



Evolution of tongue-of-ionization in Antarctica with GPS observations

Zemin Wang (1) and Jiachun An (2)

(1) Chinese Antarctic Center of Surveying and Mapping, Wuhan University, Wuhan, P. R. of China, (2) Chinese Antarctic Center of Surveying and Mapping, Wuhan University, Wuhan, P. R. of China

Polar ionosphere is coupled with magnetosphere and controlled by solar wind and IMF (Interplanetary Magnetic Field), which result in complex ionospheric change. TOI (Tongue of Ionization) is a large scale phenomenon in polar ionosphere. But details are still thin because data coverage is sparse in polar region, especially in Antarctica. With the increasing GPS (Global Positioning System) observations in Antarctica and by the ionospheric tomography model established in the paper, electron density and TEC (Total Electron Content) of ionosphere are calculated. During a magnetic storm on 10-11 October 2010, a polar cap TOI was detected. We investigate the temporal evolution and spatial structure of the TOI in detail by combining the ground-based GPS data with other observations, such as occultation data, ionosonde data. The results show a complete TOI evolution, which contains generation, development, movement, and dissipation. At the beginning of magnetic storm, a patch-like irregularity appeared. Two hours later, the irregularity grew gradually and displayed the obvious feature of TOI. Three hours later, the TOI reached a maximum and moved towards polar cap. Four hours later, the TOI moved through polar cap and disappeared gradually. For better understanding the evolution of TOI, IMF components, particle precipitation, convection motion are analyzed together. Triggered by a major southward turning of the IMF, the high latitude plasma convection expanded and the source plasma built up in the mid-latitude, which were necessary conditions for the formation of TOI. In all, by virtue of large GPS data and tomography model, a TOI in Antarctica is observed and analyzed effectively and deeply.