The atmospheric response to the spring Kuroshio front over the East China Sea is investigated using a suite of high-resolution satellite data and a regional atmospheric model. In spring, QuikSCAT wind speed shows a clear effect of sea surface temperature (SST), with high (low) wind speed observed over the warm (cold) tongue. This in-phase relationship between SST and surface wind speed is indicative of SST influence on the atmosphere. Wind convergence is found on the warmer flank of the Kuroshio front, accompanied by a narrow rainband. The analysis of satellite-borne radar measurements indicates that deep convection appears over the Kuroshio warm tongue in the spring season, with enhanced convective precipitation, frequent occurrence of cumulus convection, and increased precipitation (cloud) tops in altitude.

The Weather Research Forecast (WRF) model is used to investigate the precipitation response to the spring Kuroshio SST front over the East China Sea. Forced by observed SST (CTL), the model well simulates a narrow band of precipitation, high wind speed, and surface wind convergence that closely follows the Kuroshio warm current, consistent with satellite observations. This narrow rainband completely disappears in the model when the SST front is removed by horizontally smoothed SST (SmSST). The results show it is convective precipitation that is sensitive to the Kuroshio SST front. A case study for an eastward-moving extratropical cyclone indicates that convective precipitation increases its intensity and duration in the CTL compared to the SmSST run. Local enhancement of upward sensible and latent heat flux, and convective instability in the lower atmosphere are the key to anchoring the narrow band of convective precipitation that closely follows the Kuroshio Current.