ISSI Scientific Report Series

Volume 15
The ISSI Scientific Report Series present the results of Working Groups (or Teams) that set out to assemble an expert overview of the latest research methods and observation techniques in a variety of fields in space science and astronomy. The Working Groups are organized by the International Space Science Institute (ISSI) in Bern, Switzerland. ISSI’s main task is to contribute to the achievement of a deeper understanding of the results from space-research missions, adding value to those results through multi-disciplinary research in an atmosphere of international cooperation.

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Foreword

The world of Earth Observation (EO) is rapidly changing as a result of exponential advances in sensor and digital technologies. The speed of change has no historical precedent. Recent decades have witnessed extraordinary developments in ICT, including the Internet, cloud computing and storage, which have all led to radically new ways to collect, distribute and analyse data about our planet.

This digital revolution is also accompanied by a sensing revolution that provides an unprecedented amount of data on the state of our planet and its changes.

Europe leads this sensing revolution in space through the Copernicus initiative and the corresponding development of a family of Sentinel missions. This has enabled the global monitoring of our planet across the whole electromagnetic spectrum on an operational and sustained basis.

In addition, a new trend, referred to as “New Space” in the USA or “Space 4.0” in Europe, is now rapidly emerging through the increasing commoditization and commercialization of space. In particular, with the rapidly dropping costs of small sat building, launching and processing, new EO actors including startups and ICT giants are now entering the space business in masses, forming new constellations of standardized small sats that deliver a new class of data on our planet with higher spatial resolution and increased temporal frequency.

These new global data sets from space lead to a far more comprehensive picture of our planet. This picture is now even more refined via data from billions of smart and inter-connected sensors referred to as the Internet of Things (IoT).

Such streams of dynamic data on our planet offer new possibilities for scientists to advance our understanding of how the ocean, atmosphere, land and cryosphere operate and interact as part on an integrated Earth System. It also represents new opportunities for entrepreneurs to turn big data into new types of information services. However, these opportunities come with new challenges for scientists, businesses, data and software providers who must make sense of the vast and diverse amount of data by capitalizing on new technologies such as big data analytics.
This book invites you to explore various elements of the big data revolution, addressing the development of Space 4.0, the new generation of data-driven research infrastructure (including the emergence of data cubes), new applications integrating IoT and EO, new business models in the emerging geo-sharing economy, new ways to support e-learning and digital education, new application of technologies such as cloud computing, artificial intelligence (AI), and deep learning, and the increasing role of new actors such as innovative startups, ICT corporates, data scientists and citizen scientists. By doing so, it aims to stimulate new ideas about how to make the most of EO and derived information in a rapidly changing environment.

Wishing you an inspiring journey in the exciting field of EO Open Science and Innovation.

Josef Aschbacher
Director of Earth Observation Programmes
European Space Agency (ESA)
Frascati, Italy
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