

# Winter surface air temperature anomalies over the Tibetan Plateau and their connection to the polar stratospheric variability

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Using station observations together with ERA-Interim Reanalysis data, the characteristics of wintertime surface air temperature (SAT) anomalies over the Tibetan Plateau (TP) and their related mechanisms are investigated. The local monthly SAT anomalies over the TP in winter are accompanied by synchronous monthly SAT anomalies over broad regions ranging from North Africa, across the Middle East and extending eastward to the TP. The winter monthly SAT anomalies over the TP are closely related to a subtropical teleconnection pattern, with four action centers originating from the western Mediterranean Sea to North Africa, across the Arabian Sea and extending eastward to the TP. A subtropical teleconnection pattern index (STPI) is highly correlated with the winter monthly SAT anomalies over the TP. Both upper tropospheric geopotential height and temperature anomalies in relation to the subtropical teleconnection pattern are accompanied by an anomalous center over the North Atlantic, where the vertical geopotential height and temperature anomalies can extend from the troposphere up to the lower stratosphere. This result implies that the TP winter SAT anomalies, which are mainly influenced by the teleconnection between the North Africa and subtropical Eurasia, might be linked to the North Atlantic and polar stratospheric signals. Both the STPI index and winter SAT anomalies over the TP are significantly correlated with the polar lower stratospheric geopotential height anomalies of the preceding month, by which both the geopotential height and temperature associated with SAT anomalies over the TP are mostly captured.

**Key words:** Surface air temperature anomalies, Tibetan Plateau, Subtropical teleconnection pattern, Stratospheric geopotential height