

Stratospheric warming as a source of the 557.7 nm airglow variations

Medvedeva I.V., Beletsky A.B., Mikhalev A.V., Abushenko N.A., Chernigovskaya M.A., Tashchilin S.A.

Institute of Solar-Terrestrial Physics, Russian Academy of Sciences (ISTP SB RAS), Irkutsk, Russia (ivmed@iszf.irk.ru/ Fax: +7 3952 425557)

We investigate the effects of stratospheric warming on the behavior of the atomic oxygen 557.7 nm airglow. We use the experimental data obtained at a geophysical observatory near Irkutsk (52° N, 103° E) for the 1997-2006 period. For the period under investigation we found out several cases of abnormal behavior of intensity in the absence of strong geomagnetic disturbances when the intensity suddenly increased by 100-300%, at particular nights it reached 2 kR. We establish that these significant 557.7 nm emission intensity increases concerning mesosphere - low thermosphere heights are caused by stratospheric warming when disturbances cover the big range of atmosphere heights.

To obtain quantitative dependences of 557.7 nm emission intensity and stratospheric temperature we compare the strongest disturbances in this emission behavior with the stratospheric temperature local data received at the ISTP SB RAS satellite receiver station in the place of carrying out optical measurements and with averaged zonal characteristics of the stratosphere.

We show that significant increase of atmospheric 557.7 nm emission registered during the winter periods (January-February 1998, January and December 2000; December 2001 - January 2002) were accompanied by irregular disturbances in the stratosphere temperature mode.

We point out that for the Asian region, and, in particular, for the Eastern Siberia region, there is a considerable concentration of stratospheric warming cites which may cause features in atmospheric airglow characteristics.