

## Recent activities and future plans of NICT ionospheric observations

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National Institute of Information and Communications Technology (NICT) has been observing ionosphere by ionosondes and GNSS receiver networks in Japan and in the Southeast Asia for monitoring ionospheric condition and researching ionospheric disturbances. Domestic ionosondes have been replaced with Vertical Incidence Pulsed Ionospheric Radar 2 (VIPIR2) ionosondes which can separate the O- and X-modes of ionospheric echoes which would improve the accuracy of automatic scaling of the ionogram. We have tried to detect arrival directions of ionospheric echo using the 8ch receiving antenna array of the VIPIR2. In addition to ionosonde observations, we are providing high-resolution two-dimensional maps of absolute TEC, detrended TEC, rate of TEC change index (ROTI), and loss-of-lock on GPS signal over Japan using the dense GNSS network, GEONET, on realtime basis. We have developed ionospheric storm monitoring system based on the realtime observation data and a new ionospheric storm scale, I-scale, which is defined using the long-term ionospheric data in Japan. We have tried to develop a routine monitoring system of two-dimensional structures of sporadic E-layer using TEC and ROTI maps. In Southeast Asia, we has developed the Southeast Asia low-latitude ionospheric network (SEALION) for the purpose of monitoring and researching severe ionospheric disturbances, such as plasma bubble. SEALION mainly consists of five FMCW ionosondes in four countries in Southeast Asia. We are now developing a new FMCW ionosonde system which is GNU Radio based software defined system. We have a future plan to install a VHF radar and multi-GNSS receivers at Chumphon, one of SEALION stations at the geomagnetic equator to study plasma bubbles and their effects on precise GNSS positioning. In this presentation, we will introduce recent activity and future plan of ionospheric observation in NICT.