Does warmer-than-normal SST play a role in the JPCZ event in December 2021?

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This study highlights an extreme weather disaster that occurred along the coast of the Japan Sea from December 25 to 27, 2021, which was caused by the Japan Sea polar airmass convergence zone (JPCZ). This particular JPCZ event coincided with higher-than-normal SST over the Sea of Japan, and thus it is important to know the influence of such SST anomaly. We conducted two idealized numerical simulations by modifying the SST field using a regional atmospheric model. In the first experiment the observed SST is imposed in the model, while in the second one the climatological SST is used. Our numerical experiments indicate that the JPCZ is enhanced due to the positive SST anomaly compared with that in the experiment with climatology SST. Consequently, the precipitation is approximately 20% larger over the southwestern part of Honshu (say, Tottori prefecture) in the observed SST experiment than that in the climatological SST experiment. The increased precipitation is likely due to a larger amount of water vapor transported into the coastal region on a warmer ocean surface.

Keywords: JPCZ, SST anomaly, Precipitation, Regional atmospheric model

