HEIGHT AND TIME DEPENDENCE OF THE DYNAMICS OF THE MID - LATITUDE UPPER MESOSPHERE-LOWER THERMOSPHERE DEDUCED FROM RADIOMETEOR MEASUREMENTS IN KAZAN (56°N, 49°E) DURING 1986-1995

A.N. Fahrutdinova

The Department of Physics, Kazan State University, 18 Kremlevskaja Str., Kazan, Russia

ABSTRACT

A homogeneous series of radiometeor observations in the height interval of 80-110 km obtained during 1986-1995 at the Eastern European mid-latitude station of - Kazan (56°N, 49°E) has been used to determine the height structure of parameters of prevailing and tidal movements of the zonal and meridional circulation, their inter-annual, annual, semi-annual oscillations and several-year averages; height and seasonal structures of wave disturbances of prevailing circulation with time scales of planetary waves; investment of long-period internal gravity waves in prevailing circulation was evaluated. The influence of solar cycle activity on dynamics has also been determined.
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METHOD OF MEASUREMENTS AND PROCESSING OF DATA

Regular observations of the wind profile in the upper mesosphere - lower thermosphere are conducted at Kazan State University (56°N, 49°E) using the method of meteor track location. The main technical characteristics of the meteor radar (Sidorov and Fahrutdinova, 1991) are: carrier frequency 32 MHz, pulse duration 100 μs, pulse-repetition frequency 400 Hz, transmitted pulse power ~ 120 kW; baselines of phase interferometer, equal to 4λ and 4.5λ, oriented along the North-South and the East-West directions; root-mean-square error in height is 1 km.

Using the method of harmonic decomposition of the time series we have derived the prevailing zonal and meridional wind, amplitude and phase of the diurnal, semi-diurnal and 8-hourly tidal wind, as well as amplitude and phase of annual, semi-annual oscillations and mean-annual values of prevailing and tidal winds.

HEIGHT-TIME STRUCTURE OF PREVAILING MOTIONS

In this work we have calculated the average values of prevailing zonal U_0, meridional V_0 wind over the period 1986-1995. The parameters U_0, V_0 and their root-mean square deviations, caused by year-to-year variations are shown in Fig. 1. Over the height range 80 km to 110 km there is an increase in the northern wind from 2 ms^{-1} to 3 ms^{-1}. Zonal wind is to the west and it has a maximum value of about 7 ms^{-1} within the range of 95-98 km.

In the year-to-year variations of prevailing wind the quasi-biannual oscillations (QBO) is apparent (see Fig.2). In the period from May 1990 to June 1993 observations were not made. This break in the data is represented by a plane with zero level. The amplitude of QBO varies from 1 to 6 ms^{-1} with height and from year to year. Vertical phase velocity of QBO is equal to 3 km/month for both zonal and meridional wind, and is propagating downwards, corresponding to the upward propagation of QBO energy (Fahrutdinova *et al.*, 1997).