

EUGENE
CLIMATE
WORKSHOP REPORT
[WORK PACKAGE 2000]



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Table of Contents

1	INTRODUCTION	4
1.1	Background.....	4
1.2	Scope and Objectives of the EUGENE Project	4
1.3	Purpose of this Document	5
1.4	Applicable Documents.....	5
1.5	Reference Documents.....	5
2	WORKSHOP OBJECTIVES, EXPECTED OUTCOME, AGENDA AND PARTICIPATION.....	6
2.1	Objectives and Expected Outcome	6
2.2	Agenda	
2.3	Participation.....	6
3	SUMMARY OF WORKSHOP DISCUSSIONS.....	7
3.1	Welcome and Introductions (Agenda Item 1).....	7
3.2	Background to the Project (Agenda Item 2)	7
3.3	Workshop Objectives (Agenda Item 3).....	7
3.4	Overview of the Global Climate Observing System (GCOS) Requirements (Agenda Item 4)	8
3.4.1	Distinct Objectives of Research and Operations	8
3.4.2	Research Contributions to In-situ Measurements	8
3.4.3	SCOPE-CM.....	8
3.4.4	Infrastructure versus Services	9
3.4.5	Turning Observations into Policy-relevant Information.....	9
3.4.6	The Potential Role of a GMES Climate Core Service	9
3.4.7	The Main Building Blocks of the Global Framework for Climate Services (GFCS).....	9
3.4.8	Coordination of Activities Across Europe and the Vital Role of Member States	9
3.5	Presentation, Review and Update of Draft Climate Status Quo Report (Agenda Item 5).....	9
3.6	Strategic Considerations in Support of a Coordinated European Contribution to GEO for the Climate Societal Benefit Area (Presentation by EUMETSAT and discussions moderated by Alan Belward, JRC and Udo Gaertner (DLR)) - Agenda Item 6	10
3.6.1	Review of Chapter 5 of the EUGENE Climate Status Quo Report.....	10
3.6.2	Potential Strategic Issues from a GEO Perspective	10
3.7	Inputs for a Coherent European Position and Visibility at the GEO Ministerial Summit in November 2010 (Discussions moderated by Udo Gaertner) - Agenda Item 7	11
4	SYNTHESIS OF MAIN STRATEGIC POINTS	12
Appendix A	WORKSHOP AGENDA.....	14
Appendix B	WORKSHOP PARTICIPANTS.....	15
Appendix C	REQUESTED CHANGES TO DRAFT C OF THE EUGENE CLIMATE STATUS QUO REPORT	16
Appendix D	DISCUSSION on GEO STRATEGIC ISSUES.....	22
Appendix E	GLOSSARY OF TERMS	25
Appendix F	LIST OF ABBREVIATIONS	27

1 INTRODUCTION

1.1 Background

The EUGENE project is an FP7-funded support action. Its major goal is to contribute to the establishment of a coordinated and sustained European Earth observing system component as part of the Global Earth Observation System of Systems (GEOSS).

The establishment of a coordinated GEOSS has been initiated by the inter-governmental Group on Earth Observations (GEO). GEO was launched in response to calls for action by the 2002 World Summit on Sustainable Development and by the G8 (Group of Eight) leading industrialised countries. These high-level meetings recognised that international collaboration is essential for exploiting the growing potential of Earth observations to support decision making in an increasingly complex and environmentally stressed world. GEO is a voluntary partnership of governments and international organisations. As of November 2009, GEO's members include 80 governments and the European Commission. In addition, 58 intergovernmental, international, and regional organisations with a mandate in Earth observation or related issues have been recognised as participating organisations.

The development of GEOSS is supposed to qualitatively improve our understanding of the Earth system, enhancing global policy- and decision-making abilities to promote the environment, human health, safety, and welfare. GEOSS is expected to generate societal benefits in the following nine areas, the so-called Societal Benefit Areas (SBA):

- **Disasters:** reducing loss of life and property from natural disasters
- **Human health:** increasing the understanding of environmental factors affecting human health and well-being
- **Energy:** improving the sustainable management of energy resources
- **Climate:** improving the understanding and the prediction of climate variability and change as well as the adaptation to altered environmental conditions
- **Water:** improving sustainable water resource management through better understanding of the water cycle
- **Weather:** improving the information base with respect to meteorological parameters, weather forecasting and warning
- **Ecosystems:** improving the management and protection of terrestrial, coastal and marine ecosystems
- **Agriculture:** supporting sustainable agriculture and combating desertification
- **Biodiversity:** improving the understanding, monitoring and conserving of biodiversity

International collaboration is an essential tool in the implementation of GEOSS, as it is a pre-requisite for the creation and maintenance of the necessary observations database (and associated networks) which feed the decision-making processes. For this reason, international collaboration is a foundation of the GEOSS implementation arrangements.

1.2 Scope and Objectives of the EUGENE Project

The objective of the EUGENE project is to foster collaboration between pan-European organisations in the field of Earth observation and to strengthen the coordination of national and regional programmes and organisations in their work towards GEO by establishing an appropriate coordination process. The ultimate goal is to contribute to the establishment of a coordinated and sustained European component as part of GEOSS.

The EUGENE project aims at further developing a comprehensive European GEO strategy by proposing a structured European approach for selected GEO Societal Benefit Areas (SBAs). This will also encompass intrinsic cross-cutting issues, such as data sharing, with special attention to the relationship between relevant European frameworks and GEOSS.

EUGENE addresses European activities and actors in three selected GEO SBAs, which correspond to European political priorities:

- Climate
- Disasters
- Water

The project work plan is intentionally limited to these three areas as a subset to start with and to allow working at a sufficient level of detail. For each of the three SBAs, a consolidated status-quo report will be provided. These reports provide information on relevant European activities and contributions to GEO. They form the basis for further considerations on a European GEO approach, with the goal to establish a coordinated and sustained European Earth observing system component as part of the GEOSS, maximizing both the GEO added value and the European benefit from GEOSS

To assist in establishing the status quo, and identifying potential strategic actions, SBA-specific EUGENE expert workshops are a key mechanism for the project.

1.3 Purpose of this Document

The purpose of this document is to report on the proceedings and outcome of the EUGENE Climate Experts Workshop which was held at EUMETSAT HQ on the 26th and 27th April 2010 and is structured according to the following sections:

- Section 1 - this introduction;
- Section 2 - summarises the workshop objectives, expected outcome, agenda and participation;
- Section 3 - outlines the main workshop discussions;
- Section 4 - provides a synthesis of the main strategic points arising from the workshop.

1.4 Applicable Documents

[AD.1]: EUGENE Description of Work, 8 September 2009.

[AD.2]: EUGENE Project Implementation Plan, EUGENE-01, 20 October 2009.

1.5 Reference Documents

[RD.1]: EUGENE Climate Status Quo Report, Draft C.

2 WORKSHOP OBJECTIVES, EXPECTED OUTCOME, AGENDA AND PARTICIPATION

2.1 Objectives and Expected Outcome

The objectives of the EUGENE Climate Experts Workshop are as described in the letter of invitation to potential participants, i.e.:

The Climate SBA status quo study report will be made available for discussion at the workshop. It will be reviewed from an expert perspective. Furthermore, the report will form the basis for strategic considerations on how to achieve a well-coordinated and sustained European GEO Component and contribution to GEOSS regarding Climate.

The major outcomes of the workshop will be:

- *an updated report on the European status quo relevant to the Climate SBA;*
- *a strategic document, referring to a coordinated European contribution to GEO for the Climate SBA;*
- *potential inputs to a coherent European position and visibility at the GEO Ministerial Summit taking place in Beijing in November 2010.*

2.2 Agenda

The workshop agenda is provided in Appendix A.

2.3 Participation

A wide range of pan-European organisations and programmes, as well as major actors at the level of European Member States, were encouraged to take part in the workshop and the resultant workshop participation is given in Appendix B.

3 SUMMARY OF WORKSHOP DISCUSSIONS

Based on the agenda given in Appendix A, the following sections summarise the main workshop discussions.

3.1 Welcome and Introductions (Agenda Item 1)

In welcoming the workshop participants to Darmstadt, the EUMETSAT Director-General stressed:

- the relevance of climate change to Europe and its politicians;
- the enormity of the climate change challenge;
- Europe's technical capabilities and expertise which make it well-placed to respond to this global challenge;
- the particular interest and importance of climate issues to EUMETSAT, in view of a) its convention which includes climate monitoring and b) the contribution of its current and future operational programmes to climate monitoring.

Following the welcoming remarks of the Director-General, the workshop participants introduced themselves.

3.2 Background to the Project (Agenda Item 2)

The EUGENE project coordinator (Helmut Staudenrausch, DLR) presented the main features of the EUGENE project to the workshop participants, covering:

- GEO and GEOSS;
- Motivation for the EUGENE Project;
- Main Issues;
- Objectives and Expected Outcome;
- Scope, Methodology;
- Partnership and Main Tasks;
- Current Project Status;
- Structure of Status Quo Reports;
- Situation in Europe for the 3 SBAs under consideration;
- Feedback from Member States via the EC GEO HLWG;
- The link between GMES and GEOSS;
- Strategic Considerations.

3.3 Workshop Objectives (Agenda Item 3)

Robert Husband (EUMETSAT) presented the workshop objectives (consistent with those identified in section 2.1) i.e.:

- Identification of any required updates to the Status Quo Assessment;
- Identification of Strategic Actions to enhance Europe's contribution to the GEO Climate SBA;
- Potential inputs to ensure a coherent European position and visibility at the GEO Ministerial Summit taking place in Beijing in November 2010.

The relationship between these objectives and the workshop documentation, released beforehand to participants, was also described.

3.4 Overview of the Global Climate Observing System (GCOS) Requirements (Agenda Item 4)

Alan Belward (EC/JRC), on behalf of GCOS, made a presentation covering:

- Earth System and Human System Connections;
- Climate Information in the Policy Cycle;
- Accelerating Need for Full Access to Standardised Data;
- Travel Time to Major Cities;
- Policy Options, Management and Scenarios, Alarms;
- GCOS Surface Network;
- Spatial Distribution of monthly In-situ Stations in the GPCP Database;
- Lake Chad Replenishment Project;
- Policy and Systematic Observations;
- UNFCCC - Research and Systematic Observations;
- GCOS Key Findings for SBSTA 30;
- GCOS Progress Report 2004-2008;
- COP-15: December 2009;
- ECVs;
- Multi-purpose Services;
- WMO Integrated Global Observing System (WIGOS);
- European Component of WIS;
- Europe's Capacity to Deliver FCDR/ECVs;
- Moving from Research to Operations;
- Current Situation;
- Way Forward;
- Sustainability, Continuity and Quality.

Following the presentation, a number of issues were raised, including:

- The distinct objectives of Research and Operations;
- Research contributions to in-situ measurements;
- SCOPE-CM;
- Infrastructure versus Services;
- Turning observations into policy-relevant information;
- The potential role of a GMES Climate Core Service;
- The main building blocks of the GFCS;
- Coordinating activities across Europe and the vital role of Member States.

3.4.1 Distinct Objectives of Research and Operations

It was noted that Research and Operations often have distinct and complementary objectives and, in some cases Research programmes will lead to an Operational programme, and in other cases not. It was emphasised that both types of programme need appropriate, parallel, funding.

3.4.2 Research Contributions to In-situ Measurements

The essential contribution of the Research community to the maintenance of long-term in-situ measurements was highlighted (e.g. the 100-year measurement record of the World Glacier Monitoring Service).

3.4.3 SCOPE-CM

It was noted that SCOPE-CM is a good example of an initiative which combines Research and Operations in a very synergistic manner to achieve a very good result.

3.4.4 Infrastructure versus Services

The distinction between infrastructure availability and the setting up of a climate service was raised. The EC noted that one could envisage a core/downstream service concept (i.e. as per the GMES service architecture). The role of the WMO Regional Climate Centres (RCCs) was also noted as being relevant to the definition of the content of any climate services - see also section 3.4.6.

3.4.5 Turning Observations into Policy-relevant Information

The importance of making sure that observations are transformed into policy-relevant information for decision-makers was noted.

3.4.6 The Potential Role of a GMES Climate Core Service

It was identified that the network of RCCs has made a start in defining climate services, but this activity was focussed on the needs of NMSes (particularly concerning the use of regional data). This activity could, however, be used to assist in the definition of a future GMES Climate Core Service.

3.4.7 The Main Building Blocks of the Global Framework for Climate Services (GFCS)

The main building blocks of the GFCS were identified as Monitoring, Research and Communications. The network of RCCs could be of use in the implementation of the communications pillar of the GFCS.

3.4.8 Coordination of Activities Across Europe and the Vital Role of Member States

The difficulties associated with coordinating activities across Europe was highlighted, and it was felt that the onus on Member States to carry out this essential coordination activity should be identified as a key strategic issue.

It was also noted that certain inter-organisation coordination arrangements are in place and are working well (e.g. between EC, ESA and EUMETSAT).

3.5 Presentation, Review and Update of Draft Climate Status Quo Report (Agenda Item 5)

Robert Husband (EUMETSAT) briefly introduced this agenda item, focusing on Chapters 2 to 4 of [RD.1].

In addition the update cycle of [RD.1] was also described, i.e.:

- o Draft D (reflecting comments received at this workshop) to be released by 24 May for further review;
 - 2 week window for comments;
- o Draft E (final Draft) to be released for review by 2 July;
 - 2 week window for comments;
- o Issue 1 to be released by 28 July.

Following this introduction, Alan Belward (EC/JRC) moderated the ensuing discussions which focused on the review of sections 2 to 4 of [RD.1].

These discussions resulted in a number of requested updates to [RD.1] which are summarised in Appendix C (which also includes some requests for changes submitted after the workshop, as well as changes requested during discussions on the subsequent agenda item 6).

3.6 Strategic Considerations in Support of a Coordinated European Contribution to GEO for the Climate Societal Benefit Area (Presentation by EUMETSAT and discussions moderated by Alan Belward, JRC and Udo Gaertner (DLR)) - Agenda Item 6

Robert Husband (EUMETSAT) briefly introduced this agenda item, focussing on Chapter 5 of [RD.1].

The subsequent discussions were divided into two parts:

- a review of the contents of Chapter 5 of [RD.1] - discussions moderated by Alan Belward;
- potential strategic issues from a GEO perspective - presented and moderated by Udo Gaertner.

3.6.1 Review of Chapter 5 of the EUGENE Climate Status Quo Report

Following extensive discussions a number of changes were requested to Chapter 5 of [RD.1] which are summarised in Appendix C.

3.6.2 Potential Strategic Issues from a GEO Perspective

Following a short presentation by Udo Gaertner, a wide-ranging discussion took place, covering:

- Focus of GEO Activities;
- Coordination;
- Data and Data Policy;
- Best Practices;
- Political Context;
- Science and Technology;
- Capacity Building;
- Commercial Aspects;
- Structures.

The main features of these discussion points are summarised in Appendix D with the key conclusions being:

- the focus of Europe's interaction with GEO should be on Data Provision;
- there is a need for member states to be more active in coordinating the relevant major European actors¹ (e.g. ESA, EUMETSAT, ECMWF, EUMETNET, EC....);
- the issue of access to data (particularly in-situ data) needs to be further pursued at a political level (making use of the GEO framework as appropriate);
- the GEO framework could be useful as a political forum for advocating, at the ministerial level, initiatives/programmes that fill gaps in the observing systems (to ensure that appropriate data is available to support policy-making);
- an additional coordination structure for climate activities within Europe was not favoured.

¹ Noting, however, that an effective inter-agency coordination mechanism exists between EC, EUMETSAT and ESA

3.7 Inputs for a Coherent European Position and Visibility at the GEO Ministerial Summit in November 2010 (Discussions moderated by Udo Gaertner) - Agenda Item 7

Following an introduction by Udo Gaertner, the participants noted a number of points that could be of relevance, including:

- MACC will be promoted by ECMWF at the EC GMES Bureau Stand (with the Bureau coordinating contributions);
- Currently there are no plans for a specific EUGENE contribution (but the results of the workshop process could provide material for a contribution);
- Inspiration could be taken from the approach adopted for the Lille GMES Symposium - i.e.: individual contributions with a heterogeneous mix of climate, meteorology and observations - a sort of "GMES House";
- A display could be constructed showing how close Europe is to achieving a climate framework - which could complement the Lille GMES Symposium approach.

4 SYNTHESIS OF MAIN STRATEGIC POINTS

Based on the discussions under agenda item 6 (see section 3.6) the following strategic points are noted:

- 1) Europe is very well positioned in the international context with the active participation of ESA, EUMETSAT, ECMWF, EC and national agencies in key frameworks (e.g. IPCC, GCOS, CEOS, CGMS, GSICS, SCOPE-CM, WCRP...). These key frameworks are, in turn, closely connected to the implementation of the relevant GEO Climate tasks and targets.
- 2) Within Europe there is a strong "political will", at the highest levels, to address climate issues. This "political will" provides a solid backdrop to exploit Europe's considerable strengths in climate which are often "world class".
- 3) The overall European contribution to the GEO Climate SBA could be strengthened by targeting some specific activities with secure, long-term, funding. The importance of long-term funding was repeatedly stressed in order to ensure sustainability.

During the workshop discussions, it was debated as to whether there was a need to introduce a sustained framework to cover such activities, and it was concluded that such a framework should only be introduced if it:

- a) adds value;
- b) is compatible with existing frameworks.

As GMES is an overarching European EO programmes, it was concluded that, if such a framework was felt to be advantageous, a future GMES Climate Core Service was an obvious candidate.

- 4) Specific areas where the European contribution to the Climate SBA could be strengthened were identified as:
 - In-situ networks;
 - Creation of long time-series CDRs - Data Rescue and Homogenisation;
 - Unfulfilled Requirements for CDRs;
 - Construction of long time-series of ECVs based on satellite data (TCDRs);
 - Creation of Metadata;
 - Access to In-situ Data;
 - Reanalysis;
 - Activities relating to the building of GEOSS (e.g. contributions to the GEOSS Common Infrastructure).
- 5) More benefit could be taken from the political profile of GEO to obtain support for addressing the gaps/opportunities within Europe [see point 4) above] - with a clear link to the benefits (from a policy-making perspective).

In particular, access to data was identified as a big issue (particularly from a data policy perspective) and GEO could provide an appropriate political context for addressing this problem (access to in-situ data is a problem across Europe).

- 6) Member States need to take the lead in ensuring coordination between the relevant major European actors (e.g. ESA, EUMETSAT, ECMWF, EUMETNET, EC...) - albeit noting that a successful inter-agency coordination mechanism exists between EC, EUMETSAT and ESA.

The importance of this coordination activity is underscored by the funding, provided by member states, to individual European organisations. If there was enhanced coordination between such organisations, driven by member states, it could be expected that more benefits could accrue from this funding.

- 7) For European climate activities which are already well-coordinated at an international level (e.g. GCOS, the future GFCS, etc) GEO may not be regarded as the prime international coordination framework.

However, GEO can play a useful role in filling gaps (such as facilitating an international framework for a carbon monitoring system) and to provide bridges to political systems. Thus GEO should, in addition to pursuing its 10-year climate target, place emphasis on filling any identified gaps (using its political profile as appropriate).

APPENDIX A WORKSHOP AGENDAMonday 26 April

1. Welcome and Introductions (EUMETSAT) (14:00 - 14:15)
2. Background to the EUGENE Project (DLR) (14:15 - 14:45)
3. Workshop Objectives (EUMETSAT) (14:45 - 15:15)
4. Overview of the Global Climate Observing System Requirements (GCOS) (15:15 - 16:00)
- Break* (16:00 - 16:15)
5. Presentation, Review and Update of Draft Climate Status Quo Report¹ (Presentation by EUMETSAT and discussions moderated by Alan Belward, JRC) (16:15 - 17:15)

Tuesday 27 April

- Continuation of Agenda Item 5 (09:00 - 11:00)
- Break* (11:00 - 11:15)
6. Strategic Considerations in Support of a Coordinated European Contribution to GEO for the Climate Societal Benefit Area¹ (Presentation by EUMETSAT and discussions moderated by Alan Belward, JRC) (11:15 - 13:00)
 - Lunch* (13:00 - 14:00)
 - Continuation of Agenda Item 6 (14:00 - 15:30)
 - Break* (15:30 - 15:45)
 7. Inputs for a Coherent European Position and Visibility at the GEO Ministerial Summit in November 2010¹ (Discussions moderated by Udo Gaertner) (15:45 - 17:00)
 8. AOB (17:00 - 17:15)

¹ Supporting document to be made available prior to the workshop

APPENDIX B WORKSHOP PARTICIPANTS
EUGENE Climate Experts Workshop: 26-27 April 2010

Country/Affiliation	Title	Last Name	Name	Organisation
France	Mr.	Planton	Serge	Meteo France
Germany	Mr.	Danzeglocke	Jens	DLR
Germany	Mr.	Gärtner	Udo	DLR
Germany	Dr.	Staudenrausch	Helmut	DLR
Germany	Mr.	Roesner	Stefan	DWD
Netherlands	Mr.	Van Engelen	Aryan	EUMETNET
Netherlands	Mr.	Van Oss	Roeland	KNMI
Switzerland	Ms.	Seiz	Gabriela	Meteo Swiss
UK	Mr.	Ringer	Mark	Met Office
	Mr.	Bratina	Vojko	EC RTD
	Mr.	Strahlendorff	Mikko	EC ENTR/GMES Bureau
	Mr.	Belward	Alan	EC JRC
	Dr.	Cuvelier	Kees	EC ENTR/GMES Bureau
	Mr.	Kurnik	Blaz	EEA
	Dr.	Lecomte	Pascal	ESA
	Dr.	Loew	Alexander	Max-Planck Institute for Meteorology
EUMETSAT	Dr.	Prahm	Lars	EUMETSAT
	Mr.	Counet	Paul	EUMETSAT
	Dr.	Gartner	Volker	EUMETSAT
	Dr.	Holmlund	Kenneth	EUMETSAT
	Dr.	Schmetz	Johannes	EUMETSAT
	Dr.	Husband	Robert	EUMETSAT
	Dr.	Schulz	Jörg	EUMETSAT

APPENDIX C REQUESTED CHANGES TO DRAFT C OF THE EUGENE CLIMATE STATUS QUO REPORT

Section (Draft C)	Source	Requested Change	Sections Affected in (Draft D)	Comment
General	Workshop	Need to make sure that there is a balance between R&D and Operations - both are required.	General	
General	Workshop	Focus should be on data provision rather than services	General	Made more explicit in new section 2.2
General	Workshop	Swap the positions of sections 3 and 4	3, 4	Sections swapped
General	MF	Systematically use Climate Prediction and Climate Projection as per IPCC 2	2.2	New section 2.2 reflects IPCC definitions and MF comments
1	Project	Common EUGENE text to be inserted in introduction	1.1	Awaits finalisation of draft text
2.2	Workshop	Delete section and substitute with a generic "political" diagram illustrating the connection between ECVs and policy-making	3.1	Political diagram inserted in new section on over-arching frameworks
2.2	CNES	Page 8: Right column could include surface radiation and aerosols. Probably also ozone	N/A	Not implemented as section re-written
3	Workshop	Include descriptions of European contributions to GRDC, GPCC, WGMS, Surface Radiation	3.2, 4.1.1.2.3, 5.1.1	New sections introduced in 3.2 and reinforced elsewhere in the document
3.1	Workshop	To be further developed - including development of diagram (including removal of ECV reference)	2.2	Reworked diagram and associated descriptions and definitions inserted in new section 2.2
3.1	CNES	Figure 1 is only focused on observations not on modelling and other studies (past climate, etc.). Should be either included or at least mentioned as not treated here 3.1.1 Speak about Climate research, not only climate process studies, even if in figure 1 is focused only on observations. Define Climate research : -studies of past climate - studies on coupled models and projections (CMIP) - studies on processes - improvement of observation and assimilation techniques - etc? Near real time : precise what it means (2 to 3 hours or several days, weeks or months). For me several days is OK Note that indicators (e.g. frequency of storms, number and size of clusters, etc.) with are not ECV are also very useful for Climate monitoring. Are they EDRs? Note that the satellite data can also be radiances (level1 products), not included in the list of ECVs	2.2	Modifications and clarifications inserted
		Figure 1 Note that reanalysis is not necessarily performed on the		

EUGENE Climate Workshop Report

Section (Draft C)	Source	Requested Change	Sections Affected in (Draft D)	Comment
3.1.1	Workshop	TCDRs (Level 2) but also on level 1 data. Need to expand set of applications to include Attribution, Global Prediction, Regional Prediction, Data Assimilation for Reanalysis, Seasonal and Decadal Forecasting	2.2	Diagram and associated text re-worked
3.1.2	CNES	Define TCDR. Widely used in the report and by scientists in the meetings	2.2	
3.2	Workshop	Increase emphasis on reanalysis (as part of modelling)	2.2, 4.1, 4.1.2.2.1, 5.2.3.1	New sections introduced to increase emphasis/visibility
3.2.1	CNES	In my opinion, the list should include reanalysis data	4.1, 4.1.2.2.1	
3.2.1.1	Workshop	Include a section on major European programmes and CCI (from [RD.1])	4.1.1.1	
3.2.1.1.1	Workshop	Make clear that summary section is not an overall summary	4.1.1.1	Section re-worked
3.2.1.1.1	MF	Suggested text changes to Climate Prediction on Page 12 - see SP's input	2.2	
3.2.1.2	EuroGOOS	Integrate response from Southampton	4.1.1.2.2.3	
3.2.1.2.1	Workshop	a) Extend to WMO RCC that Europe is involved in b) Describe role of EEA and their role in the coordination of in situ data	3.2, 4.1.1.2.2.2, 5.1.1	
3.2.2.1	Workshop	Filter and integrate Norwegian input	N/A	Appendix and associated reference have been deleted as a) the Norwegian input was not in the questionnaire reference frame (thereby distorting the focus of the document) and b) national contributions have been made more prominent (including those of Norway) in section 3, 4 and 5
3.2.2.1	NCEO	Reflect as necessary Excel spreadsheet information	Appendix C.13	
3.2.2.2	MF	Updated text proposed for MF entry - similar change to Appendix C page 70	Table 4 of 4.1.2.2, Appendix C.10	
3.2.2.2	DWD	Small adjustments to table entry (and corresponding adjustments to DWD entry in Appendix)	Table 4 of 4.1.2.2, Appendix C.3	
4	Workshop	a) Starting point for section should be UNFCCC then IPCC, then GCOS b) GCOS Support networks should be described (GRDC, GPCC, WGMS and Surface Radiation). The bulk of the description should be described in the European section with appropriate cross-references in the international section c) GFCS to introduced as well	3.1, 3.2.1.1, 3.1.4	
4	Workshop	Need to add more data centres (GHG, Aerosols, Radiation, etc)	3.2	
4	Workshop	Need to identify specific European contributions (classified according	3, 4.1.1.2.3,	

Section (Draft C)	Source	Requested Change	Sections Affected in (Draft D)	Comment
		to Major and Supporting if possible). National Activity report GCOS 130 and the GCOS IP could be a good source of information	5.1.1	
4	Workshop	Systematically move to the end of each section the European contribution to GEO (in terms of tasks) and identify by italics	3	
4	Workshop	Harmonise level of detail in sections and make more concise	3	
4	Workshop	Remove benefits sections throughout	3	
4	Workshop	Introduction to be rewritten to reflect deletion of sections	3	
4.1.1.1	Workshop	Cross-refer to baseline networks and specifically flag those that GCOS supports	3.2.1.1	
4.1.1.1	CNES	Page 22 : second item, add gathered in the ESSP	3.3.1	
4.1.1.2	Workshop	a) Add standards for terrestrial observations - joint ISO/GTOS - see documents provided by Stefan Roesner b) Need to add REDD + activity to GTOS c) remove list of ECVs	3.2.3.2, 3.2.1.2, 3	
4.1.1.5	Workshop	Identify EIONET as a European contribution	3.2.1.5	
4.1.1.6	Workshop	Add a reference to WMO Resolution 40	3.2.1.6	
4.1.1.7	Workshop	Add EUMETSAT role as Secretariat and specific working groups that have relevance to climate	3.2.1.7	
4.1.1.8	Workshop	a) Identify GEO tasks (FCT and GHG) b) Add permanent secretarial roles (including that of ESA and EUMETSAT) c) Describe 3 Working Groups, role of Climate SBA Coordinator and Impending formation of the Climate Advisory Group d) CEOS role in coordinating response to GCOS IP (as recognised by COP)	3.2.1.8	
4.1.1.9	Workshop	Add 3 bullets from WMO Space Programme website	3.2.1.9	
4.1.2	Workshop	a) Add description and/or cross-reference to data centres and networks b) Add WMO RCC on Data and Monitoring	3.2.2	
4.1.2.1	Workshop	Note that SCOPE-CM is a good example of an initiative that combines both R&D and Operations to achieve a good result	3.2.2.1	
4.1.2.1	CNES	Page 26 : Figure caption: WMO space programme for climate	N/A	Original caption retained
4.1.2.3	CNES	Last line about GRUAN : complemented = performed?	N/A	Unsure about the intent of the comment
4.1.3	Workshop	a) Flag GCMP role b) Introduce new section on standards (harmonised approach QA4EO and WMO GSICS)	3.2.3.2	New section introduced
4.2	Workshop	Delete section	N/A	Section deleted
4.3	Workshop	Delete section	N/A	Section deleted
4.3	CNES	Should include some definitions on the scale and terms range with Seasonal ←-> Local to regional etc.	N/A	Superseded by the deletion of the section (as agreed at the workshop)
		Should start to list some of the services		

Section (Draft C)	Source	Requested Change	Sections Affected in (Draft D)	Comment
4.4	Workshop	Need to mention other GEMEX panels (all 3)	3.3.1	
4.4.1	Workshop	a) Emphasise strong European contribution to THORPEX b) Add to end of 1st para: "as a basis for the IPCC Assessments" c) Might have to add IGBP	3.3.1	
5	Workshop	Swap around sections 5.1.1 and 5.1.2	5.1.1, 5.1.2	
	Workshop	Introduce IGOS themes (e.g. Carbon)	N/A	Unsure whether this would significantly add to the Report
5.1.1	Workshop	a) Add an introductory section emphasizing i) The Political will of Europe to address Climate issues ii) Europe 20:20 Strategy (possibly combine with research money use (see below) b) Add: g) Commitment of European Community through the use of Research Funding c) Emphasise Capacity of ECMWF in Reanalysis (already in point c)) d) Highlight missions of EUMETSAT (under point d)?) e) Highlight ESA investment in observing capabilities and programmes to exploit systems (in some cases potential forerunners of operational missions) f) In a) add reference to EIONET and EUMETNET (balance?)	5.1.2	
5.1.1	CNES	Add g) National space agencies initiatives	5.1.2	
5.1.2	Workshop	Add table summarising European contributions to international cooperation	Table 5 in 5.1.1	
5.1.2	ECMWF	Mention ECMWF under international co-operation	5.1.1	
5.1.2	CNES	Replace both ESA and Eumetsat by ESA, Eumetsat and national space agencies	5.1.1	
5.2.1	Workshop	a) Reflect answers to questions a) if it adds value and b) What needs to be done - Assimilation, Reanalysis, Ocean and Land Data, Long-term Data Preservation b) Section should provide options and not be too definitive c) Needs to fit within the overall process of GFCS and national activities d) Framework should not be done in isolation from national and European initiatives (e.g. EU, ESA, EUMETSAT) e) Could be viewed as the promotion of the coordinated use of infrastructure to enable the provision of climate services f) Moderate sentences about sustainable footing, unfunded etc and refocus on strengthening of overall activities with specific funding Possible way forward could have a bullet on ECMWF Reanalysis	5.2.1	
5.2.1	ECMWF		5.2.1.1, 5.2.3.1	
5.2.1c)	MF	I propose a little change and a correction: "...some activities are not carried out at all due to a lack of funding (e.g data rescue and data homogenization – see Appendix C.10.3)."	5.2.2.2	

Section (Draft C)	Source	Requested Change	Sections Affected in (Draft D)	Comment
5.2.1	CNES	i) Just before a) to d): Replace means by has for consequence (other wise it means that there is no coordination/governance of sparse efforts) ii) In the way forward : propose a coordination iii) Certainly some CDR are missing but also because some ECV are not covered iv) Suggest a coordination with other partners (e.g. USA) to cover some ECVs 5Action on CGMS (?)	N/A	Section has been completely re-worked in accordance with the Workshop conclusions
5.2.2	Workshop	a) European In Situ data gaps mostly in the areas of North Africa, Middle East, Balkans, Eastern Europe - to be cross-checked with an analysis of gaps in the GCOS Regional Action Plans - they only cover developing countries b) Need to refer to EUMETNET Report and RA VI Data Rescue c) Could refer to the ACRE project as an example of data rescue d) Need to refer to the GCOS Adequacy Report and Progress Reports (for gaps in observational capacity) e) Need to emphasise the importance of data policy - something has been done - but more needs to be done (Data Policy, Data Infrastructure, Maintenance of Data Sets). f) Need to make a general statement about the availability of 30Bn to strengthen observation networks (meant for developing countries) - COP-15 document from S Roesner g) Section needs to be rewritten to reflect the above h) Gaps also include Long-term Data Preservation, Argo Floats currently funded through Research (critical for decadal prediction), Jason for sea level (may need to redistribute), Voluntary Observing System for Ships, Need for additional variables from the Oceans i) All gaps need to be consistent with information in #5.2.1 j) In general need to refer to GCOS Adequacy Reports (to see the important gaps for Europe) - to identify European opportunities	5.2	Comments integrated in a reworked section
5.2.2	MF	More emphasis on data rescue and data homogenisation	5.2.2.2	
5.2.2	MF	Section 5.2.2, some mention should be made somewhere on "the need to provide metadata documenting the whole process of data production and processing". This applies as well for satellite data and for in-situ data. This is the reason why I wonder how to introduce it (in a specific sub-section? in existing sub-sections?)	5.2.2.5	
5.2.2.5	ECMWF	The importance of Reanalysis data should be mentioned	5.2.3.1	
5.2.3	Workshop	Probably best if this section were suppressed - no explicit note to this effect but it would be in line with the general guidance about focussing on data	5.2.3	Old contents of section 5.2.3 removed and replaced with a new section on reanalysis
5.2.3.1	MF	Add "and projections" in the title and in "Factors that affect accuracy" I propose to add "chaotic component of climate system behaviour".	N/A	Section deleted in line with workshop discussions
5.2.3.2	MF	Climate prediction is here employed in the right sense since climate projections are also carried out in climate centres depending on	N/A	Section deleted in line with workshop discussions

Section (Draft C)	Source	Requested Change	Sections Affected in (Draft D)	Comment
5.2.3.2	MF	universities, ... P35: first paragraph: ECMWF is involved in climate prediction (seasonal and decadal scale). It seems that here "climate prediction" is here employed in place of "climate projections".	N/A	Section deleted in line with workshop discussions
5.3	Workshop	Re-vamp section a) CL-06-01a not just via CEOS b) Note already a lot of activities outside GEOSS c) Prelude - implementation of GCOS (IP?) including Carbon Cycle as a possible preamble d) Move 10 year target upfront and make it the current target (not the old one) - Give full text e) Provide link to GEO Report on GEO Tasks f) Countries contributing to GCOS via the VC programme - see TD 131 g) Need to X-ref to relevant GEO tasks including DA-09-01a GEOSS QA Strategy and DA-09-01c (LTDP)	5.3	Section re-worked
5.3.1	ECMWF	List European contributions to the GEO tasks, not just leads or co-leads (as done for 'water')	Table 6, 5.3.2	

APPENDIX D DISCUSSION ON GEO STRATEGIC ISSUES**D.1 Focus of GEO Activities**

It was agreed that the focus of Europe's interaction with GEO is on data provision.

D.2 Coordination - Message to Member States

There is a need for Member States to ensure coordination between the relevant major European actors (ESA, EUMETSAT, ECMWF, EUMETNET, EC....) - noting that an inter-agency coordination mechanism exists between EC, EUMETSAT and ESA.

D.3 Data and Data Policy

EC: Clear need for in-situ data from outside Europe:

- important that GEO makes progress on the data policy issue;
- should be "give and take"

NL: Should facilitate easy access to Clearing House (key issues: data, formats, validation of data, compliance with international standards)

UK: In preparation for next IPCC, JPL is going to produce datasets in a consistent format that can be used to compare with model data (and in the same format as the modelling data)

NL: Scientists also make use of the data that go into models (used for IPCC Reports). Need data in the required format for modelling - not the case at the moment.

Moderator: INSPIRE supports data policy. Data Policy paper to be presented at the forthcoming GEO plenary.

EUMETNET: High temporal and spatial resolution datasets have significant economic value and this a barrier to access

D.4 Best Practices

EUM: Common formats may be a lost cause - emphasis should be on conversion tools

Maturity of datasets - a maturity assessment (reflected in a maturity index) could be very useful for modelling and GEO could help in this direction.

DWD: Suggested the concept of Centres of Excellence for a set of ECVs - is this a concept that could help with the control of the quality of datasets

Moderator: Should Europe encourage this concept of "Centres of Excellence"?

ESA: Don't believe that ECVs can be handled using a "Centres of Excellence" concept

EUM: Centralisation was tried in SCOPE-CM but it did not work - the chains are too distributed.

D.5 Political Context

At a political level within Europe there is an interest in having a better position in climate negotiations. In this respect Europe's willingness to lead climate activities could be exploited.

There is also a need to serve political stakeholders with the best available information

GEO could be useful as a forum for advocating, at the ministerial level initiatives/programmes that fill in gaps in the observing systems (to ensure that appropriate data is available to support policy-making).

D.6 Science and Technology

Moderator: Summarised the work of the Science and Technology Committee

- Europe cannot be an Island
- What does it give?
- What does it get?

NL: On the Science front the situation is very open with a good global exchange of information. For technology the situation is not so clear.

EUM: On technology there is already quite a lot done with the exchange of instruments.

ESA: Noted the relevance of the WMO and CEOS gap analysis

EUM: Such a gap analysis could be extended to areas other than atmospheric ECVs

D.7 Capacity Building

ESA: Advocated a long-term In-situ system to support Cal/Val

UK: What is the strategy for obtaining long-term support for the Argo network?

DWD: What are the requests from developing countries for Capacity Building. GEO could help developing countries to express their needs.

EUM: Concerning ESA's comments - would like to emphasise the needs for systematic Cal/Val campaigns to ensure that datasets are suitable for climate applications.

Moderator: Once a plan has been developed, it could be offered to GEO for adoption.

Note: Some of the above comments belong to the data or best practices discussion (rather than CB - but they occurred under the CB discussion)

D.8 Commercial Aspects

Moderator: Are there any commercial aspects that we need to consider? The Americans are very keen to introduce commercial companies within GEO

NL: One of the motivations of GMES is the Lisbon agenda to promote downstream services

D.9 Structures

DLR: Is there a need for a coordination structure within Europe that would enable Europe to work more efficiently, and raise the necessary funding?

=> General conclusion - additional coordination structure not really favoured

APPENDIX E**GLOSSARY OF TERMS****E.1 Records**

Environmental Data Record (EDR): typically a data record that is generated directly from archived Near Real Time Level 2 data.

Climate Data Records (CDRs): a time series of measurements of sufficient length, consistency and continuity to determine climate variability and change.

Fundamental Climate Data Record (FCDR): is a long-term data record (radiances for satellites), involving a series of instruments, with potentially changing measurement approaches, but with overlaps and calibrations sufficient to allow the generation of homogeneous products providing a measure of the intended variable that is accurate and stable enough for climate monitoring.

Thematic Climate Data Record (TCDR): consists of values or fields of geophysical variables derived from FCDRs. Satellite derived data sets, that address Essential Climate Variables (ECVs) based on Fundamental Data Records eventually become Thematic Climate Data Records (TCDR) which are extremely valuable for higher level climate applications such as variability and trend analysis.

Climate Information Records (CIRs): are higher-level information that can be derived from the TCDRs, such as drought indices or hurricane intensities, probability of extreme events etc.

E.2 Processing

Assimilation and Reanalysis: reanalyses are produced using fixed, modern versions of the data assimilation systems developed for numerical weather prediction (in the case of ECMWF). Reanalysis products are more suitable than operational analyses for use in studies of long-term variability in climate and are used increasingly in fields that require an observational record of the state of either the atmosphere or its underlying land and ocean surfaces.

Inter-calibration and Recalibration : Intercalibration and recalibration are usually tied together within an overall calibration regime in order to:

- ensure consistency of satellite measurements from different instruments and programmes;
- tie these measurements to absolute references and SI standards;
- enable the recalibration of archived data.

Intercalibration of satellite instruments involves relating the measurements of one instrument to those of another and can be achieved when the instruments are viewing the same scenes at the same time and from the same viewing angle. Or, for time series of archived satellite data, the overlapping records of two satellite instruments can be compared. The result of an intercalibration is the consistency and the absence of any bias of one instrument's measurements with respect to the others.

Re-processing: the re-processing of satellite data is synchronised with reanalysis cycles and involves the re-processing of satellite data to generate a coherent set of products that have been derived from the most recent product generation system.

E.3 Applications

Process Studies: are studies on processes that influence the climate and are essential for the understanding of the physics of the climate system in general, and to improve climate models and climate prediction.

Operational Climate Monitoring: involves the routine, statistical characterisation of parameters for a given period and region in relation to long-term averages. This information is widely used for the climate reports of the national weather services and for different application areas (e.g. solar power consultancy, model validation, parameterisation improvement).

Detection of Climate Change [RD.10]: Detection of climate change is the process of demonstrating that climate has changed in some defined statistical sense, without providing a reason for that change.

Attribution [RD.10]: Attribution of causes of climate change is the process of establishing the most likely causes for the detected change with some defined level of confidence.

Variability [RD.10]: Climate variability refers to variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the climate on all spatial and temporal scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (internal variability), or to variations in natural or anthropogenic external forcing (external variability).

Climate Prediction [RD.10]: A climate prediction or climate forecast is the result of an attempt to produce an estimate of the actual evolution of the climate in the future, for example, from seasonal to decadal time scales. Since the future evolution of the climate system at such timescales may be highly sensitive to initial conditions, such predictions are usually probabilistic in nature.

Climate Projection [RD.10]: A projection of the response of the climate system to emission or concentration scenarios of greenhouse gases and aerosols, or radiative forcing scenarios, often based upon simulations by climate models. Climate projections are distinguished from climate predictions in order to emphasise that climate projections depend upon the emission/concentration/radiative forcing scenario used, which are based on assumptions concerning, for example, future socioeconomic and technological developments that may or may not be realised and are therefore subject to substantial uncertainty.

Impact Assessment [RD.10]: The practice of identifying and evaluating, in monetary and/or non-monetary terms, the effects of climate change on natural and human systems.

Vulnerability [RD.10]: Vulnerability is the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity.

Adaptation [RD.10]: Initiatives and measures to reduce the vulnerability of natural and human systems against actual or expected climate change effects. Various types of adaptation exist, e.g. anticipatory and reactive, private and public, and autonomous and planned. Examples are raising river or coastal dikes, the substitution of more temperature-shock resistant plants for sensitive ones, etc.

Mitigation [RD.10]: Technological change and substitution that reduce resource inputs and emissions per unit of output. Although several social, economic and technological policies would produce an emission reduction, with respect to Climate Change, mitigation means implementing policies to reduce greenhouse gas emissions and enhance sinks.

APPENDIX F**LIST OF ABBREVIATIONS**

ACRE:	Atmospheric Circulation Reconstructions over the Earth
AOPC:	Atmospheric Observation Panel for Climate
ARM:	Atmospheric Radiation Measurement
ASI:	Agenzia Spaziale Italiana
AVHRR:	Advanced Very High Resolution Radiometer
AWI:	Alfred-Wegener-Institut
BfG:	Bundesanstalt für Gewässerkunde
BNSC:	British National Space Centre
BSRN:	Baseline Surface Radiation Network
CBS:	Commission for Basic Systems
CCI:	Climate Change Initiative
CDR:	Climate Data Record
CEOP:	GEWEX Coordinated Energy and Water Cycle Observations Project
CEOS:	Committee on Earth Observation Satellites
CGMS:	Coordination Group for Meteorological Satellites
CIR:	Climate Information Record
CLIVAR:	Climate Variability and Predictability Experiment
CMA:	Chinese Meteorological Agency
CMIP:	Coupled Model Intercomparison Project
CNES:	Centre National d'Études Spatiales
CNMCA:	Centro Nazionale di Meteorologia e Climatologia Aeronautica
COP:	Conference of the Parties
DLR:	Deutsches Zentrum für Luft- und Raumfahrt
DWD:	Deutscher Wetterdienst
EC:	European Commission
ECMWF:	European Centre for Medium-Range Weather Forecasts
ECSN:	European Climate Support Network
ECV:	Essential Climate Variable
EDR:	Environmental Data Record
EEA:	European Environment Agency
EIG:	Economic Interest Group
EIONET:	European Environment Information and Observation Network
EMEP:	European Monitoring and Evaluation Programme
EO:	Earth Observation
EPS:	EUMETSAT Polar System
ESA:	European Space Agency
ESSP:	Earth System Science Partnership
EU:	European Union
EUGENE:	Improving coordination, visibility and impact of European GEOSS contributions by establishing a European GEo Network
EUMETNET:	Network of European Meteorological Services
EUMETSAT:	European Organisation for the Exploitation of Meteorological Satellites
FAO:	Food and Agriculture Organisation
FCDR:	Fundamental Climate Data Record
FCT:	Forest Carbon Tracking
GAW:	Global Atmosphere Watch
GBRDN:	GCOS Baseline River Discharge Network
GCI:	GEOSS Common Infrastructure
GCOS:	Global Climate Observing System
GCMP:	GCOS Climate Monitoring Principles
GDAC:	Global Data Assembly Center
GEO:	Group on Earth Observations
GEOSS:	Global Earth Observation System of Systems
GEWEX:	Global Energy and Water Cycle Experiment
GFCS:	Global Framework for Climate Services

GHG:	Greenhouse Gas
GMES:	Global Monitoring for Environment and Security
GMPP:	GEWEX Modelling and Prediction Panel
GODAE:	Global Ocean Data Assimilation Experiment
GOOS:	Global Ocean Observing System
GOS:	Global Observing System
GPCC:	Global Precipitation Climatology Centre
GPCP:	Global Precipitation Climatology Project
GRDC:	Global Run-off Data Centre
GRP:	GEWEX Radiation Panel
GUAN:	GCOS Upper-Air Network
GRUAN:	GCOS Reference Upper-Air Network
GSICS:	Global Space-based Inter-Calibration System
GSN:	GCOS Surface Network
GT-NET:	Global Terrestrial Observing Network
GTOS:	Global Terrestrial Observing System
GTS:	Global Telecommunication System
IASI:	Infrared Atmospheric Sounding Interferometer
ICSU:	International Council for Science
IGBP:	International Geosphere-Biosphere Programme
IJPS:	Initial Joint Polar System
IOC:	Intergovernmental Oceanographic Commission
IP:	Implementation Plan
IPCC:	Intergovernmental Panel on Climate Change
JAXA:	Japan Aerospace Exploration Agency
JCOMM:	Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology
JMA:	Japanese Meteorological Agency
KNMI:	Koninklijk Nederlands Meteorologisch Instituut
LMD:	Laboratoire de Meteorologie Dynamique
MEXT:	Ministry of Education, Culture, Sports, Science and Technology
MPI-M:	Max Planck Institute for Meteorology
MSG:	Meteosat Second Generation
MTG:	Meteosat Third Generation
MTP:	Meteosat Transition Programme
NASA:	National Aeronautics and Space Administration
NCDC:	National Climatic Data Center
NCEO:	National Centre for Earth Observations
NDACC:	Network for the Detection of Atmospheric Composition Change
NOAA:	National Oceanic and Atmospheric Administration
NMHS:	National Meteorological and Hydrological Service
NRT:	Near Real-Time
OOPC:	Ocean Observations Panel for Climate
PIK:	Potsdam Institute for Climate Impact Research
QA4EO:	Quality Assurance Framework for Earth Observation
RA:	Regional Association
RCC:	Regional Climate Centre
SAF:	Satellite Application Facility
SBA:	Societal Benefit Area
SBSTA:	
SCIAMACHY:	SCanning Imaging Absorption SpectroMeter for Atmospheric CHartography
SCOPE-CM:	Sustained, Coordinated Processing of Environmental Satellite Data for Climate Monitoring
SI:	International System of Units
SIT:	Strategic Implementation Team
SSM/I:	Special Sensor Microwave Imager
TCDR:	Thematic Climate Data Record

THORPEX:	The Observing System Research and Predictability Experiment
TOPC:	Terrestrial Observation Panel for Climate
UNEP:	United Nations Environment Programme
UNESCO:	United Nations Educational, Scientific and Cultural Organisation
UNFCCC:	United Nations Framework Convention on Climate Change
USGS:	United States Geological Survey
VOS:	Voluntary Observing Ship Programme
WCC:	World Climate Conference
WCRP:	World Climate Research Programme
WGCV:	Working Group on Calibration and Validation
WGEdu:	Working Group on Education
WGISS:	Working Group on Information Systems and Services
WGMS:	World Glacier Monitoring Service
WIGOS:	WMO Integrated Global Observing System
WIS:	WMO Information System
WMO:	World Meteorological Organisation
WMO SP:	WMO Space Programme
WOAP:	WCRP Observation and Assimilation Panel
WRMC:	World Radiation Monitoring Centre
WWW:	World Weather Watch