

Simulation of Anomalous Long-Distance Propagation of Overseas TV Broadcasting Waves

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Physical and chemical condition in ionosphere is affected not only by influence from upper side such as solar radiation but also by that from lower side such as typhoons, earthquakes and so on. In order to investigate electromagnetic phenomena associated with earthquakes, we have constructed an observation system for electromagnetic signals at VHF band at Tateyama, Chiba prefecture, and started observations since 1999. Signals are received with a five-element Yagi antenna and a Log-Periodic Dipole Array (LPDA) antenna with horizontal polarization toward the west direction, amplified with pre-amplifiers and main-amplifiers, and introduced into spectrum analyzers. Broadband spectra of 47-76MHz are observed with the spectrum analyzers to investigate spectral characteristics of observed signal. In the observed band, TV broadcasting waves from Asian countries are sometimes received. These propagation are classified into three types, and one of them has following characteristics: a) the propagation sometimes occurs in spring and fall during 8-20 o'clock (JST) and b) has clear frequency boundary which changes in time between 47-65MHz.

In order to investigate this long-distance propagation, we have made model simulation. A simple model was used: VHF wave is launched toward horizontal direction and refracted in ionosphere. IRI (International Reference Ionosphere) data were used via NASA NSSDC Web site. The data on N20 E120 are used, which is around middle of Malaysia and the observatory. The radio wave at 50MHz launched toward the horizontal direction can propagate only in spring and fall around 18 o'clock. The observed frequency dependence of propagation was also able to be simulated using this model.