

Three-dimensional observation of the ionosphere and the plasmasphere using beacon satellites

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Three dimensional distribution of electron in the ionosphere and the plasmasphere will be derived using the beacon receivers and the tomography method. GPS Earth Observation Network in Japan consists of about 1,000 GPS receivers and provides two-dimensional distribution of total electron content with high spatial resolution. Adding on this network, 150MHz-400MHz beacon receivers for low-earth orbit (LEO) satellites, such as Argos and Cosmic, will be established in Japan. The difference of the orbit of GPS satellites and LEO satellites provides information on the vertical profile of electron. The computer tomography method can derive the three-dimensional distribution of electron using these beacon satellite data. The occultation data by satellite-borne GPS receivers will be also included in this tomography. Several satellite-borne GPS receivers are planned to be launched in the coming several years. The increase of the observation opportunity enables the continuous observation of the three-dimensional distribution of electron. The observational network will be expanded in the west-pacific region in the collaboration with the other countries in this region to obtain the wide coverage from low-latitudes to high-latitudes. Optical instruments for airglow observation, coherent radars and ionosondes will be used to complete and calibrate the estimated electron distribution. This three dimensional data will be included in the data assimilation model to discuss on the physical mechanism of the day-to-day variation of the ionosphere. A network of the scintillation monitor will be established to evaluate and predict the influence of the ionosphere on the radio communication.