LONGITUDINAL PECULIARITIES OF MERIDIONAL CIRCULATION IN LOWER THERMOSPHERE AND MESOSPHERE

R. B. Bekbasarov, K. A. Karimov, and M. A. Takyrbashev

Institute of Physics
Frunze, USSR

Figure 1 presents average monthly longitudinal profiles of geostrophic wind in winter. Positive values correspond to meridional movements from north to south. The figure shows that the zonally averaged values of the meridional component of the wind velocity $\bar{V}_g$ are close to zero. At the same time there are considerable meridional movements with average monthly speed maxima of 70-80 mps, especially at great altitudes and in high latitudes. The presence of sectors where meridional flows preserve their directions in the course of time comparable with a synoptical period is noted in all longitudinal profiles of the distribution of V_g (λ). The sector boundaries are subject to insignificant monthly variations.

On the average mutually equivalent dispositions of sectors with prevailing meridional flows were observed each month on constant pressure surfaces. Fig. 2 shows an example of such a disposition of these sectors at the level of 0.4 mb. Sharp shifts of sector boundaries are normally limited to, and coincide in time with, stratomesospheric warmings.

Thus, it can be concluded that the normal longitudinal meridional circulation is characterized by the presence of sectors where meridional flows do not change their direction in the course of time comparable with synoptical periods.

Fig. 3 presents the longitudinal distribution of meridional wind in middle latitudes taken from the analysis results of radiometeor and ionospheric stations (Atlanta, Garchy, Dushanbe, Irkuts, Kuhlungsborn and Frunze) observational data obtained in 1976-1980. Positive values correspond to winds from south to north. The winter period is divided into a relatively undisturbed period (November-December) and a disturbed period (January-February).

As is seen from the figure, meridional winds have a longitudinal variability that is equivalent to both the warm and cold half years. Annual variability of the meridional wind component as follows from the results obtained in Frunze and Atlanta is shown in Fig. 4. The results presented in Figures 3 and 4 show that large scale quasistationary disturbances of the circulatory regime that determine its longitudinal differences exist both in the lower thermosphere and in the stratomesosphere.

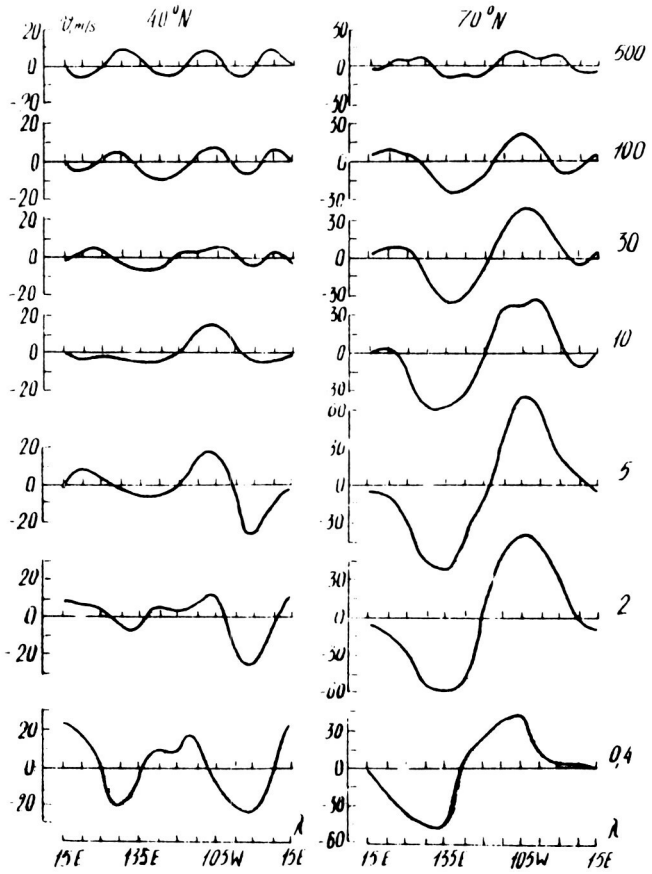

Fig. 1 Longitudinal variation of the monthly mean meridional geostropic wind v for 500 to 0.4 mb surfaces at latitudes 40°N and 70°N. Positive values denote northerly winds.

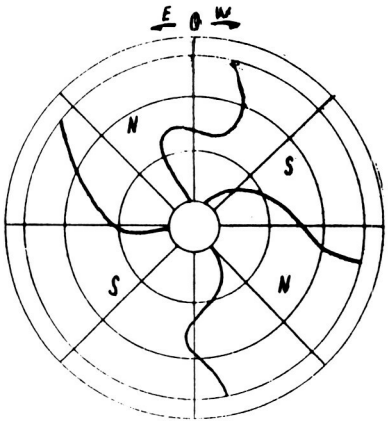

Fig. 2 Sectors of prevailing northerly N and southerly S flows over the northern hemisphere at 0.4 mb.

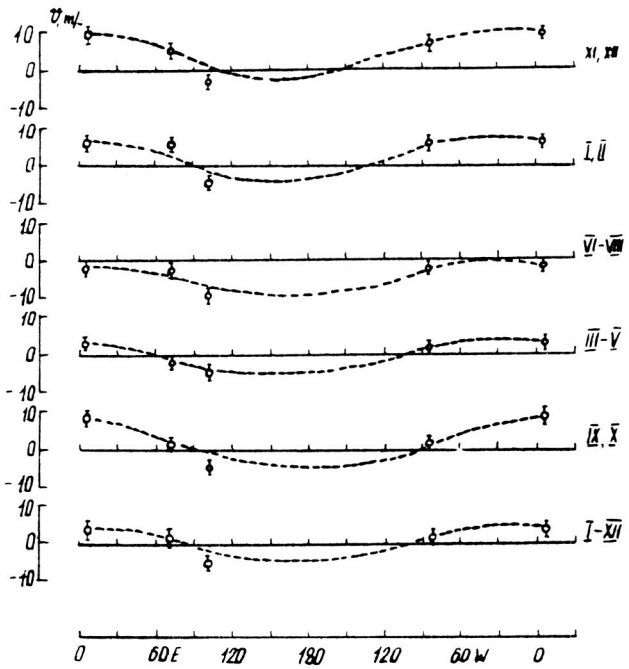

Fig. 3 Seasonal and annual means of average prevailing meridional wind at 95 km as measured at, from left, Garchy, Frunze, Irkutz, and Atlanta for the year 1976-80. Positive values denote southerly winds.

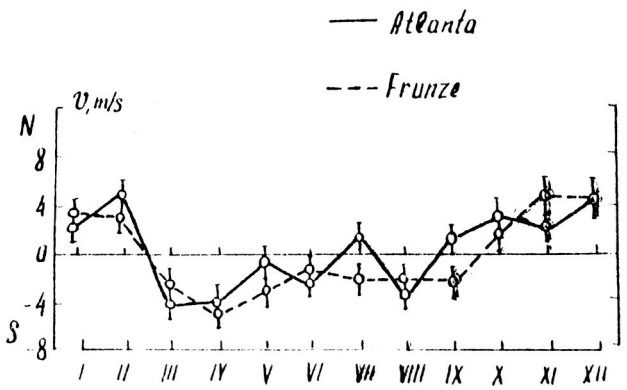

Fig. 4 Seasonal variation of mean meridional winds at 95 km over Atlanta and Frunze.