

## Periodic variation of the Doppler shift frequency in association with the Tonga eruption

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The eruption of the Tonga submarine volcano occurred at 4:00 UT on January 15, 2022, and was accompanied by a large-scale atmospheric wave. TEC disturbances were observed in New Zealand about one hour after the eruption and about two hours and a half later in Australia. In Japan, a pressure variation of about 2 hPa was observed about 7 hours after the eruption (11:00-12:00 UT), and TEC disturbances were also observed in association with this pressure variation. In addition, earlier than the arrival of this pressure variation, TEC disturbances were also observed around Japan. Because Japan and Australia are located in a magnetic conjugate position, it is thought that the TEC disturbances generated in Australia propagate in Japan through the magnetic field lines. Such conjugate relation of disturbances through magnetic field lines has also been reported for coseismic ionospheric disturbances (Iyemori et al., 2005).

The Doppler shift variation with a period of about 4 minutes was observed in association with the variation before the arrival of the pressure variation. The variation of Doppler shift frequency was observed in the radio wave at 5006 kHz (transmitter: Chofu, receiver: Sarobetsu), but no variation was observed at 3925 kHz (transmitter: Nemuro, receiver: Chiba). From the fact that the radio wave at 3925 kHz is reflected at a lower altitude, it is suggested that the variation occurred in the F region but not in the E region. In this presentation, we will present the results of detailed analysis together with TEC variations.

Keywords: Ionosphere, HF radio wave, Doppler shift frequency, Tonga eruption