

Observations of Anomalous Long-Distance Propagation of Overseas TV Broadcasting Waves and Investigation of Their Mechanisms

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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 as follows.

1) It is generated from 8:00~20:00JST in spring and fall. The maximum frequency which can be spread is observed in 50~65 MHz.

2) It is generated from 20:00~24:00JST in spring and fall. The characteristic of the frequency can't be observed.

3) It is generated from 8:00~20:00JST in summer. The characteristic of the frequency can't be observed.

In order to investigate this long-distance propagation, we have made model simulation. A simple model was used for Type A: VHF wave is launched toward horizontal direction and refracted in ionosphere. IRI(International Reference Ionosphere) data were used via NASA NSSDC Web site. 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 and these results show good agreement with the observational results.