Session: C9 Poster: M92B

Consistency of sea surface temperature analyses in depicting ENSO behavior

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El Niño-Southern Oscillation (ENSO), a dominant mode of climate variability on interannual time scales, influences circulations of the atmosphere and ocean and biogeochemical cycles significantly. Because of the associated impacts on flood and drought, agriculture, and fishery, etc., it has important socio-economic consequences. Characterizing ENSO behavior using sea surface temperature (SST) products is important to the understanding and prediction of ENSO. A number of SST products exist today, some of which extended back to the 1800s. However, their consistency in depicting ENSO behavior has not been investigated systematically. Here we use four SST analyses to examine their consistency in describing ENSO conditions in the past three decades (the satellite era). The datasets include the NOAA 1/4o Daily Optimum Interpolation Group for High Resolution SST (GHRSST), NOAA Extended Reconstructed SST version 3 (ERSSTv3b), NOAA Optimum Interpolation Sea Surface Temperature version 2 (OISSTv2), and Hadley Centre SST version 1 (HadISST1) products. We analyzed conventional NiÒo indices computed from SST anomalies (referenced to the seasonal climatology for a common period), the amplitudes of El Niño and La Niña determined from these indices, low-frequency change in these amplitudes, and the spatial structure of large El Niño events such as the 1997-98 eastern-Pacific El Niño and the 2009-10 central-Pacific El Niño. The SST products have different smoothing or de-correlation scales (ranging from a couple to several hundred kilometers) during their gridding procedures in order to fill data gaps or suppress spatial noise. The impact of smoothing on the representation of ENSO characteristics is investigated. Our results highlight the importance of resolution in characterizing ENSO characteristics and have important implications to the reliability of using historical reconstruction of SST to infer low-frequency change in ENSO behavior.