Predictability of thermosphere-ionosphere variations originating from the lower atmosphere using GAIA

*品川 裕之[1]、陣 英克[1]、三好 勉信[2]、藤原 均[3]

*Hiroyuki Shinagawa[1], Hidekatsu Jin[1], Yasunobu Miyoshi[2], Hitoshi Fujiwara[3]

1. 国立研究開発法人情報通信研究機構、2. 九州大学、3. 成蹊大学
1. National Institute of Information and Communications Technology, 2. Kyushu University, 3. Seikei University

A numerical model of the whole atmosphere-ionosphere coupled model GAIA developed at National Institute of Information and Communications Technology (NICT) has been used to study various phenomena in the atmosphere and the ionosphere. The present version of GAIA employs the meteorological reanalysis data JRA-55 to incorporate lower atmospheric forcing to the model. Using the reanalysis data, the model is capable of reproducing actual day-to-day variations in the atmosphere and ionosphere. In space weather forecast, however, some users need information of ionospheric conditions for one or more days ahead. Since GAIA self-consistently solves the whole atmosphere and the ionosphere, it is expected that the model can reproduce realistic atmosphere and ionosphere for a certain period even without the reanalysis data. To test the predictability of thermosphere-ionosphere with GAIA, we compared two atmosphere-ionosphere simulation results: cases with and without reanalysis data starting from the same initial condition. We found that the two results are in reasonably good agreement for about one day, but that the difference becomes larger for more than two days. The result suggests that one-day prediction is possible with GAIA for variations in the thermosphere and ionosphere associated with lower atmospheric forcing.

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