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高緯度電離圏ポテンシャル分布のモデリングに組み込まれた飽和効果
Saturation effects incorporated in the modeling of the high-latitude potential distribution

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We have developed an empirical model of the electric potentials in the high-latitude ionosphere which can express the distribution for superstorms. Our model is the numerical solution of the Laplace's equation with the boundary conditions obtained from the statistical analysis of the DE 2 electric field data, and the use of nonlinear functions for data fitting. For the determination of the boundary condition, we also used the data of the location of the precipitation particle boundary detected by DMSP spacecraft during several superstorms. The method used in our modeling can include the potential saturation effect. The model shows that polar cap potential reaches about 250 kV, which is in agreement with previous observations. Another advantage of our model is the ability to produce the distribution of the auroral oval corresponding to the potential distribution. By comparing between the potential distribution and the equatorward boundary of the modeled auroral oval, we can define the subauroral region. Our result shows that subauroral potential is large in the dusk sector, and saturated approximately at 70 kV. This is consistent with recent radar observations.

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