Supplementary Information for

An evaluation of the Arabian Sea Mini Warm Pool's advancement during its mature phase using a coupled atmosphere-ocean numerical model

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Introduction:

The following information supports the results: "An evaluation of the Arabian Sea Mini Warm Pool's advancement during its mature phase using a coupled atmosphere-ocean numerical model."

Text S1: Interannual Variation of Mini Warm Pool Area:

The interannual Variation of MWP area is shown in Fig. S1. In recent years, 2013 and 2016 have been the years with an area of the MWP less than and more than 0.25 standard deviation, respectively. In 2018, the MWP area was closer to climatology. As a result, these three years have been selected for the simulation in our study.

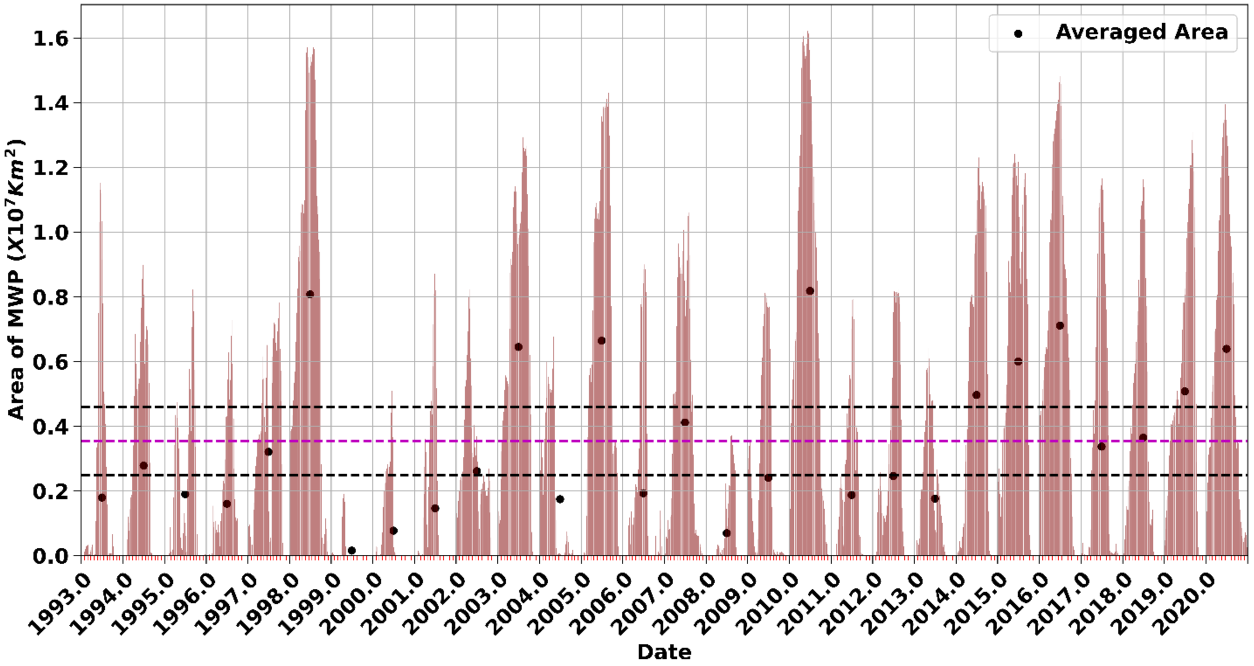


Figure S1: Area MWP area from 1993 to 2020. The black dashed lines suggest the 0.25 standard deviation, while the magenta dashed line shows the mean area. The black dot in each year depicts the average MWP area. The area is calculated following the criteria of Li et al. (2023).

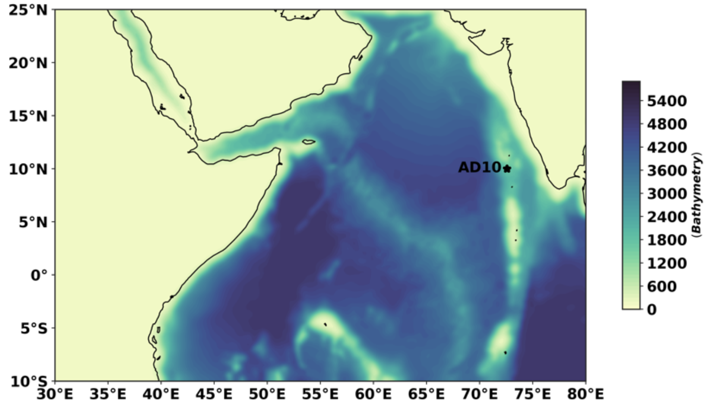


Figure S2: Location of the buoy AD10.

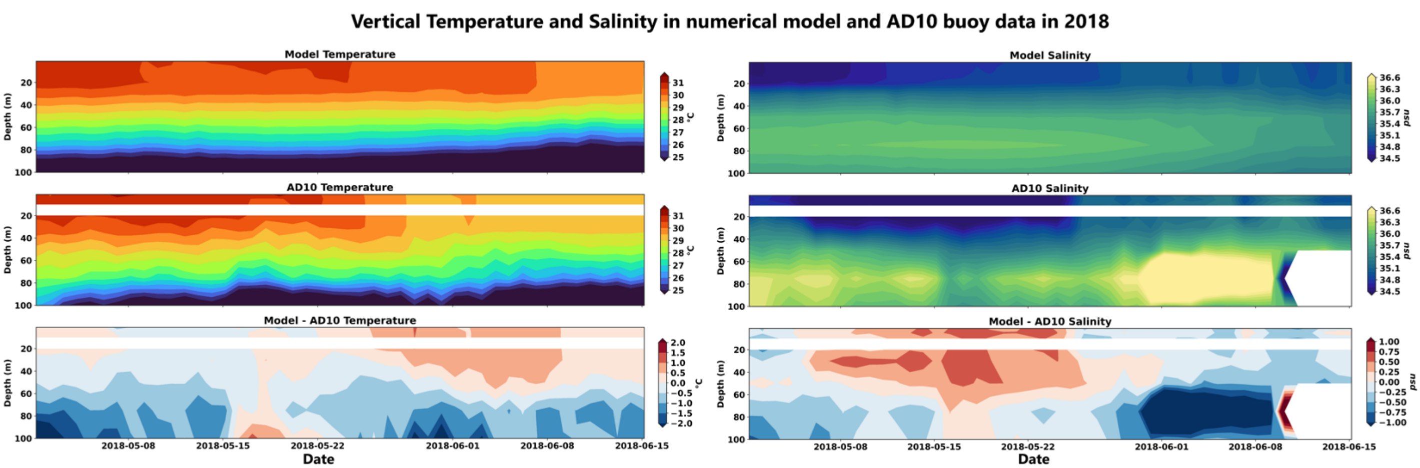


Figure S3: A comparison of the vertical temperature and salinity profiles between AD10 and the nearest point location in the numerical model for 2018.

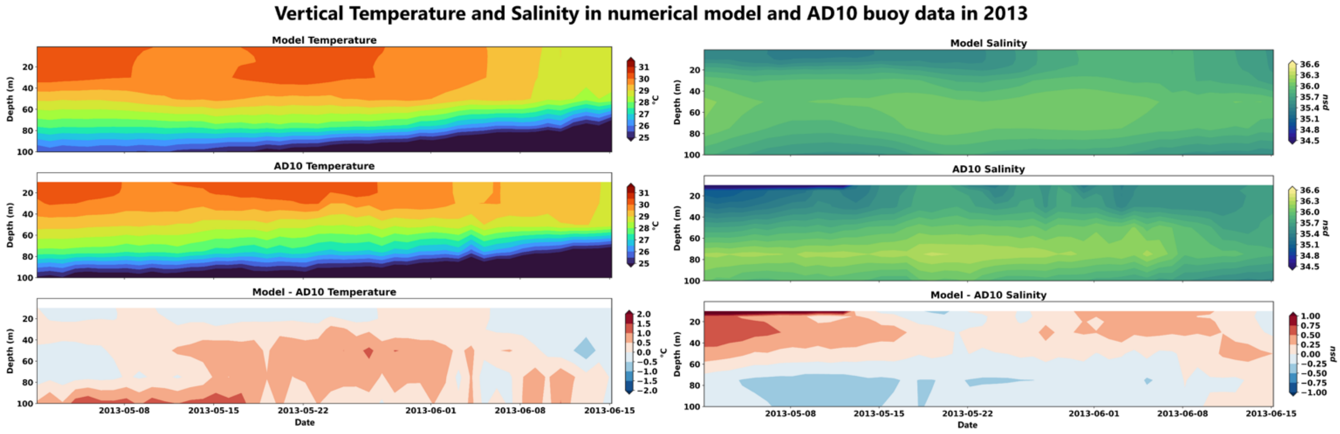


Figure S4: A comparison of the vertical temperature and salinity profiles between AD10 and the nearest point location in the numerical model for 2013.

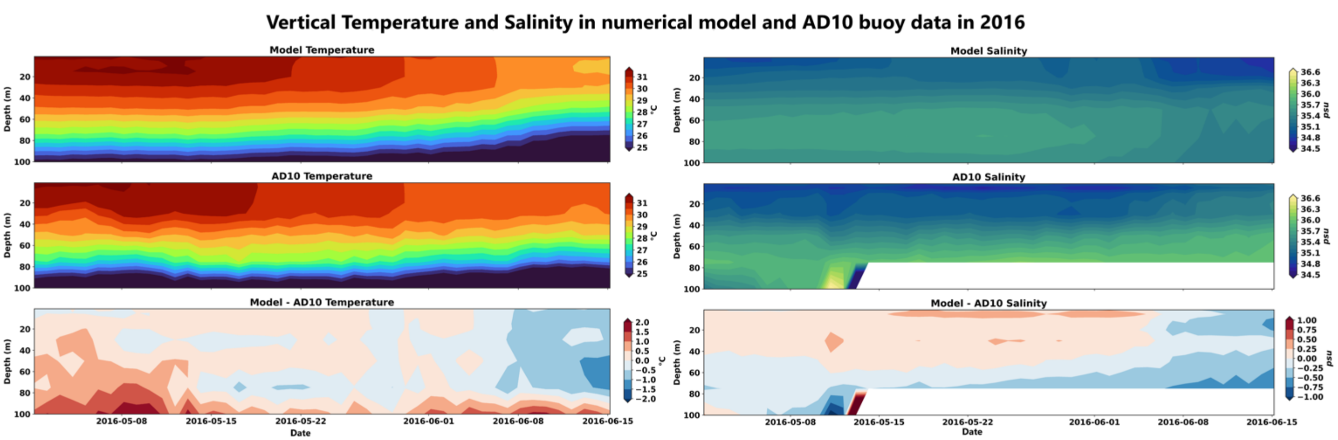


Figure S5: A comparison of the vertical temperature and salinity profiles between AD10 and the nearest point location in the numerical model for 2016.

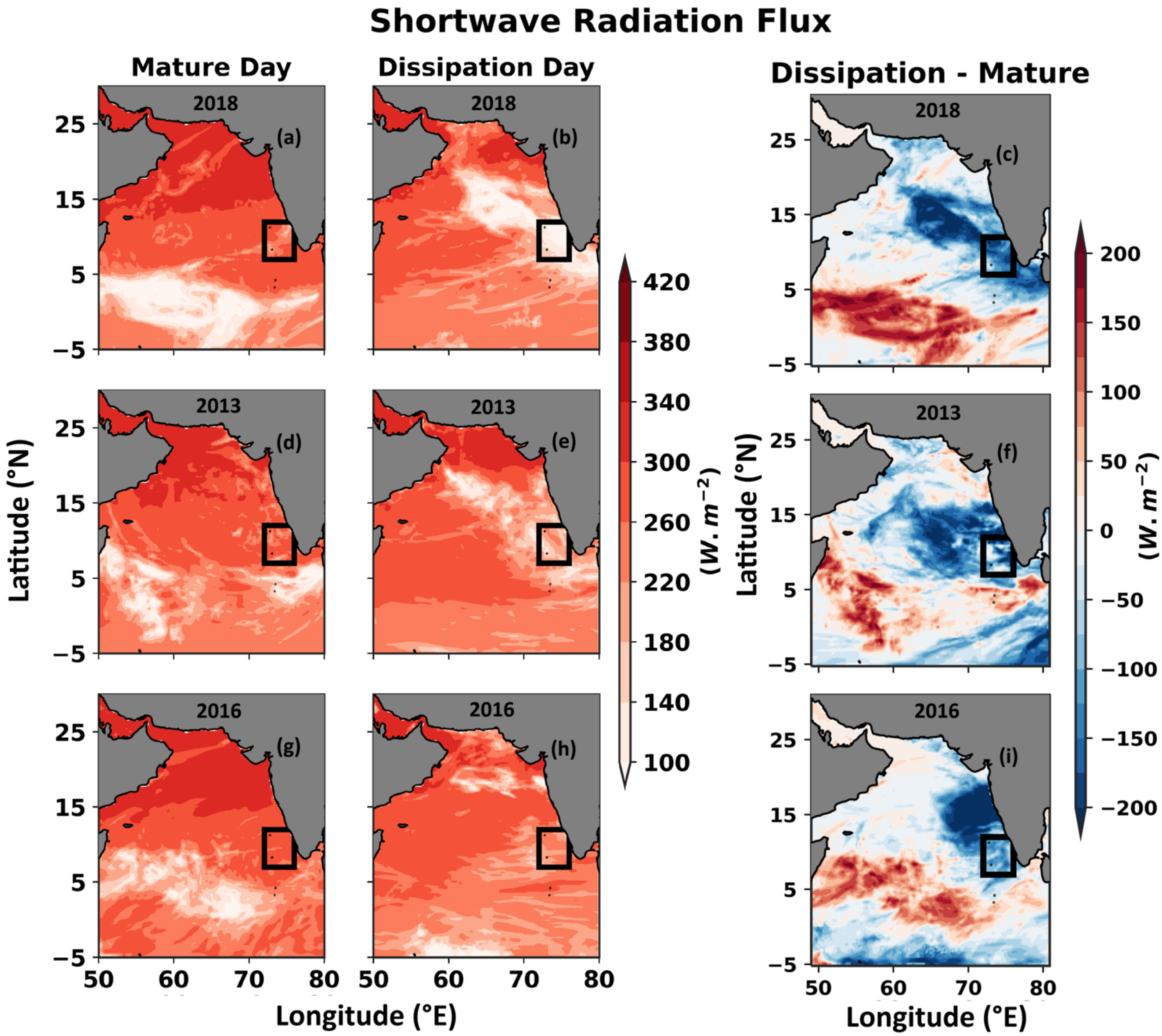


Figure S6: Comparison of shortwave radiation flux in mature and dissipation days in 2018 (a-c) (MWP strength close to climatology), 2013 (d-f) (MWP was missing), and 2016 (g-i) (MWP was intense). (c), (f), and (i) indicate the difference between dissipation and mature day. The mature days for the MWP are May 20 in 2018 and 2013 and May 4 in 2016. The dissipation day for the mini warm pool was taken on June 8, 2018, 2013, and June 6, 2016.

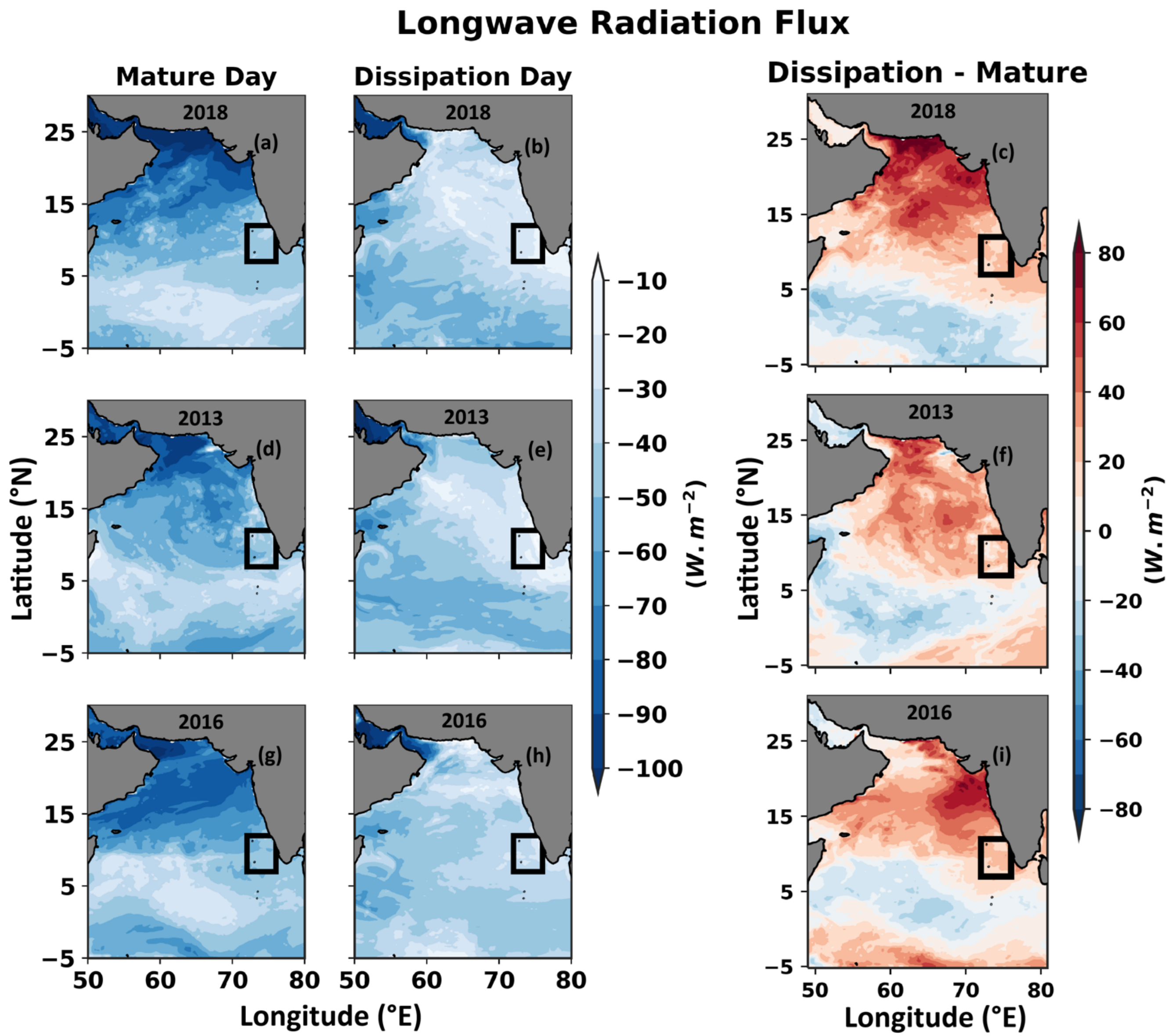


Fig. S7 is the same as Fig. S6 but for longwave radiation flux.

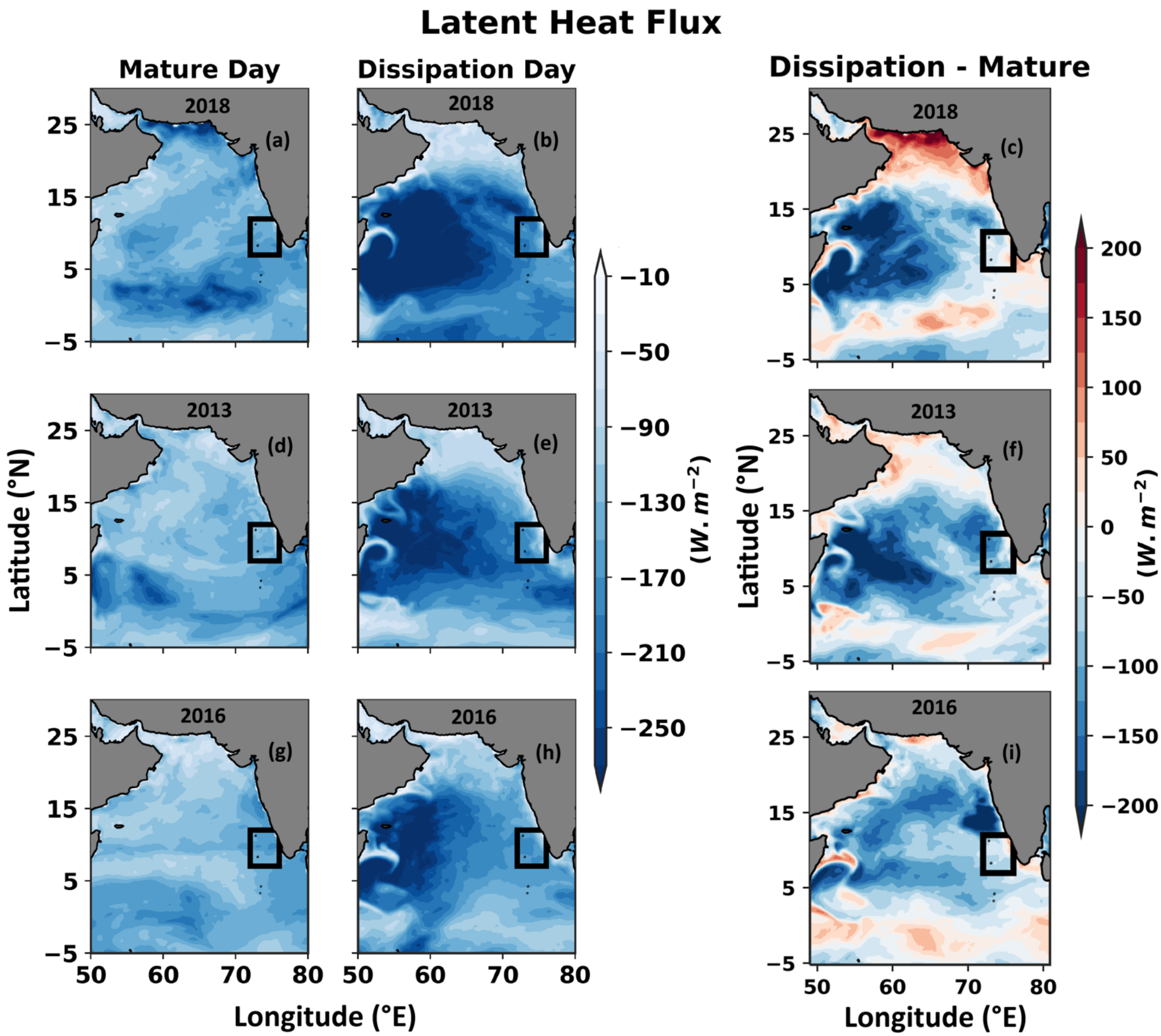
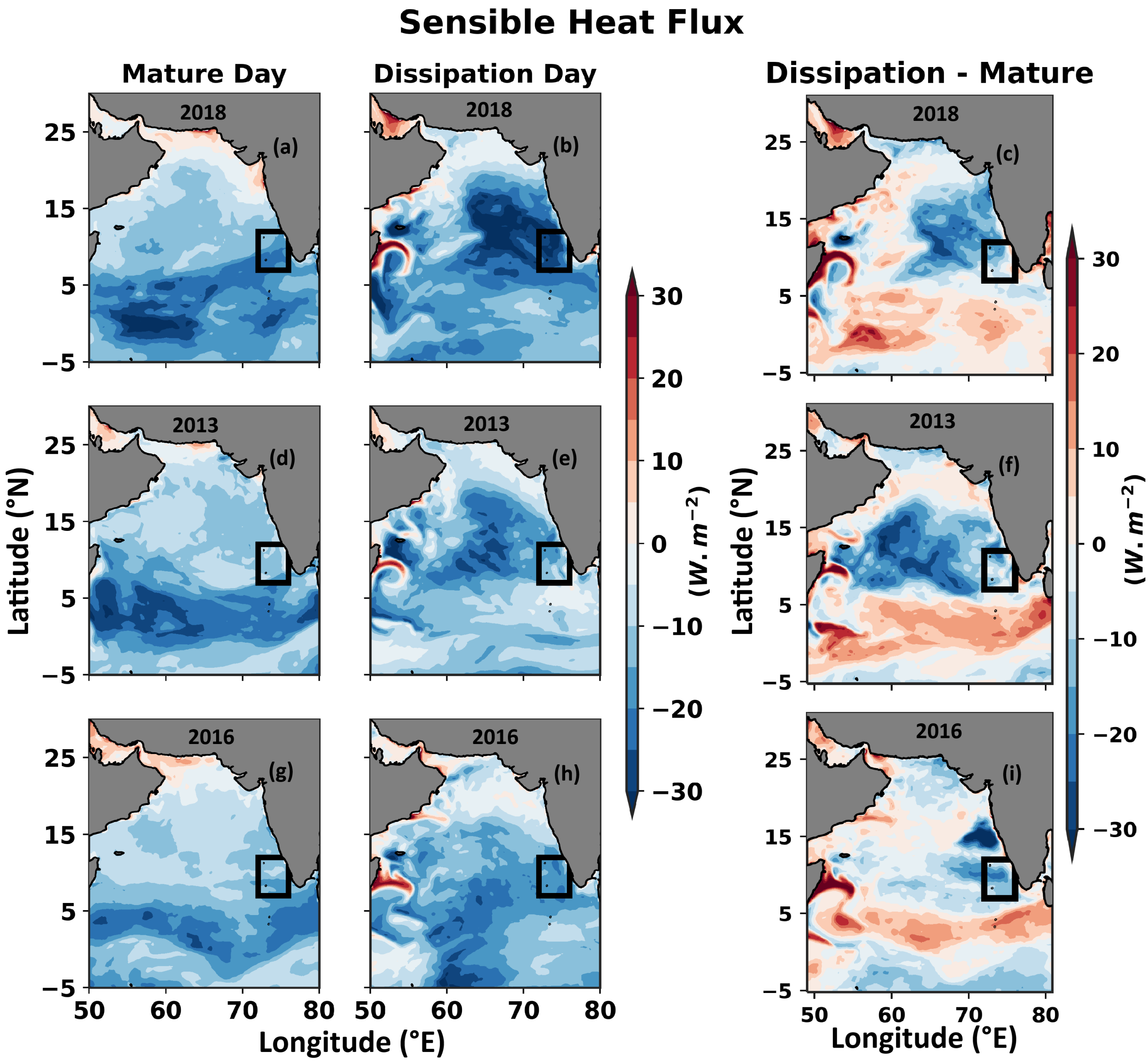


Fig. S8 is the same as Fig. S6 but for latent heat flux.



65 **Fig. S 9 is the same as Fig. S6 but for sensible heat flux.**

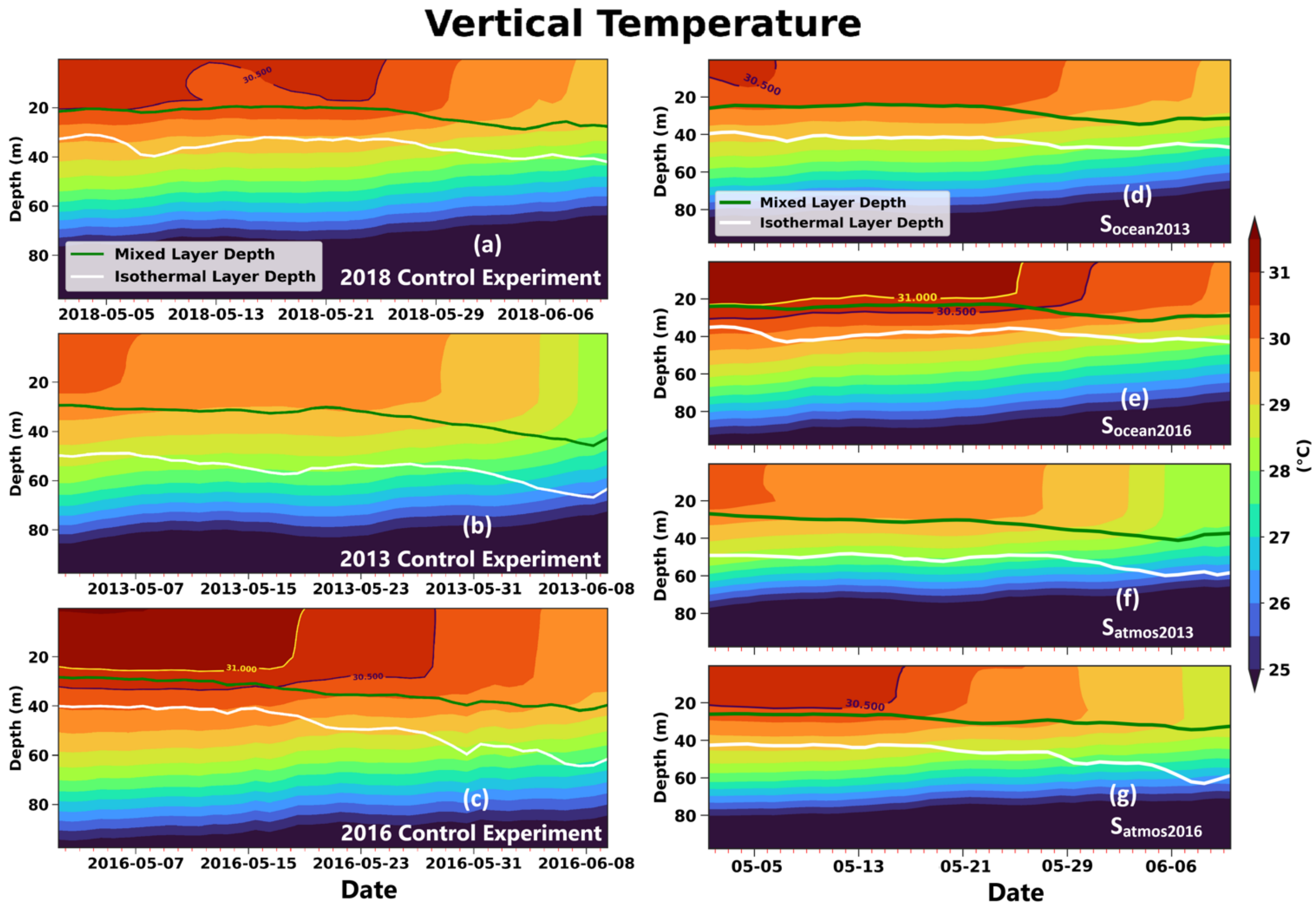


Figure S10: Area averaged (72- 76ºE and 7-13ºN, i.e., the white box shown in Fig. 1) vertical temperature for three control ((a) 2018 control experiment, (b) 2013 control experiment, and (c) 2016 control experiment) and four sensitivity experiments ((d) $S_{ocean2013}$, (e) $S_{ocean2016}$, (f)$S_{atmos2013}$, and (g) $S_{atmos2016}$). In the sensitivity experiments, the oceanic and atmospheric conditions have been changed to various years; thus, only the day and month are kept on the x-axis.

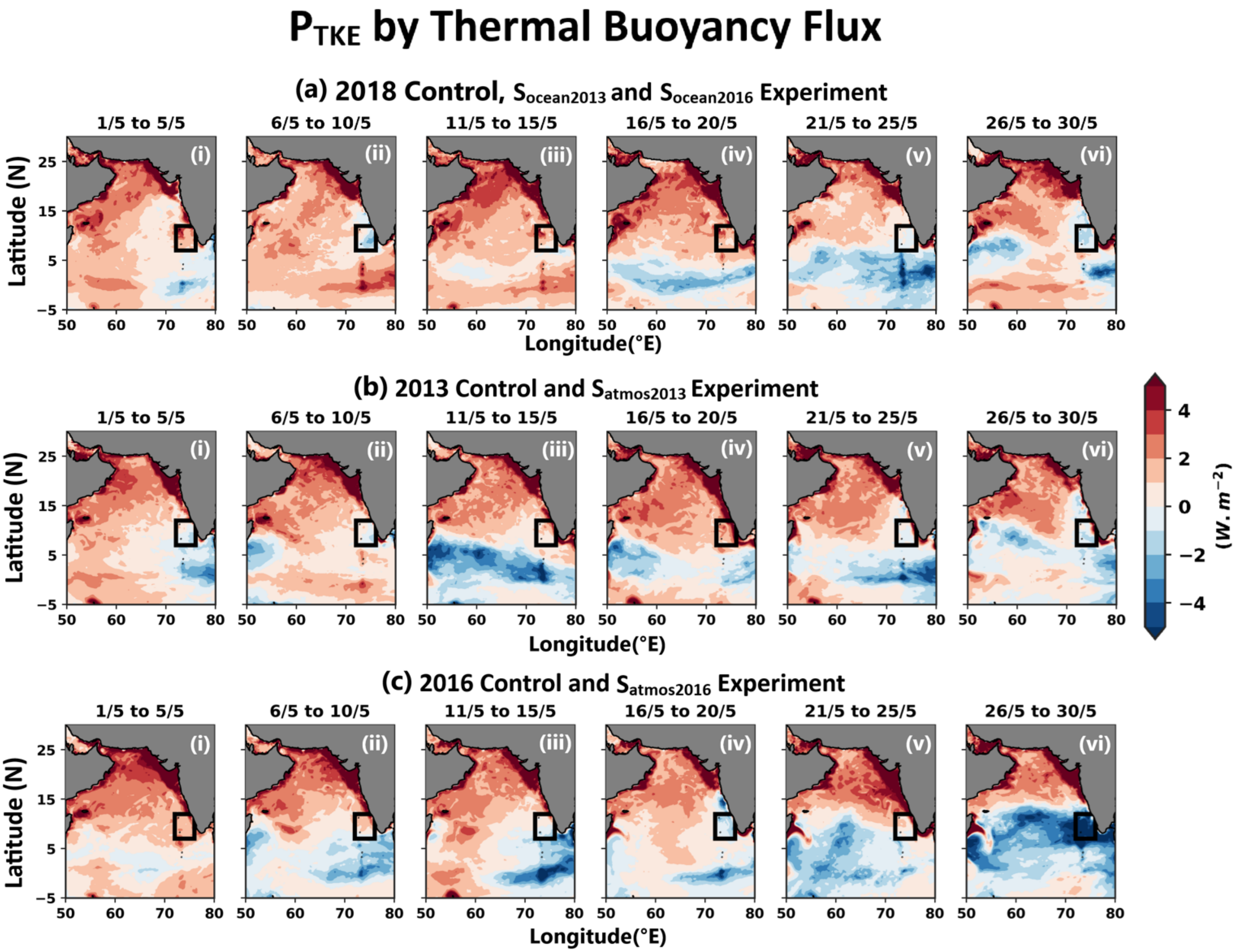


Fig. S11 5-day average evolution of thermal buoyancy flux-induced production of turbulent kinetic energy (P_{TKE}) for all control and sensitivity experiments. The fill values are showing after multiplying 10^4.Atmospheric forcings are identical for the 2018 control, $S_{ocean2013}$, and $S_{ocean2016}$ experiments. Likewise, the P_{TKE} remains the same across all three experiments (a). Similarly, the P_{TKE} owing to thermal buoyancy flux in the 2013 control experiment and $S_{ocean2013}$ (b) and the 2016 control experiment and $S_{ocean2016}$ (c) are identical. Table 1 shows details from the sensitivity experiments. The days associated with mean evolution are listed at the top of each subplot.

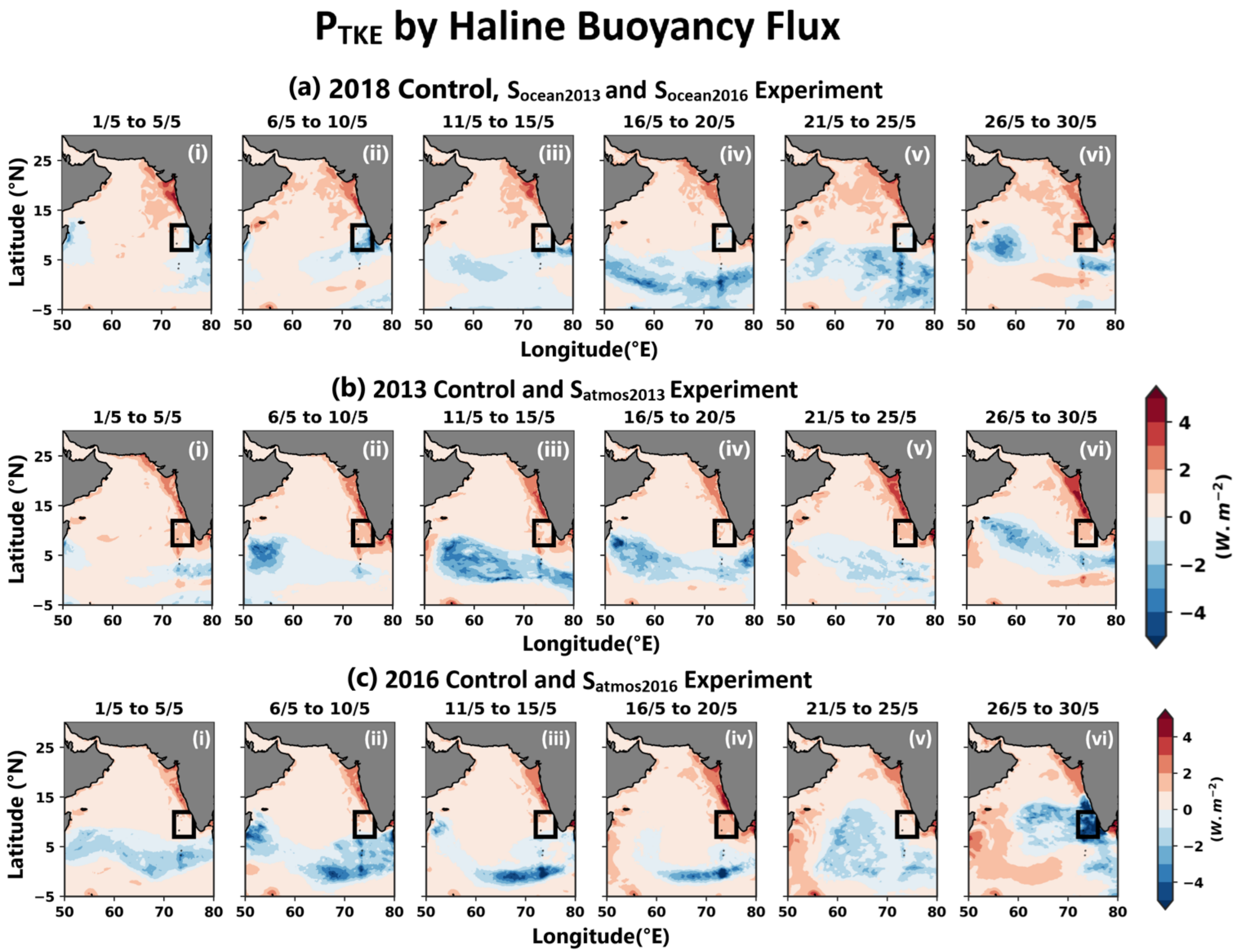


Fig. S12 is the same as Fig. S11 but for P_{TKE} due to haline buoyancy flux.

References

Li, N., Zhu, X., Wang, H., Zhang, S., & Wang, X. (2023). Intraseasonal and interannual variability of sea temperature in the Arabian Sea Warm Pool. *Ocean Science*, *19*(5), 1437–1451. https://doi.org/10.5194/os-19-1437-2023