

**G** GLOBAL  
**C** CLIMATE  
**O** OBSERVING  
**S** SYSTEM



WORLD METEOROLOGICAL  
ORGANIZATION

INTERGOVERNMENTAL  
OCEANOGRAPHIC COMMISSION

**REPORT OF THE SECOND SESSION OF THE  
JOINT SCIENTIFIC & TECHNICAL COMMITTEE  
FOR GCOS**

**(Washington, DC, USA, January 11-14, 1993)**

**May 1993**

**GCOS - 2**

**(WMO/TD No. 551)**

UNITED NATIONS  
ENVIRONMENT PROGRAMME

INTERNATIONAL COUNCIL  
OF SCIENTIFIC UNIONS

## TABLE OF CONTENTS

	ORGANIZATION OF THE SESSION . . . , . . . . .	1
	1.1 <b>Opening of the Meeting</b> . . . . .	1
	1.2 Approval of the Agenda . . . . .	1
	1.3 Intersessional Activities . . . . .	1
2.	REPORT OF THE CHAIRMAN . . . . .	2
3.	INVITED REPORTS . . . . .	5
	3.1 Reports of the Sponsoring Organizations . . . . .	5
	3.2 Presentation of National Plans for GCOS . . . . .	7
	CONSIDERATION OF THE GCOS PLAN . . . . .	9
	4.1 Reports of the Task Groups . . . . .	9
	4.2 Discussion of other Reports . . . . .	11
	4.3 Working Group Assignments . . . . .	14
5.	GCOS IMPLEMENTATION ISSUES . . . . .	14
	5.1 The Intergovernmental Meeting on the WCP . . . . .	14
	5.2 External Coordination . . . . .	15
	5.3 Resources . . . . .	15
6.	OTHERBUSINESS . . . . .	16
	6.1 Intersessional Activities . . . . .	16
	6.2 Arrangements for JSTC-III . . . . .	17
7.	CLOSURE . . . . .	17

## 1. ORGANIZATION OF THE SESSION

### 1.1 Opening of the Meeting

1.1.1 Sir John Houghton, Chairman of the Joint Scientific and Technical Committee (JSTC) for the Global Climate Observing System (GCOS), opened the Second Session of the JSTC in Washington, D.C. on January 11 at 9:00 am and welcomed everyone present. All the members of the JSTC, representatives of the four sponsoring organizations, and many invited guests and visitors were in the audience. For the attendance list, see Annex I. The Chairman thanked the United States, and particularly the National Aeronautics and Space Administration (NASA) for hosting the meeting. He also thanked the staff that had been assigned to support the meeting for their preparation and assistance.

1.1.2 On behalf of NASA, Dr. S. Tilford, the JSTC First Vice Chairman, welcomed the members and guests, and expressed pleasure in hosting the meeting. He provided some practical information concerning organizational matters of the meeting.

### 1.2 Approval of the Agenda

1.2.1 The proposed agenda was discussed and an item on intersessional activities added. See Annex II.

### 1.3 Intersessional Activities

1.3.1 The Director of the Joint Planning Office (JPO) presented a report of accomplishments since the first session of the JSTC (See **WMO/TD** No. 493). The JSTC-I meeting assembled the members of the JSTC for the first time, reviewed the terms of reference for the JSTC, and reiterated the objectives of GCOS. The JSTC also considered a set of critical issues which needed to be addressed with priority. Highest priority was given to the preparation of a comprehensive plan for GCOS which would provide the strategy for its development and implementation. The meeting also prepared a draft of a GCOS brochure (**WMO** No. 777) which was subsequently completed and provided to attendees at the Rio de Janeiro UNCED meeting.

1.3.2 During the intersessional period, the Director of the JPO, in concert with the co-sponsoring organizations established several *ad hoc* task groups to address observational requirements as recommended at JSTC-I. With the support of the co-sponsors, and particular WMO Departments, these expert task groups and individual experts were invited to develop position papers on key components of the climate system. Three new task groups were commissioned to address:

- 1) Atmospheric Processes,
- 2) Atmospheric Chemistry,
- 3) Land Surface Processes.

The Ocean Observing System Development Panel (OOSDP) was invited to provide observational recommendations for the ocean. Members of the JSTC attended and participated in OOSDP discussions. In addition, the Director of the World Climate Research Programme (**WCRP**) provided a document on Clouds and Radiation; Dr. Croom, on Satellite Requirements; Dr. Dickinson, on Data Policy; and Dr. Rapley, on Cryosphere Requirements. These documents were tabled during the JSTC meeting.

1.3.3 During the intersessional period the Chairman of the JSTC and the Director of the JPO represented the GCOS programme at a number of meetings of various organizations including subsidiary bodies of the sponsoring organizations.

1.3.4 The Director also noted the encouraging response to a letter from the Secretary General of WMO inviting countries to establish GCOS coordination offices. To date, several have been established. JSTC members reported on activities in their countries later in the meeting.

1.3.5 The Director of JPO discussed the list of the documents distributed to the JSTC before the meeting. Finally, he restated the importance of this meeting in clearly outlining the strategy to plan, develop and implement the GCOS activities.

## **2. REPORT OF THE CHAIRMAN**

2.1 The Chairman of the JSTC presented a report on the progress of GCOS to date. He stressed the need for a clear concept of the GCOS programme and the need to develop an initial draft plan to guide the establishment of the observing system. He noted that the first opportunity to present the draft plan for the observing system would be the Intergovernmental Meeting on the World Climate Programme (IGM-WCP) to be held in Geneva in April 1993. He noted that documents must be drafted for submission at this meeting to outline the purpose and plans for GCOS, and to request resources for the planning activities of the JSTC and the **JPO**, and to the degree practicable, for observational activities to enhance current systems.

2.2 The Chairman reviewed recent developments with regard to climate and climate change issues. The Intergovernmental Panel on Climate Change (**IPCC**) had published a supplementary report, and a Convention on Climate Change had been signed at the UNCED in Rio de Janeiro. While the words of the Convention may appear to be vague, the Chairman noted that they are, in reality, very strong. The Convention calls for the

" . . . stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. . . "

These recent events pose a challenge and a clear opportunity for the scientific community, and for the GCOS programme. The Chairman described how these developments provide further impetus for climate observations. He reiterated that data are required to:

- o monitor the climate to detect change,
- o predict climate change, and
- o determine the effects of climate change.

2.3 The Chairman noted that models hold much promise in the prediction of climate. For example, some success has been achieved in predicting the onset of the El Niño-Southern Oscillation (ENSO) phenomenon almost one year in advance using very simple coupled atmosphere-ocean models. While the predictive capability of such models is very encouraging, he noted the need for observations to initialize and constrain the models simulations, and for validation. For longer time scales, it is necessary to have coupled models to address possible climate changes that may be due to the greenhouse gases. Finally, models are required to understand natural perturbations and the inherent variability of the climate. For example, recent results obtained in Germany (Bengtsson, personal communication) show that volcano emissions rich in particulate material induce a climate anomaly which may persist for some years.

2.4 The Chairman pointed out the large uncertainties that remain. The two most important he cited are the cloud-radiation feedback mechanisms and the influence of the ocean circulation, particularly as it influences the uptake of carbon dioxide and controls the timing and regional influence of climate change.

2.5 The Chairman noted some misconceptions that have arisen regarding GCOS. To dispel these impressions, he noted that:

- (1) the GCOS programme will not do everything required to understand the climate; it will work to foster new observations and data networks that could help satisfy some of the needs of the research and modelling communities;
- (2) the GCOS programme will not assume responsibility for or take over existing and effective programmes; it will, in many cases, assist these programmes in addressing climate objectives;
- (3) the GCOS programme has no ambition to compete for funds usually devoted to the R & D programmes; it is concerned principally with the development of operational activities;
- (4) the GCOS programme cannot simply include the totality of everyone's wishes; it must develop a sound and feasible plan to obtain those observations that are scientifically supportable and justifiable. There are, after all, limitations in both money and human resources.

2.6 The Chairman reviewed the tasks facing the members of the JSTC, clarifying what should be accomplished at this meeting. Noting that it will be necessary for GCOS programme to include many nations and international organizations to participate in building a coherent earth observing and forecasting system for the climate, a clear plan describing what observations are needed and how to obtain them is required. Thus, the development of an initial draft plan should be the central activity of the meeting. He suggested the basis for the draft plan would be the information provided by the task groups, the OOSDP report, and additional documents prepared by experts for discussion.

2.7 The Chairman highlighted that data -- their collection, quality assurance, transmission, assimilation, and utilization -- will be critical components of the system. The plan should include a call for the integration of surface-based and space-based data. He noted that current practices of integrating data from these disparate sources leave many opportunities for improvements such as, for example, the optimal utilization of satellite data for weather prediction. He noted that comprehensive interpretation and use of data are enormous challenges to the community, and it will be important for the system to make full use of data from levels I through III. The Chairman noted that to do so will pose a technical and an organizational challenge, and will require the establishment of an effective data management group as part of the GCOS activity.

2.8 Another important issue raised by the Chairman was the preparation for the IGM-WCP noted above. He felt it is essential that IGM-WCP be made aware of the resources needed for GCOS programme planning and for the operational enhancements that will be recommended.

2.9 To focus discussion, the Chairman proposed a three-component strategy:

- (1) To define an initial operational observational system. **Existing** operational components and those which could become operational should be identified, along with the appropriate data system;
- (2) To identify and specify the key observations which should be added to the initial system at the earliest time;
- (3) To identify future research and development activities that are likely to lead to additional operational requirements and to technological improvements in observational capability.

2.10 The Chairman suggested that during the meeting, it would be more effective to consider these issues in smaller working groups which could address four principal topics: (1) the atmosphere, (2) the ocean, (3) the land surface and ice, and (4) the data management.

2.11 The discussion that followed indicated general support for the strategy proposed. Some members expressed appreciation for the work to date, and many agreed with the emphases of the Chairman, particularly on the importance of the data system issues.

### 3. **INVITED REPORTS**

#### 3.1 **Reports of the Sponsoring Organizations**

##### 3.1.1 World Meteorological Organization (**WMO**)

3.1.1.1 Dr. Delsol, on behalf of the WMO, expressed satisfaction with the progress in developing GCOS and appreciated the clarification concerning the role of GCOS and its relation with previously existing observing organizations like the World Weather Watch and the Global Atmosphere Watch.

##### 3.1.2 Intergovernmental Oceanographic Commission (**IOC**)

3.1.2.1 Dr. Scherer reported on recent developments of IOC and on the planning for the Global Ocean Observing System (GOOS). GOOS is conceived to consist of 5 modules which are intended to share common data, means, and facilities as far as practicable: (1) Climate Monitoring, Assessment and Prediction; (2) Monitoring and Assessment of Marine Living Resources; (3) Monitoring of the Coastal Zone Environment and its Changes; (4) Assessment and Prediction of the **Health** of the Ocean; and (5) Marine Meteorological and Operational Services. GOOS will be developed on a sound scientific basis using the findings of existing, on-going research programmes including WOCE, TOGA, and JGOFS. Operational programmes including IGOSS, **IODE**, and GLOSS will form the foundation. He stated that the climate module of GOOS is similar, if not exactly identical, to the ocean component of GCOS.

3.1.2.2 The committee discussed the inter-relation of the “ocean” and the “climate” observing systems. The distinction between “identical” and “similar” appeared to be subtle. The IOC representative estimated that more than 90% of the planned observational climate components of GOOS would be the same as the oceanic components of the GCOS.

3.1.2.3 With regard to the planning activities for GOOS, he noted that a close co-operation and collaboration between the two programmes is occurring and will continue. Dr. Scherer further noted that planning is underway for the meeting of the governmental representatives on GOOS (I-GOOS) and the scientific and technical steering committee (**J-GOOS**). He assured the JSTC members that they would be kept informed as GOOS planning develops.

##### 3.1.3 United Nations Environment Programme (**UNEP**)

3.1.3.1 Dr. Gwynne addressed the JSTC on behalf of UNEP. He stated that UNEP supports the development of GCOS and had endorsed the efforts toward preparing the GCOS plan. He noted that questions remain concerning the relation between GCOS and other observing systems being discussed, citing the proposed Global Terrestrial Observing System (GTOS) as an example. GTOS is being conceived to provide observations for terrestrial ecosystem monitoring, but it would contribute substantially to the observations for the climate system. Plans for the GTOS programme include the

establishment of a planning and support office, an advisory scientific committee, and a management committee. A work plan and a resource strategy plan will be developed by these two committees.

3.1.3.2 Several intergovernmental organizations have expressed an interest in supporting GTOS. The JSTC members discussed the relations between GTOS and the academic research community, particularly the programmes of interest to ICSU. The possibility that ICSU could facilitate the interactions between GTOS and the scientific community were noted, as was the problem of the very limited funding.

#### 3.1.4 International Council of Scientific Unions (ICSU)

3.1.4.1 Dr. Morel, Director of the WCRP, addressed the Committee on behalf of ICSU. He said that ICSU welcomed and supported the creation of GCOS, but cautioned that ICSU will not be in a position to provide guidance for the “operational” activities of GCOS which, by their nature, fall outside of the scope of research. He requested that the GCOS programme avoid the potential confusion that could arise between research and operational activities. He further proposed that a list of items identifying those that are “research” and those that are “operational” would be more helpful than semantic definitions. In his view, this potential confusion exists for each of the global observing systems. He also cautioned that steps should be taken to avoid unnecessary proliferation, overlapping, or duplication. He recommended that an agreement be reached among the sponsoring organizations to define their responsibilities.

3.1.4.2 The Committee discussed further the relation between research and operational activities. It was noted that they have different objectives and different time scales, so they could be effectively differentiated. It was agreed that research observations must make important contributions to the GCOS, but that the research community must define their observation programmes on the basis of their (evolving) scientific priorities. This diversity of purposes for observations were acknowledged by the Committee.

3.1.4.3 In addition, the Chairman invited the two ICSU representatives to prepare a statement addressing their concerns. The statement submitted noted that an aim of GCOS

... is to foster and coordinate the implementation of semi-permanent observing systems that serve the needs of climate applications and support climate research.. .

and noted

... that not all information requirements for global change research programmes can or should be satisfied by GCOS observing systems...

It further called on GCOS

... to specify the nature and scope of operational or quasi-operational observing systems. . .to allow the research community to concentrate on unsolved research observing tasks. Furthermore, GCOS will assist the

global change research community in its endeavour to develop relevant global environmental research observing systems.

### 3.2 Presentation of National Plans for GCOS

#### 3.2.1 Germany

3.2.1.1 Dr. Bengtsson described the efforts in Germany. Germany has established a preliminary GCOS committee with broad participation and with a GCOS secretariat at the German Meteorological Service. Meetings have been held, and a comprehensive brochure and report are in progress for the IGM-WCP. Dr. Bengtsson noted that the major activity is in modelling and in global data centres.

#### 3.2.2 United Kingdom

**3.2.2.1** The Chairman described the efforts in the United Kingdom. A national GCOS Office has been established at the Rutherford Appleton Laboratory. It is jointly supported by several partners in the British National Space Centre, with direct funding from the Department of the Environment and from the Science and Engineering Research Council (SERC), with two further partners, the Meteorological Office and the Natural Environment Research Council (**NERC**) providing support within their own institutes. The Department of Trade and Industry is currently considering support for the Office.

**3.2.2.2** The objectives of the office are to:

- o assist in the definition and planning of GCOS,
- o inform UK policy with regard to contributions,
- o provide liaison with national and international bodies regarding GCOS,
- o assist in the integration of relevant operational and research programmes,
- o collate and disseminate information regarding GCOS.

#### 3.2.3 Japan

**3.2.3.1** Dr. Haruyama described the efforts in Japan. There, the government and research communities are recognizing the importance of GCOS. Several governmental agencies are studying the GCOS concept and possible contributions to GCOS by Japan. With respect to space-based observation systems for GCOS, the Japanese space agency prepared a report of a long-term scenario on Japan's Earth Observation Plan which will be a major component of GCOS space observation. Along with this report, National Space Development Agency of Japan (NASDA) is developing the Advanced Earth Observing Satellite (ADEOS) and the Tropical Rainfall Measuring Mission (**TRMM**) and is studying future plans.

### 3.2.4 Venezuela

**3.2.4.1** Dr. Caponi described the efforts in Venezuela. The organizations in Venezuela which have a direct interest in GCOS have agreed to coordinate their efforts through the existing National Commissions of: (1) Meteorology and Hydrology; (2) Oceanography; and (3) Climate change impacts and response strategy. These bodies, which represent both operational and research organizations, were created under the Ministry of Science and Technology to advise the Venezuelan president on their respective fields. They meet on a monthly basis and have excellent contacts between them. In January, the Meteorology and Hydrology Commission will have a workshop on Venezuela's activities related to GCOS in preparation for the IGM-WCP.

### 3.2.5 Australia

**3.2.5.1** Dr. McEwan reported on the activities in Australia, and distributed copies of a progress report outlining progress in organizing the national response to GCOS and GOOS. A workshop was held in December to permit various agencies to review the plans for GCOS and GOOS, and to develop their programmes accordingly. An Australian GCOS/GOOS Joint Working Group has been established. Dr. McEwan has been named Vice Chairman.

### 3.2.6 Nigeria

**3.2.6.1** Dr. Balogun updated the Committee on efforts in Nigeria. This year, a conference on climate, sponsored by the Nigerian Meteorological Services and the Nigerian Meteorological Society is planned in Nigeria. Among other subjects, the aims and the objectives of GCOS will be discussed. The conference should attract individuals, groups, and societies with interest in climate. Examples include the universities, the Nigerian Federal Environmental Protection Agency, the Nigerian Academy of Science, and Ministries of Water Resources and Agriculture. In the meantime, the brochure describing GCOS has been given wide circulation in Nigeria. Dr. Balogun, Director of the new Institute of Ecology and Environmental Studies at the Obafemi Awolowo University reported that it will incorporate climate studies in its programmes.

### 3.2.7 China

**3.2.7.1** Dr. Su noted that there is no formal GCOS committee in China yet, but indicated that there is an intention to establish one in the future.

## 4. CONSIDERATION OF THE GCOS PLAN

### 4.1 Reports of the Task Groups

#### 4.1.1 The Atmospheric Processes Task Group

4.1.1.1 Dr. **Bengtsson**, Chairman of the Atmospheric Processes Task Group, briefed the Committee on the task group discussions and recommendations. The group had met in Geneva from September 29 to October 2, 1992 and produced a working paper describing the atmospheric components required for climate.

4.1.1.2 The task group report identified the major objectives which, in priority order, included: (1) climate prediction of the first (deterministic) and second (stochastic) kind; (2) climate monitoring; (3) detection of climate change; and (4) observing the effects of climate change. Dr. Bengtsson noted that the task group envisaged the development of GCOS by using current systems and extensions in the near term. For the longer term, they recommended that the GCOS programme co-operate with research programmes that are conducting process studies, such as GEWEX and CLIVAR. It was noted that these programmes would undertake observational activities which could later be used as a basis for recommending observations for GCOS when appropriate.

4.1.1.3 The short-term recommendations of the task group include improving the distribution of WWW stations collecting data, establishing the TOGA Pacific observing system as an operational activity, and more widespread use of buoys and ships of opportunity. They also made recommendations concerning the use of data assimilation models for climate studies.

4.1.1.4 On the basis of the task group report, the members discussed the reasons for the task group priorities (highest priority was assigned by the task group to short-term (seasonal to inter-annual) climate prediction), but it was agreed that the task group had developed an appropriate early emphasis. The Chairman cited the societal benefits as being well established, and noted that success in the use of short-term models would facilitate development of models for longer-term prediction, and noted that understanding the strong ENSO signals were critical for interpreting climate records.

4.1.1.5 The subsequent discussion ranged from the meaning of "system" in the GCOS context, and the strategy for developing one. They discussed the relationship of GCOS to scientific programmes, the operational versus research funding implications, and considered the data systems needed. Many constructive and specific suggestions were made in the plenary meeting and were developed in the working groups which followed.

#### 4.1.2 The Atmospheric Chemistry Task Group

4.1.2.1 Dr. Whelpdale, Chairman of the Atmospheric Chemistry Task Group, briefed the Committee on the task group efforts. The task group met in Geneva October 27 to 30, 1992. He described the rationale and the strategy for measurements of constituents in the atmosphere. The task group recognized the significance of the current

programme of active global and regional sites in the GAW programme. The task group made specific proposals to improve the coverage and measurement suite, noting in addition the need for adequate data management, particularly quality assurance. In his presentation, he stressed the need for collaboration with programmes such as GAW, and participation with IGBP and WCRP activities.

4.1.2.2 Recommendations for proposed new sites for measurements included global and regional stations, and “superstations” where fundamental chemical constituents should be measured for a limited time. Many of the chemical constituents to be measured have been proposed as components of other programmes such as GAW, the International Global Atmospheric Chemistry (**IGAC**) programme of the IGBP, the Baseline Surface Radiation Network (**BSRN**) and the Stratospheric Processes and their Role in Climate (SPARC) of the WCRP, the International Global Aerosol Programme (**IGAP**), and other programmes. The group also considered the value of space-based observations as well. Recommendations of the task group stressed the enhancement of GAW stations to include aerosols, support for the BSRN and the new sites including “superstations”, and the use of satellite techniques for the stratosphere, and in the future, for the troposphere.

4.1.2.3 The task group report stimulated further discussion of many key issues in the plenary meeting including, for example, the collaboration needed between research and operational activities, the relationship between the GAW and IGAC programmes and GCOS, and the role of the surface radiation network. The Committee urged that GCOS continue to emphasize the importance of measurements of atmospheric chemical constituents. Members reiterated the need for continuing accurate measurements in selected places in order to detect possible changes in the atmospheric composition, and agreed with the recommendations for close co-operation with ongoing programmes.

#### 4.1.3 Land Surface Processes Task Group

4.1.3.1 Dr. Gurney, Chairman of the task group, presented a report on the meeting which was held in Geneva from October 13 to 16, 1992. He noted that while the group inadequately represented the ecological community, it was strong in hydrology, modelling, and terrestrial processes. The task group report identified some key terrestrial components which require systematic observations, and outlined specific criteria for selecting sites.

4.1.3.2 As with the preceding two task groups, the recommendations prompted considerable discussion. Some critical issues raised included the spatial scale of the observations, the role of space based measurements, the need for better calibrations of space based observations, the requirement for vegetative indices, the need for information to specify boundary conditions and validation for models, and finally, the data system.

#### 4.1.4 Ocean Observing System Development Panel (OOSDP)

4.1.4.1 At JSTC-I, it was agreed that the Ocean Observing System Development Panel sponsored by the Joint Scientific Committee (of WCRP) and the Committee for Climate Change in the Ocean (CCCO) (no longer in existence) could make a valuable contribution to the JSTC as it strives to develop the ocean requirements for climate. To

initiate the collaboration, several JSTC members were invited to attend meetings of the OOSDP. With JSTC representation, the OOSDP agreed to develop a draft document for JSTC-II which could serve as an interim report of the panel, and which could be extremely helpful in developing the ocean observation system for GCOS. The chairman of the OOSDP, Dr. Nowlin, discussed the work of the panel in preparing the draft for the ocean component of GCOS.

4.1.4.2 Dr. Nowlin noted that, in their deliberations, the OOSDP carefully considered the purpose for the observations, and identified the principal components needed for climate. They noted that a constantly evolving system would be necessary, since there is only a limited understanding of the ocean circulation and its role in climate at present. At the request of the JSTC, the OOSDP defined the critical observing elements and identified short- and longer-term recommendations for observations, some of which are now being done in research programmes. For the short-term, they recommended retaining the TOGA Tropical Atmosphere Ocean (TAO) array, broadening the upper ocean measurement base, and as appropriate, continuing measurements now being made under various research programmes such as WOCE and JGOFS.

4.1.4.3 The Director of WCRP voiced several concerns about the ocean component of GCOS including the "**research**"/"**operational**" funding issues and relationship of GCOS to the newly developing WCRP programmes such as CLIVAR.

## 4.2 Discussion of other Reports

### 4.2.1 The Cryosphere

4.2.1.1 Dr. Rapley provided a working paper on the cryosphere, and in the discussion of it, proposed a Global Cryosphere Observing System (**GCrOS**) to observe the ice in all its forms: sea-ice, ice-sheets, and glaciers. He noted the importance of these observations for climate, and proposed they be addressed as part of the planning for GCOS.

4.2.1.2 The Committee agreed with Dr. Rapley on the importance of ice but did not concur with his proposition to create a **GCrOS**. It was noted that sea-ice is being addressed as an ocean component, and glaciers had been discussed at the land surface task group and should continue to be part of the element. Since ice-sheets are not specifically addressed by existing groups, the Committee agreed that they should be considered in the future planning.

### 4.2.2 Space Based Observations

4.2.2.1 A review of the space-based observational components for GCOS was presented by Dr. Croom. Data from satellites will be a central element and provide a major source of information for long-term climate observations. Dr. Croom noted that the observational requirements for GCOS would include a suitable mixture of operational meteorological satellites and quasi-operational satellite missions. GCOS should also encourage research missions and the development of new instruments and concepts. He

noted that the observational needs will be served best if the GCOS programme is represented and participates in mission discussions. Consequently the GCOS programme must work closely with the major space organizations.

4.2.2.2 The Committee discussed the relationship between the GCOS planning activities and the space agencies. The Committee recommended the GCOS programme include working groups that should address the needs for climate observations, but due consideration should be given to existing working groups to avoid duplication. It was **also** recommended that an *ad hoc* working group be established to help define the overall space-based observational requirement for GCOS, and to identify gaps in current and planned programmes. Such a group could also assist with the representation of the GCOS programme within the space community.

4.2.2.3 As a result of recommendations at JSTC-I, the GCOS programme applied for and was given associate member status in the Committee on Earth Observations Satellites (CEOS). The Chairman noted the importance of the GCOS participation within CEOS and its working groups. Further co-ordination with other affiliates to produce a comprehensive list of requirements was encouraged.

#### 4.2.3 The Global Terrestrial Observing System (GTOS)

4.2.3.1 Dr. Walker, in his position as Chairman of the Scientific Steering Committee for the Global Change and Terrestrial Ecosystem (GCTE) programme of IGBP, presented a report on the proposed GTOS. He noted that it originated at a meeting to discuss "Monitoring Long-term Changes in Terrestrial Ecosystems" sponsored by the Observatoire du Sahara et du Sahel (OSS), the GCTE, and UNESCO's Man And the Biosphere programmes. The objectives of GTOS are to detect and monitor the responses of terrestrial ecosystems to global change, and to validate global models. Dr. Walker suggested that GTOS could contribute substantially to the terrestrial component of GCOS.

4.2.3.2 The Committee considered that the intergovernmental agencies (**UNEP**, UNESCO, IOC, etc.), together with ICSU, should harmonize and coordinate the various observing systems which have a climate component that could support the observing needs of GCOS. The JSTC recommended that it be represented on the appropriate GTOS committee when it has been established. The request for such representation should be presented at the next organizational meeting on GTOS scheduled for the summer.

#### 4.2.4 World Weather Watch (**WWW**)

4.2.4.1 A presentation on the World Weather Watch was provided by the Director, Dr. Rasmussen. He noted that the WWW is involved in many activities in support of **short-** and medium-range weather forecasting. However, through the analysis and application of global data assimilation systems, the WWW also provides many of the basic fields for climate diagnostics.

4.2.4.2 The Director described the organizational elements in support of WWW. He stated that the ultimate authority for WWW is the WMO Congress, now composed of representatives from the 165 or so governments. The specific oversight and guidance for

**WWW** comes from the Commission on Basic Systems (CBS) which includes government experts. Working groups of CBS set rules and govern the components of WWW: the Global Observing System (GOS); the Global Telecommunications System (GTS); and the Global Data Processing System (GDPS). These are all integrated through a Working Group on Data Management. The Secretariat at WMO supports the work of these working groups. The six Regional Associations see to the implementation in their respective areas.

4.2.4.3 The Director reported that the WWW has recently been charged to broaden its activities to address “associated activities” such as climate observations. Such tasks will become more important in WWW, and will call for the WWW to develop links to other organizations. The requirements for atmospheric observations for climate, for example, are expected to come from GCOS. The WWW is prepared to cooperate in addressing these needs.

4.2.4.4 The Committee welcomed these supportive remarks, and reiterated the importance it acknowledges for the WWW in support of the observing system for climate. Some particular strengths of WWW were noted: (1) the distributed nature of the system; (2) the role of users in driving the observations; (3) the central organization.

4.2.4.5 It was generally agreed that GCOS programme should provide a similar function for climate that the WWW provides for weather forecasting. The Committee noted that adding additional requirements for complementary observations for WWW would not be appropriate, but called for the GCOS planning to co-operate with existing WWW bodies to mutually develop the appropriate observational capability. Members **also** expressed concern that existing ocean data exchange systems, including the International Oceanographic Data Exchange (**IODE**), should be adjusted and strengthened to serve operational needs, particularly those for climate.

4.2.4.6 Members of the Committee who are familiar with the Convention that established WMO suggested that it would be advisable to consider modifying it or developing other formal structures to provide an appropriate legal framework for the expanded activities necessary for climate systems. While no specific recommendation was made, the item may need to be addressed in the future.

4.2.4.7 Noting the progress made by the WWW programme in data management, members discussed the structure for the data management system needed for GCOS. Debate focused on whether a general data system structure should be considered, or whether GCOS should proceed by categorizing data and seek specific data processing channels which would involve individual scientific institutions or research teams.

4.2.4.8 It was noted that the United States has an interagency working group on data management for global change established by the Committee on Earth and Environmental Sciences (CEES). It was further suggested that working group reports may serve as a guide for GCOS. The JSTC members from space agencies noted that they are currently devoting considerably more resources to data management, including the necessary *in situ* data, than before. They cited the high data rates, the archiving needs, and the data policy concerns as key issues at this time.

### 4.3 Working Group Assignments

4.3.1 Having tabled and discussed the various documents in plenary sessions, the Chairman suggested that the Committee divide into four smaller working groups to review and synthesize the recommendations contained in the working documents. The working groups were charged to structure their discussions to support the preparation of appropriate documentation for the IGM-WCP.

4.3.2 Groups were selected to address the atmosphere, the ocean, the land surface processes, and the data system. The Chairman instructed the groups to address inter *alia* the following items:

- o the overall strategy, addressing in particular
  - first operational system
  - key deficiencies
  - role of research and development,
  - the needs of the user communities,
- o data management issues in their respective areas,
- o the relationship with existing organizations.

## 5. GCOS IMPLEMENTATION ISSUE!3

### 5.1 The Intergovernmental Meeting on the WCP

5.1.1 With the development of appropriate IGM-WCP documentation as a goal, the working groups reported progress to the Committee in plenary sessions by presenting draft documents which were critiqued and discussed in detail by the Committee.

5.1.2 The report of the data management working group prompted considerable discussion. It was suggested that GCOS adopt a data policy statement patterned after that officially adopted by the United States. Members of the Committee were concerned that the use of data generated from systems such as GCOS not be provided for unrestricted or commercial use. While the Committee did not formally adopt the data policy suggested by the working group, this particular issue was resolved by an agreement upon the following statement:

Global environmental concerns, as reflected in the recommendations agreed at the U.N. Conference on Environment and Development, provide overriding justification for ensuring the unrestricted international exchange of GCOS data for non-commercial global climate science and application.

5.1.3 After considerable review and discussion, the resulting final drafts were provided to the JPO for incorporation into a single document, the *Draft Plan for GCOS*, for submission to the IGM-WCP in April.

## 5.2 External Coordination

5.2.1 The Committee raised fundamental questions concerning the mechanisms whereby nations may make commitments of support for the observations and data systems for GCOS. An intergovernmental mechanism was suggested to fill this need. Several examples were cited as having been effective to marshal resources in similar situations (e.g., FGGE, TOGA). The Chairman suggested that such a mechanism might be introduced, for example, at the IGM-WCP. However, it was felt that the legal framework for such a mechanism and the potential ramifications should be thoroughly explored and evaluated before such a mechanism is endorsed for GCOS.

5.2.2 Since GCOS is a comprehensive programme and relates to many different national and international programmes and activities, it is essential to develop an appropriate means to address governments for the provision of resources. The Committee charged the Chairman and the Director of the JPO to explore appropriate and effective mechanisms for this, but agreed to contribute their services as needed.

5.2.3 The responsibilities of the GCOS JPO were reviewed. They include:

- o maintaining the GCOS plan,
- o supporting the JSTC activities,
- o coordinating with operational or quasi-operational programmes related to GCOS, for example, WWW, GAW, GOOS, GTOS, and **WCP**,
- o coordinating with research programmes such as WCRP, IGBP,
- o coordinating with other groups such as CEOS.

5.2.4 It was stated that the GCOS JPO should have the overall responsibility for components of the GCOS plan. In order to ensure the effective planning and appropriate integration of **all** the components of the observing system for climate, it was recommended that sponsoring agencies consider locating those staff members who are developing components of observing systems in Geneva with the GCOS JPO. Dr. Merle has already been seconded by France, through the IOC, to the JPO. His role is to link the activities of GOOS and GCOS programmes with regard to ocean climate components,

## 5.3 Resources

5.3.1 The Chairman reviewed the resource requirements for GCOS, noting they were of two kinds: (1) support for the GCOS JPO to develop the appropriate international organization of the GCOS programme; and (2) support for the observing programmes and data activities themselves which will be recommended in the future plans. The Committee was reminded that resources may be provided through contributions by the sponsoring organizations, direct national contributions to the GCOS Trust Fund, or via secondments of appropriate scientific or technical experts.

5.3.2 It was noted that funding for the support of the JSTC meetings and activities, and for the support other organizational activities of the GCOS programme are urgently needed. The continued definition and specification of the GCOS components

requires the participation of *ad hoc* expert groups and consultants as recommended by the **JSTC**. These groups should include, in addition to technical experts in instrumentation and measurement, those data users who have experience, particularly in data assimilation into models. The groups would address detailed specifications of the instrument and data systems (including compatibility and calibration of instruments, quality control, data dissemination, and the generation of products up to level III). Wherever possible, existing bodies should be employed for this work. For the space instruments, the various space agencies should be invited to take responsibility for the organization of some of the expert groups. Nonetheless, resources must be identified to continue the planning process.

**5.3.3** The role of developing countries and the need for capacity building in these countries have been important issues for the GCOS programme since it began. At **JSTC-II** it was again recognized that, in these countries, the state of the traditional climate archives as well as current observational networks of relevance to GCOS are under considerable financial pressure. It is imperative that the GCOS programme actively encourage financial and other resources be provided to assist developing countries in protecting, maintaining, and enhancing GCOS related systems and programmes. It was suggested that Phase II of the Global Environment Fund (GEF) might consider the funding of projects to strengthen national networks in developing countries to meet observational requirements.

## **6. OTHER BUSINESS**

### 6.1 Intersessional Activities

6.1.1 The JSTC recommended the formal establishment of an executive sub-committee to provide a forum for discussing management and policy issues arising in regard to the GCOS programme. It recommended that the group consist of senior management representatives of the sponsoring organizations, the officers (Chairman, First and Second Vice Chairmen) of the JSTC, the Director of the JPO. The group should be chaired by the Chairman, JSTC. Meetings are suggested approximately once per year.

6.1.2 It was recognized that the current membership of the JSTC does not appropriately reflect the broad range of disciplines that are being considered as integral components of GCOS. In particular, the terrestrial and ecosystem communities should be more adequately represented.

6.1.3 The JSTC recommended that the membership be temporarily increased with the addition of two new members. The Chairman was requested to approach the sponsoring organizations to seek their concurrence with this recommendation.

6.1.4 The JSTC recognized the need to establish a small number of standing groups or sub-committees to address issues arising in the early planning for GCOS. The members noted the need for such groups to have appropriate representation.

6.1.5 The JSTC specifically recommended that a Sub-committee on Data to oversee GCOS plans for the generation, specification, and documentation of components of the data system should be established.

6.1.6 The JSTC charged the Chairman and Director of JPO to establish other groups as necessary.

## 6.2 Arrangements for JSTC-III

6.2.1 The Committee agreed that the next meeting be held November 1 to 3, 1993 in Abington, United Kingdom.

## **7. CLOSURE**

7.1 The Chairman closed the session at 16:00 on January 14, 1993.

\* \* \* \* \*



LIST OF PARTICIPANTS

Members of the Joint Scientific and Technical Committee

Sir John HOUGHTON (Chairman)	Rutherford Appleton Laboratory, <b>Didcot</b> , United Kingdom
Professor E.E. BALOGUN	Department of Physics, Obafemi Awolowo University, Ile-Ife, Nigeria
Dr. L. BENGTTSSON	Max <b>Planck</b> Institute for Meteorology, Hamburg, Germany
Ing. C. <b>CAPONI</b> (2nd Vice-chairman)	<b>Direccion</b> General de <b>Investigacion</b> de Agua, <b>Suelo</b> y <b>Vegetacion</b> , Caracas, Venezuela
Dr. P. GOLDSMITH	European Space Agency, Paris, France
Dr. Y. HARUYAMA	Earth Observation Programme Office, Tokyo, Japan
Dr. A. LEBEAU	M&o-France, Paris, France
Dr. A. MCEWAN	CSIRO Division of Oceanography, Hobart, Tasmania, Australia
Dr. J. MEINCKE	Institut fiir Meereskunde, <b>Universität</b> Hamburg, Hamburg, Germany

**ANNEX I, p. 2**

Dr. W.D. NOWLIN, Jr.	Department of Oceanography, Texas A & M University, College Station, Texas, U.S.A.
Dr. SU Jilan	Second Institute of Oceanography, Hangzhou, China
Dr. S.G. <b>TILFORD</b> (1 <sup>st</sup> Vice-chairman)	Earth Science and Applications Division, NASA Headquarters, Washington, DC, U.S.A.
Professor S. TSUNOGAI	Department of Chemistry, Faculty of Fisheries, Hokkaido University, Hakodate, Japan
Dr. A.A. VASILIEV	Hydrometeorological Research Centre of the Russian Federation, Moscow, Russian Federation
Dr. D.M. WHELPDALE	Atmospheric Environment Service, Downsview, Ontario, Canada

**Representatives of Sponsoring Organizations**

**W M O**

Dr. J.L. RASMUSSEN, Director, World Weather Watch Programme  
Department  
Dr. F.E. DELSOL, Director, Atmospheric Research and Environment  
Programme Department

**I O C**

Dr. J. MERLE, IOC Secondment to GCOS, c/o WMO  
Dr. W. SCHERER, Director, GOOS Support Office

I C S U

Professor P. MOREL, Director, World Climate Research Programme  
Department, WMO

Professor J. TOWNSHEND, Department of Geography, University of  
Maryland, U.S.A.

U N E P

Dr. M. GWYNNE, Assistant Executive Director, Earthwatch  
Co-ordination and Environmental Assessment

Secretariat

Dr. T. SPENCE, Director, **Joint** Planning Office for GCOS

Invited guests

G. ASRAR	National Aeronautics and Space Administration, Washington, DC, U.S.A.
D. CROOM	Rutherford Appleton Laboratory, <b>Didcot</b> , United Kingdom
R. GURNEY	University of Reading, Reading, United Kingdom
P. JULIAN	National Meteorological Center, National Oceanic and Atmospheric Administration, Washington, DC, U.S.A.
T. KARL	National Environmental Satellite Data Information Service, National Oceanic and Atmospheric Administration, Washington, DC, U.S.A.

- J.A. KNAUSS  
National Oceanic and Atmospheric  
Administration,  
Washington, DC, U.S.A.
- J.W. MAUNDER  
Canadian Climate **Centre**, Atmospheric  
Environment Service,  
Downsview, Ontario, Canada
- G. NEEDLER  
Redford Institute of Oceanography,  
Dartmouth, **Novia** Scotia, Canada
- J. NEILON  
International Activities Division,  
National Weather Service, National Oceanic  
and Atmospheric Administration,  
Washington, DC, U.S.A.
- A. PATRINOS  
Office of Energy Research, U.S. Department  
of Energy,  
Germantown, MD, U.S.A.
- D. PICK  
European Organization for the Exploitation  
of Meteorological Satellites,  
Darmstadt-Eberstadt, Germany
- K. RAO  
Office of Research, National Environmental  
Satellite Data Information Service,  
National Oceanic and Atmospheric  
Administration,  
Washington, DC, U.S.A.
- C. RAPLEY  
Mullard Space Science Laboratory,  
Department of Physics and Astronomy,  
University College London,  
Dorking, United Kingdom

- D. RODENHUIS  
Climate Analysis Center, National Weather Service, National Oceanic and Atmospheric Administration, Washington, DC, U.S.A.
- T. ROSSWALL  
International START Secretariat, Washington, DC, U.S.A.
- B. WALKER  
GCTE Core Project Office, Commonwealth Scientific and Industrial Research Organization, Lyneham, ACT, Australia
- R. WATSON  
Earth Process Studies Program Office, National Aeronautics and Space Administration, Washington, DC, U.S.A.
- W.S. WILSON  
National Ocean Service, National Oceanic and Atmospheric Administration, Silver Spring, MD, U.S.A.
- G. WITHEE  
National Environmental Satellite Data Information Service, National Oceanic and Atmospheric Administration, Washington, DC, U.S.A.

Other participants

- C. BARRET  
National Weather Service, National Oceanic and Atmospheric Administration, Silver Spring, MD, U.S.A.
- M. BRISCOE  
National Ocean Service, National Oceanic and Atmospheric Administration, Silver Spring, MD, U.S.A.

**ANNEX I, p. 6**

- M. COUGHLAN  
National Oceanic and Atmospheric  
Administration,  
Silver Spring, MD, U.S.A.
- P. CROWLEY  
U.S. Department of Energy,  
Germantown, MD, U.S.A.
- D. DYE  
Department of Geography, University  
of Maryland,  
College Park, MD, U.S.A.
- D. EVANS  
National Ocean Service, National Oceanic  
and Atmospheric Administration,  
Silver Spring, MD, U.S.A.
- N. FLEMMING  
Institute of Oceanographic Sciences,  
Godalming, United Kingdom
- R. GODIN  
U.S. Naval Observatory,  
Washington, DC, U.S.A.
- E. GROSS  
Department of Earth and Planetary Sciences,  
John Hopkins University,  
Baltimore, MD, U.S.A.
- E. ITSWEIRE  
Ocean Sciences, National Science Foundation,  
Washington, DC, U.S.A.
- D. KIRTLAND  
Geological Survey, U.S. Department of  
Interior,  
**Reston, VA, U.S.A.**
- R. LAMBERT, Jr.  
Ocean Sciences, National Science Foundation,  
Washington, DC, U.S.A.

- R. LEGECKIS  
National Environmental Satellite Data  
Information Service, National Oceanic  
and Atmospheric Administration,  
Washington, DC, U.S.A.
- L. MOODIE  
National Environmental Satellite Data  
Information Service, National Oceanic  
and Atmospheric Administration,  
Washington, DC, U.S.A.
- R. MURPHY  
National Aeronautics and Space  
Administration,  
Washington, DC, U.S.A.
- T. NELSON  
Office of Naval Observatory,  
Arlington, VA, U.S.A.
- J. PERRY  
National Academy of Sciences,  
Washington, DC, U.S.A.
- J. SHERMAN, III  
National Environmental Satellite Data  
Information Service, National Oceanic  
and Atmospheric Administration,  
Washington, DC, U.S.A.
- B. SMITH  
National Environmental Satellite Data  
Information Service, National Oceanic  
and Atmospheric Administration  
Washington, DC, U.S.A
- w. SPAETH  
Pacific Northwest Laboratories,  
U.S. Department of Energy,  
Washington, DC, U.S.A.
-

**WMO/IOC/ICSU/UNEP  
GLOBAL CLIMATE OBSERVING SYSTEM**

---

**JSTC-II/Doc. 1, Rev. 2  
(18.V. 1993)**

---

**JOINT SCIENTIFIC AND TECHNICAL COMMITTEE  
SECOND SESSION  
WASHINGTON, DC, 11-14 JANUARY 1993**

**ITEM: 1**

**AGENDA**

1. ORGANIZATION OF THE SESSION
    - 1.1 Opening of the Meeting
    - 1.2 Approval of the Agenda
    - 1.3 Intersessional Activities
  
  2. REPORT OF THE CHAIRMAN
  
  3. INVITED REPORTS
  
  4. CONSIDERATION OF THE GCOS PLAN
    - 4.1 Reports of the Task Groups
    - 4.2 Discussions of Other Reports
    - 4.3 Working Group Assignments
  
  5. GCOS IMPLEMENTATION ISSUES
    - 5.1 Intergovernmental Meeting on the WCP
    - 5.2 External Coordination
    - 5.3 Resources
  
  6. OTHER BUSINESS
    - 6.1 Intersessional Activities
    - 6.2 Arrangements for JSTC-III
  
  7. CLOSURE
-