

## Empirical model of the electric potentials in the high-latitude ionosphere

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We have developed an empirical model of the electric potentials in the high-latitude ionosphere which has input parameters of only IMF  $B_y$ ,  $B_z$ , and solar wind velocity. Ruling out the contribution of other minor controlling factors allows us to obtain statistical characteristics of the high-latitude potentials for various solar wind conditions from DE2 electric field data. Using these characteristics as boundary conditions, we solved Laplace's equation for the potential for the entire high-latitude ionosphere. Results of modeling show a coherent pattern even in a case where the recent Weimer's 2005 model produces a highly-skewed distribution presumably because that model is based on a hybrid technique, which has spherical harmonic functions within a small area near the pole and multiple Fourier series functions at lower latitudes. Our model also produces reasonable cross polar cap potentials for extreme solar wind conditions. The predicted values are close to the ones reported in several recent studies from DMSP spacecraft observations. Detailed properties of our empirical model for various solar wind conditions are presented.