Evaluation of usability of The Radio NIKKEI for HF Doppler observation

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There is HF Doppler (HFD) observation in one of the means to analyze a spatial movement and the structure of the ionosphere disturbance by using HF. In HFD observation, transmit the shortwave to which the frequency is steady and receive the reflected wave with two or more reception points and obtain information on the ionosphere disturbance from the amount of the frequency change and reception strength. As for the ionosphere disturbance observation point, to analyze a spatial movement and the structure of the ionosphere disturbance by the HFD observation, a lot of one becomes advantageous.

In the HFD observation of the past, the electric wave transmitted by UEC HFD station (JG2XA) at Chofu campus is observed by two or more reception points. The ionosphere disturbance observation point can be increased by increasing the reception point. But a large labor is required to maintain many receiving stations. If the transmitter station is opened newly, it is possible not to increase the reception point and to increase the observation point. But it is very difficult because the frequency allocation and the license are needed. Then, we thought about the use of The Radio NIKKEI of the shortwave broadcasting for HFD observation. The transmitting station of The Radio NIKKEI is at Nagara town Chiba Prefecture and it is 65km in the straight line distance between JG2XA and the transmitting station of The Radio NIKKEI. Therefore, if radio NIKKEI can be used, the ionosphere disturbance observation point in the vicinity of Kanto can be spatially expanded only by adding the frequency of The Radio NIKKEI to a past reception point. Moreover, the frequency of The Radio NIKKEI and the frequency of JG2XA have the interval of about 1˜2MHz, so the expansion can be expected with the frequency. To use The Radio NIKKEI for the HFD observation, the frequency precision and the frequency stability level become problems. Doppler shift in the HFD observation is several Hz even if it is large. So the frequency of The Radio NIKKEI should be steadier more enough than that of it by a small value. It is unquestionable for the frequency offset if it corrects it if the frequency is steady. It is easy to correct the frequency offset if the frequency is steady. It is easy to correct the frequency offset if the frequency is steady. Moreover, The Radio NIKKEI is broadcasting the voice of the amplitude modulation, so it is necessary to confirm the possibility of the influence of the interference with the sideband.

Then, the reception experiment of the direct wave of The Radio NIKKEI was done at Chofu campus. As a result, the frequency variation was steady enough though there was a gap of about 1Hz in the maximum about the frequency precision according to the frequency with 0.025Hz/day or less. However, it will be necessary to observe it in the future because the secular fluctuation of the frequency stability level cannot be confirmed yet. Moreover, it has been understood to understand the signal carrier doesn't receive the interference with the sideband and to use it for the HFD observation. Next, when the reception experiment was conducted in Sugadaira Space Radio Observatory and compared it with the reception result of JG2XA and doppler shift similar to JG2XA was able to be observed. It was concluded that the HFD observation network was able to be enhanced by adding radio NIKKEI reception part from the above-mentioned result to past HFD Receiving stations.

It reports on the prospect of the example of analyzing the Es structure and the transport characterization to unify JG2XA and The Radio NIKKEI and the HFD observation network expansion in the future in the lecture.