

Preface

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Magnetic fields are the dominant energy source for heating the Sun’s corona and for producing energetic solar activity such as flares and coronal mass ejections. Solar magnetic fields are also the dominant factor in structuring the coronal plasma and in shaping the heliosphere that encompasses the Earth and the other planets. Over the past three decades, remote-sensing observations of the vector magnetic field in the solar photosphere have become routine. Direct diagnostics of coronal magnetic fields, however, are still in their infancy and remain technically challenging. Nevertheless, driven by advances in instrumentation and by society’s need to understand and predict coronal processes, it is anticipated that rapid growth in coronal magnetic-field diagnostics will be made in the next decade.

This *Topical Issue of Solar Physics* is devoted to the nascent field of coronal magnetometry. Most contributed articles were first presented at the “Workshop on Coronal Magnetism –

Coronal Magnetometry

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Connecting Models to Data and the Corona to the Earth”, which was held 21–23 May 2012 in Boulder, Colorado, USA (www.hao.ucar.edu/CoronalMagnetismWorkshop/). The purpose of the workshop was to foster the development of tools to interpret current and future measurements of coronal magnetic fields. The *Coronal Multi-channel Polarimeter* (Tomczyk *et al.*, 2001) instrument is now obtaining routine observations of coronal polarization, and improved measurements are on the horizon in the visible to IR spectral regions with the construction of the *Advanced Technology Solar Telescope* (Keil *et al.*, 2003). At radio wavelengths the upgrade of the *Owens Valley Solar Array* (Gary and Hurford, 1994) and the construction of the *Chinese Spectral Radioheliograph* (Yan *et al.*, 2009) will open access to a variety of powerful diagnostics that are complementary to those at IR wavelengths. In addition, the *Frequency Agile Solar Radiotelescope* (Bastian, 2003) and the *Coronal Solar Magnetism Observatory* (www.cosmo.ucar.edu/) were recently recommended by the US National Research Council Solar and Space Physics Decadal Survey (Baker and Zurbuchen, 2013) which promise comprehensive and routine measurements of coronal magnetic fields and plasma.

Following the scientific organization of the workshop, this *Topical Issue* covers the following subjects:

- i) Techniques for measuring coronal magnetism from UV to radio wavelengths.
- ii) Instruments and facilities to observe coronal magnetism.
- iii) Forward and inverse modeling of the observed signatures of coronal magnetism.
- iv) Extrapolations of photospheric magnetic fields into the corona.
- v) The role of coronal magnetism in solar activity, space weather, and space climate.

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