



SPARC Workshop SHARP2016

## **The pre-phase of major sudden stratospheric warmings (MSSW) and the cold phase of ENSO: mean perspective and case study of 2009**

Andrea Schneidereit, Dieter H.W. Peters

Leibniz-Institute of Atmospheric Physics

[schneidereit@iap-kborn.de](mailto:schneidereit@iap-kborn.de)

Although, the mean winter polar stratospheric vortex is cold and seems to be very stable under La Nina conditions, major sudden stratospheric warming events (MSSW) occur with the same frequency under both extreme phases of ENSO as shown by Butler and Polvani (2011). The authors showed that the frequency is twice as high as the frequency during non-ENSO winters.

Based on ERA-Interim re-analysis data the wave activity in the pre-phase of MSSWs is examined. The present analysis shows an increase of wave-2- geopotential in mid- and high latitudes during La Nina. Simultaneously with an increase of the climatological zonal mean eddy heat flux of wave 2 in the extra-tropics, La Nina creates two regions of enhanced anticyclonic flow: over Alaska and Scandinavia. It is examined that the eddy heat flux of anomalies together with the correlations between  $v^*$  anomaly and La Nina  $T^*$  climatology, and between La Nina  $v^*$  and  $T^*$  climatology attribute mainly to the increase. This result seems to be linked to the intensity of MSSWs.

Furthermore, the enhanced dual tropospheric wave forcing over Alaska and Scandinavia may be caused by tropical processes. For MSSW-2009 event it is shown that the combination of moderate La Nina and active MJO phases together are responsible for a reinforcement of the ridge over Alaska. Furthermore, the Scandinavian ridge is maintained by wave trains emanating from the ridge over Alaska. This leads to an amplification of wave 2, which determines the strongest eddy heat flux at 100 hPa ever observed until that date.