R005-26
B 会場 ：9/25　PM1 （13:45-15:30）
13:45〜14:00

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Horizontal inhomogeneity of the D-region ionosphere detected by OCTAVE VLF/LF observations network during X-class solar flares

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When solar flares occur, electron density in the ionosphere (60-100 km altitudes) increases because of intense X-rays. So far, relationship between VLF (3-30 kHz) and X-ray flux has been reported (Paulin et al., 2010), although there are few reports for horizontal inhomogeneity of the reflection height in the D-region ionosphere. The purpose of this study is to reveal horizontal homogeneity of electron density in the D-region ionosphere during X-class solar flares using multi-path VLF/LF (30-300 kHz) transmitter signals of “Observation of CondiTion of ionized Atmosphere by VLF Experiment (OCTAVE)” network. The OCTAVE network is our originally worldwide VLF network for monitoring the D-region phenomena such like solar flares, energetic electron precipitation, and acoustic waves and atmospheric gravity waves associated with earthquakes and volcanic eruption. When solar flares occur, VLF/LF amplitude and phase vary with decreasing the reflection height. The transmitters used in this study were NWC (21.817S, 114.167E, 19.8 kHz), JJI (32.05N, 130.82E, 22.2 kHz), JJY (37.37N, 140.85E, 40.0 kHz; 33.47N, 130.18E, 60.0 kHz), and BPC (34.63N, 115.83E, 68.5 kHz). The receivers were located at RKB (Rikubetsu, Hokkaido, 43.45N, 143.77E), ZAO (Zao, Miyagi, Japan, 38.10N, 140.53E), SGR (Sasaguri, Fukuoka, Japan, 33.63N, 130.51E), KAG (Tarumizu, Kagoshima, Japan, 31.59N, 130.55E), and PTK (Pontianak, Indonesia, 0.003N, 109.37E), which are part of OCTAVE network. When the class of solar flares is X2.2, X2.7 and X4.9, amplitudes of variations in the VLF/LF amplitude (Δ A) and phase (Δ P) were 2.9-24.9 dB and 24.8-420.0 degrees, respectively. Using wave-hop method, we estimated reduction in reflection height (Δ h) from the observed Δ A and Δ P. The Δ h were estimated to be 1.0-12.9 km for 16 paths, and showed that Δ h tends to increase with solar zenith angle in large solar flares. In addition, we estimated the increase in electron density (Δ N) with azimuth angle using IRI-2016 model. As a result, the difference of Δ N with the propagation direction was confirmed. Δ N of west to east propagation path was larger than that of east to west one. In this presentation, we will discuss the horizontal inhomogeneity of the reflection height during solar flares taking into account difference of VLF east-west propagation.