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**Richard H. Picard
Klaus Schäfer
Adolfo Comeron**
Editors

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Introduction

The Fifteenth Conference on Remote Sensing of Clouds and the Atmosphere was held in Toulouse, France, as part of SPIE Europe Remote Sensing 2010. The conference included 43 papers divided into nine oral sessions, a poster session, and a special joint session. The areas covered in the regular sessions were cloud remote sensing; lidar, radar, and passive atmospheric measurement techniques; profiling of aerosols, trace gases, and meteorological parameters; spectrometric methods, including FTIR and DOAS; middle/upper-atmosphere remote sensing; and radiative transfer. The special session on atmospheric measurements during the 2010 eruption of the Eyjafjallajökull volcano in Iceland was a joint session with Conference 7832, Lidar Technologies, Techniques, and Measurements for Atmospheric Remote Sensing.

The papers presented included a broad range of methodologies from basic theoretical principles of atmospheric phenomena and remote-sensing techniques to end-user applications of remote-sensing products.

Remote sensing from space and ground, as well as critical enabling technologies and disciplines, were all addressed. Space-based remote sensing has been traditionally applied to producing global data products and investigating relatively large-scale phenomena, and current and planned satellite instruments are indeed continuing to yield useful knowledge in this area. However, there is increasing activity in applying satellite-based sensors to more local measurements, including monitoring of the sources and dispersal of air pollutants. Ground-based instruments, on the other hand, are inherently adapted to investigating small-scale and local phenomena. Nevertheless, by forming networks of ground-based instruments – and now even global-scale networks of such networks – coordinated data over extended regions and over the whole globe will be obtained. Thus the gaps between the small and large scale and between local and global phenomena are being bridged by the evolution of both ground-based and space-based sensors as well as improved methods of analysis. The coordination of measurements among ground-based sensor networks and between ground-based and space-based sensors depends on accurate cross-calibration methods. In addition, accompanied by powerful analysis and computational techniques, such coordinated measurements permit the cross-validation of the resulting data sets, yielding data sets of superior quality.

Progress in atmospheric remote sensing is also manifesting itself in a number of other ways. Accurate and efficient radiative transfer is an essential technique in nearly all atmospheric remote sensing, and radiative transfer methods are enabling the treatment of ever more complex geometries and boundary conditions. The remote sensing of clouds and remote sensing of the atmosphere and the earth surface in the presence of clouds are among the chief

beneficiaries of such advances. Passive measurement techniques are developing increased spatial and spectral resolution, as well as enhanced specificity in detecting particular atmospheric gases and aerosols, thus providing more effective complements to active lidar/radar techniques. Atmospheric remote sensing at higher altitudes in the stratosphere and middle atmosphere – and even the thermosphere/ionosphere – is also becoming more effective by incorporating perturbations due to gravity waves, tides, and geomagnetic storms.

In the future we expect to see continued evolution of space-based and ground-based sensor concepts and implementations, as well as improved methods of analysis and new applications. We also expect a continuation of current trends to smaller-scale measurements from space, to more extensive and even global webs of ground-based instruments, to retrievals depending on fewer and less idealised approximations, and to more pervasive sensing from a broader range of platforms, including unmanned aerial vehicles and micro/nano/pico-satellites.

These proceedings contain the reviewed and revised papers corresponding to the regular oral and poster conference presentations. Papers from the special joint session on the Iceland volcanic aerosols were given lidar-conference (7832) paper numbers, but are included in the proceedings of both of the sponsoring conferences.

We would like to thank the authors for the very high quality of their papers and thank the SPIE staff for their invaluable work in the organization of the conference and the editing of these proceedings. We also thank Aldo Amodeo, Evgueni Kassianov, Christopher J. Mertens, Nicolaos Sifakis, and Konradin Weber – all members of the conference Programme Committee – for assistance in reviewing these papers, including the papers from the joint session.

**Richard H. Picard
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