

Effects on midlatitude ionosphere observed from ground-based ionosonde data obtained at Alma-Ata station during strong geomagnetic storms

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The ionospheric effects of thirteen great geomagnetic storms occurred in the 1986-2005 time period observed over Alma-Ata (43.25_N, 76.92_E) were studied experimentally using ground-based ionosonde. The observations showed a number of unusual (for the Alma-Ata location) ionospheric phenomena during the active phase of the geomagnetic storms. It is a very high F2 layer ($h'F=490\text{km}$), an anomalous formation of the E, E2, and F1 layers at nighttime, and the appearance of aurora-type sporadic E layers. Processes of interaction of energetic neutrals with the upper atmosphere modeled by Bauske et al. (1997) for magnetically disturbed conditions seem to explain the phenomena of ionization of F1 and E regions at night.