Geophysical Research Abstracts
Vol. 15, EGU2013-3758-2, 2013
EGU General Assembly 2013


# Effect of R2-FAC development on the ionospheric electric field pattern deduced by a global ionospheric potential solver

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Toward the understanding of the effect of the magnetosphere originated disturbances on the global ionospheric electric field and current system, we developed a two-dimensional ionospheric potential solver based on the so-called "thin shell model." The important extension from the previous studies is that our model covers the pole-to-pole ionosphere without placing any boundary at the equator. By using this solver, we investigate how the ionospheric electric field changes from undershielding condition to overshielding condition as the field aligned current (FAC) distribution changes. Calculations are performed by changing IR2/IR1 (the ratio of current intensities of region 2 (R2) and region 1 (R1) FACs) and by moving R2-FAC relative to the fixed R1-FAC. The results are summarized as follows: (1) The turning point, at which the ionosphere turns from undershielding to overshielding is IR2/IR1 = $0.7 \sim 0.8$. (2) With increasing the local time deference between the R1 and R2-FAC peaks, the efficiency of the shielding by R2-FAC increases but the associated potential skews to the nightside. (3) At the same time the shielding effect is weakened around noon, where the R1-potential intrudes to the low latitude region instead, but the R2-potential remains dominant at other local times. The result suggests that the overshielding or undershielding should be identified by observations not only in a limited local time sector but also in the overall ionosphere as much as possible. In order to accurately describe the ionospheric condition, we suggest new classification terms, "complete-overshielding" and "incomplete-overshielding."