D-region ionospheric variations after the 2024 Noto Peninsula earthquake using OCTAVE VLF/LF transmitter signals

*Hiroyo Ohya[1], Fuminori Tsuchiya[2]

1. Graduate School of Engineering, Chiba University, 2. PPARC, Graduate School of Science, Tohoku University

In the D-region ionosphere, oscillations of LF (low frequency, 30-300 kHz) transmitter signals with a period of 100 s were reported about five minutes after mainshock of the 2011 Tohoku earthquake (Ohya et al., 2018). During the 2015 Nepal earthquake, variations in LF amplitudes with a period of 100-200 s were reported (Akashi et al., 2021). These variations were caused by acoustic waves excited by Rayleigh waves. However, detailed coupling between earthquakes and the D-region ionosphere has not been revealed. In this study, we investigate the D-region ionospheric variations after the 2024 Noto Peninsula earthquake using OCTAVE (Observation of CondiTion of ionized Atmosphere by VLF Experiment) VLF/LF transmitter signals. We have built the OCTAVE observation network in Asia, Europe, and America for monitoring the ionosphere and magnetosphere. Intensity and phase were observed with a sampling time of 0.1 s. The mainshock of the Noto earthquake (M7.6) occurred at 07:10 UT on 1 January, 2024. When the propagation velocity of the Rayleigh wave was assumed to be ~3.5 km/s, we calculated the propagation time of acoustic wave between the Earth’ s surface and reflection height of the VLF/LF waves (about ~90 km height). The LF transmitter signals for JJY40kHz-KAG (Kagoshima, Japan) and JJY40kHz-RKB (Rikubetsu, Japan) propagation paths showed changes in the amplitude of +/-1 dB and phase of +/-5 degree, respectively, at the arrival time of acoustic wave up to the D-region height. The period of the LF variations was ~90 s. In this presentation, we will show the detailed phenomena in detail.

