Generalized polarization relationships for acoustic gravity waves in the nonisothermal atmosphere with the wind

O.N. Savina (1), P.A. Bespalov (2) and N.A. Ryzhov (1)

(1) Nizhny Novgorod State Technical Univversity, Russia, (2) Institute of Applied Physics, Russian Academy of Sciences, Nizhny Novgorod, Russia (savina@appl.sci-nnov.ru)

The problem of acoustic gravity waves propagation in the nonisothermal atmosphere with the horizontal inhomogeneous wind and viscosity of medium was examined. This problem was solved by means of introduction the wave impedance, which is equal to the ratio of the vertical component of the velocity to the pressure disturbance. In the paper the formalism, which made it possible to write down the nonlinear first order equation of the type of Riccati's equation for the acoustic gravity waves impedance was developed. As a result of the analytical or numerical solution of Riccati's equation the polarization relationships in the atmospheric are determined. After the determination of wave impedance all characteristics of atmospheric wave fields are determined as a result of solving the linear first order differential equation. The formalism, based on the solution of the nonlinear Riccati's equation for the wave impedance made it possible to substantially simplify the algorithm of the numerical study of the acoustic gravity waves in the atmosphere with the nonisothermal temperature profile. In the paper a traditionally complex question connected to the boundary condition at high altitudes was solved. The preliminary results of application the developed formalism to the numerical calculation of the acoustic gravity waves fields in the atmosphere with the real high-altitude profiles of temperature and horizontal winds velocity were given.

The work was partial supported by the Russian Foundation for Basic Research (project No. 05-02-16742 and No. 05-02-16350).