

## Preface: Radio Heliophysics: Science and Forecasting

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### 1. Introduction

Heliophysics is considered to be the all-encompassing sub-field of astrophysics that includes subjects from the Sun's core to planetary cores, and indeed, to the edge of the heliosphere where the Sun's influence in the Galaxy ends and that of the interstellar medium (IsM) takes over. There are many different physical domains within heliophysics, where the physical specifications and boundary conditions vary considerably, and thus it is a wide area of

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current scientific research. Radio heliophysics is the part of heliophysics where radio observations, measurements, emission, and detections play a role in our overall understanding of the heliophysical system.

Contributions for this Topical Issue (TI) of *Solar Physics* include articles from many aspects of radio heliophysics where radio (observations, measurements, data, results, modeling, *etc.*) forms the basis of each article or is a strong complementary data set to other heliophysics observations, measurements, or modelling. The aim of this TI is to highlight the wide uses, scope, and, indeed, capabilities and power of radio observations in scientific and space-weather forecasting investigations of our solar system and the Sun's influence from its core to the heliosphere–IsM boundary and especially upon the Earth's environment. Observations and modelling of the heliosphere through or by incorporating radio methods and radio data are of a critical importance to improving our understanding of the physics behind the various components of the heliophysical system and how each of these components ties into the next; these are discussed and highlighted in the various articles. Radio observations are also essential to advance our understanding of space weather both in the vicinity of Earth and at other solar-system bodies (*e.g.* the Sun–Earth connection in its many facets from the solar dynamo to ground-level events at Earth's surface).

## 2. Workshop

This TI was stimulated by the interplanetary scintillation (IPS) workshop that took place at Nagoya University (following the CAWSES-II meeting) hosted by the Solar–Terrestrial Environment Laboratory (STEL), Japan, in November 2013, and much of this TI is from work and ideas discussed at and following the workshop.

The workshop SOC was comprised of three of the authors of this TI Preface: Munetoshi Tokumaru, who also served as the LOC, Mario M. Bisi, and Bernard V. Jackson. That workshop was the seventh in a series of IPS, Radio-Heliophysics, and Remote-Sensing workshops held between 2004 and 2013. Financial support for the workshop was provided from the JSPS Grand-in-Aid for Scientific Research-A 25247079 (M. Tokumaru) and the Korean Space Weather fund to USCD (B.V. Jackson). Twenty-three researchers participated in the workshop and discussed analytical methods and the standardization of IPS data as well as the results of their studies and their future plans; further details of this workshop series have been given by Bisi *et al.* (2013); see also [stsw1.stelab.nagoya-u.ac.jp/ips\\_nagoya.html](http://stsw1.stelab.nagoya-u.ac.jp/ips_nagoya.html)). One major outcome of this workshop was the initial definition of a standardized IPS data set, which is due to be officially released as the IPS Common Data Format v1.0 (IPSCDFv1.0) in 2015. This will provide non-IPS specialists with a better way to ascertain, access, and use some basic IPS results and data products.

## 3. Summary

The next workshop, the eighth in the series overall, is entitled “Third Remote Sensing of the Inner Heliosphere and Space Weather Applications Workshop”, taking place in Morelia, Mexico, 20–24 November 2015. The core organizers are three of the authors of this TI Preface, J. Americo Gonzalez-Esparza, Mario M. Bisi, and Bernard V. Jackson, as well as David F. Webb from Boston College, MA, USA. Following this workshop, IPSCDFv1.0 is expected to be released.

Finally, we thank the many authors for the influx of extra papers from those not able to attend the IPS Workshop in 2013 as well as the articles from those in attendance. We also convey our special thanks to the team of referees, who worked diligently in making sure the articles contained within this TI of *Solar Physics* on “Radio Heliophysics: Science and Forecasting” are of the highest scientific quality and content. We are pleased with the articles in this TI and are very happy that they collectively cover many aspects of radio heliophysics techniques, observations, modelling, data analyses, and comparisons with other forms of data and modelling from near the Sun’s “surface” out to beyond the Earth, including the influence on the Earth’s space environment.

#### 4. Articles

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We would also like to thank STELab at Nagoya University for providing the rooms and internet access for the Workshop as well as for travel funding for several of the participants. We acknowledge UCSD funding received from the Korean Space Weather Center (KSWC) that provided lunches, coffee breaks, travel, and subsistence during the workshop, and for discussions following for some participants. In addition, we thank SCOSTEP CAWSES II for funding several workshop participants to the CAWSES-II meeting, which enabled them to subsequently stay on for the IPS Workshop.

**Disclosure of Potential Conflicts of Interest** The authors declare that they have no conflicts of interest.

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