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Preface

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The Community of European Solar Radio Astronomers (CESRA) organizes triennial workshops on investigations of the solar atmosphere using observations at radio and other wavelengths. Although special emphasis is given to radio diagnostics, the workshop topics are of interest to a large community of solar physicists. The 2010 workshop, "Energy Storage and Release through the Solar Activity Cycle – Models Meet Radio Observations", addressed

Energy Storage and Release through the Solar Activity Cycle – Models Meet Radio Observations
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explosive energy conversion, large-scale instabilities, and nonthermal processes in the active and quiet solar atmosphere. Many of the articles included in this Topical Issue were presented in the CESRA 2010 workshop, but the issue was also made open for general submission on the core topics.

The recent long declining phase of Solar Cycle 23 gave us the opportunity to study the solar atmosphere at different levels of activity and its impact on the heliosphere. Radio diagnostics contributes important information, notably because it covers the whole range from the low atmosphere to 1 AU and because of its sensitivity to nonthermal electron populations. Radio observations of the quiet Sun have confirmed that the "quiet" emission may not be that quiet after all – it can be intense and show considerable time variation. Studying the quiet Sun at radio wavelengths has the advantages that it can be done from the ground and that the physics of the processes involved can be understood without the need to worry about some well-known burdens (*e.g.* non-LTE effects, excitation and ionization equilibria, abundances) that one needs to face at other spectral ranges.

At microwaves, the emission from non-flaring active regions comes from gyro-resonance radiation above sunspots and free–free radiation from hot plasma trapped in active region loops. The gyro-resonance emission mechanism is unique to radio data and is a useful tool to measure the magnetic field above sunspots. Radio observations are valuable in providing information on temporal variations of the emission from active regions. Pulsations of the radio emission show a large variety of temporal and spatial signatures, periods, bandwidths, and amplitudes. Study of these phenomena is a powerful tool for coronal plasma and magnetic field diagnostics.

Radio observations of flares and coronal mass ejections (CMEs) help us address questions about energy release and its properties, the configuration of the flare-CME source regions, particle acceleration and transport, and the origin of solar energetic particles. Furthermore, both flares and CMEs can ignite shock waves, and radio observations offer the most robust tool to study them. All the above aspects of radio emission, both from the flaring and non-flaring solar atmosphere, are reflected in the present Topical Issue, which includes one invited review paper.

The CESRA 2010 workshop was held in La Roche-en-Ardenne (Belgium). The members of the Scientific Organizing Committee were H. Aurass (Germany), K.-L. Klein (France), A. MacKinnon (UK), C. Marqué (Belgium; co-chair), V. Melnikov (Russia), A. Nindos (Greece; co-chair), S. Pohjolainen (Finland), and S. Poedts (Belgium) as president of the Solar Physics Section within the Joint Astrophysics Division of the European Physical Society and the European Astronomical Society.

The members of the Local Organizing Committee were O. Boulvin, E. D'Huys, C. Marqué, (co-chair), A. Vandersyppe (co-chair) and P. Vanlommel, with the support of the personnel of the Royal Observatory of Belgium and its director, R. Van der Linden.

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