Wave processes in the middle atmosphere during the minor SSW development in winter 2014-2015

K.A. Didenko 1, E.A. Bezotecheskaya 2,3, E.A. Maurchev 1

1. Pushkov Institute of Terrestrial Magnetism, Ionosphere, and Radio Wave Propagation (IZMIRAN), Russian Academy of Sciences, Troitsk, Moscow, Russia.

2. Arctic and Antarctic Research Institute, Saint-Petersburg, Russia.

3. A.M. Obukhov Institute of Atmospheric Physics of Russian Academy of Sciences, Moscow, Russia.

A study of the dynamic regime of the middle atmosphere in the 2014-2015 winter season was carried out using reanalysis data. The variability of the atmosphere as a whole this winter was due to the development of sudden stratospheric warming (SSW). Despite the fact that this SSW is classified as minor, it has had a significant impact on the temperature regime, circulation and chemical composition of the middle atmosphere. The main attention is paid to the study of wave activity variations of stationary planetary waves (SPW) and processes caused by wave activity before, during and after the SSW. The method of perturbed potential enstrophy analysis is used to study wave activity and wave processes. It is shown that variations in wave activity before the development of the SSW are due to wave-wave interactions, and during and after are due to the exchange processes of SPW2 (zonal wave number 2) with the mean flow. The development of the minor SSW in January 2015 had similar characteristics to the development of the major SSW, which likely led to the observed changes in the dynamic regime of the underlying atmospheric layers. The differences in the distribution of upper-tropospheric jet streams (JS) frequency during the month before and after the SSW, for example, have been shown.

The research was supported by Russian Science Foundation grant #23-17-00273, https://rscf.ru/en/project/23-17-00273/.