Planetary waves in the O_2(0-1) emission rate during stratospheric warming

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The comparison results of variations of nightly averaged intensities and rotational temperatures of OH(6,2) and O_2(0-1) bands in the nightglow measured with the infrared spectrograph at station Maimaga (63N, 129,5E) and changes of the thermal stratosphere state at heights of 2 and 10 mbar have been given. The daily averaged temperature of the stratosphere in the polar cap (65N–90N) at Climate Prediction Center site, NOAA (www.cpc.ncep.noaa.gov) is used and data two winter time for the period of 1999-2001 are analyzed. It is found that during stratospheric warming against the background of the global increase in the O_2(0-1) intensity the oscillations of about 10 days time scale are observed. The oscillation amplitude decreases as stratospheric warming disappears. Simultaneous oscillations of the same time scale but of smaller amplitude are also detected in the rotational temperatures of O_2(0-1). Apparently, when a planetary wave reaches the height of O_2(0-1) excitation (~95 km), it enhances the vertical wind directed down. Then, the arrival of the air enriched by atomic oxygen from the thermosphere into the oxygen-deficient mesosphere increases also. The molecular oxygen emission intensity depending on the square of atomic oxygen concentration is considerably grown. In this case, the heating of the mesosphere is observed simultaneously. Thus, observed oscillations of the intensity of O_2(0-1) can be explained by the modulation of the vertical wind by the planetary wave. Such an evident correlation with the development of the stratospheric warming does not observe in variations of the emission intensity of OH.