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Программа конференции

Section STP. Solar-Terrestrial physics

25.03.2021

Subtitle: Low Ionosphere and Atmosphere

Chair: Irina Mironova

13:40-14:00	**Andrey A. Popov**, Nikolay M. Gavrilov	Statistical Corrections of Random Errors in the Nightglow Observations of Hydroxyl Rotational Temperature in the Upper Atmosphere

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STP060

Statistical Corrections of Random Errors in the Nightglow Observations of Hydroxyl Rotational Temperature in the Upper Atmosphere

Andrey A. Popov[1], Nikolay M. Gavrilov[1]

[1]Saint- Petersburg State University, Atmospheric Physics Department , Saint Petersburg, Russia.

andrew.popovix@gmail.com

Mesoscale variations of the rotational temperature of excited hydroxyl (OH*) can be used as indicators of wave processes in the mesosphere and lower thermosphere region at altitudes 85 – 90 km. The data of spectral measurements of nightglow OH* emission contains not only information about wave processes, but also contributions from instrumental noise and random atmospheric turbulent fluctuations. A statistical method is applied to estimate variances of random fluctuations and exclude them from the observations of the OH* rotational temperature.

To filter out mesoscale variations we used calculations of the differences between the measured values of OH* rotational temperature T(t) separated with time intervals dt:

DT = T(t+dt)-T(t), (1)

Several values of dt ~ 0.5 - 2 hr were used. Averaging squares of differences DT over all temperature pairs obtained during a month, one can get the total variance

S(dt) = < DT*DT >, (2)

Where sign <> denote the monthly averaging. For small dt one can assume a polynomial series dependence of S on dt:

S(dt) = s + rdt +…, (3)

where s and r are constants. The term s in (3) has sense of the variance of random non-correlated noise corresponding to dt = 0. One can obtain s approximating monthly variances S(dt) obtained for different small dt with linear dependence (3) using the least square method. If one have two values S(2dt) and S(dt), Eq. (3) leads to the formula

s = 2S(dt) - S(2dt), (4)

The variances of random non-correlated noise s were estimated from the data of nightglow observations by both the least square approximation with linear dependence (3) and with formula (4). It is shown that both methods give very similar results and can be used for the random noise estimations. The differences

U(dt) = S(dt) – s, (5)

gives corrected monthly variances of correlated in time component of mesoscale temperature variations. Examples of seasonal and interannual changes in the wave component of corrected mesoscale variances U(dt) of the rotational OH* temperature at different observational sites are obtained, which may reflect changes in the intensity of mesoscale internal gravity waves in the mesosphere and lower thermosphere region at different geographical locations.

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