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冬季北太平洋亜熱帯高気圧強度の 10 年規模変動
Changes in intensity of the wintertime North Pacific Subtropical High on quasi-decadal timescale

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Temporal variations of the North Pacific Subtropical High (NPSH) intensity, which is defined by the sea level pressure averaged within a region of 120?145W, 20?40N, during 60 winters from December 1950/February 1951 to December 2009/February 2010 are investigated using the National Centers Environmental Prediction/National Center Atmosphere Research (NCEP/NCAR) reanalysis dataset. The months from December to February correspond to the period having peak winter conditions in the atmosphere field. The NPSH shows a dominant quasi-decadal (about 10 years) intensity variation and has an equivalent barotropic structure in the vertical direction through the troposphere. The tripole pressure system associated with quasi-stationary Rossby wave packet propagation is found over the wide regions from the NPSH to the Gulf of Mexico: in the strengthening phases of the NPSH, the pressure weakens over the central Canada and strengthens over the Gulf of Mexico. The spatial structure has a resemblance with the Tropical Northern Hemisphere (TNH) teleconnection pattern detected by the Barnston and Livezey (1987, Monthly Weather Review): actually, the NPSH intensity has a significant correlation (R = 0.54) with an index of TNH defined by a rotated empirical orthogonal function (REOF) analysis for the geopotential height at 700hPa field. Changes in the wind associated with the NPSH-related teleconnection pattern impart large impacts on the surface air temperature and precipitable water fields over the America: the associated northerly wind brings cold/dry air onto the western American region and the southerly wind brings the warm/wet maritime air onto the eastern part of the American.

The statistical analyses such as a composite analysis and a correlation analysis show significant relationships between the NPSH and sea surface temperature (SST); a zonal dipole SST structure is found in the tropical ocean: positive SST anomalies are distributed in the western part of tropical ocean and negative anomalies are in the eastern part of tropical ocean in the strengthening phases of the NPSH. The SST pattern is similar to that related to the El Nino/Southern Oscillation (ENSO): actually, the NPSH intensity has a significant correlation (R = ?0.54) with the Nino?3.4 index defined as SST averaged of 120?170W, 5S?5N. A composite analysis shows that, in the La Nina events, a Hadley cell characterized by a upward flow in the northern tropical Pacific around 150W, 15N and a downward flow in the subtropical Pacific region around 140W, 30N is formed locally and resultantly causes a strengthening of the NPSH. It can be pointed out that the NPSH intensity and the NPSH-related teleconnection pattern, i.e., TNH pattern, are induced mainly by the quasi-decadal time scale ENSO found in the recent analysis (Hasegawa and Hanawa 2006, Journal of Oceanography).

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