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Geomagnetic and ionospheric response to the arrival of interplanetary shock wave

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The magnetosphere and ionosphere response to the arrival of interplanetary shock wave at 24 January 2012 caused by CME was investigated using complex of spacecraft and ground-based instruments. The SSC produce strong increase of the density, temperature, energetic particles fluxes with energies from 40 keV to >2 MeV inside the magnetosphere as seen from the THEMIS, GOES spacecrafts data. The interplanetary shock wave which produce SSC is a not shock wave in the outer magnetosphere (Mf $\approx$ 0.4) according the THEMIS spacecraft data. SSC produce the substorm development on the night side during prolonged positive Bz-component of IMF and generation of Pc4-5 pulsations on the morning side. On the evening side SSC cause the increase of the TEC (ΔTEC$\approx$ 8-9%), determined by the GPS receivers in Scandinavia. The response was accompanied by the increase of the electron density at the altitudes 100-200 km as seen from the VHF EISCAT radar in Tromso. So the main contribution to TEC increase has the lower part of the ionosphere. Obviously the TEC response is caused the particle precipitation into the ionosphere. It testified by the strong increase of the aurora intensity at different spectrum lines (400-700 nm) which registered by hyperspectral imager NARUSSCA II of the Polar Geophysical institute in Svalbard. The increase of the CNA in Scandinavia and in Svalbard was also registered during SSC. The SSC produce strong increase of the GIC (geomagnetically induced currents) at electric power lines of the Kola Peninsula and Karelia ($\sim$30 A).