

US-Japan cooperative solar wind observation using IPS and SMEI

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The interplanetary scintillation (IPS) method can observe the dynamics and structure of the solar wind in three dimensions with a relatively short time cadence using IPS radio sources distributed over the sky. Because of this advantage over in-situ measurements, we have been conducting multi-station 327 MHz IPS observations at the Solar-Terrestrial Environment Laboratory (STELab). The IPS measurement is a line-of-sight integration which is convolution of the solar wind structures, the distance of these from the Earth and other diffraction effects present along the line of sight. We have recently succeeded in developing a method to deconvolve the line-of-sight integration effects using a computer-assisted-tomography (CAT) technique to obtain solar wind speed and electron density fluctuations. The CAT analysis not only retrieves three-dimensional solar wind parameters, but also provides better spatial resolutions than previous analysis techniques.

The present IPS system at STELab observes several tens of IPS sources a day. To make solar wind observations with higher spatial and temporal resolution using the CAT method, we need more perspective views of the solar wind. Therefore, we are planning a new UHF antenna with a collecting area of 60m X 120m that will observe more than 100 IPS sources per day. The antenna is designed with a tolerance for radio noise interference and high aperture efficiency. Based on the successful development of the IPS CAT analysis, we are presently continuing a US-Japan cooperative project for space weather research between UCSD/CASS and STELab. This project with the new antenna will enhance IPS/US cooperation including future comparative analyses of data from the Solar Mass Ejection Imager (SMEI) and from STEREO.