太陽風変動に対する磁気圏電離圏応答数値実験
―負の太陽風動圧変動―

藤田茂[1]、山岸久雄(2)[2]、村田健史(3)[3]、田光江(3)[3]、田中高史(4)[3]
[1] *気象大学校*
[2] *極地研究所*
[3] *情報通信研究機構*
[4] *九州大学*

Numerical experiments on response of the magnetosphere-ionosphere system to the solar wind variations
- Negative impulse of Solar wind dynamic pressure -

S. Fujita[1], H. Yamagishi[2], T. Murata[3], M. Den[3], T. Tanaka[4]
[1]*Meteorological College*
[2]*National Institute of Polar Research*
[3]*National Institute of Communication of Information Technologies*
[4]*Kyushu University*

The magnetosphere-ionosphere compound system responds variously to the solar wind variations. So many observations on the ground, in the ionosphere, and in the magnetosphere present so many results. It seems not so easy to comprehend the fundamental nature of the magnetosphere-ionosphere compound system. However, it is essentially important to understand the fundamental processes in the compound system. From this point, we start to construct a database for response of the magnetosphere-ionosphere compound system by assigning various solar wind variations in the global numerical model. As the magnetosphere-ionosphere system is a nonlinear system, we cannot expect linearity of the response. Thus, we need to perform so many calculations for this database. In addition to this database, the knowledge database is also quite important. S. F. started to construct such knowledge database.

As one of the results for constructing the database, we present here the fundamental natures of the response of the magnetosphere-ionosphere system to the negative impulse of the solar wind dynamic pressure are studied. The simulation study of the negative SI was done before [Fujita et al., 2004]. However, they were concentrated on the mirror-relation between the positive SC and the negative SI. We need to study further the behavior of the magnetosphere-ionosphere system during the negative SI. When the negative impulse impinges in the magnetopause, the Region 1 field-aligned current (R1 FAC) and R2 FAC appears alternatively in the lower-latitudes of the dayside ionosphere. These current systems shift nightward and poleward. This alternative appearance of FACs invokes positive and negative potential patterns switching alternatively. Finally, a long-period variation in the convection system in the polar ionosphere appears. In addition, depressed R1 FACs and enhanced R2 FACs during the negative SI invoke the overshielding of the convection electric field. These two phenomena are already confirmed by recent observations. In the talk, we will explain the physical mechanisms of the variations of the magnetosphere-ionosphere compound system during the negative SI.

References

Fujita, S., T. Tanaka, T. Kikuchi, and S. Tsunomura, A numerical simulation of a negative sudden impulse, Earth Planets Space, 56, 463-472, 2004.