Plasma Diagnostics via Radio Weather Phenomena: Relevance and Criticalities

M. Messerotti[1,2]
(1) INAF-Astronomical Observatory of Trieste, Italy
(2) Dept. of Physics, University of Trieste, Italy

Radio weather represents the physical and phenomenological state of plasma environments in the radio band. Radio emissions in the solar-planetary environments are originated by a series of plasma processes whose nature is related to the physical state of plasmas at the source, like e.g. density, spatial topology and magnetisation, and to their variations along the radiation propagation path when interacting with background plasmas.

Hence, radio phenomena carry key information on the underpinning physics and can be used as plasma probes by reverse modelling that provide fundamental tiles for: a. interpretation of the experimental scenario; b. identification of precursor conditions; c. Space Weather forecast. The ingredients for successfully carrying out this workflow are, respectively, the availability of: a. adequate dedicated space- and ground-based radio instrumentation for in situ and remote observations; b. robust self-consistent radio emission models; c. validated operational forecasting models.

A review of the actual and expected capacities in the radio field emphasises the inadequacy of the experimental, theoretical and forecasting means for a full exploitation of the radio-weather-based diagnostics. In consideration of the relevancy to various applications in the Space Weather framework, these limitations represent a serious issue that deserve the due attention by the stakeholders and decision makers.