Geophysical Research Abstracts
Vol. 16, EGU2014-3538, 2014
EGU General Assembly 2014

Modeling of the Infrasound Propagation in the Atmosphere: With Gravitational Effect and Attenuation Considered

Yang Song
Wuhan University, School of Electronic Information, Department of Space Physics, Wuhan, China (phsongyang@gmail.com)

For modeling the propagation of infrasound below 5 Hz, the high frequency approximation is no longer valid and the effect of gravity needs to be taken into account. Damping of infrasound in the realistic atmosphere is another important ingredient. With the impacts of gravitational field and realistic atmospheric attenuation considered, an acoustic ray tracing model and a Finite Difference Time Domain (FDTD) model are developed. The ray tracing equations are deduced from the real part of the dissipative dispersion relation of acoustic wave, while the acoustic attenuation coefficient and growth rate in a stratified moving atmosphere are deduced from the imaginary part of the dispersion relation.The buoyancy frequency and the cut-off frequency of acoustic wave are set to be the values in a nonisothermal atmosphere, and the attenuation coefficient is corrected by the realistic absorption. In the FDTD model, the governing equations of acoustic wave in a dissipative gravitational-stratified atmosphere is solved by combing a dispersion relation preserving scheme in space and a Runge-Kutta scheme in time. The results show that the ray trajectory obtained by the ray tracing model agrees well with that simulated by the FDTD model. The simulation of the ray tracing model illustrate that the gravitational effect plays a dominant role in the stratospheric ducting and the attenuation effect could be neglected. However, the contribution of the absorption becomes more important and can't be ignored in the thermospheric ducting. By taking the gravity into consideration, the acoustic frequency in our models is no longer constrained by the high frequency approximation. Consideration of the dissipation effect can also improve the computation accuracy of ray trajectories and the efficiency of wave amplitude evaluation.