



Long term ionospheric trends: Observation and modeling results

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By using Artificial Neural Network (ANN) method, we constructed empirical models of foF2 over Asia/Australia sector based on ionosonde observations. Using this ANN model, we systematically analyzed the long term trends of foF2 over this area for the first time. Results illustrated that the foF2 in the Asia/Australia sector has an average decrease of 0.05% per year in the past fifty years. This trend can not be interpreted only by greenhouse effect. We suggest that the long term variations of geomagnetic field may be another origin. To confirm this interpretation, we modeled the effects of long term variations of geomagnetic field on the ionospheric long term trend by TIME-IGGCAS for the first time. The modeling results indicate that the variations of geomagnetic field indeed can result in the long term variations of ionosphere because of the variations of the effects from the neutral wind on the ionosphere. Since the geomagnetic field variations differ from place to place, the ionospheric trends induced from geomagnetic field also have location dependence. The modeled ionospheric trends also have obvious seasonal and local time variations. Because the corresponding controlling factors have location dependence, these variations also show typical regional features. By comparison with existing results, we suggest that the changes of the global geomagnetic field may partly contribute to the inconsistent seasonal and local time variation patterns in ionospheric trends from different observations. We conclude that the effects of geomagnetic orientation on the ionospheric long term trend cannot be ruled out, especially in areas with large geomagnetic field variations.