



Varying Relationship between La Niña and SST Anomalies in the Kuroshio and Adjacent Regions during Boreal Winter: Role of the East Asian Winter Monsoon

Sheng Chen¹, Jiepeng Chen¹, Xin Wang¹, and Ziniu Xiao²

¹South China Sea Institute of Oceanology, Chinese Academy of Sciences, Guangzhou, China

²Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing, China

The winter sea surface temperature (SST) anomalies in the Kuroshio and adjacent regions (KAR), which greatly influence the East Asian–North Pacific–North American climate, are closely related to El Niño–Southern Oscillation (ENSO). This SST relationship between the KAR and the equatorial eastern-central Pacific is widely assumed to be symmetric between El Niño and La Niña. Compared to previous studies indicating the significant and strong KAR warming during El Niño winters, this study indicates weakly negative KAR SST anomalies in the composite analysis for all La Niña events. Positive winter KAR SST anomalies unexpectedly appear in approximately half of La Niña events, which counteract negative SST anomalies in the rest of La Niña events. Further analysis suggests that the impact of La Niña on KAR SST anomalies is modulated by the East Asian winter monsoon (EAWM) during early winter. The weaker-than-normal EAWM offsets the anomalous northeasterly winds in the KAR induced by La Niña and then reinforces the KAR warming through warm oceanic advection. As for strong EAWM, it enhances the northeasterly winds to the west of an anomalous Philippine Sea cyclone associated with La Niña, leading to KAR cooling with more latent heat flux loss from the ocean and anomalous cold oceanic advection. Additionally, when the EAWM is independent of ENSO and is associated with the western Pacific pattern, it also can exhibit a pronounced influence on the KAR SST anomalies via the major processes of surface latent flux and horizontal heat advection in the ocean, accompanied by a change in Kuroshio transport.