Space Studies of the Upper Atmospheres of the Earth and Planets including Reference Atmospheres (C)
Improved Description of the Ionosphere through Data Assimilation (C4.1)

LOWER ATMOSPHERIC ELECTRIC FIELD DUE TO CLOUD CHARGE DISTRIBUTION

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The distributions of electric charge in the electrified clouds introduce important effects in the ionosphere and into the region between the ionosphere and the Earth. The electrical properties of the medium are changed greatly between thundercloud altitudes and the magnetosphere. A model for the penetration of DC thundercloud electric field between the Earth's upper and lower atmosphere has been presented here. The model deals with the electromagnetic responses of the atmosphere simulated through Maxwell's equations together with a time-varying source charge distribution. The modified ellipsoidal-Gaussian profile has been taken for the charge distribution of the electrified cloud. The conductivity profile of the medium is taken to be isotropic below 70 km height and anisotropic above 70 km. The Earth's surface is considered to be perfectly conducting. A general form of equation representing the thundercloud electric field component is deduced. In spite of assumptions for axial symmetry of thundercloud charge distribution considered in the model, the results are obtained giving the electric field variation in the upper atmosphere. The vertical component of the electric field would relate the global electric circuit while the radial component showed the electrical coupling between the lower atmosphere and the ionized Earth's environment. The variations of the values of field components for different heights as well as Maxwell's current have been evaluated. Coupling between the troposphere and the ionosphere is critically dependent on the height variations of electrical conductivity. Field-aligned electron density irregularities in the ionosphere may be investigated

through the present analyses.