THE USE OF THE SENTINEL MISSIONS FOR SCIENCE

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ESA is currently implementing, in coordination with the European Union, a set of operational Earth observations missions. The five Sentinel families under development will feature radar, super-spectral imaging and ocean and atmospheric monitoring capacities. They are primarly designed to provide routine observations for operational GMES services. However, the manifold instrumentations with different spectral and spatial resolutions, the global coverage with high revisit times, and the long-term operational commitments of the Sentinel missions are also very relevant for studying and monitoring of Earth system processes with time-scales up to several years.

Understanding and modeling the dynamic behaviour of the Earth System with all its' components and their interaction is the 'grand challenge' for the geoscience community. It is motivated by our limited knowledge about the consequences on the different Earth System components introduced by human activities, such as fossil-fuel combustion, and the fragmentation of terrestrial vegetation cover and the related loss of biodiversity. The development of such an Earth System model requires the involvement of all relevant science disciplines whereas Earth observation, as the tool which allows a synoptic view on the globe with spatially and temporally relevant observations, plays an important role.

ESA is supporting this scientific undertaking with dedicated Earth Explorer missions, each tailored to specific scientific questions. In addition, the series of Sentinel missions, though not tailored towards the scientific challences, are very relevant for addressing the grand challences of the Earth science disciplines. This is based on data continuity of data already widely used within the science communities including the long-term operational commitment, essential for the parameterisation of long-trend forecasting. Furthermore, the high temporal frequencies, well-matched for capturing rapid changes, are supporting model validations, their subsequent improvements and moreover fostering an integrated data analysis based on sophisticated assimilation schemes. Longterm climate forecasting undoubtly will benefit from this development. In addition, the Sentinels offer an increased spectral coverage which supports data harmonisation, a pre-requisit for establishing fundamental climate data records, and additional science products with manifold potential applications supporting knowledge transfer into the GMES service domain. Another asset is the timeliness of the data. All Sentinel constellations will be operational simulaneously from mid 2015 onwards and it is expected that most Earth Explorers will operate contemplementory offering a range of synergies starting from the provision of auxiliary information to substantial inputs for addressing scientific challences. The timeliness furthermore fosters and calls for integrated data exploitation strategies which are considered of paramount importance for the development of a holistic Earth system model. The integrated data analysis shall be further stimulated by dedicated theme orientated exploitation announcement of opportunities, tailored to specific aspects of the Earth system modeling, and coordinated with international science communities.

The paper is intended to outline ESA's plans to prepare the science exploitation of the Sentinel missions.