Ionospheric disturbances over Japan during the geomagnetic storm in October and November 2003

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Occurrences of GPS radio wave scintillations over Japan during the geomagnetic storms in October and November 2003 were studied with data from GPS scintillation monitors and dual-frequency GPS receiver network.We started the one-year-observation from December 2002 at Kyoto University by our GPS scintillation monitor developed by Cornel University.

Through the observation scintillation phenomena were detected in two nights on 4 and 20 November 2003. Two scintillation monitors of Electronic Navigation Research Institute (ENRI) installed at Okinawa and Tokyo had also detected scintillations in these two nights.On 4 November 2003, intense TEC perturbations were detected by dual-frequency GPS receiver network. They were found to travel from west to east. These TEC perturbations had a north-south band-like structure and about 100 km wave length. Their propagating velocity was about 50m/s. Medium-Scale Traveling Ionospheric Disturbance (MSTID) is known to have same scale of wave length with about 100 m/s in velocity. The propagation velocity of these band-like structures on 4 November 2003 had slower than that of MSTID. The geomagnetic storm is occurred in the period from 29 October to 1 November and on 20 November. The scintillations were detected only at Naha from 29 October to 1 November. They were detected at three sites on 20 November 2003 like as the case on 4 November 2003.Although the strength of scintillation activity at Mitaka was the weakest in general, the intense scintillation activity has been detected at Mitaka on 7 and 8 April 2002. The minimum Dst index on these two days was about -10nT. The geomagnetic condition of these two days was quiet. It is possible that this scintillation activity on Japan would be generated by enhanced equatorial anomaly and plasma bubble activities.We compare the band-like structures of TEC map on 4 November 2003 with the TEC perturbation on 7 April 2002. The GPS scintillation data was compared with TEC perturbation data to discuss the condition of ionosheric disturbance during geomagnetic disturbed periods.