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Temporal and spatial rotational spectra of wind velocity variations with periods 2-40 days in lower and middle atmospheres of the Earth

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Abstract

Current work is dedicated to the investigation of temporal and spatial energy spectra of wave processes in the field of lower and middle atmospheres (0-100 km) of the Earth. For analysis we used data of wind measurements at heights 80-100 km performed at meteor radar in Kazan (56N, 49E). Also we used data of BADC UK MO containing wind velocity in nodes of the longitudinal - latitudinal grid (96×72) for the height range 0-55 km. Analysis of calculated temporal rotational energy is performed separately for time scales 2-7 days, 7-20 days and 20-40 days. At middle latitudes of Northern and Southern Hemispheres the change of the prevailing direction of the wind velocity rotation is detected. Established change of the prevailing rotation of the wind velocity vector at heights 0-100 km shows that these latitudes are in the region of active cyclonic and anticyclonic activity. Also we found that for middle and high latitudes of the Northern and Southern Hemispheres the planetary wave regime is specific as well as the regime of the geostrophic turbulence is specific for low latitudes and the equator. This result is acquired using the analysis of the spatial energy spectra for heights 0-55 km. The inclination of these energy spectra in the linear region with wave numbers 8-25 is [-6;-4] for middle and high latitudes (it corresponds to the planetary wave regime) and [-2;-1] for low latitudes and equator (it corresponds to the regime of the geostrophic turbulence).

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Keywords

Planetary waves, Rotational spectra, Spatial spectra