

Summary Report of the Tenth session of the Terrestrial Observation Panel for Climate of the Global Climate Observing System and Global Terrestrial Observing System

FAO HQ, Rome, Italy, 15-16 November 2007

Final draft



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Acronyms

CEOS	Committee on Earth Observation Satellites
CNRS	Centre national de la recherche scientifique
CTDC	Centre for Terrestrial Carbon Dynamics
ECVs	Essential Climate Variables
ETN-R	European Terrestrial Network for River Discharge
GCOS	Global Climate Observing System
GCOS SC	Global Climate Observing System Steering Committee
GEO	Group on Earth Observations
GGMS	Global Groundwater Monitoring System
GOFC/GOLD	GTOS Panels on Global Observation of Forest and Land Cover
GRACE	Gravity Recovery and Climate Experiment
GRDC	Global Runoff Data Centre
GTNs	Global Terrestrial Networks
GTN-G	Global Terrestrial Network for Glaciers
GTN-GW	Global Monitoring of Groundwater Resources
GTN-H	Global Terrestrial Network for Hydrology
GTN-P	Global Terrestrial Network for Permafrost
GTN-R	Global Terrestrial Network for River Discharge
GTOS	Global Terrestrial Observing System
GTOS SC	Global Terrestrial Observing System Steering Committee
IES	Institute for Environment and Sustainability European Commission
IGBP	International Geosphere-Biosphere Programme
IGOS	Integrated Global Observing Strategy
IGRAC	International Groundwater Resources Assessment Centre
IP	Implementation Plan
IPPC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
JRC	Joint Research Centre
LCCS	Land Cover Classification System
NRC	Environment, Climate Change and Bioenergy Division
SBSTA	Subsidiary Body for Scientific and Technological Advice
TCO	Terrestrial Carbon Observations
TOPC	Terrestrial Observation Panel for Climate
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
WCRP	World Climate Research Programme

1. Meeting Report

The tenth session of the Terrestrial Observation Panel for Climate of the Global Climate Observing System (GCOS) and Global Terrestrial Observing System (GTOS) was held at the headquarters of the Food and Agriculture Organization of the United Nations (FAO), Rome, Italy, from 15 to 16 November 2007. The agenda and list of participants are given in appendix I and II. Apologies were received from Prof. Shaun Quegan and Dr Michel Verstraete.

1.1. Welcome and approval of agenda

John Latham and David Goodrich welcomed the new Panel members and thanked them for accepting to be part of the Terrestrial Observation Panel for Climate (TOPC). Considering the current GCOS and GTOS activities to support the United Nations Framework Convention on Climate Change (UNFCCC) the efforts of TOPC, especially in regards to the terrestrial ECVs, are essential.

After the agenda was approved the new TOPC members introduced themselves (see Appendix IV). It was noted that Dr Anatoli Brouchkov and Prof. Gen Inoue had not replied to the invitation to become a member of TOPC, it was therefore agreed that suitable alternative candidates need to be identified which meet the working requirements of the Panel. The Panel expertise had already been strengthened in the land surface modelling, hydrology and groundwater topics and continuity has been ensured by maintaining 3 previous members. However strengthening of the Panel expertise in the cryosphere (including ice sheets), fire and maybe hydrology (in regards to water scarcity issues) should be considered. A closer interaction with the end user community should also be undertaken. It was also confirmed that TOPC should have cross cutting representation with the other GTOS Panels (GOFC-GOLD and Terrestrial Carbon Observations – TCO).

Action 1: TOPC members to provide nominations of possible candidates (technical expertise, geographical coverage and issues such as gender should be considered). Note that the GCOS SC encouraged that the cryosphere component of the Panel be strengthened. Due by: February 2008

Note that TOPC members agreed that there was a need for an expert on ice sheets and snow cover to be part of the TOPC Panel. Suitable candidates identified were Koni Steffen and Richard Armstrong.

1.2. GCOS and GTOS background

GCOS (David Goodrich)

The mission of GCOS is to ensure that the data required to meet the needs of users of climate information are obtained and made available for:

- Climate system monitoring, climate change detection and attribution;

- Research, modelling and prediction of the climate system;
- Assessing impacts, vulnerability & adaptation;
- Application to sustainable economic development.

GCOS is achieving these goals through a number of activities which include strengthening existing networks and collaborating with entities such as the United Nations Framework Convention on Climate Change (UNFCCC), the Committee on Earth Observation Satellites (CEOS) and the Group on Earth Observations (GEO). The GCOS Panels contribute to the preparation of the GCOS Implementation Plan (IP), the adequacy reports and other documents such as the satellite supplement. GCOS Panel members have also contributed to the realization of the Learning from the Intergovernmental Panel on Climate Change (IPPC) 4th Assessment Report, national reporting guidelines on observing systems and other relevant inputs. For 2009, the Subsidiary Body for Scientific and Technological Advice (SBSTA), has requested a substantial report on the status of the climate observing system, which includes an assessment of lessons learned, and what are the new observational priorities. The report will also include national activities, data sets, methodologies and standards. The TOPC Panel would be involved in compiling the terrestrial component of the report.

David Goodrich provided a summary of the results of the GCOS Steering Committee (16-19 October 2007, Paris, France), including: the agreement of the World Climate Research Programme (WCRP) to co-sponsor TOPC (mechanism and funding to be defined); the GCOS Steering Committee (SC) endorsement on the recommendations on standards and observations, and the common position of FAO and the World Meteorological Organization (WMO) in developing a terrestrial framework which may include the participation of other entities [such as the International Organization for Standardization (ISO) and the United Nations Environment Programme (UNEP)]. The GCOS SC also encouraged the strengthening of the cryosphere component of TOPC both at the level of Panel membership and activities.

Panel members welcomed the involvement of WCRP as a co-sponsor of TOPC and looked forward to its active participation in panel activities.

GTOS (John Latham)

The main role of GTOS, since its establishment in 1996, has been to provide policy-makers, resource managers and researchers with access to the data they need to detect, quantify, locate, understand and warn of changes (especially reduction) in the capacity of terrestrial ecosystems to support sustainable development. Since its establishment, GTOS has been working to improve the quality, the coverage and accessibility of terrestrial ecosystem data. GTOS is developing activities that focus on five issues of global concern: 1. Change in land quality; 2. Availability of freshwater resources; 3. Loss of biodiversity; 4. Climate change, and 5. Pollution and toxicity (limited activity).

The new role of TOPC has to be clearly defined, for example its role in supporting the terrestrial networks, its contribution to assessments (e.g. ECVs and adequacy

reports) and how much of an implementation's role it should take on (if any) all need to be considered. GTOS has been working closely with the UNFCCC and will be reporting at the conference in Bali (December 2007) the work undertaken on the assessment of standards for the terrestrial ECVs and potential framework mechanisms. One of the roles of TOPC is to assist GTOS in the assessment of standards but TOPC will also have the support of the other GTOS Panels on Global Observation of Forest and Land Cover (GOFC-GOLD) and Terrestrial Carbon Observations (TCO). The GTOS Supplement on the terrestrial ECVs was prepared for the UNFCCC meeting to raise awareness of policy maker and other stakeholder communities. See: www.fao.org/gtos/doc/pub52.pdf

Due to the changes in finances, GTOS will be undergoing restructuring to meet new requirements but will continue to fulfill its mission towards its stakeholder and the end user community. FAO has strengthened its mandate in regards to climate change and food security. GTOS is now hosted in the new Environment, Climate Change and Bioenergy Division (NRC).

1.3. Review of the Terms of Reference of TOPC

Discussions were held on the revision of the terms of reference of the TOPC Panel, final proposed draft can be found in appendix IV.

It was also suggested that the responsibility of coordination for each ECV should be allocated to TOPC members at the end of the meeting.

Action 2: TOPC Chair to propose coordination role for each ECV by February 2008.

Note it would be also useful to have a focal point (does not necessarily have to be a TOPC Panel member) to coordinate the assessment of standards for each ECV.

1.4. Status of Global Terrestrial Networks (GTNs)

GTN-R and GRDC (Ulrich Looser): Major concerns highlighted for the Global Terrestrial Network for River Discharge (GTN-R) was the decline in the number of stations and the lack of data access from the sites. Only 185 sites had confirmed participation in the network and of these not all of them are providing data (which is difficult to obtain due to its sensitivity). GTN-R will try to address these issues undertaking the following activities:

- Approach participating countries to inform on status and request additional metadata, time series data and access to near real-time data.
- Re-approach non-participating countries to reconsider their position and to participate in the GTN-R project.
- Finalize river discharge station selection together with participating countries.
- Finalize metadata profile for collection of metadata by June 2008.

- Adopt real-time data collection software currently developed within the European Terrestrial Network for River Discharge (ETN-R) project for utilization of GTN-R data collection by December 2008.
- Investigate linkages to the HARON initiative.

An inadequate and deteriorating system for collecting and managing water resources related information is also reported by the Global Runoff Data Centre (GRDC). There is little or no quality assurance and control standards applied to *in situ data* and there is insufficient basic capacity to access, interpret and apply water cycle information available from satellite systems. National agencies seem under the perception that monitoring does not need to be continued once a reasonable time series has been collected (i.e. they are not considering that change in runoff values may occur in the future).

There is an urgent need to reverse this negative trend and it was suggested that an advisory group of experts on climate and hydrological be established which can identify the key stations and sites (pristine areas and basins) where climate change observations are required (e.g. for the refinement of models). Countries can then be contacted requesting the maintenance of these specific sites to ensure long term monitoring and that the data generated be made accessible. The meeting of the Commission on Hydrology in 2008 could also be a suitable arena to raise the issues and concerns of the declining hydrology networks.

Action 3: Ulrich Looser, Jay Famiglietti and Valery Vuglinsky to contact the WMO Hydrological Commission on the pristine areas and basins initiative and other related activities to assess the need to create an advisory group (as proposed by the GCOS SC). Due by March 2008.

GTN-GW (Jay Famiglietti): The Workshop on Global Monitoring of Groundwater Resources was held, 18-19 October, 2007, Utrecht, The Netherlands, and provided the platform to initiate the development of the global terrestrial network on ground water (GNT-GW). The main results included:

- International Groundwater Resources Assessment Centre (IGRAC) and its Global Groundwater Monitoring System (GGMS) will be the lead institution and repository for global groundwater observations.
- GGMS will archive monthly data using 1° global grids.
- Data will be provided on a by-county basis, and will be uploaded via a user-friendly web interface by local experts.
- Preliminary list of groundwater and hydrogeologic variables for inclusion in the GGMS are: groundwater level, groundwater abstraction, salinity and other indicators of water quality, storage coefficients, well head elevation, screen depth, and local aquifer characteristics including aquifer type, thickness and whether measurements are for confined/unconfined units.
- Workshop participants strongly recommended that GGMS also archive and distribute "raw" observations.

TOPC recognizes the importance of GTN-GW as the observations undertaken are important for a number of issues not just related to climate change. TOPC would therefore like to support the initiative and requests GTOS and GCOS endorsement.

The Gravity Recovery and Climate Experiment (GRACE) satellites should remain operational until 2012 but a replacement satellite sensor will only be available until 2015-2020. Currently this gap will only be filled with data from European satellites which will be at a lower resolution.

Action 4: Considering the importance of GRACE to the monitoring system the potential gap in data should be highlighted to CEOS. Action Jay Famiglietti and Han Dolman. Due by March 2008.

Hydrolare (GT-H - Valery Vuglinsky): Lake and reservoir data is of interest to the science community (e.g. indicator of climate change) and private companies (e.g. hydropower generation). 150 lakes (which account 95% of the total volume) have already been identified as sites to monitor climate change. The main issue now is how to ensure access to the data. It suggested that GEO should be the mechanism to generate the political support that ensures data access from national institutions. There is a need to contact and inform all national and international stakeholders who generate and use the data. Satellites are useful for measuring area and height but calculating the volume needs to be undertaken *in situ*. Hydrolare will begin with Russian sites and the data received (from the beginning of 2008) should be freely available.

GTN-G and GTN-P (Wilfried Haeberli): Glaciers and permafrost remain key observations for monitoring regional and global changes in the climate system at high latitudes and altitudes. The loss of glaciers and the reduction in snow cover are expected to have a strong effects on the water cycle (increased frequency and severity of seasonal droughts) in regions of Asia, Europe and the Americas.

There is a lack of precipitation data, especially solid precipitation.

Changes in ice sheets seem to be occurring at a much faster rate than anticipated few years ago and simulated in numerical model simulations. As a consequence, "continental ice sheets" (Greenland and Antarctica) has become an important variable concerning medium-term global climate change and should therefore be considered as an ECV.

Action 5: Review the current cryosphere ECVs, recognizing the rapid change in ice sheets and its global impacts. Should be done through cross referencing with the IGOS Cryosphere theme reports. Action by Wilfried Haeberli, due by March 2008.

The International Polar Year will be a good opportunity to promote cryosphere activities and establish new networks. A key issue will be the maintenance of these activities and access to the data being generated by the numerous initiatives.

1.5. ECVs general discussion

A revision of the current ECVs needs to be undertaken to ensure continued relevance and take into account current technologies and observational capacities. The review process should be undertaken through the examination of current literature (especially the IGOS reports). Apart from the climate change aspects, the assessment should take into consideration the needs of a broad spectrum of end users, its observational importance and the feasibility of undertaking the measurement. Climate change feedback, mitigation and adaptation issues also need to be considered.

Review sheets should be prepared on why the ECV is needed, how it will be used, who will measure it. In addition a clear definition of each ECV needs to be established and how the description relates to the IGOS reports needs to be verified.

Ice sheets, soil moisture (surface soil wetness), evaporation (but difficult to measure) and fire emissions are observations which should be considered as new ECVs. Water use was indicated as being difficult to measure but important (especially for adaptation).

Action 6: The review of the terrestrial ECVs should be undertaken by the following TOPC members:

River discharge (T01), water use (T02), ground water (T03) and lake levels (T4) should be reviewed by Jay Famiglietti, Ulrich Looser and Valery Vuglinsky.

Snow cover (T05), glaciers and ice caps (T06) and permafrost (T07) should be reviewed by Wilfried Haeberli.

FAPAR (T10) and land surface albedo (T08) by Michel Verstraete.

Land cover (T09), Leaf Area Index (T11), Biomass (T12), Fire disturbance (T13) should be reviewed by Shaun Quegan and other new TOPC members to be appointed.

IGOS Carbon theme will be reviewed by Han Dolman and Michel Verstraete.

Review sheets prepared by Wilfried Haeberli and Shaun Quegan.

Jay Famiglietti, Jan Polcher and Han Dolman to review the suitability of moving the status of the soil moisture from emerging to full ECV.

The above process should also provide input into the 2009 GCOS review or adequacy report for UNFCCC SBSTA to be submitted in December 2009. The GCOS Secretariat will initiate the process to develop the framework of the report.

Progress on above activities to be reported at the TOPC teleconference in March, final outputs to be developed for the next TOPC meeting.

1.6. Work on standards

GTOS is undertaking the assessment of available standards and protocols for the 13 terrestrial ECVs and the development of a terrestrial framework for the preparation of guidance materials, standards and reporting guidelines for terrestrial observing systems for climate. GTOS reports the progress on these activities at UNFCCC SBSTA 27, Bali, December 2007. SBSTA will be requested to provide guidance on the preferred framework mechanism (3 options have been submitted). The Land Cover Classification System (LCCS and its land cover meta language - LCML) is undergoing the process of international standardization (under ISO) and is being adopted by numerous nations and international initiatives (including its adoption to develop a common legend for North America).

TOPC needs to lead the assessment of the standards and coordinate the technical working groups that develop the draft standards. In addition TOPC should develop the national reporting requirements of the UNFCCC. Not all the ECV need to go through the process it depends on the status of the observations and on the observational requirements of national and international stakeholders. The added benefit of this process will be raising the importance of these observations to countries.

GTOS Report 49: www.fao.org/gtos/doc/pub49.pdf

GTOS Report 48: www.fao.org/gtos/doc/pub48.pdf

1.7. Funding strategies

It was agreed that it was important that the relevance of terrestrial ECV observations to developing end user products should be make clear to the donor community. GTOS and GCOS should maybe consider developing a common message or funding strategy? End user community also needs to be clearly identified.

1.8. Next meeting schedule

The next TOPC meeting should be held in October 2008 (but on the 31) maybe at WMO or FAO headquarters. Discussions should be held with WCRP in regards their contribution to cover meeting costs.

A teleconference should be scheduled for the end of January or the beginning of February.

1.9. Other issues

Socio-economic data: There is a need to integrate the data when it comes to address mitigation and adaptation issues. TOPC needs to ascertain if its role is as a



data provider or if it should also take on a data integration role. Data gaps also need to be considered, for example socio-economic data such as water demand, is also essential for climate change issues.

Annex I :: Agenda

15-16 November 2007 :: FAO HQ, Rome Italy

1. Welcome and introductions
2. Review of Agenda
3. 5 to 10 min intro of each member
4. Role of TOPC in GCOS & GTOS (David Goodrich, John Latham)
5. Report from GCOS Steering Committee
6. Discussion Terms of Reference TOPC Panel
7. Status GTN's
 - 7.1. GTN-H
 - 7.1.1. Looser/Grabs
 - 7.1.2. Famiglietti (IGRAC/UNESCO Workshop Groundwater)
 - 7.2. GTN-R (Looser)
 - 7.3. GTN-G (Haeberli)
 - 7.4. GTN-M
 - 7.5. GTN-P
8. Expansion and status cryospheric observations within GCOS and TOPC (Goodison)
(Will take place on Friday)
9. Terrestrial Commission development; roles, responsibilities and strategy (Latham, Dolman, Goodrich)
10. The terrestrial standards (who will take the lead on each ECV)
11. Role of TOPC towards support to the terrestrial networks?
12. Review Sydney workshop report
13. Discussion on priority list and timelines. Also implementation mechanisms (including how TOPC will link to other GTOS and GCOS Panels and other initiatives)
14. Discussion on funding strategies and possible project proposals.
15. Calendar and future meetings
16. Meeting close (16 November AOB)

Annex II :: Meeting Participants

TOPC Panel Members

Han Dolman (Chair)
 Jay Famiglietti
 Wilfried Haeberli
 Ulrich Looser
 Jan Polcher
 Valery Vuglinsky

Other Participants

David Goodrich (GCOS Programme Director)
 John Latham (GTOS Programme Director)
 Reuben Sessa (GTOS Programme Officer)
 Barry Goodison (Chair, Climate and Cryosphere Project – CLIC)

Annex III :: TOPC TORS for 2007-2011

Although climate change is now firmly established, there remains considerable uncertainty about the rate of change and its regional variability. Precise quantification of the rate of change remains important to determine whether feedback or amplification mechanisms are operating within the climate system. Unfortunately, the climate observing system in the terrestrial domain still remains the least well-developed component, whilst at the same time there is increasing significance being placed on terrestrial data for both climate understanding as well as impact and mitigation assessment.

Foundations exist for both the in situ observation networks and the space-based observing components of the terrestrial domain. Space Agencies and other organizations are generating new products, the Global Terrestrial Networks (GTNs) are being established and growing in effectiveness, and their associated international data centres are beginning to be populated with data.

TOPC has played an important role in establishing standards for the terrestrial climate variables within its overall mandate of improving the understanding of the terrestrial components of the climate system, the causes of change to this system and consequences in terms of impact and adaptation. Changes in the context of both the status of ECV's and the need for new ones required for impact and mitigation studies require some re-establishment of the focus of TOPC. These concern:

- Review and revise the terrestrial ECVs such as groundwater (recharge), soil moisture, biomass, fire (CO₂ emissions) needed to determine transient change, impact and mitigation.
- To identify key ECV's that play a role in feedbacks (amplification and impacts) within the climate system (snow, glaciers, lake level) and reassess whether current approaches to their measurement is adequate.
- Increased attention on coordination and long term maintenance of *in situ* networks to establish both independent bottom up data sets of ECV's and data sets required for calibration and validation of Earth Observation data.
- Investigate how a number of current research networks (e.g. Fluxnet, LTER's) can be effectively adopted (or endorsed) by GCOS/GTOS terrestrial networks..
- Promote the development of data integration and assimilation techniques for the terrestrial domain.
- Ensure that the five current Global Terrestrial Networks (hydrology, glaciers, permafrost, rivers, lakes) are fully implemented.
- Through GCOS and GTOS maintain strong links with SBSTA and UNFCCC and relevant international research programmes (e.g. WCRP, IGBP) in defining key requirements for observations of the terrestrial ECV's.
- Contribute to the 2009 GCOS progress report to the UNFCCC.
- Link with international opportunities to promote the need for continued observations such as the International Polar Year 2007-2008 (www.ipy.org), the International Year of Planet Earth 2007 - 2009 (www.esfs.org) and subsequent initiatives.
- Maintain engagement of CEOS to ensure delivery of required satellite observations as stated in the GCOS 107 report.
- Maintain engagement with efforts to establish international (continental) terrestrial observation networks.
- Liaise with GTOS wherever appropriate, e.g. in the establishment of guidelines and standards for the observation of terrestrial ECVs.
- Liaise with GCOS and GTOS science Panels on issues of common interest.

Annex IV :: TOPC New Panel Members (as from March 2007)

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