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Development and maintenance of MCS associated with SST variations over the Yellow Sea, Korea

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The East Asian summer monsoon has an impact on producing heavy rainfall over South Korea. During summer rainy season, the mesoscale convective system (MCS) becomes more intense due to warm and moist air plentifully transported by the southwesterly low-level monsoon flow that was impinged on the South Korea. One of the reasons for the heavy rainfall, a relatively higher sea surface temperature (SST) front is known to influence the planetary boundary layer (PBL), resulting in an enhancement of low-level convergence and precipitation (Toy and Johnson, 2014). The warm SST front plays an important role in development of MCS and mid-latitude heavy rainfall events. On 13 August 2012, a linear-MCS was observed over Yellow sea and rainfall amounts exceeded 430 mm/day. A rainfall of 100 mm/hr was recorded during 3 hours in the western coastal area, South Korea. During the heavy rainfall event, a relatively strong warm front in SST over the Yellow sea existed distinctly. To understand the impact of SST on the development of MCS and physical mechanisms of heavy rainfall event, we examined SST frontal effects on precipitation over the Yellow Sea based on satellite data and high resolution atmospheric model simulations. We performed sensitivity experiments with SSTs using the Cloud Resolving Storm Simulator (CReSS, Tsuboki and Sakakibara, 2002) to investigate the causes of SST variation effects on MCSs over ocean. The control experiment with the observed SST (CNTL) is successfully simulated with reproducing linear MCS and rainfall patterns, compared with observations. The latent heat flux from the sea surface strongly appeared and it is found to be associated with sea-atmosphere interactions. From the sensitivity experiment that smooths SST gradients, the simulated linear MCS was relatively weak and latent heat flux was rapidly reduced. Sensitivity tests showed that the relatively strong warm pool in the SST contributed to developing and enhancing the linear MCSs over Yellow sea, South Korea.

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