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The European Space Agency Climate Change Initiative – Prospects for new vegetation observations from Space

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Climate change is arguably the greatest challenge facing mankind in the twenty-first century. Observations from space provide unique information which greatly assists the successful understanding of climate change. It is increasingly clear that these observations are critical, but as yet there is not a co-ordinated sustained programme which will ensure they are available to all. In addition, the nature of the problem requires that such data are adequately preserved over long periods of time, ensuring a reliable long term record. Over the course of the last few years a robust and formalised dialogue between the bodies with responsibility for the specification of climate observations and space agencies has led to a coherent set of requirements, agreed globally.

A key commitment in the UNFCCC is related to systematic observation and development of data archives related to the climate system. The Global Climate Observing System (GCOS) has become the recognised mechanism for facilitating this commitment. Through GCOS and CEOS the needs in terms of space data products have been internationally well defined and scientifically agreed. The missing part is how to provide a consistent set of GCOS Essential Climate Variables.

To respond to this need the European Space Agency (ESA) has initiated a new programme, Global Monitoring of Essential Climate Variables, (known for convenience as the ESA Climate Change Initiative) to provide an adequate, comprehensive, and timely response to the extremely challenging set of requirements for long-term satellite-based products for climate. A very important component in this process is to ensure international collaboration and thus achieve global consistency in ECV product generation.

The initiative will implement a programme of work which is based on the delivery of climate variables derived from satellite data sets (not just ESA but all sources via international collaboration) and includes all aspects of their availability including data acquisition, calibration and validation, long term algorithm maintenance, data curation, reprocessing as necessary, all within the context of an internationally agreed set of priorities.

The ESA programme will bring together European expertise covering the full range of scientific, technical and development specializations available within the European Earth Observation community, and will establish lasting and transparent access for global climate scientific and operational communities to its results.

This will move from the present static situation of ad-hoc or isolated fixed-term projects, to a long-term cyclical process of systematic updating, regeneration and reanalysis of the underlying fundamental data records, and the production of fully up to date, complete and consistent records of the relevant Essential Climate Variables. It is essential to recognise that no single data set from any single EO mission or space agency is sufficient to constitute, independently of other data sources, all data required for a complete ECV: Merging from different sensors and sources, is a critical step in the generation of a complete ECV. The products must also be designed to allow easy and intelligent access by the climate community for integration into their models. In turn these models will need to become much more data-driven as the critical need for political decisions in future will be shorter term scenario development, together with local now-casting capacity to allow nations to anticipate and address regional impacts of change.

Integration will be sought at several levels to ensure the programme has full collaboration at international level and to provide mechanisms for critical feedback to ESA from the many communities with an interest in climate research. This includes building interfaces to the appropriate specialist modelling groups (e.g., vegetation, carbon cycle, water cycle modelling), establishing cross-talk between ECVs and ensuring coordination with GCOS, the International Climate Research Programmes, CEOS, GEO, partner Space Agencies and EC and national research programmes. The Terrabites network represents a key contributor in this context.

With respect to vegetation from space CCI activities will focus first on Land Cover and Fire Disturbance with potential future activity being targeted towards LAI and $\mathrm{f_{APAR}}$, Albedo, Biomass and Soil Moisture.