

THE STRATOSPHERIC WARMING 2012 / 2013: INFLUENCES ON WEATHER EXTREMES AND LARGE SCALE DYNAMICS IN STRATOSPHERE AND MESOSPHERE

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THEME: Atmosphere, weather and climate

KEY WORDS: Sudden stratospheric warming event, planetary waves, middle atmospheric circulation, mesospheric cooling, extreme weather, gravity waves

ABSTRACT:

The effects of stratospheric warming events (SSW) are not restricted to the stratosphere only. There is a considerable impact on the troposphere and mesosphere. Mesosphere coolings are often observed prior to SSW. There are also hints, that SSW can impact tropospheric weather. Therefore, SSW are very important coupling mechanisms in the atmosphere and it is important to define precursors to help improving forecasting.

The synoptic situation and atmospheric dynamics during winter 2012/2013 in the Northern Hemisphere are analyzed in order to characterize both, larger scale (planetary) and smaller scale (gravity) waves. Therefore, remotely sensed measurements derived from satellite based METOP-A-GOME-2 (total ozone) and TIMED-SABER (temperature profiles) are used.

The planetary wave (PW) regime is found being dominated by zonal wavenumbers 1 and 2. A Hovmöller analysis shows that both PW-1 and PW-2 propagate against the zonal mean flow. They break, trigger a wind reversal result in a major warming. Induced momentum on the background zonal flow due to wave breaking is estimated. As a consequence of the SSW PW-3 is found to be modified significantly in its wave characteristics (phase speed, frequency).

Evidence for a mesospheric cooling prior to the SSW is found. Gravity wave characteristics (power flux) in that altitude regime is found to be modified significantly.

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