

Further study of TEC disturbances on November 6, 2001 derived from dense GPS receiver network and ionosonde chain over Japan

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Ionospheric disturbances during a magnetic storm on November 6, 2001 were analyzed using total electron content (TEC) obtained by a dense GPS receiver network, GEONET, which covers the whole of Japan and F-layer peak parameters obtained by a meridional ionosonde chain which consists of Wakkanai (45.39N), Kokubunji (35.71N), Yamagawa (31.20N) and Okinawa/Ogimi (26.68N). Latitude vs. time maps of TEC were generated by using the GEONET data and they were compared with NmF2 and hpF2. During an event on November 6, 2001, a weak positive storm was recognized in terms of foF2 during the daytime, while TEC was nearly doubled at all latitudes. This event is explained by the effect of a prompt penetrating eastward electric field under the condition of persisting equatorward neutral circulation which was setup prior to the prompt penetration of the electric field and continued for more than 24 hours. The ionosphere was raised by about 100 km simultaneously at the four ionosonde stations. Small ion-neutral collision frequency at high altitudes results in the loading of plasma into the plasmasphere. At night, a positive storm condition continued at the latitudes higher than 33N both for NmF2 and TEC, which is caused by the equatorward neutral winds. At the latitudes lower than 33N, a negative perturbation was observed in the evening hours caused by the suppression of the evening enhancement of eastward electric field. A quantitative difference of storm signatures between NmF2 and TEC are attributed to the plasma loading to the plasmasphere and succeeding downward plasma flux. As the ionospheric disturbance in terms of foF2 was insignificant and the event might not be recognized as a storm, while the disturbance in terms of TEC was quite severe. Thus we should term such events as TEC storms.