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Formation of sporadic E under the influence of AGWs and horizontal background wind

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It is shown that the declined propagation of atmospheric gravity waves (AGWs) (with horizontal $k_x, k_y \neq 0$and vertical wavenumbers $k_z \neq 0$) can influence the horizontal and vertical convergence of heavy metallic ions at the mid-latitude lower thermosphere. In the case of presence of background horizontal wind with velocity close to AGWs horizontal phase velocity and opposite to AGWs horizontal phase velocity occurs the increase of the ions vertical convergence inside regions with spatial scale of half vertical wavelength $\lambda_z/2$ and the formation of the multilayered sporadic E takes place.

In order to investigate temporal evolution of processes related with sporadic E formation the 3-D numerical simulations are performed in the following cases (1) horizontal background wind and AGWs are absent, (2) background horizontal wind with arbitrary direction is considered and (3) AGWs and background horizontal wind ae considered along with taking into account ambipolar diffusion. In the cases of presence of AGW the ions/electron convergence in thin dense layers and formation of multi-layered sporadic E is demonstrated. It is shown that the ions/electron density of Es layers also depends on the horizontal and vertical wavelengths of AGWs' velocity perturbations. The vertical spatial location of the horizontal Es layers is determined by the vertical wavelength of AGWs.

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