Geophysical Research Abstracts
Vol. 12, EGU2010-499-3, 2010
EGU General Assembly 2010


# Interplanetary plasma scintillation parameters measurements retrieved from the spacecraft observations.

Guifré Molera Calvés (1), S.V. Pogrebenko (2), J. Wagner (1), G. Maccaferri (3), G. Colucci (4), G. Kronschnabl (5), F. Scilliro (6), G. Bianco (7), M. Pérez Ayúcar (8), C.B. Cosmovici (9), and the PRIDE Team

(1) Aalto - MRO, Metsähovi, FI, (2) JIVE, Dwingeloo, NL, (3) INAF-IRA, Medicina, IT, (4) E-GEOS, Matera, IT, (5) BKG, Wettzell, DE, (6) INAF-IRA, Noto, IT, (7) ASI, Matera, IT, (8) ESA-ESAC, Madrid, ES, (9) INAF-IFSI, Rome, IT, (10) OAN-IGN, Yebes, ES

Measurement of the Interplanetary Scintillations (IPS) of radio signals propagating through the plasma in the Solar System by the radio astronomical instruments is a powerful tool to characterise and study the spatial and temporal variation of the electron density in the Solar wind. Several techniques based on the observation of natural and artificial radio sources have been developed during the last 50 years. Here we report our results of the IPS parameters measurement based on the multi-station observations of the planetary mission spacecraft. The ESA Venus Express spacecraft was observed at X-band (8.4 GHz) by several European VLBI stations - Metsähovi Radio Observatory (Aalto University , FI), Medicina (INAF-RA, IT), Matera (ASI, IT), Wettzell (BKG, DE), Noto (INAF-IRA, IT) and Yebes (OAN-IGN, ES) during a 2008-2010 campaign in a framework of the PRIDE (Planetary Radio Interferometry and Doppler Experiments) project as a preparatory stage for the European Radio Astronomy VLBI facilities participation in the planned ESA planetary missions (EJSM, TESM, EVE and others). Observational data were processed at Metsähovi Radio Observatory with the on-purpose developed high performance, ultra-high spectral resolution and spacecraft tracking capable software spectrometer-correlator and analysed at the Joint Institute for VLBI in Europe (JIVE, NL). High quality of acquired and analysed data enables us to study and define several parameters of the S/C signal and accompanying “ranging” tones with milli-Hz accuracy, among which the phase fluctuations of the spacecraft signal carrier line can be used to characterise the interplanetary plasma density fluctuations along the signal propagation line at different spatial and temporal scales at different Solar elongations and which exhibits a near-Kolmogorov spectrum. Such essential parameters as the phase scintillation index and bandwidth of scintillations and their dependence on the solar elongation, distance to the target, positions of the source in the Solar system and Solar activity index were retrieved from our measurements and are reported. This study is focused on the technique of the measurements and data analysis, leaving the physical interpretation of the measurement results to the upcoming studies when more observational data is collected. Our measurements of the phase scintillations from the sources within the Solar system are complementary to the classical measurements of the power level scintillations of signals from the natural radio sources. The results presented in this paper are promising and observations will continue during 2010.