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A Response in the ENSO cycle to an extratropical forcing mechanism during the El Niño to La Niña transition

Y. Wang, A. R. Lupo, and J. Qin
Chinese Academy of Meteorological Sciences, Beijing, China (yfwang@cams.cma.gov.cn, -)

Current El Niño-Southern oscillation (ENSO) theory emphasizes that the forcing that drives the cycle mainly exists within tropical regions. However, these ideas are quite limited in explaining completely the occurrence of ENSO. Here we examine if extratropical forcing can affect the ENSO cycle, specifically the transition from El Niño to La Niña. Although the dispersion of the Okhotsk-Japan (OKJ) atmospheric wave train across the mid-latitude North Pacific during June terminates in subtropics, the associated regime of southward surface wind anomalies could reach Eastern Equatorial Pacific. The OKJ wave train plays a substantial role in generating a similar underlying sea surface temperature (SST) wave train through a barotropic process in air-sea interactions and is negatively correlated strongly with the SST around the Eastern Equatorial Pacific after October. The strong OKJ propagation in the positive phase in June is more significantly associated with negative SST anomalies occurring within the Eastern Equatorial Pacific after October, while the strong OKJ propagation in the negative phase in Jun is associated with positive SST anomalies around the Eastern Equatorial Pacific after October. The negative SST anomalies at the southern end of the SST wave train with the strong overlying OKJ propagation in the positive phase in June and the associated southward surface wind anomalies retained its strength by the further infusion of energy and gradual southward displacement joining the negative SST anomalies around the Eastern Equatorial Pacific after the October when La Niña usually matured in-situ. The strong OKJ propagation in the positive phase in June tends to occur during a quick summer and fall transition period from El Niño to La Niña. This study strongly suggests that the extratropical forcing plays an ignored role in affecting the ENSO cycle especially in forming La Niña, which was not included in the current ENSO theory.