カスプ域の熱圏質量密度異常を生成する上昇流の形成過程

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Formation process of upward flow producing thermospheric mass density enhancement in the cusp region

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CHAMP satellite observations have revealed that the thermospheric mass density enhances in the cusp region. For this generation, an upward flow driven by frictional heating in the F region is thought to be important, but further studies are needed to determine whether or not the upward flow like thermal convection is possible in the stably stratified thermosphere. Rather, the upward flow in the stably stratified atmosphere may change to buoyancy oscillation. In this study a numerical model of nonhydrostatic and compressible atmosphere is used to investigate the relation between the buoyancy oscillation and the upward flow. The neutral atmosphere is coupled with ionosphere as the driver of frictional heating. The frictional heating is assumed to be caused by a 2-cell ion convection and ion density distribution produced by solar EUV. It is found that buoyancy oscillations are expanded as acoustic waves from the F region altitude. The buoyancy oscillations rapidly accelerate the upward flow, and are gradually attenuated by viscous and thermal diffusion. The buoyancy and viscosity are finally in balance and form the steady upward flow, when the mass density anomaly is maximum. The time constant of the mass density anomaly would be determined by viscous and thermal diffusion.