



Observations of acoustic-gravity waves in the troposphere by lidar

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Many experimental researches reveal disturbances of the parameters of the upper atmosphere and ionosphere caused by the development of strong weather disturbances, seismic events on the surface, a tsunami generated by an underwater earthquake. The physical mechanisms that implement these various communication layers of the atmosphere and determine the morphological characteristics of ionospheric disturbances, remain insufficiently understood.

Hypotheses about the influence of the processes in the lower atmosphere on the condition of the upper atmosphere and ionosphere are based on the concept of generation of acoustic-gravity (AGW) and internal gravity (IGW) waves in the lower atmosphere and their distribution in the upper atmosphere. That is why, the study of the processes of generation AGW in the lower atmosphere is interest to confirm the validity of such representations.

Regular source of perturbations of all layers of the atmosphere is the solar terminator (ST). Observations perturbation parameters of the atmosphere and ionosphere during the passage of the ST will determine the frequency spectrum of the resulting disturbances.

The paper presents the results of experimental researches, which demonstrating an increase of wave activity with periods of AGW and IGW in the observations of the lower atmosphere during the passage of the solar terminator. Observations of variations in the parameters of the lower atmosphere during the passage of ST were performed by the lidar. The observations were carried out in Kaliningrad (52N, 22 E) in 2012-2014.

Analysis of the observations focused on the allocation of variations with periods ranging from 2 to 20 min., caused by the generation of AGW in ST. The duration of each observation was for several hours. This allows us to consider the dynamics of changes in the characteristics of such variations during observations.

Analysis of the results of observations revealed a number of features in the dynamics of AGW during the passage of ST.

1. Increasing the amplitude variations of parameters of the lower atmosphere and ionosphere with periods of 2-10 min is clearly apparent during the passage of the solar terminator on the observation point.
2. In observations clearly separated infrasonic components of variation and IGW. This is a decrease in the amplitude variations with periods of 3-5 min. This behavior variations of atmospheric parameters associated with the difference Brunt-Vaisala frequency and the frequency of the acoustic cutoff.

Ionospheric observations of variations of the total electron content (TEC) of the ionosphere also reveal variations with periods of AGW. Variations of the ionospheric TEC parameter with periods of AGW (4-10 min.) are clearly seen during the passage of the solar terminator and continue for 1-2 hours in the illuminated region of the ionosphere. Gain variations of the ionosphere with such periods may be due to acoustic-gravity waves propagating from the terminator in the lower atmosphere.