

Impact of Sudden Stratospheric Warming on the Surface Air Temperature in East Asia

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The sudden stratospheric warming (SSW), which is characterized by an abrupt increase of polar stratospheric temperature by several tens of degrees in a week, has been known to affect tropospheric weather and climate on sub-seasonal time scale in the boreal winter. Such downward coupling has been often examined in North Atlantic and Europe, but rarely examined in East Asia. In this study, by applying the two definitions of SSW to the reanalysis data, the possible impacts of the SSW events on the surface air temperature (SAT) and tropospheric circulation in East Asia are analyzed. It is found that Eurasian continent, including Siberia and the Northeast Asia, tends to experience anomalously cold SAT for up to thirty days after the SSW events. The resulting SAT anomalies largely resemble those associated with negative Arctic Oscillation. However, over East Asia, SSW-related SAT change is weak and not statistically significant. Only during the extreme SSW events when the downward coupling between the stratosphere and troposphere is strong, East Asia exhibits significantly cold SAT anomalies. This relationship is presented by grouping SSW events into those followed by cold SAT anomalies over East Asia and those by warm anomalies for varying threshold values of the SSW events.

Key words: sudden stratospheric warming, East Asia, surface air temperature, stratospheric–tropospheric downward coupling