

A network of HF Doppler sounding systems in Japan

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Since 2003, a network observation of HF Doppler sounding has been conducted in Japan for remote-sensing the atmospheric, ionospheric and magnetospheric processes. Currently, 1 transmitting station (Tx) and 7 receiving stations (Rx) are operative by a collaborative effort of four different universities. The main transmitting station is located at Chofu, Tokyo, Japan in the Campus of University of Electro-Communications (JG2XA). JG2XA transmits continuous waves at 5006 kHz and 8006 kHz with a transmitting power of 200 W. By receiving this JG2XA signal at 7 Rx stations (Sugadaira, Oarai, Kure, Kashima, Iitate, Fujisawa and Sugito) we derive the Doppler shift imposed during the propagation and reflection in the ionosphere. In particular, the Doppler shift data can be used to detect vertical motion of the ionospheric F region with a temporal resolution of 10 s. At some stations, we also have observed signals from Radio Nikkei 1 (JOZ at 3925 kHz, JOZ2 at 6055 kHz, and JOZ3 at 9595 kHz) transmitted from Nagara, Chiba, Japan, which allows us to observe the vertical motion of the ionosphere at several altitude levels. The data obtained from this experiment since 2003 are all available at <http://gwave.cei.uec.ac.jp/~hfd>. Not only quick-look plots but also several types of digital data (raw wave form and Doppler shift data) can be retrieved from this database. The experiment covers various ionospheric phenomena in the Magnetosphere-Ionospheric (M-I) coupling system, such as sporadic E-layer (Es), medium-scale traveling ionospheric disturbances (MSTIDs), large-scale traveling ionospheric disturbances (LSTIDs), global-scale electric field variation, geomagnetic pulsations, and sudden commencement (SC). The data can also be used for the studies of vertical coupling between the lower atmosphere and ionosphere, for example, observations of ionospheric variation after large earthquakes, volcanic eruptions and typhoons. To facilitate analyses of the phenomena listed above, it is desired to observe a wider area in latitude and longitude. For this purpose we plan to extend the network covering the entire ionosphere over Japan in the near future. In the presentation, we will give a brief introduction to the experiments and online database, and then discuss the future direction of the studies of atmosphere, ionosphere and magnetosphere using the HF Doppler sounding in a framework of international collaborations.

Keywords: HF Doppler experiment, Ionosphere