

STANDARDS AND HARMONIZATION OF TERRESTRIAL OBSERVATIONS

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WHY STANDARDS?

The GCOS Implementation Plan identified 13 terrestrial Essential Climate Variables (ECVs): Albedo; Biomass; Fire disturbance; Fraction of absorbed photosynthetically active radiation (FAPAR); Glaciers and ice caps; Groundwater; Lake levels; Land cover (including vegetation type); Leaf area index (LAI); Permafrost and seasonally-frozen ground; River discharge; Snow cover; and Water use.

These observations are currently measured by numerous organizations for a variety of purposes. However, in general, a variety of different measurement protocols are used, which results in a lack of homogeneity in the data (in space and time). This heterogeneity limits the use of the data for many terrestrial applications and constrains scientific capacity to monitor and assess changes in climate change.

UNFCCC REQUEST TO GTOS

To begin to address this important issue, the Subsidiary Body for Scientific and Technological Advice (SBSTA) of the UNFCCC in 2006 “called on the GTOS Secretariat to assess the status of the development of standards for each of the essential climate variables in the terrestrial domain”.

INVESTIGATIONAL APPROACH

The question of standards for the terrestrial ECVs encompasses a very broad spectrum of topics in terms of: (i) the environmental variables involved; (ii) the geographical coverage and diversity of these variables, leading to differing measurement approaches; (iii) the types of documents or formats relevant to the development of standards (standards, guides, protocols, guidelines); (iv) the areas in principle requiring standardization (initial measurements, data processing, analysis, final

product); (v) the need for *in situ* as well as satellite measurements; and (vi) the number of sources where information relevant to standardization may be generated or archived.

Taking into consideration the above, GTOS has undertaken a comprehensive search for standards, guidelines, methodologies and processing protocols for each terrestrial ECV. Considerable efforts were made to contact stakeholders (including UN agencies, national data centres and international observing networks) and to undertake database and Web searches. The resulting information and documentation has been compiled, and reports with a summary of the findings, conclusions and recommendations have been, or are being, developed for each ECV.

CURRENT FINDINGS AND RESULTS

From the initial investigations, few standards appear to exist and no internationally accepted standards that directly address the needs of the user community have been identified so far. At the same time, there are guides for measurement methods—



The lack of homogeneous observations hinders many terrestrial applications, limits the ability to detect and quantify changes, and hampers understanding of the impacts of climate change



FAO/J.Spaull/22684

which may describe several methods and discuss the utility of each—and measurement protocols that describe in detail how a specific terrestrial variable should be sampled and measured *in situ*. However, for many of the ECVs, the existing procedures exhibit considerable diversity in techniques and approaches.

For satellite-based measurements, the complexity arises from differences among satellite sensors, their suitability to provide exactly the measurements needed, and the often limited spatial coverage. Of particular concern is temporal coverage, which is often limited.

Due to the diversity in satellite data, the continuing technological evolution and the nature of satellite-based earth observations, it is generally not feasible (or desirable) to have one set of algorithms. However, what is important is to ensure the validation (for each generated product) and inter-comparisons (among similar products) of satellite-derived observations. This is being addressed by research teams, which as a matter of routine develop common protocols and undertake the validation of products (e.g. the CEOS Working Group on Calibration and Validation).

STAKEHOLDER REVIEW AND WEB FORUM

A large stakeholder community has been informed of the process being undertaken, and a Web site (see link below) has been created that allows stakeholders to review, comment and add additional information to the work so far undertaken. It is hoped that this will facilitate the peer review process required to complete the individual products.

NEXT STEPS

The GTOS Secretariat will continue to compile and finalize the reports based on the peer review process, and will report on the progress made and provide suggestions on how to move forward to SBSTA at its 27th Session, in December 2007, where issues regarding systematic observations will be discussed. It is hoped that SBSTA will provide guidance and support to further continue this initiative. Once the recommendations of SBSTA have been received, GTOS will create technical working groups for each ECV to develop and propose potential standards or guidelines. However, this will only be feasible once financial support has been secured.

RELATED LINKS:

GTOS ECV standards activities: www.fao.org/gtos/topc/ECV.html | TOPC: www.fao.org/gtos/topc.html
CEOS Working Group on Calibration and Validation: <http://lpvs.gsfc.nasa.gov>