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***Satellite Data Compression,
Communications, and Archiving III***

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Editors

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Introduction

The papers in this volume are the manuscripts behind presentations made at the SPIE's annual meeting, SPIE Optics + Photonics 2007, held 26–30 August 2007 in San Diego, California, USA. These papers and their presentations constitute SPIE Conference 6683 on Satellite Data Compression, Communications, and Archiving III, held on the last two days of the symposium, 29–30 August 2007. The conference brought together researchers, engineers, and administrators involved in observation and analysis of the Earth from satellites. Participants included members of the civilian Earth and space community from around the globe. Presentations and papers were submitted from participants from Argentina, Canada, China, France, India, Spain, Taiwan, and United States of America.

This was the third year of this conference. The three components of the conference were all connected: compression, satellite communications engineering and distribution, and issues such as archiving and data management. A central theme across all these components was the problem of data handling of large data rates generated from the atmospheric sensors located on-board satellites necessary to monitor the Earth and its environment. As a result of the tremendous advancements in the quality and resolution quantity in each of these sensors, the rate of data they produce has increased dramatically. Further, satellites platforms host a number of these advanced sensors which must share a limited down-link bandwidth. For instance data rates for an increment can sometimes exceed 60Mbps.

One essential tool to manage data volume, which must share the limited radio frequency bandwidth as it is transmitted from the satellite, is data compression. Data compression also has an important role in distribution and in archiving. Because the requirements on the data end use vary, and characteristics of the data vary, a wide range of different data compression schemes must be considered. For instance lossless, near-lossless and lossy schemes are being considered where appropriate for use within the system. For some applications, such as transmission over a noisy channel, error correction is essential, for other applications the algorithms throughput or compression rate are more important. This has driven an effort to evaluate and develop open algorithms and implementations that can be shared globally. We have also seen Shannon's information theory used to create benchmarks to evaluate the algorithms against optimal performance in a principled way.

A lesson that can be drawn from the diverse presentations at this conference is that the heterogeneous nature of satellite sensor data characteristics (statistics) and the variety of end uses (requirements) has led to the realization that available generic compression algorithms are insufficient. Generic transforms such as wavelets may work well on some types of data (such as visible images) or

in some modes (such as lossy). The methods however, often break down when applied to data they were not designed to handle such as hyper and ultra-spectral data, or modes they were not optimized for such as lossless mode. By collecting the wide range of novel and creative approaches to satellite data compression, this volume and the associated conference, is aimed at advocating a broad and global dialog that allows us to find or develop the best tools for this new challenge.

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