

Calculating propagation time of HF radio wave using ray-tracing method and simple comparison with the observation.

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To provide the information of nowcast of radio propagation, we have started a project, HF-START (HF simulator Targeting for All user's Regional Telecommunications). In this project, a simulator that is able to predict propagation of HF radio waves is constructed by ray-tracing calculation. Using this simulator, we have examined whether HF radio wave travels between any two points. In this calculation, the electron density, which is necessary to calculate reflection index is determined by International Reference Ionosphere (IRI). In this project, HF receivers have been installed at Chiba University (Chiba, 35.62N, 140.10E), Sarobetu (Hokkaido, 45.16N, 141.74E), Numata (Gunma, 36.62N, 139.02E), Yamagawa (Kagoshima, 31.20N, 130.61), Ogimi (Okinawa, 26.68, 128.15E) for observing HF radio wave transmitted from radioNIKKEI (Nagara, Chiba, 35.46N, 140.20E) to confirm the results of the ray-tracing calculation. In the ray-tracing calculation, therefore, we set the same locations of the transmitter and receivers as the observatories of HF-START. As a result of simple comparison between the ray-tracing results and the observation, it is found that there was a difference of the propagation time between the ray-tracing results and the observations. It is possible that the radio wave propagation between radioNIKKEI and Ciba University is not ground wave but sky wave that is reflected by ionosphere. As for further calculation, we plan to use the electron density distributions determined by GAIA and GNSS tomography in the ray-tracing calculation.