Geophysical Research Abstracts
Vol. 18, EGU2016-17661, 2016
EGU General Assembly 2016
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The large volcanic eruptions at different latitude bands and patterns of winter temperature changes over China

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Based on the chronology of 29 large volcanic eruptions events (Volcanic Explosivity Index≥4) since 1951 and gridded temperature dataset from China Meteorological Data Sharing Service System, we identified the patterns of winter temperature changes over China after the large volcanic eruptions, comparing with the mean temperature within the five years before, then we analyzed the related dynamic mechanisms of different patterns by NCEP reanalysis data and model output data from Community Earth System Model (CESM). The results showed that the winter temperature decreased more than 1°C in East China after volcanic eruptions on middle-lower latitudes and equatorial bands. After volcanic eruptions on different latitudes, the temperature spatial patterns were summarized as two types, which included that temperature was cooling centered on Northeast and warming in Tibets, and its opposite pattern. The first pattern was usually detected after tropical volcanic eruptions in spring/summer and it also appeared after volcanic eruptions on high latitudes in spring/autumn. After middle-lower latitude volcanic eruptions, the variation of geopotential height on 500hPa showed that the positive anomaly was existed at the East of Ural mountain, which caused the temperature decreased in Northwest , Central East and Southeast when east asian trough was intensified. After high latitudes volcanic eruptions, the zonal circulation was more obvious at middle latitudes, the cold air was not easy to transport [U+FF0C] therefore winter temperature increased in China except for the Yangtze River Basin. The result of full forcing experiments by CESM showed that temperature decreased at most regions after large volcanic eruptions on equatorial /high bands, and troughs and wedges were developed on 500 hPa. The variation of geopotential height was nearly reversed after volcanic eruptions on high latitudes, only the temperature of Tibetan Plateau decreased. But how the variation of geopotential height regulated the temperature pattern was not clear after tropical volcanic eruptions.