et al., 2016), it can be concluded, that also the effects of Wyrtki Jets are fully accounted for in our model simulations. We thank the reviewer for pointing out the importance of Wrytki Jets for intertropical Indian Ocean processes, which was not discussed previously in our manuscript. A related discussion is now added (lines 40-43).

Since the sponge layer does not block the signal propagation, in principle the model's variability can originate from both, the local and the remote forcing. As can be seen in RF. 2, on the interannual scale, the model's variability in EC2 is more influenced by the prescribed wind forcing in EC1 and the temperature/salinity anomaly in ESB than by the local wind. As requested, we calculated the related correlations (RF. 3). The results show that the correlation between the wind forcing along the eastern Andaman Sea coast (EC2) and the wind forcing along the coasts of Sumatra (EC1) is low (0.075 - 0.25). Thus, it can be concluded that on the interannual time scale, the model's variability is not majorly induced by the coastal Kelvin waves, which are forced by the local winds along the eastern coast of the Andaman Sea. We now discussed this issue in lines 286-290.

Regarding the last issue mentioned by Reviewer 2, her/his suspicion was correct; the wind forcing along the Sumatra coasts is highly correlated to the model's variability on the interannual scale (RF. 2d, e, f). However, the wind forcing in this area can be considered as an important component of the IOD-related equatorial Indian Ocean dynamics (Delman et al., 2016; Lu et al., 2018). As shown in RF. 3, the wind forcing in EC1 shows a high correlation with the DMI (-0.66; 0.79). As we already clarified above, the equatorial forcing can enter our model domain adequately via open boundary conditions. Consequently, the salinity anomaly we analyzed contains already all the relevant processes. Therefore, we think that adding an analysis of the underlying wind forcing at the equator as suggested by Reviewer 2, is not providing any further insight into the dynamics of the BoB, which are in the focus of our study.

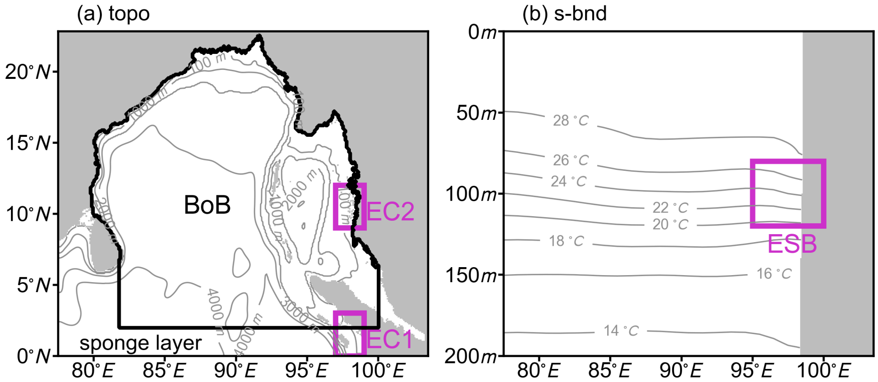
Reference:

Delman, A. S., Sprintall, J., McClean, J. L., and Talley, L. D. (2016), Anomalous Java cooling at the initiation of positive Indian Ocean Dipole events, J. Geophys. Res. Oceans, 121, 5805– 5824, doi:10.1002/2016JC011635.

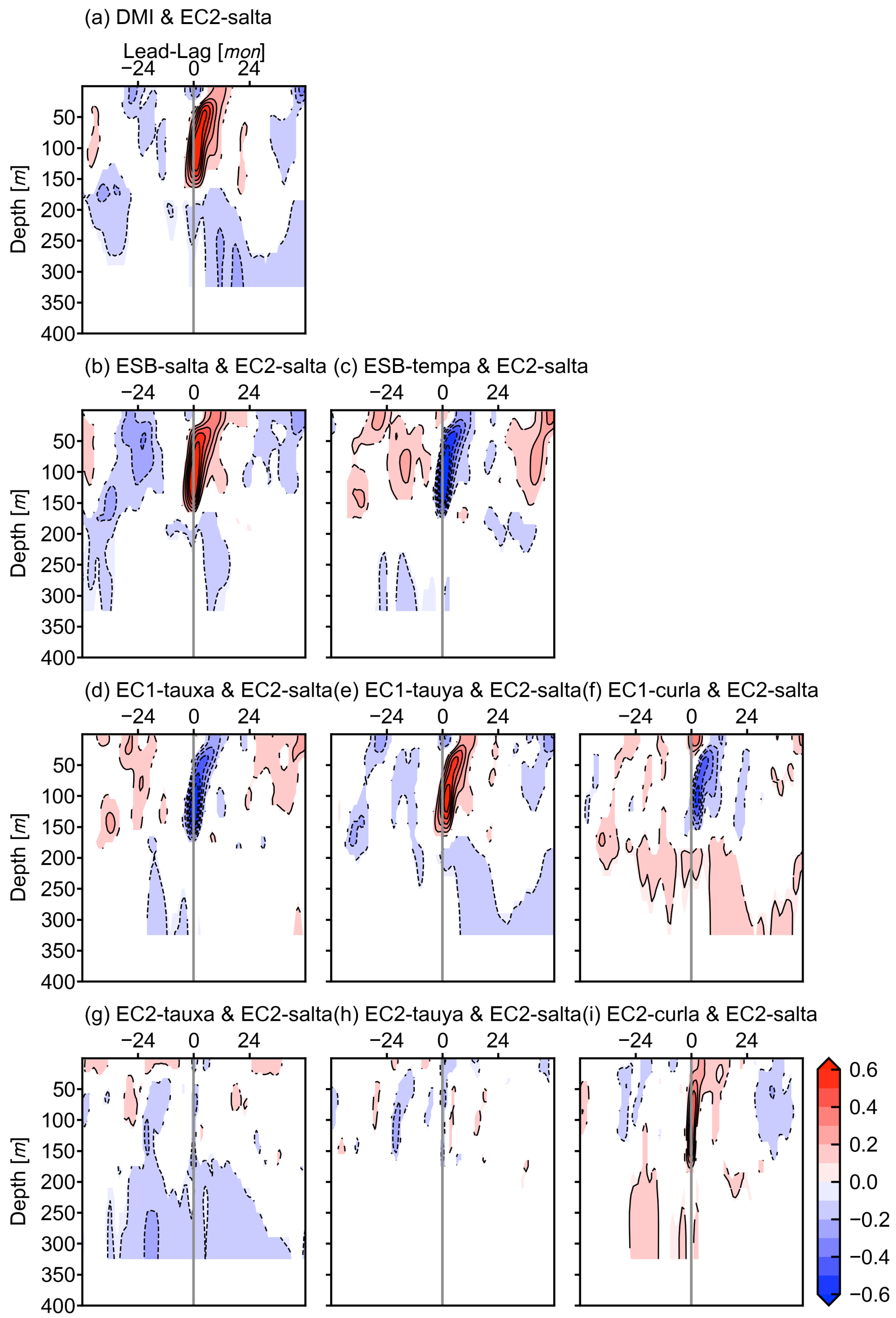
Liu, L., Liu, B., Han, G. et al. Assessment of the seasonal variation of simulated Wyrtki jet over the tropical Indian Ocean in CMIP5 models. Arab J Geosci 9, 676 (2016). https://doi.org/10.1007/s12517-016-2704-3

Lu, B., Ren, HL., Scaife, A.A. et al. An extreme negative Indian Ocean Dipole event in 2016: dynamics and predictability. Clim Dyn 51, 89–100 (2018). https://doi.org/10.1007/s00382-017-3908-2

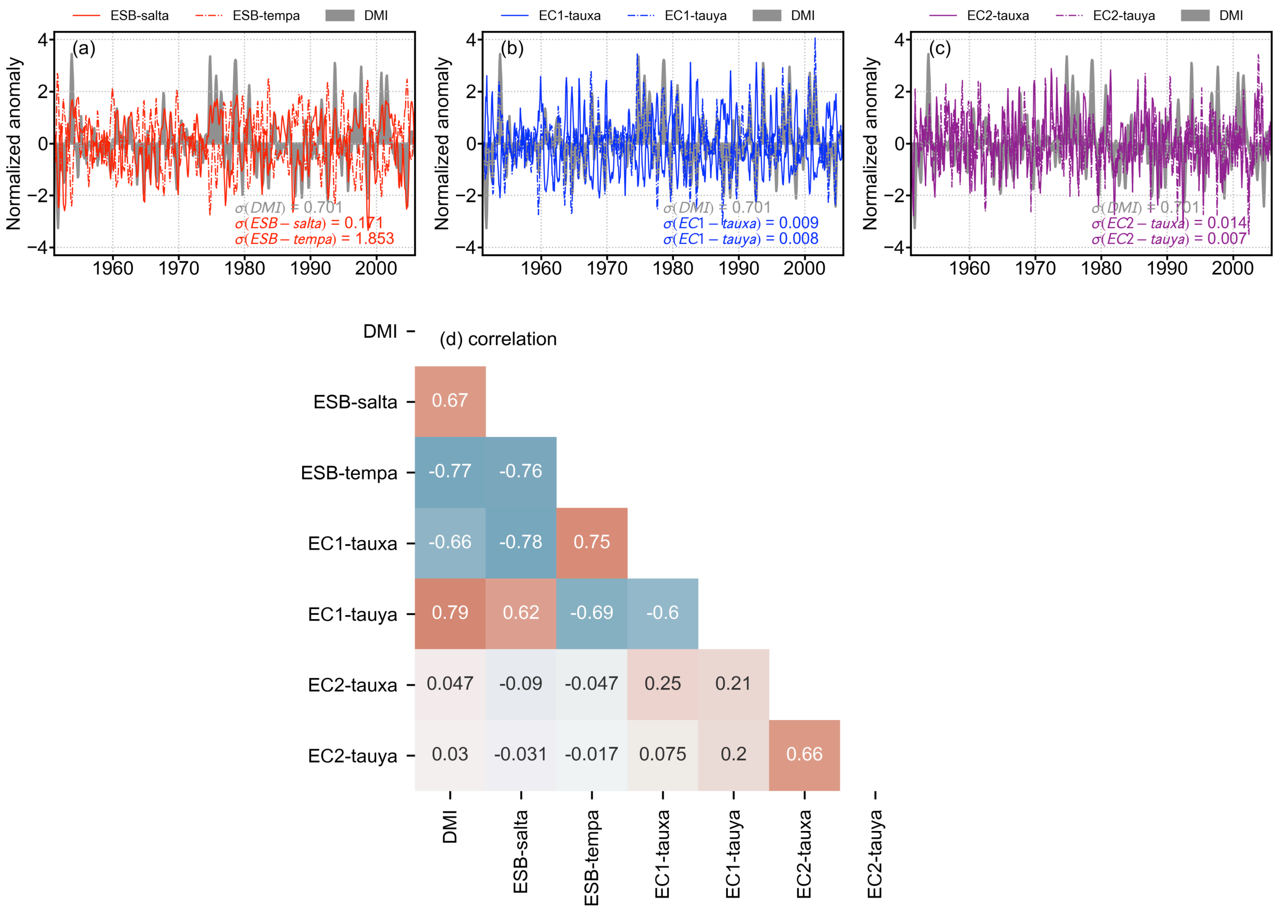
Response Figures (RF)



RF. 1: Schematic diagram of subareas (a; EC1, EC2) and subsection (b; ESB).



RF. 2: Lead-lag Pearson correlation coefficient between the forcing and the EC2-salinity-anomalies at different depths from HAMSOM (interannual scale). Analysis period is from 1960 to 2005.



RF. 3: Normalized 3-month running mean of the forcing (interannual variability; a, b, c) and their correlations (d).