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Intraseasonal differences of the stratospheric signal on temperature and precipitation anomalies over Europe during wintertime

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Several studies have provided evidences that stratosphere-troposphere coupling conditions the mean and the variability of Northern Hemisphere surface climate. However, there are still many uncertainties about mechanisms involved in this connection, so that it is a topic with an increasing interest with the aim of improving surface climate prediction. In this work, we analyze the effect of stratospheric polar vortex extremes on 850-hPa temperature and precipitation over Europe within thirty days after. Preliminary analyses give evidences of intraseasonal variability in the tropospheric-wave activity preceding stratospheric polar vortex extremes. Consequently, in this study stratospheric extremes have been grouped in three sets according to its occurrence through winter: early winter (October-December), midwinter (January-February) and late winter (March-April). Daily mean data have been used: temperature from ERA-Interim reanalysis for 1979-2011 and precipitation from Global Precipitation Climatology Project for 1996-2011.

Results show that the signal of stratosphere-troposphere coupling on temperature and precipitation depends on the period in which stratospheric extremes occur. Overall, the largest European areas with statistically significant signals correspond to midwinter extremes, both in anomalous 850-hPa temperature and precipitation composites. On average, Southern Europe is wetter than climatology and Irland area is drier and colder during one month after a midwinter weak polar vortex; Iberian Peninsula, British Island and Scandinavian appear colder whereas warmer Southeastern Europe. The anomalous precipitation pattern over Europe during a month after a weak polar vortex varies substantially between the three winter sets. For strong polar vortex, both in midwinter and late winter, Iberian Peninsula and North Atlantic basin appear remarkably drier and wetter, respectively.