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Identifying the early 2000s hiatus associated with internal climate variability

Xin-Gang Dai (1) and Ping Wang (2)

(1) Institute of Atmospheric Physics(IAP), CAS, Beijing, China (daixg@tea.ac.cn), (2) Chinese Academy of Meteorological Sciences, China Meteorological Administration, Beijing

This study focuses on re-examining the early 2000s hiatus and the associated key components of the global mean surface temperature (GMST) using multiscale statistics for five well-known gridded surface temperature and two reanalysis datasets. The hiatus is characterized as a near-zero trend on the decadal scale corresponding to the maximum P-value via an F-test in statistics. The results reveal that the hiatus exists in both the GMST and global mean air temperature (GMAT) time series, rather than in global warming component, which has maintained an approximately constant rate of change of approximately 0.08ºC/decade over the past three decades. The hiatus's duration is different from that of time series such as 2002-2012/2001-2013/2002-2014 in HadCRUT4, NOAA-old, ERA-Interim and NCEP-R2. The newly gridded datasets with data infilling or bias correction for interpreting the sea surface temperature (SST) measurement from the old versions show a slightly higher trend from for 2002-2012 than the hiatus, which is thus regarded as a slowdown. Comparison suggests that the hiatus should be during the period 2002-2012. Orthogonal wavelet decomposition of the temperature time series shows that the hiatus was merely a decadal balance between cooling from interannual variability and global warming, in addition to weak warming from interdecadal and multidecadal climate oscillations. In addition, the evolutions of the GMST's interannual composite well coincided with Niño3.4 SST anomalies, which is consistent with the numerical simulation performed by Kosaka and Xie in 2013. Hence, it is the anomalous El Niño Southern Oscillation (ENSO) events in the early 2000s that caused the hiatus despite a constant rate of global warming and the maximum magnitude of the multidecadal composite that led to the limited contribution to the trend during this period. The multidecadal composite follows a downward path, which implies that future climate conditions will likely rely on competition between multidecadal cooling and global warming if the multidecadal climate cycle repeats, as was experienced during the second half of the twentieth century.