EMS Annual Meeting Abstracts
Vol. 13, EMS2016-707, 2016
16th EMS / 11th ECAC

Climatology of lead-lag relationships of Northern Annular Mode during the cold seasons in the Northern Hemisphere.

Martin P. King (1) and Javier Garcia-Serrano (2)

(1) Uni Research Climate, Bjerknes Centre, Bergen, Norway (Martin.King@uni.no), (2) Earth Sciences Department, Barcelona Supercomputing Center, Barcelona, Spain

A number of previous studies have been conducted on the stratospheric Northern Annular Mode (NAM) variability and its lagged correlation in the troposphere, together with precursor in vertically propagating planetary waves as indicated by the meridional eddy heat flux. Here, using the ERA-INTERIM reanalysis dataset for 1979-2015, we re-examine these processes in a month-by-month basis for each month from September to May during when NAM shows a strong variability. The variation in the strength of the stratosphere and lagged troposphere correlation throughout these months is reported, and the associated planetary waves propagation before, during, and after an anomalous NAM event is investigated. In the sense of anomalous positive NAM events, preceding and concurrent reduced upward propagating planetary waves are found in the upper atmosphere, as in previous studies. However, an enhanced propagation of planetary waves in the upper atmosphere succeeding these events also occur within a month and terminate the upper-level NAM anomaly. In cases where the stratosphere-troposphere lagged correlation is weak, it is found that the lagged enhanced upward propagating waves exist throughout the troposphere to the surface, not just in the upper atmosphere. Decomposing the eddy temperature T* and meridional velocity v* into their climatological and anomalous parts (following Nishii and Nakamura 2005, Nishii et al 2011) at the 50hPa level indicates that enhanced or reduced v*T* result depending on the interference of anomalous and climatological eddies and whether in the zonal average they constructively result in positive or negative v*T* anomaly. The initiation of strong NAM coincides with reduced stationary eddy temperature strength, and a strong NAM condition advect heat horizontally in such a way that zonal asymmetry and thus stationary eddies strengths would again develop. It is hoped that the results from this study can be useful to inform the potential for subseasonal to seasonal predictability and to evaluate models' performance.