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Height-season structure of the available potential energy and kinetic energy in the lower and middle atmosphere

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Abstract

The distributions of kinetic energy (KE) and available potential energy (APE) in the lower and middle atmosphere of the Northern and Southern hemispheres over the period 1992-2003 are investigated. Annual mean values of the amplitude and phase of annual and semiannual oscillations in the zonal and eddy forms of KE and APE are calculated in the height range 0-55 km (1000-0.316 hPa) for the 21st layer. A clearly pronounced annual cycle of the zonal and eddy components of KE and APE with maxima in the winter season are observed in the troposphere of both hemispheres. In the lower stratosphere, the annual-cycle maximum is shifted toward the summer season because of the meridional gradient of the zonal mean temperature. In the stratosphere of both hemispheres, along with annual oscillations, semiannual oscillations are present in all forms of energy. The intensity of these oscillations for the zonal KE and APE at the upper-stratosphere heights is comparable to the intensity of annual oscillations. A local structure of the energy regime of the upper mesosphere-lower thermosphere is investigated against the background of the global energy regime from the data of meteor sounding in Kazan. It is shown that, for both the global and regional regimes, specific features of the phase profiles of energy characteristics can be explained by the presence of barriers during the propagation of wave disturbances along the vertical. © Pleiades Publishing, Inc. 2006.

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