Polar ionospheric plasma convection and current models having space weather applications

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To forecast plasma convection, current distribution, and geomagnetic disturbances, or space weather, from satellite measurements in the upstream solar wind, a method has been developed to derive the electrostatic potentials in the polar ionosphere. The magnitude of the potential extreme points, and the position of these points and zero potential from each DE 2 pass have been examined statistically, and these parameters have been found to have systematic relations to several solar wind parameters. With these relations a potential model has been constructed. From this model current distribution patterns and geomagnetic disturbances have been calculated. The latter has been used as feedback to the convection model to make the convection model more reasonable in particular for substorm.

To forecast plasma convection, current distribution, and geomagnetic disturbances, or space weather, from satellite measurements in the upstream solar wind, a method has been developed to derive the electrostatic potentials in the polar ionosphere obtaining from any combination of the IMF orientation and magnitude, and solar wind velocity. The magnitude of the potential extreme points, and the position of these points and zero potential from each DE 2 pass have been examined statistically, and these parameters have been found to have systematic relations to several solar wind parameters. With these relations a potential model has been constructed. The model has been also used for obtaining current distribution patterns, and from these current distribution patterns geomagnetic disturbances have been calculated. The calculated magnetic perturbations have been compared with the observations at gound stations, and the difference has been used as feedback to the convection model to make the convection model more reasonable in particular for substorm which develops in smaller spatial and shorter temporal scales.