R005-34
Zoom meeting C ：11/2 AM2 (10:45-12:30)
11:15〜11:30

D-region ionospheric signatures associated with the 2015 Nepal earthquake using LF transmitter signals

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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., JGR, 2018]. This is only one report for coseismic disturbances in the D-region ionosphere. In this study, we investigate the D-region ionospheric variations associated with the 2015 Nepal earthquake using LF transmitter signals that reflect in the D-region ionosphere. The mainshock of the Nepal earthquake (Mw 7.9) occurred at 06:11:26 UT on April 25, 2015. The propagation path was BPC (68.5 kHz, 34.63N,115.83E) - TKN (Takine, Fukushima, 37.34N, 140.67E). Intensity and phase were observed with a sampling time of 0.1 s. We compared time variations between the LF transmitter signals and vertical velocity data of seismometers provided by IRIS (Incorporated Research Institutions for Seismology), USA. It was found that the received LF signal showed changes in the amplitude of +/-0.1 dB and phase of +/-1 degree change, respectively, after 1294 s after the mainshock of the earthquake. Based on wavelet analysis, a periodic component of about 100-300 s was seen in both the LF signals and seismic velocity at arrival time of acoustic waves excited by Rayleigh waves. The coherences between the LF variation and the seismic velocity were 0.90 and 0.77 for amplitude and phase, respectively, which were significant at the 95% confidence level. If the acoustic waves were excited at the midpoint of BPC-TKN propagation path by the Rayleigh waves that propagated horizontally from the epicenter, and propagate upward up to the D-region height 70 km, the propagation time from the ground to 70 km height would be 225 s. The propagation time of the Rayleigh wave calculated from seismograph data was 1057 s, and the whole propagation time of the Rayleigh and acoustic waves was 1282 s. The arrival time of the acoustic waves is 06:32:48 UT. This is in good agreement with the start time of the LF oscillation. We also used the wave-hop method to estimate the change in the reflection altitude. The results showed that the reflection altitude changed by ± 40 m, which corresponded to changes in the amplitude of +/-0.1 dB and phase of +/-1 degree change, respectively.