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Non-linear interaction of the tidal components of atmospheric oscillations

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The tidal oscillations of the wind and temperature are one of the basic processes which are responsible for the formation of dynamical and thermal regimes in the mesosphere and lower thermosphere (MLT) region. Study of the variability of atmospheric tides and their sources is the key for understanding of the energetic and dynamics of this atmospheric region. On the basis of the Northern Hemisphere winter-time atmosphere circulation simulated with the Middle and Upper Atmosphere Model (MUAM) the relative role of distributed in the middle atmosphere sources of the nonmigrating tides is considered. It is shown that when planetary waves are strong in the stratosphere (for instance, during sudden stratospheric warming events), the main contribution into the generation of non-migrating tides is resulted from the non-linear interaction between migrating tides and the stationary planetary wave with zonal wave number m=1. Accounting of the longitudinal ozone inhomogeneities leads to the appearance of the additional sources of the non-migrating semidiurnal (m = 1) and diurnal (m = 2) tides. Filtration of the thermal sources of the different tidal components in the MUAM allows us to estimate the generation of secondary migrating tides due to non-linear interaction between the primary thermal tides. The contribution of the diurnal and semidiurnal tides to the formation of the zonally averaged circulation in the MLT region is estimated.