The July 2012 geomagnetic storm

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Ionospheric storms represent an extreme state of the ionosphere, which are caused by geomagnetic storms, and the complicated ionospheric storm effects are always a research focus for the ionospheric community. The geomagnetic storm occurring on 14-17 July 2012 is an extremely rare event of space weather in solar cycle 24, characterized by a southward interplanetary geomagnetic field lasting for about 30 h below -10 nT.
In this talk, multiple instrumental observations including electron density from ionosondes, total electron content (TEC) from Global Positioning System (GPS), Jason-2, and Gravity Recovery and Climate Experiment (GRACE), and the topside ion concentration observed by the Defense Meteorological Satellite Program (DMSP) spacecraft are used to comprehensively present the regional differences of the ionospheric response to this event. In the Asian-Australian sector, an intensive negative storm is detected near longitude ~120°E on July 16, and in the topside ionosphere the negative phase is mainly existed in the equatorial region. The topside and bottomside TEC contribute equally to the depletion in TEC, and the disturbed electric fields make a reasonable contribution. On July 15, the positive storm effects are stronger in the Eastside than in the Westside. The topside TEC make a major contribution to the enhancement in TEC for the positive phases, showing the important role of the equatorward neutral winds. For the American sector, the EIA intensification is stronger in the Westside than in the Eastside and shows the strongest feature in the longitude ~110°W. The combined effects of the disturbed electric fields, composition disturbances and neutral winds cause the complex storm-time features. Both the topside ion concentrations and TEC reveal the remarkable hemispheric asymmetry, which is mainly resulted from the asymmetry in neutral winds and composition disturbances.
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