

Interdecadal changes of 30-year-SST normals during 1871-1999

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SST predictions are usually issued in terms of anomalies and standardized anomalies relative to a 30-year normal: climatology and standard deviation (SD). The World Meteorological Organization (WMO) suggests updating the 30-year normal every 10 years. In complying with the WMO's suggestion, we have constructed a new 30-year normal for the 1971-2000 base period (available here).

http://www.cpc.ncep.noaa.gov/products/predictions/30day/SSTs/sst_clim.html

To put the new 30-year normal in a historical prospect, we studied all the 30-year normals since 1871, starting from the beginning of each decade (such as 1871-1900, 1881-1910, etc.). Using the new Hadley Centre Sea-Ice and SST data set (HadISST) for 1870-1999, eleven 30-year normals (except the 1971-2000 normal is approximated by the 1971-1999 normal) are calculated, and the interdecadal changes of the seasonal mean climatology, standard deviation and persistence are discussed.

The seasonal mean climatology has a large interdecadal change (0.6 degree) over the Antarctic Circumpolar Current, Kuroshio and Gulf Stream, which may not be true due to the coarse resolution of the analysis (2 degree x 2 degree). The seasonal mean climatology of the NINO3 SST varies interdecadally with an amplitude of 0.15 degree, being relatively cold for 1885-1900, warm for 1900-1930, cold for 1930-1970 and warm for 1970-1985 (years are at the centers of 30-year normals). The seasonal mean climatology in the Pacific Decadal Oscillation (PDO) region (160E-160W, 35N-45N) shows a larger interdecadal change (0.3 degree), being relatively cold for 1885-1940, warm for 1940-1980 and cold after 1980. This is consistent with previous studies on PDO.

We focused on the seasonal mean SD of SST in the NINO3 and PDO regions. Compared with the average seasonal mean SD of NINO3 during 1871-1999, the seasonal mean SD is relatively large for 1885-1910, small for 1910-1950 and large for 1950-1985. The fact that the seasonal mean SD during 1910-1950 is much smaller than those before and after is also evident in the Darwin sea level pressure. The seasonality of SD (smallest in spring and largest in winter) also varies interdecadally, relatively weak during 1910-1950 and strong during 1950-1985. This is consistent with the observation that the phase-lock to the annual cycle since 1985 is much weaker than that during 1950-1985. The seasonal

mean SD in the PDO region varies seasonally, being largest in summer and smallest in winter and spring. It also varies interdecadally with an amplitude of 0.15 degree, being relatively small for 1885-1935 and large for 1935-1985. It is noticed that the relatively large seasonal mean SD corresponds to the relatively warm seasonal mean climatology and vice versa.

We focused on the seasonal mean SST persistence at a two season lag. The seasonal mean persistence of NINO3 is largest in summer and smallest in winter. The seasonality of persistence is relatively weak during 1885-1910, phase-shifted during 1910-1940 and strong during 1950-1975. The strong seasonality of persistence is consistent with the large seasonality of SD during 1950-1985 discussed earlier.