GEMSIS-I: A new modeling method of ionospheric potential pattern with SuperDARN

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We have been developing a new method to derive the large-scale structure of the ionospheric convection pattern on the basis of the Super Dual Auroral Radar Network (SuperDARN) data. The conventional map potential technique, developed by Ruohoniemi and Greenwald [1998], uses the empirical convection model (so called the APL model) as a base function of the fitting. Because this empirical model was made from the observations by only the one radar covering 65 to 85 degree in magnetic latitude, the model was extrapolated to the outside of the observed latitude range by assuming the Laplace equation, that is, no field-aligned currents (FACs). Since a substantial amount of FAC comes from/into the region at latitudes even below 65 degree, it is not appropriate to incorporate the observation at the subauroral to mid-latitudes into their model fitting. Our new approach to improve these weaknesses is summarized as the following two points. First, a more recent empirical model developed by Weimer [2001], which is observationally guaranteed farther down to ˜50 degree in latitude, is adopted as the primary base function. Secondly, a pair (positive and negative) of subauroral electric potentials with certain widths in both latitude and longitude are added with some function form to the base function. This is to better incorporate the observed ionospheric flows in the subauroral to mid latitudes due to the electric field originating from the Region-2 field-aligned currents (R-2 FACs). We present the preliminary result in which the present modeling method is applied to some cases accompanying subauroral polarization streams (SAPS) on the dusk side as well as those during magnetic storms. We also discuss how the choice of parameters of the additional R-2 potential function affects the final fitting result of the potential map.