

Interaction between the troposphere and stratosphere in a changing climate

Indrė Gečaitė

Vilnius University/ Institute of Geoscience, Lithuania

ABSTRACT

It is possible, that under changing climate conditions the changes in the interaction between the troposphere and stratosphere may occur. This may cause new conditions of the formation of sudden stratosphere warming (SSW) events and further formation of weather anomalies in the troposphere. One of the methods to evaluate the peculiarities of troposphere-stratosphere interactions is using the wave activity flux (WAF) intensity as an indicator. Extremely strong WAFs coming from the troposphere to the stratosphere may cause weak polar vortex and SSW. This may lead to the formation of further weather anomalies. The chief diagnostic tool used in this study is the extreme values of the vertical component of three-dimensional Eliassen Palm (EP) WAF vector, which is calculated by the equation proposed by R.A. Plumb using the Modern-Era Retrospective Analysis for Research and Applications version 2 (MERRA-2) three-hourly reanalysis data. EP WAF is related to the eddy heat flux and is a key indicator of the upward (coming from the troposphere) and downward (going back towards the troposphere) propagation of quasi-stationary planetary-scale waves. The calculations were performed using data from a height of 30 km. The aim of this study is to evaluate how WAF intensity and spatial characteristics has evolved over the last four decades. The results were obtained and evaluated with the non-parametric Mann–Kendall test. Changes in spatial distribution of the WAF extremes were illustrated using four main regions: Europe, Asia, North America, and the Pacific.

Keywords: Eliassen Palm; wave activity; Plumb; SSW; MERRA-2