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# Coupled Decadal Variability in the North Pacific Ocean: Observations and Theory

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Air-sea coupled variability is investigated in this study by focusing on the observed sea surface temperature signals in the Kuroshio Extension (KE) region of 32°–38°N and 142°E–180°. In this region, both the oceanic circulation variability and the heat exchange variability across the air-sea interface are the largest in the midlatitude North Pacific. SST variability in the KE region has a dominant timescale of $\sim 10$ yr and this decadal variation is caused largely by the regional, wind-induced sea surface height changes that represent the lateral migration and strengthening/weakening of the KE jet. The importance of the air-sea coupling in influencing KE jet is explored by dividing the large-scale wind forcing into those associated with the intrinsic atmospheric variability and those induced by the SST changes in the KE region. The latter signals are extracted from the NCEP-NCAR reanalysis data using the lagged correlation analysis. In the absence of the SST feedback, the intrinsic atmospheric forcing enhances the decadal and longer timescale SST variance through oceanic advection, but fails to capture the observed decadal spectral peak. When the SST feedback is present, a warm (cold) KE SST anomaly works to generate a positive (negative) wind stress curl in the eastern North Pacific basin, resulting in negative (positive) local SSH anomalies through Ekman divergence (convergence). As these wind-forced SSH anomalies propagate into the KE region in the west, they shift the KE jet and alter the sign of the pre-existing SST anomalies. Given the spatial pattern of the SST-induced wind stress curl forcing, the optimal coupling in the midlatitude North Pacific occurs at the period of $\sim 10$ yr, slightly longer than the basin crossing time of the baroclinic Rossby waves along the KE latitude.