

Comparison of FM-CW Ionosonde and MAGDAS observations with S4 index in Peru

Akiko Fujimoto[1]; Shuji Abe[2]; Akihiro Ikeda[3]; Akimasa Yoshikawa[4]
[1] Kyutech; [2] ICSWSE, Kyushu Univ.; [3] KNCT; [4] ICSWSE/Kyushu Univ.

An FM-CW (Frequency Modulated Continuous Wave) radar is a type of HF (High Frequency) radar. We have installed three FM-CW stations along the Japanese longitude, at Japan, Russia and Philippine, in order to measure the electric fields that penetrate the ionosphere (Yumoto, 2006). One of the FM-CW project goals is to understand the relationship between Equatorial Electrojet (EEJ) and the generation mechanism of the Equatorial Spread F (ESF) associated with Equatorial Plasma Bubbles (EPBs). The ionospheric plasma-density irregularities, especially ESF, could result in the scintillation of trans-ionospheric GNSS/GPS signals. The study on the generation mechanisms of ESF is the important issue to estimate the occurrence of the ionospheric scintillation for the safety human activity using the space region. The abnormal magnetic field variation along the magnetic equator, EEJ, is reported to be associated with the ESF.

In 2018, we installed a new FM-CW radar at Sicaya Observatory in Peru. ICSWSE (International Center for Space Weather Science and Education, Kyushu University) also has the ground-based magnetometer network (MAGDAS) on the world including Peru MAGDAS chain. The Sicaya FM-CW observation will give the opportunity of the simultaneous ionospheric observation, the geomagnetic field variation recorded by MAGDAS system at Huancayo and the GPS scintillation status given by S4 index operated by IGP (The Geophysical Institute of Peru).

During 15-18 March 2019, we have the high-time resolution (every 3 minutes) Ionosonde campaign observation in Sicaya. The geomagnetic activity was the weak disturbed with Dst index -41 nT at 12:00 UT on 17 March 2019. The amplitude of EEJ was smaller than the normal EEJ variation and the depressed EEJ structure was recorded at the Sicaya in the evening sector on 17 March with the high S4 value at Brazil (where is located on the east side from Sicaya). The Sicaya Ionogram shows the long-term ESF on 17 March with the couple hours. We will demonstrate the comparison of Ionospheric irregularities with the magnetic activity in the equatorial region for the GPS scintillation.