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Boosting Scientific Exploitation of Sentinel Data: The Earth Observation Data Centre for Water Resources Monitoring

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The scientific exploitation of earth observation (EO) data is becoming increasingly challenging for many reasons. The first reason is the sheer magnitude of the data generated by the latest generation of EO sensors. While in the past scientific users were confronted with data volumes in the order of tens to hundreds of Gigabytes, nowadays data volumes of several Terabyte have to be handled. Very soon, tens to hundreds of Terabyte up to Petabytes will become the norm for continental- to global scale applications. The second reason is data complexity. Modern EO sensor technology is pushed towards the physical limits, making it necessary to understand each part of the measurement process and any unwanted interferences with significant detail. Last but not least, today's higher scientific standards will exert pressure on the EO community to engage in more extensive computations: While in the past it has often been sufficient to perform a scientific experiment with one single algorithm on a limited test data set, nowadays this is not an attractive scenario anymore. Today it is expected that algorithms are not only being tested with data sets of significant size but also that algorithms are compared with competing algorithms. In some applications, like e.g. in climate change assessments, it is even required that any subtle trends depicted by the data are carefully checked by using an ensemble of EO data retrieval algorithms.

The scientific community has already started to respond to these increasingly demanding requirements. Firstly, one can find a growing number of EO research teams that are capable of processing Terabyte large data sets with multiple algorithms in-house. To arrive at this point these research teams have invested significantly in their computing capabilities and focused their work on selected sensor technologies and/or application domains. Secondly, spurred by international funding programmes such as the one of the European Commission, one can observe an increasing trend towards more specialisation and cooperation. Also this strategy has already led to remarkable advances in the provision of high-quality scientific EO data sets. Nonetheless, many of these collaborative developments stand on shaky grounds given that the scientific and technical know-how and the data processing capabilities remain largely fragmented. This is because the cooperation between different EO teams is typically project-based and can end abruptly after the end of a project. In other words, few EO teams cooperate on a more strategic level that involves e.g. the sharing of software code or the joint use of common IT resources.

In recognition of the problems discussed above, and with a view on the high potential of the upcoming Sentinel satellites for monitoring of global water resources (Wagner et al. 2011, Hornáček et al. 2012), we are proposing the foundation of an Earth Observation Data Centre for Water Resources Monitoring (EODC-Water). The EODC-Water will be a collaborative undertaking of research organisations, public agencies and private industry with the goal to foster the use of EO data for monitoring of global water resources. It will do so by proving a collaborative computer cloud that connects several data centres throughout Europe, thereby enabling the archiving, distributing, and processing of large EO data sets. The basic idea is to move the processing to the data instead of moving the data to where the software is. This sounds simple, but its realisation will overhaul the way of how EO data processing and distribution are organised. Another important element of EODC-Water will be its partner organisations which have agreed to participate in a collaborative software development process for establishing end-to-end EO data processing chains.

EODC-Water will boost the scientific exploitation of EO data by allowing its scientific users to focus their efforts on scientific problems rather than having to deal with standard processing tasks such as data management, geometric- and radiometric correction, etc. Additionally, it will enable the testing of scientific algorithms on large EO data sets, performing inter-comparisons with state-of-the-art algorithms, and the validation with more

extensive reference data sets. EODC-Water will thus enable scientists to generate innovative research more quickly as compared to a situation where scientists have to rely just on their in-house capabilities.

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