

Theoretical Simulations of Electric Current Effects on the Ionospheric Plasma Structure

*Charles Lin¹, Jann-Yenq Liu², Chuan-Ping Lein¹, Chia-Hung Chen¹

1.Department of Earth Science, National Cheng Kung University, 2.Institute of Space Science, National Central University, Chung-Li, Taiwan

Recent studies show ionospheric plasma density modifications due to lithosphere and atmosphere activities. One of the possible mechanisms for the ionosphere modifications might be direct current transmission effect to the ionospheric dynamo region. On the other hand, the disturbances could also affect the ionosphere by generating atmospheric disturbance waves that modify the neutral winds and thus affect the ionospheric dynamo and electron density. In this study, simulations of the direct current and disturbance wind dynamo effects are carried out using a coupled three-dimensional global ionosphere electrodynamic model. Simulations carried out by inclusion of the upward/downward transmission of direct electric current at 85 km altitude with various areas of current injections, indicate negative/positive TEC effects. The simulations for different local time sectors are also carried out showing that the effect is most prominent at dusk followed by that of at afternoon and noon periods. The simulations will also be compared with GPS-TEC observations of pre-seismic anomalies.

Keywords: Coupled Ionosphere Electrodynamic Simulation, Electric Current, Pre-seismic Ionosphere Anomalies