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WORLD METEOROLOGICAL
ORGANIZATION

INTERGOVERNMENTAL
OCEANOGRAPHIC COMMISSION

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

(Hamburg, Germany, September 19-22, 1994)

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GCOS - 4

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SUMMARY OF THE SESSION

The fourth session of the JSTC was held in Hamburg, Germany from 19-22 September 1994 with 45 in attendance. The Committee received the reports of the Chairman, the Director of the Joint Planning Office, and the chairmen of the three science panels, two task groups, and one working group. During the session, several small groups reviewed the reports and plans of these subsidiary bodies, and made recommendations to the plenary session. In addition, a small group addressed opportunities to enhance national participation in GCOS, and made proposals which were adopted by the JSTC.

The chairman of the Atmospheric Observation Panel reported progress made toward defining a baseline upper-air network which is now being reviewed for implementation. At its upcoming meeting in Japan in March, the Panel will next consider surface measurements to develop a similar baseline network in concert with climatologists, and atmospheric composition measurements in cooperation with the Global Atmosphere Watch and research programmes.

The chairman of the Ocean Observation System Development Panel provided an update on the final report of the Panel to be issued at the end of the year. A joint GCOS and GOOS sponsored follow-on, the Ocean Observation Panel for Climate, was recommended by the JSTC. Its terms of reference would motivate the formulation, evaluation, and recommendation of the priority elements of the ocean observing system for climate. Liaison with the operational and research communities were stressed.

The **first** meeting of the **GCOS/GTOS** Terrestrial Observation Panel was reviewed by the chairman. The Panel developed a hierarchical framework for *in situ* and **space**-based observations. The framework of an overall plan has been established, and at the next meeting in Washington in April, the document will be reviewed. In the meantime, the JSTC recommended that hydrologic and cryospheric observational issues be addressed and incorporated into the plans.

The chairman of the Space-based Observation Task Group presented the draft plan and supportive material prepared by the group. The Committee provided suggestions for improvement of the plan, and recommended that it be published early in 1995. In addition, a number of specific projects were proposed and approved to initiate pilot activities to develop space-based observations, data, and products. The JSTC established a Space-based Observation Panel to continue the refinement of the space plan and to oversee implementation activities.

The Data System Task Group chairman similarly presented a draft plan for the data and information system for GCOS. The plan will be published early in 1995. A Data and Information Management Panel was set up to provide continuing oversight of

GCOS data activities, and to provide a mechanism for enhancing data quality, access, and associated activities via specific projects and pilot studies.

The chairman of the Working Group on **Socio-economic** Benefits reported the progress made in reviewing extant literature and developing a strategy for motivating future studies of the value of climate information including outlooks, forecasts, and advisories. The group will complete its initial report early in 1995.

National participation in GCOS was considered by a small working group at the session. It was determined that additional materials on GCOS would be of value to many of the participating countries and agencies. Specific recommendations were made to prepare plans and supportive materials for this purpose. In addition, the JSTC proposed to seek funds to establish a position for a resource mobilization expert in the **JPO** to assist countries in developing proposals for international funding. Finally, a conference for GCOS participating countries was proposed for 1997.

The fifth session of the JSTC will be held in Japan, October 16-20, 1995.

REPORT OF JSTC-IV

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), informally opened the Fourth Session of the JSTC at the Hotel Treudelberg in Hamburg, Germany on September 19, 1994. He welcomed the invited speaker, Dr. Hans von **Storch** to make a presentation on the modelling activities of the Max-Planck-Institut für Meteorologie, the host institution for the meeting.

1.1.2 Dr. von **Storch** provided an overview of a number of modelling activities of the Institute, calling attention to the scope of the activities, and the relationship of the various models to their data requirements. He illustrated his presentation with model results, and where available, validating observations. The attendees expressed their appreciation for his presentation.

1.1.3 . The Chairman formally opened the meeting at 9:00 am, September 20, 1994 and welcomed those present (See Annex I). The Chairman was pleased at the large turn-out, noting that fifteen of the members of the JSTC were in attendance. He particularly welcomed six of the seven new JSTC members to the meeting, introducing them to the participants. (Dr. Taira was at sea leading an oceanographic experiment). The Chairman also welcomed representatives of the four sponsoring organizations of GCOS, the invited guests and visitors, and invited all the attendees to provide a brief introductory remark.

1.1.4 The Chairman made note of the contributions made by the former members of the JSTC, and thanked them. He informed the group that a formal note of appreciation had been sent to Drs. Goldsmith, Lebeau, Meincke, Su, Tilford, and Tsunogai.

1.1.5 The Chairman acknowledged the new JSTC members (See Annex I), and proposed that three vice-chairmen be appointed. Dr. Bengtsson and Mr. Winokur were nominated to join Ing. **Caponi**. The JSTC unanimously approved the nominations. The Chairman also noted the addition of the four *ex officio* members who chair the various panels and working groups.

1.2 Approval of the Agenda

1.2.1 The proposed agenda for the meeting was introduced. The Chairman, noting the significance of the agenda item on Co-operation with National Programmes suggested that

it be advanced before the discussion of GCOS Implementation Issues and the Integrated Proposal. Members concurred with the change and the agenda was approved as modified (See Annex II).

1.3 Conduct of the Meeting

1.3.1 The Chairman proposed a working schedule for the meeting. The first day would be devoted to agenda items 1 through 5. On the second day, participants would be invited to consider items 5 and 6 in smaller working groups. The final day would be a plenary discussion of these and other remaining items.

1.3.2 The Chairman noted that, in addition to the lecture by Dr. von **Storch**, additional scientific presentations were scheduled on the second day from Dr. **Bennetts** on the uses of data at the Hadley Centre, and from Dr. Heimann on models of the carbon cycle.

2. **REPORT OF THE CHAIRMAN**

2.1 The Chairman invited Dr. **Spence**, the Director of the Joint Planning Office (JPO) to present a report of activities since the last JSTC meeting. At JSTC-III, a number of panels and working groups were recommended. The Director reviewed the progress of the five subsidiary bodies which had been established. He noted that **all** five had met, and that reports of their meetings and of their chairmen had been tabled for discussion during this JSTC session. He reviewed the other documentation for the session, and commented on progress with publication of many of the reports and plans. Finally, he briefly reviewed related activities of the JPO staff, including attendance at numerous meetings and frequent presentations on GCOS. He thanked the members of the JSTC and others who had attended meetings and workshops on behalf of GCOS. Additional details may be found in Annex III.

2.2 The Chairman of the JSTC presented his report to the members and invitees. He noted that Working Group I of the Intergovernmental Panel on Climate Change (**IPCC**) had just met to discuss its upcoming report which will be a substantive input to the first Conference of the Parties (COP) to meet in Berlin in April 1996. He noted that observations are urgently needed to provide input for models, particularly for analysis and prediction, as **well** as impacts of climate change.

2.3 He reiterated the challenge of the JSTC to develop a sound long-range plan, but also to provide a near-term response to the needs for observations, data management, and data access for researchers, governments, and other organizations. He reminded the participants of the urgency to develop specific activities and initiate them.

2.4 He noted that the agenda would have reports of several panels and task groups, and observed that these contain elements which must be advanced from concepts to practical actions. In particular, he noted that both the task groups on space-based observations and on data systems had drafted conceptual plans. He urged that the groups provide further specific inputs to the plans, and publish them at the earliest opportunity. The Chairman

noted that the plans have defined specific tasks, but that it is essential to identify: (1) who will do these tasks; and (2) where and how they will be accomplished.

2.5 The Chairman noted that a key agenda item would be the question of co-operation with national programmes. As at JSTC-III, he observed that national response to GCOS has not been adequate to date. He observed that this may be due to a lack of understanding of GCOS in many participating countries. He urged the JSTC to assist in providing more useful information about GCOS, and more realistic estimates about its resource requirements. However, he noted the continuing difficulty in communicating effectively to the various countries, due in part to the multidisciplinary nature of climate, and the variety of national organizations and agencies which have responsibility for climate issues.

2.6 He urged the participants to develop a more effective strategy for involving nations in the programme during the session. He specifically invited the group to consider how to develop points of contact and/or committees for GCOS, and to identify appropriate agencies and individuals in the various countries which will participate in the GCOS programme.

2.7 The Chairman noted that many countries are now organizing their responses to GCOS, and that approaches taken in some of these countries could be used as a paradigm for others. He proposed that a working group at the meeting focus on developing a suite of materials aimed at those countries which may be major participants in GCOS, and a suite aimed at those countries which will require additional assistance in the establishment of GCOS points of contact and/or committees, and especially those requiring assistance in developing their observational and data management activities.

2.8 The Chairman reminded the Committee that one mechanism of importance to GCOS is the Integrated Proposal, now being prepared for submission to the World Climate Programme sponsor organizations at their next major international congresses or council meetings. He noted that the thrust, Dedicated Observations for Climate, offers an opportunity to describe the GCOS programme, its plans, and its resource requirements.

2.9 Finally, the Chairman restated the opportunity provided by the Climate Convention to publicize the role of GCOS in obtaining required observations, and to obtain **additional** support for the GCOS programme.

2.10 The Chairman then invited discussion concerning his report or that of the **JPO** Director. In response, there was considerable discussion, focused mainly on presenting the most effective case for GCOS. Some members urged that potential benefits deriving from GCOS be made more explicit in the various GCOS documents. One member reminded the colleagues of the upcoming WMO Congress and other sponsoring organization meetings. He noted that specific recommendations should be put forward at such meetings.

3. **INVITED REPORTS**

3.1 Reports from Sponsoring Organizations

3.1.1 The representative of the World Meteorological Organization (**WMO**), Dr. Delsol, Director of the Atmospheric Research and Environment Programme (**AREP**) Department, informed the meeting of recent events at WMO concerning GCOS.

3.1.2 Dr. Delsol confined his remarks to the latest Executive Council (EC) meeting at which the JSTC Chairman made a progress report. Citing the report of the EC, Dr. Delsol reported that the Council was pleased to learn of the GCOS progress, approved the strategy of the JSTC to plan and develop the programme, and expressed support for future GCOS activities. The EC agreed with the statement of GCOS priorities, and supported the proposal of the Initial Operational System (**IOS**) to ensure the observational needs are met. In keeping with the GCOS strategy, the EC recommended that observational components already contributing to the GCOS needs be identified clearly as essential elements of the **IOS**.

3.1.3 Dr. Delsol did note the EC concern that Members of WMO be more closely linked with GCOS. In this context, the EC requested the Secretary General to contact the various governments to recommend that, if they had not yet done so, they name points of contact and/or committees to develop national responses to GCOS. On the other hand, the EC requested that the GCOS programme prepare documents with more specific guidance for national participation.

3.1.4 The Intergovernmental Oceanographic Commission (**IOC**) was represented by Dr. Scherer, the Director of the Global Ocean Observing System (GOOS) Support Office. He first noted that a close interaction among the global observing systems (GOOS, Global Terrestrial Observing System (GTOS)) is essential. He urged that the systems particularly co-ordinate their activities on data management and space requirements.

3.1.5 Dr. Scherer then discussed the recent developments with GOOS, and in particular, recalled the second intergovernmental meeting of the I-GOOS in Melbourne at which an internal structure for GOOS was discussed. He reported that the JSTC proposal, to utilize GOOS as a primary avenue for ocean observation implementation, was referred to a Technical Implementation Panel of I-GOOS, not yet established, for consideration and implementation (See Annex IV).

3.1.6 Dr. Scherer also discussed the first meeting of the Joint Scientific and Technical Committee for GOOS (J-GOOS) in France which was chaired by Dr. **McEwan**. He also informed the meeting about the IOC Executive Council meeting at which GCOS and GOOS were discussed.

3.1.7 Anticipating an upcoming agenda item concerning the future of the Ocean Observation System Development Panel (OOSDP), Dr. Scherer noted that the J-GOOS will review the OOSDP report due to be published at the end of the year, and looked for close co-operation between J-GOOS and the JSTC in the establishment of a follow-on panel. With the next J-GOOS meeting planned for February 1995, the JSTC should prepare its recommendations (See sections 4.4 and 6.4).

3.1.8 The representative of the International Council of Scientific Unions (ICSU), Dr. Townshend, urged that there be additional communication between GCOS and the World Climate Research Programme (**WCRP**) and the International Geosphere-Biosphere Programme (**IGBP**).

3.1.9 He noted several recent discussions concerning data restrictions had occurred, and recommended that the JSTC take a strong position which would foster widespread data availability and access.

3.1.10 Dr. Townshend observed that several potentially important areas such as the cryosphere, hydrosphere, and coasts (for impacts, especially) are not yet receiving adequate attention in GCOS. However, as Chairman of the GCOS/GTOS Terrestrial Observation Panel (TOP), he agreed to address the two former issues and incorporate appropriate elements in the terrestrial plan now being developed.

3.1.11 The United Nations Environment Programme (**UNEP**) representative, Mr. Alusa, updated the members on the support for GCOS in the UNEP. He recalled that the climate activities in UNEP had been reduced at the last Governing Council meeting, but expressed the hope that adequate financial support would be available to assist GCOS planning and development.

3.1.12 Mr. Alusa noted that GCOS should emphasize the way it will make contributions to such societal issues as the human dimensions of climate change, environmental impacts, and sustainable development. Regarding the need for national points of contact, he suggested that closer contacts be made with the national climate committees, and further that subcommittees to address GCOS be considered.

4. **GCOS PLANNING**

The JSTC Chairman invited the chairmen of the various panels and task groups to provide brief reports on their recent activities, to be followed by focused plenary discussion on the issues arising. He proposed that small working groups would be commissioned to develop specific actions to be considered in plenary later in the meeting.

4.1 Report of the GCOS Space-based Observation Task **Group**

4.1.1 The Chairman of the Task Group, Dr. Ryder, introduced the documents arising from the work of the Space-based Observation Task Group. He reviewed the conclusions contained in his report, the report of the first meeting of the Task Group, and the draft of a Space Plan with annexes.

4.1.2 The Chairman stressed that the Task Group took care not to anticipate the outcome of the science panels, and not to develop independent priorities. However, the Task Group did address the various topical areas for which space-based observations may be essential. Considerable progress was made by defining a suite of "GCOS Missions" -- a set of seven key areas which permit a comprehensive evaluation of observational requirements, agency missions, and the compliance between the two.

4.1.3 Dr. Ryder presented the overall recommendations of the Task Group, and in particular that the JSTC establish a standing Space-based Observation Panel (SOP). He invited discussion from the attendees. In response, members first expressed their pleasure with the progress made by the Task Group, and agreed that a coherent plan was rapidly emerging. Members thought that several concepts and definitions advanced by the Task Group (e.g., compliant, operational) would be helpful. In addition, some members noted that a few specific proposals (e.g., for intercomparison of instruments to guide rational instrument selection) would be very beneficial to space agencies.

4.1.4 Members raised other particular issues:

- o Although the documents present valuable reference material, ways must be found to use the information to make an effective international system;
- o Some duplication of effort may be implicit in the variety of sensors. Steps should be taken to evaluate the synergy among components;
- o Some developing countries may experience problems in using satellite based observations: (1) the costs for participation or to receive data, or (2) lack of expertise to take advantage of the information;
- o Some higher level products are required, but agencies may be planning to stop short of producing such products;
- o Many historic data sets have not been properly exploited to date. It would be useful to urge additional research be undertaken to more fully exploit such satellite data sets.

4.1.5 The Committee appreciated the report of the Chairman of the Task Group, and recommended that a standing panel be established to continue the development of the space plan.

4.2 **Report of the GCOS Data System Task Group**

4.2.1 The Chairman of the Task Group, Mr. Withee, presented a brief report of the work of the Data System Task Group noting that the data system will be the link among the various GCOS elements, and will be a mechanism for bringing the system together. He pointed out that the first meeting included a wide spectrum of experts and representatives.

4.2.2 The Task Group Chairman noted several central themes from the work of the Task Group: (1) emphasis on a full and open data sharing policy with widespread access; (2) need to base the data system on existing activities and functioning systems; (3) use of emerging new techniques (e.g., client-server systems, distributed data base systems) and new technologies (e.g., communications systems); and (4) need for a commonality among the observing systems to maximize flexibility and utility.

4.2.3 Mr. Withee briefly described the Data Management Plan, including its vision and strategy. He informed the participants that the Plan was a comprehensive one, and

addressed data system design including quality control, data assimilation, archival, documentation, access and distribution, communications, and standards. He concluded by proposing a standing Data Management Panel, and proposed a **5-year** work plan, requesting input from the JSTC on these items.

4.2.4 Participants were pleased at the progress made in developing a Data Management Plan, and complimented Mr. Withee and Dr. **McGuirk**. The members agreed that GCOS can make a major contribution by taking advantage of the technological opportunities to assist in meeting user needs.

4.2.5 The JSTC agreed that the data system should be designed primarily to meet the needs for climate data, but should be developed with a suitably open architecture to accommodate, to the degree possible, the needs of other global observing systems. It was recommended that future meetings on these topics include members of the GOOS and GTOS planning committees to ensure a common interlinked system results.

4.2.6 Some members raised **particular** issues:

- o Proposed space agency plans include large data management components, and are *relying* on pilot studies to develop effective data systems. GCOS should consider similar pilot studies to permit systematic evolution;
- o The Plan emphasizes the availability of data for those who develop products. More attention should focus on the end-users of climate data before implementing agencies commit to system designs;
- o Many scientists develop data sets for particular purpose;, then may move on. GCOS should try to recover such data for further use, and encourage scientists to share their information more widely;
- o A valuable contribution from GCOS will be in the integration of data sets from disparate sources to develop products for common benefit.

4.2.7 The Committee reiterated its support for the work of the Task Group, and encouraged the formation of a standing panel to continue the development of a comprehensive data management system.

4.3 Report of the Atmospheric Observation Panel

4.3.1 The Chairman of the Atmospheric Observation Panel (AOP), Dr. Bengtsson, reviewed the outcome of the first session of the AOP. The Panel considered the various needs for GCOS atmospheric data to provide a structure to evaluate requirements and the effectiveness of current systems to meet them. Six categories were identified: (1) data to characterize the 3-D state of the atmosphere including second order moments, vertical fluxes of heat, moisture, momentum and related dynamical quantities; (2) data to determine the state of the surface of the earth (e.g., sea surface temperature (SST), soil moisture, vegetation, albedo, roughness, snow cover, ice, etc.); (3) data for the determination of clouds and for radiation fluxes at the surface and the top of the atmosphere; (4) data on

atmospheric composition; (5) data for process studies; and (6) data for long-term monitoring. Item (5) was acknowledged to be the purview of the research programmes.

4.3.2 Dr. Bengtsson noted that, in addition to the observations needed for numerical weather prediction, these requirements call for:

- 1) a homogeneously distributed upper-air baseline network;
- 2) a surface baseline network of SYNOP stations;
- 3) a baseline network for atmospheric composition;
- 4) satellite observations of temperature and moisture;
- 5) global observations of the essential surface parameters.

He noted that the integration of these observations must be through a Climate Data Assimilation System (CDAS) which should be developed with urgency.

4.3.3 The AOP Chairman informed the participants that item 1) has been proposed to the appropriate WMO subsidiary bodies; item 2) will be prepared in conjunction with a Working Group of the Commission for Climatology; item 3) will be developed in co-operation with the Global Atmosphere Watch and other atmospheric composition programmes (e.g., International Global Atmospheric Chemistry programme). Elements of items 4) and 5) will be developed in concert with the SOP and the GCOS/GTOS Terrestrial Observation Panel (TOP).

4.3.4 To conclude, Dr. Bengtsson outlined future activities for the AOP. He noted **first** that **Dr. Karl** has organized a meeting on "Documenting and Detecting Long-term Climate Change: Monitoring Requirements for GCOS" in Asheville; second, the next AOP meeting is scheduled for March 1994 immediately following an International Symposium on Assimilation of Observations in Meteorology and Oceanography in Japan; third, that a workshop on global chemistry modelling will be organized for late next year; and finally, that he will organize a meeting of climate modellers to identify observational priorities from that perspective in early 1996.

4.3.5 Dr. Vasiliev, President of the Commission for Basic Systems of WMO, informed the group that CBS had recently enlarged its terms of reference, and added provisions which will permit the CBS to meet observational and data management requirements of GCOS. At its extraordinary session in August, CBS considered item 1. It was also noted that the network was discussed at two Regional Association (RA) meetings, and that Dr. Balogun and the Director, JPO would be available to discuss the network at the WMO RA I meeting in Africa this fall.

4.3.6 The Committee was pleased to see the progress made by the AOP, particularly with regard to the upper-air network, and specific plans for the future. It encouraged the Panel to develop similar networks for the surface observations and for chemical constituents.

It particularly supported the series of scientific meetings such as the one organized by Dr. Karl and those suggested by the AOP Chairman.

4.4 Report of the Ocean Observation System Development Panel

4.4.1 The Chairman of OOSDP, Dr. Nowlin, provided a brief update on the progress of the Panel. The Panel has scheduled its final meeting in October 1994. In response to comments received from the reviewers of the most recent draft version, it is expected that the final meeting will emphasize data for models, emerging technologies, and sharpening of priorities. The Panel will submit its final report at the end of the year.

4.4.2 In addition to the **final** report, members of the OOSDP have recently published in-depth reports on key areas associated with the role of the ocean in climate. Dr. Nowlin noted that five additional reports are being finalized for publication in the next few months.

4.4.3 Dr. Nowlin identified some subsequent steps to be taken: (1) incorporate the principal recommendations into the GCOS and GOOS plans; (2) form a follow-on body to continue to refine and develop requirements; (3) develop an inventory of existing components and data; and (4) develop cost estimates.

4.4.4 As a preview, the OOSDP Chairman suggested the highest priorities would be for El **Nino/Southern** Oscillation (**ENSO**) observations, measurements for sea-level change, *in situ* observations for global SST, improvements in global air-sea flux fields, selected long-term measurements now emerging from research programmes, and requirements to advance model development.

4.4.5 Participants expressed appreciation of the efforts of the Chairman and members of the OOSDP in developing a comprehensive design for ocean observations needed for climate. Members noted that, in addition to the final report, several in-depth studies had already been published and were being widely cited. The members looked forward to the publications now being prepared for publication in the next few months.

4.5 Report of the GCOS/GTOS Terrestrial Observation Panel

4.5.1 Dr. Townshend, Chairman of the GCOS/GTOS TOP, Dr. Townshend, reviewed the results of the first meeting. He noted that the Panel identified as a high priority the need to develop a balanced integrated system of ground-based and satellite-based terrestrial-observations to **fulfil** the goals of GCOS and GTOS.

4.5.2 The Panel initiated a review of the needs of various modelling activities, and recognized they had a wide spectrum of observational requirements in terms of spatial and temporal resolution and accuracy. Consequently, no single set of observations or single sampling strategy will likely meet all needs. The Panel plans to continue its review of model requirements in subsequent sessions.

4.5.3 In terms of *in situ* observations, the Panel recognized the extensive amount of data currently being collected throughout the world, but were concerned by the absence of an overall strategy regarding sampling and definition of the observations that need to be

made. As a result, the Panel developed and proposed a hierarchical system for the collection of surface observations. The system is characterized by four levels of increasing intensity and sophistication of observations with a concomitant decline in the number of sites required at each level. Level IV, for example, requires about 10,000 sites with simple observations; level I, 10 to 50 sites with sophisticated observations. The Panel determined that the surface programme would be primarily the responsibility of GTOS, in consultation with GCOS. The Panel agreed that the surface system should take maximum advantage of existing facilities while ensuring a representative set of Barth's surface properties. It was recognized that capacity building would be required, particularly in developing countries.

4.5.4 The TOP Chairman also reviewed the needs for fine and coarse resolution data from remote sensing systems. He noted that data resulting from some systems have substantive limitations due to factors such as acquisition strategies, pricing policies, and changing overpass times of satellites. The Panel also recommended a reduction in the diversity of formats for remotely sensed data.

4.5.5 The Committee appreciated the report of the TOP Chairman, and encouraged the further development of a plan for terrestrial observations.

4.6 Report of the GCOS socioeconomic Benefit Working Group

4.6.1 The Chairman of the Working Group, Dr. Briscoe, provided a brief report of the **first** meeting held in August 1994. He noted that a full report of the Working Group was being prepared, and would be available early in 1995.

4.6.2 He informed the participants that a preliminary report of the Working Group activities was simultaneously being presented at the Conference on the Economic Benefits of Meteorological and Hydrological Services in Geneva by Dr. Maunder, a member of the Working Group.

4.6.3 In reviewing the meeting of the Working Group, Dr. Briscoe noted two background points which arose:

- o Evaluations of benefits should consider planners and policy makers, as well as science users and end-users in various economic sectors;
- o Even perfect climate forecasts have no value if they are not used. Thus, it is as important to understand how users respond to forecasts as to achieve credible forecast capability.

4.6.4 Based on its findings during its meeting, the Working Group made recommendations in five areas: (1) analysis of value; (2) method refinement; (3) protocol definition; (4) monitoring and reporting; and (5) future continuation.

4.6.5 Dr. Briscoe provided a brief **precis** of these points:

- 1) studies analysing value of seasonal-to-interannual forecasts should be performed for several sectors (principally agriculture) and geographical regions;
- 2) better methodologies are needed to estimate the value of a climate observing system for multi-year climate variability and change, and for societal impacts not easily quantified;
- 3) a set of guiding principles would permit different groups to compare results;
- 4) responses to new forecast products (e.g., US Climate Analysis Center **long-lead time outlook**) should be studied to provide information about user's responses;
- 5) the Working Group, supplemented by outside expertise and with appropriate liaison (e.g., Organisation for Economic Co-operation and Development (OECD)), should continue.

4.6.6 The Committee appreciated the report of the Working Group Chairman and the efforts of the Working Group. Members were particularly supportive of the need for guiding principles to estimate the value of forecasts and the observations on which they are based. One member expressed concern about the focus on seasonal-to-interannual periods, while another was concerned that the Working Group members were not themselves going to do studies, but rather were simply urging that they be done. Dr. Briscoe pointed out that some members of the Working Group would indeed make contributions in their particular areas of expertise, although that is not the primary purpose of the Working Group.

4.6.7 The JSTC agreed that the Working Group should continue as proposed, and that the resulting Working Group report be published as a GCOS document when completed.

5. CO-OPERATION WITH NATIONAL PROGRAMMES

5.1 National Co-operation

5.1.1 The JSTC Chairman invited Vice-chairman **Caponi** to present the paper he prepared on "Encouraging National Participation in GCOS". Mr. **Caponi** noted that since its initial meeting, the JSTC has been concerned about national participation in GCOS. He urged the participants to consider developing a specific plan to address this issue.

5.1.2 Mr. **Caponi** noted that GCOS is an interdisciplinary programme addressing a variety of issues which are often not the remit of a single government agency. Although overtures to countries have been made, the response has not been encouraging for the reason cited. In reviewing these earlier attempts, Mr. **Caponi** stressed that a more comprehensive approach must be taken.

5.1.3 He identified the principal tasks for this session: (1) develop a list of materials about GCOS which could be used by countries to assist them in participating, and (2) identify

mechanisms to effectively distribute materials to appropriate individuals and agencies in the participating countries.

5.1.4 Mr. **Caponi** illustrated the sorts of material which could be beneficial, and proposed specific items be prepared for widespread distribution. However, due to the differing responses of developed and developing countries, he proposed that the JSTC consider making use of national responses in developed countries as illustrative examples. These may serve as examples for others to follow. For developing countries, he offered a proposal to establish a resource co-ordinator position in the JPO to assist developing countries in participating in GCOS.

5.1.5 The JSTC appreciated Mr. **Caponi's** document, agreed with his views, and welcomed his proposals. The Chairman suggested that a small working group be established to refine some specific proposals for consideration in plenary.

5.2 Reports of National Activities

5.2.1 In the context of national participation, the Chairman invited members of the JSTC to provide reports of recent GCOS activities in their countries. Written reports were submitted by a number of JSTC members, and are included as Annex V.

5.2.2 Mr. Winokur provided a brief review of activities now being organized in the U.S. He described a newly established federal structure which has been designed to address national programmes related to the environment and natural resources. A Task Group has been developed to co-ordinate observations and data management for these programmes. Mr. Winokur noted that he is the vice-chairman of the Task Group and Dr. Kennel, the chairman. Mr. Winokur shared the mission statement of the Task Group. It will permit the Task Group to be the U.S. focal point for GCOS and the other global observing systems, and will be the vehicle for co-ordination with GCOS through a secretariat to be established in Washington. Mr. Winokur noted that the JPO Director recently briefed the Task Group and provided useful information on GCOS progress and plans.

5.2.3 Dr. Nowlin reported that the U.S. National Academy of Science has recently reviewed the GOOS programme, and had recommended a forum for development and co-ordination of ocean observations.

5.2.4 Mr. Haruyama reported that progress has been made on GCOS in Japan. He noted that a meeting of 20 experts had recently occurred, and that government agencies are developing joint responses to the needs of GCOS and the other observing systems. He noted in particular that GCOS will be scheduling meetings in Japan during 1995, and suggested that the meetings would provide opportunities for a closer interaction between the Japanese science community and government agencies and GCOS.

5.2.5 Dr. Whelpdale provided a brief comment on the Canadian national activity regarding GCOS. He observed that an *ad hoc* Task Group was established, and was preparing a report for policy makers. It will assist in guiding the Canadian involvement in GCOS.

5.2.6 Other JSTC members commented briefly on progress in their countries, but conceded that the establishment and implementation of the global observing programmes will take considerable organizational efforts in governments.

5.2.7 The Chairman and the Committee were pleased to learn of these national activities, and acknowledged the value of an integrated response to the global observing systems by governments.

6. GCOS IMPLEMENTATION ISSUES

The JSTC Chairman invited the participants to separate into three smaller working groups to address the three principal agenda items: (1) the Space-based Observation Plan; (2) the Data Management Plan; and (3) the Cooperation with National Programmes. Following these sessions, he invited the participants to work in small groups to consider three additional items and to provide specific guidance for: (1) the future activities of the Atmospheric Observation Panel; (2) the future activities of the **GCOS/GTOS** Terrestrial Observation Panel; and (3) the future developments of an Ocean Observation Panel for Climate. Each of the groups was provided with terms of reference and was invited to develop recommendations for consideration in plenary.

6.1 Space Issues

6.1.1 Dr. Ryder chaired a small working group to consider space-based observation issues. The group addressed the draft Space Plan, the establishment of a Space-based Observation Panel, including its terms of reference and suggested membership, and co-ordination with other GCOS Panels and external groups. Based on their deliberations, the working group proposed a suite of actions to be endorsed by the JSTC. In particular, the group recommended modification and improvement of certain elements of the space plan including:

- o** Updating the Plan with input from the **GCOS/GTOS** Terrestrial Observation Panel and from the OOSDP on ocean requirements (October 1994);
- o** Defining the strategy for acquisition of high-resolution surface observations (**Landsat/SPOT/JERS** type) by October 1994;
- o** Providing further explanations of the criteria for classification of instruments;
- o** Updating the time-line diagrams of agency plans;
- o** Adding a section on the value added by the GCOS process;
- o** Adding information to several annexes of the plan,
- o** Revising the Executive Summary;

- o Publishing Version 1.0 of the Plan in both hard copy and electronically (e.g., Internet • World Wide Web) early in 1995.

6.1.2 The working group accepted and forwarded the recommendation of the **Space-based Observation Task Group** for a standing panel to be established. The working group reviewed the terms of reference, suggested membership, and identified significant agenda items for the **first** meeting scheduled for mid-1995 (See Annex VI). The working group felt the Panel should particularly consider issues associated with data continuity. Other agenda items should include:

- 1) developing one or more measurement case studies to illuminate long-term consistency problems (e.g., by taking one measurement and analysing it on an instrument-by-instrument basis);
- 2) investigating problems relating to data availability using pilot studies which could be used in other contexts (e.g., Along Track Scanning Radiometer (ATSR) data products);
- 3) focusing on the requirements for a specific scientific area (e.g., aerosols);
- 4) making revisions to the Space Plan for Version 1.1.

6.1.3 The working group made specific recommendations concerning co-ordination. It recommended that the NASDA sponsored User Survey be submitted to the next meetings of the GCOS science panels as a working document. Feedback should then be subsequently incorporated into Version 1.1 of Space Plan.

6.1.4 The working group developed a detailed work plan for the next year including publication schedules, meetings, and opportunities to publicize the space requirements. By spring 1995, the work plan called for:

completion and publication of Version 1.0 of the Space Plan by early 1995;

identification of examples that serve to optimize existing space-based data sets by spring 1995;

identifying necessary stages to ensure data and products are prepared and available for climate users (eg, ATSR) by spring 1995;

In addition to the items noted above, the work plan proposed that GCOS sponsor a conference on space-based climate measurements for mid-1996, and a conference on **space-based** climate measurements for the fourth quarter of 1996.

6.1.5 The working group addressed capacity building, and suggested that the SOP develop an approach to provide advice to agencies/countries on priorities (including training) that arise from GCOS space activities. Continued participation of representatives from developing countries was urged. They also recommended that active participation in the Committee on Earth Observation Satellites (CEOS) and its working groups be continued.

The Director of EUMETSAT provided relevant material concerning their programmes and status, and offered to continue their close collaboration with the SOP in developing the **GCOS** space plan and in implementing activity of mutual interest.

6.1.6 Noting that the SOP would base its findings and recommendations on the science foundation provided by the science/design panels, the recommendations from this working group were discussed in plenary. Members reiterated the view that the SOP should base its findings and recommendations on the science foundation provided by the science panels. The recommendations of the working group were endorsed and fully supported by the JSTC.

6.2 Data Issues

6.2.1 Mr. Withee chaired a small working group to consider data management issues. The group addressed the draft Data Management Plan, recommended the establishment of a standing GCOS Data and Information Management Panel @IMP), considered its terms of reference and membership, and called for co-ordination with other GCOS Panels and external groups. The group considered that the GCOS Data and Information System should be developed to be a common system that would accommodate the data from the climate modules of GOOS, GTOS, and appropriate elements of WWW and GAW. GCOS should adjust the design of the system to accommodate the special needs of these other modules. Non-climate programmes could adopt the GCOS data system architecture to ease the development of their own distributed systems and provide users with a common data and information system.

6.2.2 The working group proposed a suite of actions to be endorsed by the JSTC as a result of their deliberations. Regarding the draft plan, they suggested:

- Clarifying the relationship between GCOS, GOOS, and GTOS data management activities, emphasizing that the climate portions of GOOS and GTOS data management plans should be developed in common with GCOS;
- Providing more focus on distribution and/or access to products including material on inventories and data descriptions;
- Developing a process for labelling “GCOS” products;
- Adding a discussion on slightly different approach to data levels -- historical, near-real time, research, and analyses/simulations/forecasts;
- Annexing a list of potential participating centres and a description of proposed pilot projects;
- Reviewing and revising the five-year action plan to reflect near-term planning;
- Publishing Version 1 .0 of the Plan in both hard copy and electronically (e.g., Internet • World Wide Web) by early 1995;

6.2.3 Regarding the terms of reference for the DIMP, the working group recommended including a statement on the relationships between WWW, GOOS, GTOS , and GCOS. It also suggested that GOOS, GTOS, and **WWW** send representatives to the Panel.

6.2.4 The working group was concerned that adequate scientific input be provided to the DMP and requested that the science panels suggest valuable science-based projects which would use climate data sets that are being assembled. They further invited the science panels to each identify one or two experts as members of the **DIMP**. Finally, they requested that the science panels provide guidelines and/or criteria for selecting climate data sets to begin construction of an inventory of data sets.

6.2.5 Some specific recommendations from the working group were discussed in plenary and included the following activities:

- o Encouraging countries to contribute resources and/or staff to JPO to address data issues (Withee; Feb 1995);
- o Prototyping GCOS distributed system based on MOSAIC and World Wide Web including at least 3 centres (Koltermann, Withee, JPO; Feb 1995);
- o Develop system to assist developing countries establish and maintain a climate analysis capability (Bengtsson; Feb 1995);
- o Produce first version of inventory for GCOS data sets and products selected on the basis of science panel criteria (**Oct** 1995);
- o Publish inventory on suitable media (diskette, CD-ROM, etc.) with access and display software (**Dec** 1995);
- o Design and implement prototype architecture for a distributed GCOS data, product, and GCOS centre directory to include at least 3 countries (Withee; **Oct** 1995).

6.2.6 The Committee expressed support for these activities.

6.3 **Atmospheric Implementation Issues**

6.3.1 Dr. Bengtsson chaired a small working group to review the report of the AOP and to make recommendations to plenary. The group proposed a series of recommendations:

- o Atmospheric Data Requirements

The working group suggested that requirements be reviewed particularly with respect to priority and accuracy following the outcome of the Asheville workshop on "Documenting and Detecting Long-term Climate Change" to be held January 9 - 11. The working group recognized that the data requirements depend on the particular climate issue at hand, and that ENSO prediction, climate change studies, and carbon

cycle investigations all had different observational requirements which must be properly accounted for within GCOS. Members pointed out the important **socio-economical** aspects of extreme meteorological events such as tropical storms, and that the data requirements should reflect these aspects.

Data from the World Weather Watch (**WWW**) play an important role in GCOS, since meteorological observations constitute a cornerstone for climate **modelling** and research. Regrettably, important data concerning the state of earth's surface (e.g., snow, ice and soil moisture) are not effectively exchanged. The group requested that the WMO, via the Commission for Basic Systems (CBS), take appropriate action so that these data could be added to the list of meteorological data regularly exchanged. In the longer term it was suggested that GCOS explore the possibility of using WWW telecommunication networks to exchange GCOS data in general, or at least such data which is required for climate prediction.

o Climate data sets

The working group endorsed the AOP recommendation to establish specific baselines for upper-air, surface data and atmospheric composition, respectively. The upper-air baseline network has been discussed by CBS and is being considered by WMO Members. With respect to the surface network, it was noted that certain parameters such as precipitation require special attention. It was proposed that the Global Precipitation Climatology Centre (GPCC) (originally established by WCRP) become a permanent activity of GCOS. Observations of snow, ice, and soil moisture should be considered for inclusion by the GPCC.

o Climate data assimilation

Level III data sets resulting from operational NWP are playing important roles in climate studies. Of particular importance are the reanalysis activities presently under way at a few institutes (e.g., European Center for Medium-range Weather Forecasting (**ECMWF**) and the U.S. Numerical Meteorological Center (NMC)). These data sets are presently restricted to the atmosphere using observed SST data as boundary conditions. It is strongly recommended that data assimilation be extended to coupled ocean/atmosphere/land models. Actions should be taken to encourage the development of a Climate Data Assimilation System (CDAS) with high priority.

o . TOGA network

As ENSO prediction becomes operational it will be necessary to establish the TOGA network on an operational basis under the GCOS and GOOS auspices.

o Atmospheric chemistry

The working group considered the data requirements for atmospheric composition as presented in the report of the GCOS Atmospheric Observation Panel and agreed that some important aspects were not adequately covered. The group proposed to ask two experts to prepare (lo-page) position papers on:

the coordination between existing monitoring networks, namely GAW, the stratospheric detection change programme, and different long-term duration observation programmes set-up by the scientific community;

the atmospheric chemistry model requirements.

Based on those two documents a workshop should be convened to harmonize the different points of view and provide the final GCOS atmospheric chemistry data requirement, particularly from modelling point of view (fall 1995).

6.3.2 The working group considered future activities and developed a timetable:

“Documenting and Detecting Long-Term Climate Change: Monitoring Requirements for GCOS; Asheville, N.C. (Jan 1995);

Surface Reference Baseline Network; meeting with Commission for Climatology Working Group (Jan 1995);

Next AOP meeting in Tokyo at Japan Meteorological Agency (Mar 1995);

Workshop on global chemistry modelling (fall 1995);

Workshop on data requirements for modelling including ENSO, coupled models, bio-geochemical cycles, in connection with WCRP/IGBP activities and jointly with other science panels (spring 1996);

Inputs provided to GCOS data system from modelling point of view.

6.3.2 The working group reviewed the membership of the AOP in light of the above recommendations and proposed that experts be added on climate change detection (e.g., fingerprints) and atmospheric composition modelling since such expertise is not presently available on the Panel. The group also recommended closer interactions with both the SOP and the DISP, to **first**, harmonize atmospheric requirements with the space-based observation plans, and second, to ensure that the requirements of climate modellers be considered in the data management plans.

6.3.3 The working group, noting the importance of publications, recommended the prompt publication of the ENSO report and the reports of two previous task groups on the atmosphere.

6.4 Oceanographic Implementation Issues

6.4.1 Dr. Nowlin, Chairman of the OOSDP, assembled a working group to consider the next steps to be taken regarding oceanographic requirements for climate. The principal issues were to consider: (1) future action items regarding the ocean component of GCOS for JSTC consideration; (2) the establishment, terms of reference and membership of an Ocean Observation Panel for Climate to follow the OOSDP which is completing its work this year;

(3) important initial activities for the Panel; and (4) plans for the publication of the OOSDP report.

6.4.2 The working group developed recommended actions for the JSTC relating to the Ocean Component of GCOS:

- o Incorporate recommendations and priorities from the OOSDP final report into GCOS plans. This is a continuing activity;
- o Establish an Ocean Observation Panel for Climate (OOPC) to succeed OOSDP. The Panel should be a joint activity of GCOS, J-GOOS and JSC. In addition:

the OOPC should have its initial meeting in mid- 1995,

the OOPC should include members who served on the OOSDP,

- o Provide suggested initial steps for the new OOPC;
- o Initiate an inventory and assessment of available data (and products) needed for the ocean component of GCOS. Begin assessments of these data now and add needed new data and products as they become available;
- o Assist with provision of resources needed by the new OOPC.

6.4.3 The working group developed terms of reference for an OOPC, and proposed that it be jointly sponsored by the JSTC and J-GOOS and with JSC liaison (see Annex VI). The Panel should include expertise in each of the following areas:

- Surface fields and forcing, including sea level,
- Upper ocean variability,
- Water mass renewal and deep circulation,
- Ocean dynamics and general circulation,
- Ocean/climate models and operational products,
- Carbon system,
- Sea ice,
- Enabling technology.

The working group further recommended that some members of the OOSDP be encouraged to continue on the OOPC.

6.4.4 The working group suggested some first steps for the OOPC to consider:

- o Continue development of the design for the ocean observing system for climate. The final, OOSDP design should be further developed. Example areas requiring attention include:

oversights, such as effects of river discharge on the ocean carbon cycle,

continued prioritization of recommended observational elements,

consideration of alternative sampling strategies (e.g., how to make the best use of conductivity and salinity profiling floats in establishing long-term variability of heat and freshwater content of the upper ocean?);

- o Assist the DIMP to make an inventory of available data (and products) needed for the common module of GCOS and GOOS, adding to the inventory necessary new data and products as they become available. Arrange for examination of these data and products.

6.4.5 The working group recommended that the OOSDP publish and distribute its final report with a title reflecting that the design is for the common module of GOOS and GCOS. GOOS and GCOS should provide the OOSDP chairman with desired mailing lists. The OOSDP chairman noted his intention to make figures and a copy on disc of the OOSDP final report available to the JPO of GCOS. The document, or parts thereof, could then be used as desired by GCOS or GOOS.

6.4.6 The JSTC expressed its appreciation for the working group recommendations, and endorsed them.

6.5 Terrestrial Implementation Issues

6.5.1 Dr. Townshend chaired a small working group to consider recommendations for the JSTC. The group considered the report of the first meeting of the GCOS/GTOS TOP, and addressed elements which require further development for inclusion in a terrestrial plan for climate observations. It noted that to date, the TOP has focused largely on GCOS climate needs, but in the future, should widen its view. The working group also considered the membership of the TOP, and interactions between it and other GCOS panels and external bodies.

6.5.2 The working group recommended that the terrestrial report be rewritten and amended to include a detailed rationale for the proposed hierarchical structure. The group also proposed that the following activities will need to be completed to finish an initial plan for terrestrial observations for climate (by Jul 1995):

o Hydrology

The working group recommended that a small meeting be held before **Dec** 1995 to review the hydrological needs for the terrestrial plan. In preparation, Dr. Kaczmarek agreed to submit a paper on hydrology and the needs of hydrological modelling groups, and Drs. Dumenil and **Spence** will develop preliminary materials on hydrological observations in preparation for this meeting;

o Ecology

The group recommended that the ecology section be improved by including material developed at the GTOS WG II meeting in Trondheim and inputs solicited from GCTE. Dr. Norse will provide the input from the GTOS meeting; Dr. Townshend will contact GCTE for their input.

o Biodiversity

The working group agreed that while climate change will affect biodiversity, land use change has a more significant impact. Thus, biodiversity issues should be considered by GTOS. Dr. Norse will report back with a GTOS statement on observational needs for consideration at the TOP-II meeting.

o Cryosphere

The group recommended that the JSTC commission a report from Dr. Barry who has offered to contribute information on this topic. The report should include observing needs for ice sheets, glaciers, permafrost, and snow. Sea ice has been included in the ocean component, and will not be addressed in this report. Dr. Barry's report and other materials should be tabled at TOP-II meeting.

o Human Dimensions

The working group was divided concerning the content of a human dimensions section in the terrestrial plan. However, it was agreed that Dr. Norse will prepare a report for consideration by TOP-II. It should include a succinct analysis of models of human activity including emissions that might affect climate.

6.5.3 The working group recommended that two to three people be added to the TOP, particularly to address hydrological and cryospheric elements as noted above.

6.5.4 The group also recommended that the existing plan needs to be improved by stating more clearly the meteorological requirements. Upon completion of that task, the working group suggested that Dr. Townshend contact AOP and OOPC members. In addition the JPO should contact the WMO secretariat to determine which meteorological needs are already being met.

6.5.5 The working group considered those key terrestrial observations required from space platforms, and presented a tentative list for consideration by the SOP. A final list will be provided to the SOP by mid-October for inclusion in the Version 1 .O of the Space Plan.

6.5.6 The Committee agreed to support the working group recommendations.

6.6 Co-operation with National Programmes

6.6.1 Mr. **Caponi** and Dr. Whelpdale co-chaired a small working group to develop an action plan for the JSTC to consider. The group agreed to examine means to initiate and improve interaction between GCOS and the various participating countries. The group considered: (1) how GCOS should relate to governments; (2) the larger issue of the implementation of GCOS, GOOS, and GTOS; and (3) a timetable for distribution of material to governments.

6.6.2 Initial discussion in the working group focused on effective ways to reach the appropriate government officials and scientists in countries:

- o General Approach

- provide information to countries on the three programmes (GCOS, GOOS, GTOS) simultaneously, pointing out the interrelationships among the three. A joint flier is being prepared to show the links among the global observing programmes;

acknowledge that countries' needs differ, and thus, so will their responses to participation in the three programmes.

Top down approach:

contact representatives of the sponsoring agencies within a country, encouraging representatives to arrange meetings to stimulate interest;

ask national Committees on Sustainable Development to convene national meetings.

Bottom up approach:

invite members of the various related committees (e.g., IGOSS, GOOS, GCOS, WCRP, etc.) to send informal letters encouraging participation;

invite GCOS spokesmen to brief interested national officials.

- o Points of Contact

identify a point of contact within a country for interaction with the JPO, suggest typical responsibilities, and develop communication links and protocols;

invite points of contacts to supply information back to the JPO on national interests;

stimulate the establishment of national coordinating committees. It is recognized that this will be an internal responsibility. However, some terms of reference for such committees have been suggested.

6.6.3 The working group considered guidance material which could be included in an information package for governments:

o Introductory material should:

explain the need for a global system within context of sustainable development,

refer to all the programmes (GCOS, GOOS, GTOS), but focuses on climate and GCOS,

include such items as:

i) GCOS Brochures, Fliers, Newsletters

ii) a brief version of the GCOS plan

iii) the data plan and space plan

iv) lists of available documents, reports

v) list of GCOS principals (JSTC, panel chairs and members, etc.)

vi) calendar of events

The items (excluding iii) should be dispatched by the **JPO** in January 1995.

6.6.4 The working group also considered how the countries may be able to help by:

providing an inventory of experts and existing activities;

identifying areas where assistance is required either for existing activities or in formulating plans for participation;

assisting in including national programmes and plans into the context of the international GCOS programme;

and conversely, the working group considered that GCOS may be able to assist countries by:

maintaining key elements or TOGA (ENSO predication and consequences);

providing information to improve climate forecasts;

providing information on trends and extreme events (e.g., periods of drought, minimum rainfall);

assisting with the establishment of additional observing stations (e.g., detecting upwelling along the west African coast);

providing data to improve predictions of the interannual variations of climate (flood damage, crop failure, loss of life);

developing and facilitating joint projects (e.g., with a GCM centre to examine improvements in seasonal forecasts);

contributing to capacity building for space-based observations.

6.6.5 Dr. Balogun submitted a comprehensive statement concerning GCOS co-operation with national programmes specifically in Africa. He identified a number of points of contact who could be effective in co-ordinating GCOS activities. Elements of his document which addressed the establishment of national committees and their terms of reference were incorporated in the working group recommendations.

6.6.6 The working group proposed a meeting of participants in GCOS . This meeting should include representatives of the various countries that have initiated or plan to initiate GCOS activities, and would provide a forum for international discussion. It was proposed for 1997.

6.6.7 A proposal was developed to provide a “resource mobilization expert” for the JPO to assist countries in developing competitive proposals to secure international funding for observational activities. The position will require support from external sources, but could provide an opportunity to assist developing countries meet infrastructure needs.

6.6.8 The recommendations of the working group were well received in the plenary session. The JSTC agreed to contribute to the preparation of the appropriate package of information, and to seek resources to provide better national contacts. It was agreed that this activity should receive highest priority during the next year.

6.7 Action Plan Update

6.7.1 The Director of the JPO reviewed the pending actions to be accomplished during the next year for review at JSTC-V. He compiled the list of meetings and events proposed by the various working groups, and presented an overview for the JSTC. In addition, he reviewed the plans for the various publications that are being prepared. Included in the latter are the GCOS plan, the space plan, version 1 .O, the data plan, version 1 .O, numerous reports of meetings, and documents concerning the observational requirements. It was noted that additional support for the JPO will be required, and several members of the JSTC agreed to consider providing resources.

6.7.2 The Director took the opportunity to review the current financial arrangements and staff assignments with the JSTC. He reminded the JSTC that Japan has seconded Mr. Matsuura to the JPO where he has made significant contributions to the work of the office. He expressed his appreciation, to Mr. Haruyama for this generous offer, and for his contribution to the development of the user requirement document for the space plan. He noted that Dr. **McGuirk** will be able to spend considerable time during the next year working with the JPO and the DIMP to further develop the data and information management plan. He anticipated that a senior scientist will be assigned to work on the terrestrial component in the near future.

6.7.3 The Director reminded the JSTC **that** additional resources and staff are urgently needed as the planning activities expand. Particular needs were identified relating to the work of the DMP, the SOP, and in meeting the needs of the three science panels.

6.7.4 **The** Director urged the JSTC and other interested individuals to participate actively in the development of the plans, the preparation, review, and publication of documents, and in the preparation and conduct of pilot studies. He noted that efforts to implement the programme will require full participation.

6.7.5 The JSTC Chairman echoed **the** request for active participation by the JSTC members, particularly those with access to resources which could contribute to the programme. He urged them to become active proponents for GCOS, and to use every opportunity to support and publicize the programme.

7. **INTEGRATED PROPOSAL**

7.1 As noted by the Chairman of the JSTC during his opening remarks, the Integrated Proposal is being prepared on behalf of the World Climate Programme and associated activities such as GCOS. The proposal will be based on the guidance received at the Intergovernmental Meeting on the World Climate Programme held in April, 1993. Additional guidance is being received from a panel of government representatives and the Co-ordination Committee for the World Climate Programme (CCWCP).

7.2 **The** Director of the JPO provided a draft of the GCOS portion of the Integrated Proposal. He invited the members to review the draft and to provide comments back to the JPO. He requested a prompt response, since a meeting of the CCWCP is scheduled for October 5-6. The draft will be considered at that time.

8. OTHER BUSINESS

8.1 Intersessional Activities

8.1.1 As a result of this session, there were numerous activities scheduled during the next year. Particularly close contact between the JPO and the JSTC members was suggested to ensure that members are aware of plans and progress. Conversely, the JSTC members were urged to provide updates on their activities related to GCOS.

8.1.2 Also, as a result of the large number of activities involving individual members of the JSTC that were developed during the session, the JPO agreed to provide a summary to facilitate JSTC member participation where appropriate.

8.1.3 The Director of the JPO provided copies of the GCOS plan for input. He urged the JSTC to make editorial input, but especially requested members to submit illustrations to the JPO which could be used in the plan or in other publications.

8.1.4 Finally, the Director notified the JSTC members that the office will be issuing the *GCOS Newsletter* on a regular basis. The next edition should be completed in the next few weeks. He requested members to submit brief articles for consideration in the Newsletter.

8.2 Arraneements for JSTC-V

8.2.1 A gracious offer to host the next JSTC in Japan was made by Mr. Haruyama on behalf of the National Space Development Agency (NASDA) of Japan, the Science and Technology Agency (STA), and the Japanese Meteorological Agency (JMA) . The Committee accepted the generous offer, and agreed that the next meeting would be held 16 to 19 October, 1995 in Japan.

9. **CLOSURE**

9.1 The Chairman reiterated his appreciation to the host, Dr. Lennart Bengtsson and staff of the Max-Planck-Institut fir Meteorologie for their assistance. He again thanked the invited speakers for their interesting scientific presentations, and the participants for their enthusiastic support and dedication during the session.

9.2 The Chairman closed the JSTC-IV session at **4:30** pm on 22 September 1994.

ANNEX1

LIST OF PARTICIPANTS

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ANNEXII

AGENDA

1. ORGANIZATION OF **THE** SESSION
 - 1.1 Opening of the meeting
 - 1.2 Approval of the agenda
 - 1.3 Conduct of the meeting
2. REPORT OF THE CHAIRMAN
3. INVITED REPORTS
 - 3.1 Reports from sponsoring organizations
4. GCOS PLANNING
 - 4.1 Report of the GCOS Space-based Observation Task Group
 - 4.2 Report of the GCOS Data System Task Group
 - 4.3 Report of the GCOS Atmospheric Observation Panel
 - 4.4 Report of the Ocean Observation System Development Panel
 - 4.5 Report of the **GCOS/GTOS** Terrestrial Observation Panel
 - 4.6 Report of the GCOS Socioeconomic Benefit Working Group
5. CO-OPERATION WITH NATIONAL PROGRAMMES
 - 5.1 National co-ordination
 - 5.2 National activity updates
6. GCOS IMPLEMENTATION ISSUES
 - 6.1 Space issues
 - 6.2 Data issues
 - 6.3 Atmospheric implementation issues
 - 6.4 Oceanographic implementation issues
 - 6.5 Terrestrial implementation issues
 - 6.6 Co-operation with national programmes
 - 6.7 Action Plan update
7. INTEGRATED PROPOSAL
8. OTHER BUSINESS
 - 8.1 Intersessional activities
 - 8.2 Arrangements for **JSTC-IV**
9. CLOSURE

ANNEX III

Viewgraphs from the Report of the JPO Director

1. Joint Scientific & Technical Committee (JSTC)

Chairman:

Sir John Houghton (UK)

Vice-chairmen:

Dr. Lennart Bengtsson (Germany)
Ing. Claudio **Caponi** (Venezuela)
Mr. Robert Winokur (USA)

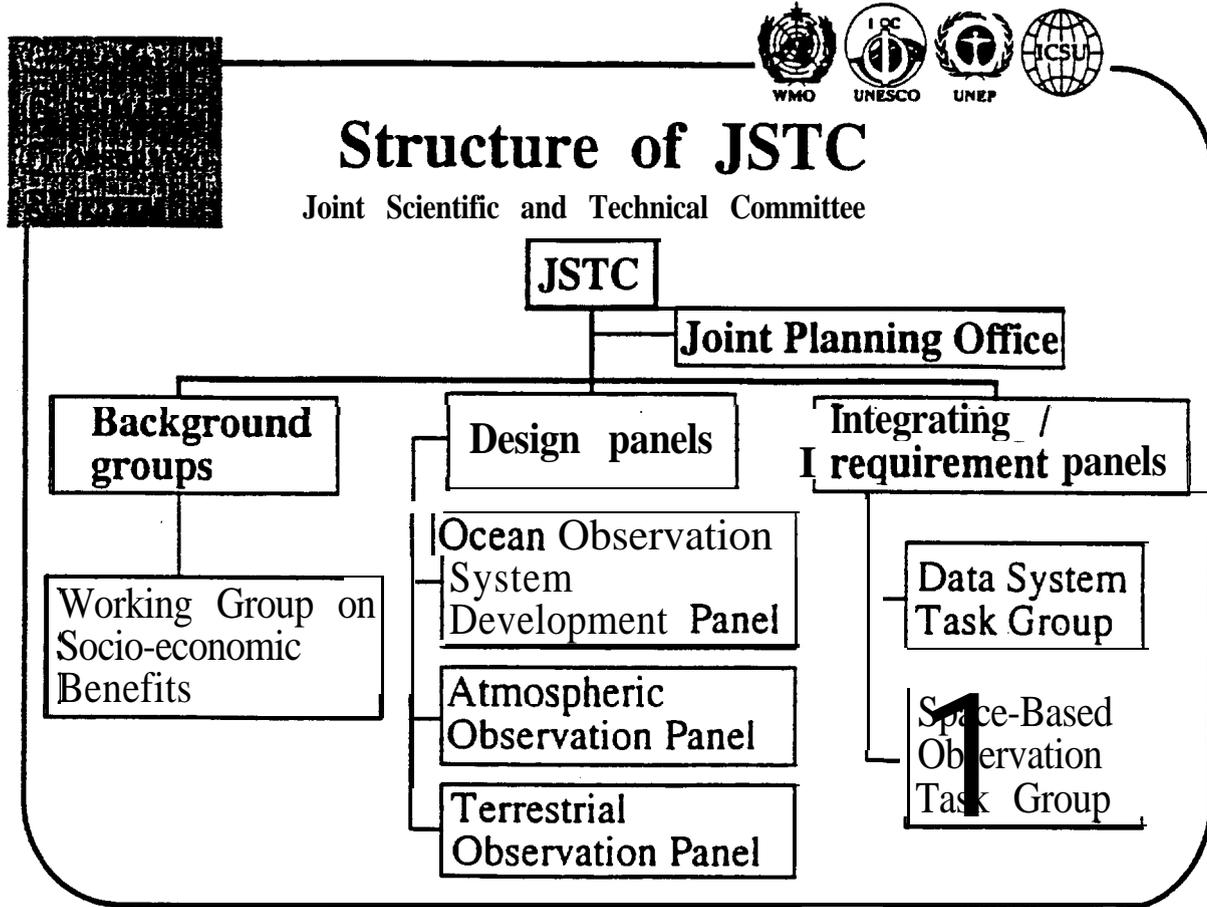
Members:

Dr. Ekundayo Balogun (Nigeria)
Dr. Daniel Cariolle (France)
Mr. Yukio Haruyama (Japan)
Dr. Zdzislaw Kaczmarek (Poland)
Dr. **Charles** Kennel (USA)
Dr. Angus **McEwan** (Australia)
Dr. Worth Nowlin (USA)
Dr. Christopher Readings (Netherlands)
Dr. Keisuke Taira (Japan)
Dr. Alexandr Vasiliev (Russian Fed)
Dr. Douglas Whelpdale (Canada)
Dr. Zhou Xiuji (China)

Ex Officio Members:

Dr. Melbourne Briscoe (USA)
Dr. Peter Ryder (UK)
Dr. John Townshend (USA)
Dr. Gregory Withee (USA)

2. Structure of the JSTC



3. Atmospheric Observation Panel

Meeting: 25-28 April in Hamburg, Germany

Dr. Lennart Bengtsson, Chairman
13 participants

Considered the reports of earlier meetings:

GCOS Atmospheric Processes Task Group
GCOS Atmospheric Composition Task Group

Developed recommendations for implementation

At JSTC-IV:

Report of the Chairman of the Panel

Review recommendations

4. GCOS/GTOS Terrestrial Observation Panel

Meeting: 28-30 June in Washington, D.C.

Dr. John Townshend, Chairman
20 participants

Considered the reports of earlier meetings:

GCOS Terrestrial Task Group
GTOS Scientific & Technical Planning Group
Data Harmonization Meeting

Considered observational requirements for climate models

Considered observational requirements to assess climate change impact on ecosystems

Developed an outline and strategy to formulate a comprehensive Terrestrial Observation Plan

At JSTC-IV:

Report of the Chairman of the Panel

Review recommendations

5. Space-based Observation Task Group

Meeting: 3-6 May in Darmstadt, Germany

Dr. Peter Ryder, Chairman
16 participants

Considered the Draft Space Plan

Developed findings and recommendations

At JSTC-IV:

Report of the Chairman of the Task Group

Review the Draft Space Plan

Establish a Space Observation Panel

6. Data System Task Group

Meeting: 22-25 March in Offenbach, Germany

Dr. Greg Withee, Chairman
25 participants

Considered the Draft Data Management Plan

Developed findings and recommendations

At JSTC-IV:

Report of the Chairman of the Task Group

Review of the Draft Data Management Plan

Establish a Data Management Panel

7. Working Group on Socio-Economic Benefits

Meeting: 1-3 August in Washington, D.C.

Dr. Mel Briscoe, Chairman
14 participants

Considered an initial assessment of economic benefits of **climate** forecasts;

Developed findings and recommendations

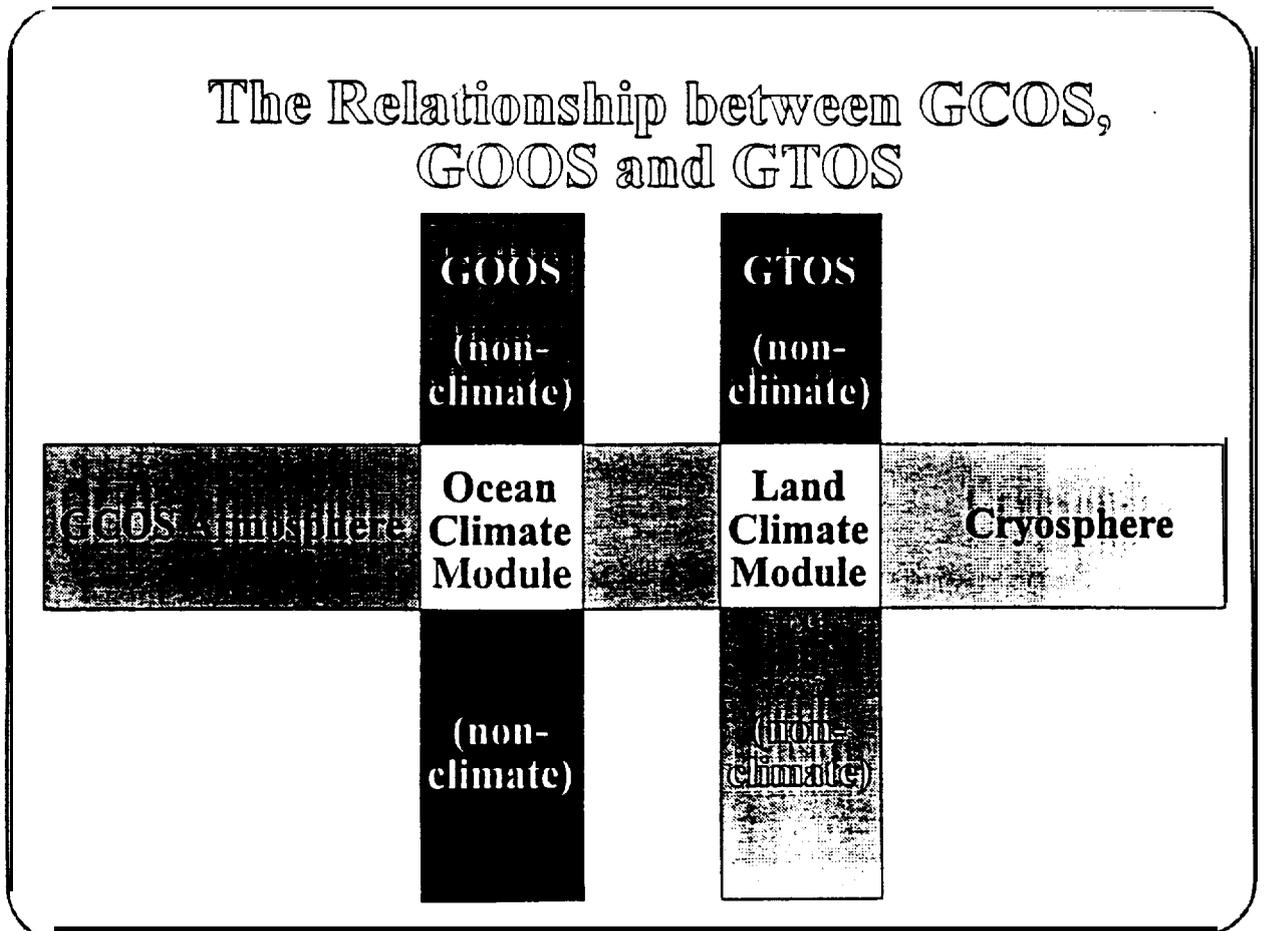
A f JSTC-IV:

Report of the Chairman of the Working Group

Review findings and recommendations

Recommend future activities

8. The Relationship between GCOS, GOOS, and GTOS



GCOS Activity Calendar

Month/year	Event	Participant
November 1993	JSTC-III - UK CEOS Plenary Meeting - Japan Visit Japanese agencies; presentations Visit US agencies; presentations	All TS, DC, NM TS, NM TS
December 1993	GTOS STPG-I Meeting @ RAL	TS, HK JH, TS, DC, NM
January 1994	Meeting @ IOC - discussions Meeting @ ICSU - discussions WMO EC WG on Commercialization GEF briefing Dr. Julian consulting at JPO	TS TS TS TS
February 1994	ICSU Env. Adv. Comm. - presentation CBS WG on Data Management Meeting @ RAL CIMO XI - presentation	TS TS, DM JB, DC, NM TS
March 1994	GCOS Data System Task Group - Germany CBS WG on Satellites	TS, DC, DM TS, NM
April 1994	GCOS Atmospheric Obs Panel - Germany CAS XI I-GOOS Planning Meeting - Melbourne OOSDP-9 Visit US agencies Meeting @ JPO	TS, PJ TS TS, JSTC TS, Nowlin TS NM, Smith Assoc
May 1994	GCOS Space-based Obs. TG - Germany J-GOOS Meeting - France CEOS Users Meeting - Germany WMO RA-VI - Norway (BUAN presented) WMO RA-V - New Caledonia (BUAN presented) Hydrology in Climate Change - USA	TS, DC, NM McEwan DC Co-sponsor
June 1994	GCOS/GTOS Terr. Obs. Panel - USA Harmoniz. Env. Data/GTOS WG I - Germany WMO Executive Council Advisory Panel on Integrated Proposal Meeting @ RAL	TS, PJ JH, TS, NM TS JB, DC, NM

GCOS Activity Calendar

July 1994	IOC Executive Council COSPAR - Germany Meeting @ RAL Dr. Croom acting D/GCOS	TS DC, NM, Balogun JH, TS, DC
August 1994	GCOS Socio-economic Benefit WG • USA CBS Ext. • Finland (BUAN considered) Visit US agencies US PSAC/CENR TG on Obs & Data • talk Meeting @ Smith Assoc • UK Dr. Croom acting D/GCOS	TS Vasiliev TS TS DC, NM, Smith
September 1994	JSTC-IV • Germany GTOS WG II & III • Norway & Switzerland CEOS Plenary • Germany WMO Technical Commission Presidents CCI Adv Comm on Clim Appl & Data (ACCAD) Conf on Economic Benefits Meeting @ JPO	All DC, NM TS TS Maunder JB
October 1994	OOSDP-10 • USA Co-ord Comm on WCP TOGA TAO Implementation Panel • S. Korea JPO Director to visit Japanese agencies ESA Earth Obs User Consultn Mtg • Holland Vet consulting @ JPO	Nowlin TS TS TS DC
November 1994	WMO RA-I • Botswana CEOS WG on Data • China DBCP-X • USA Interprogramme Data Mgmt W/T Surface Velocity Pgm • USA GCOS/GTOS TOP Hydrology Sub-group	TS, Balogun DM DM, TS TS, Townshend
December 1994	CEOS WG on Cal/Val • Australia	

Note: JB J. Brownscombe
DC D. Croom
PJ P. Julian
NM N. Matsuura
TS T. Spence

GCOS Activity Calendar

Month/year	Event	Participant
January 1995	GCOS Monitoring of Clim Chg Mtg - USA GTOS STPG-II • Morocco Isotopes in hydrology - Switz GCOS AOP sub-group + CCI WG's	TS, others TS Co-sponsor TS, PJ, others
February 1995	GCOS DIMP-I - USA CBS WG on Data Management - USA I-GOOS Strategy Panel	TS, DM TS, DM TS
March 1995	Assimilation of Obs in Atm & Oce - Japan GCOS AOP-II - Japan Climate Convention 1st Conf of Parties • Germ	TS, Bengtsson TS, Bengtsson
April 1995	Intl TOGA Conference • Australia GCOS/GTOS TOP-II - USA WMO EC Panel on Atm Chem	TS, PJ TS, Townshend Whelpdale
May 1995	WMO Congress GCOS/GOOS OOPC-I - TBD	TS, Vasiliev TS
June 1995	WMO Congress GCOS SOP-I - USA J-GOOS II - Paris IOC Assembly	TS, Vasiliev TS, DC, Ryder TS TS
July 1995	IUGG - USA	
August 1995		
September 1995		
October 1995	JSTC-V - Japan WMO-IGAC Conf on Atm Compos Chg • China CEOS Plenary - Canada	All
November 1995		
December 1995		

ANNEXIV

Resolution from I-GOOS-I-PSI-1

Implementation Responsibility of the Common GCOS/GOOS Module

The Planning Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System (I-GOOS),

Noting

- (i) the report of the Third Session of the Joint Scientific Committee (sic) for the Global Climate Observing System (JSTC-GCOS),
- (ii) IOC Resolution EC-XXV.3 on the commonality of the Ocean Module of GCOS and the Climate Module of GOOS,

Considering

- (i) that the common **GOOS/GCOS** module can only be successfully implemented through the combined efforts of all Member States of IOC, WMO, and UNEP,
- (ii) that operational design priorities and implementation strategy needs to consider the implementation requirements of all GOOS modules in order to achieve effectiveness and operational efficiency,
- (iii) that I-GOOS at its First Planning Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System (I-GOOS) has recommended the establishment of the I-GOOS Technical Implementation Panel,

Decides

- (i) to refer the implementation of this common **GCOS/GOOS** module to the I-GOOS Technical Implementation Panel for appropriate action;
- (ii) that it urges the Technical Implementation Panel to give high priority to this implementation issues and that it communicate its considerations and recommendations to I-GOOS, J-GOOS and the JSTC for GCOS immediately subsequent to its first meeting.

ANNEX V

National Activity Updates

1. Canada

A document was provided to the JSTC reporting on the recent activities in Canada.

1) Canadian *ad hoc* GCOS Task Group

A Canadian *ad hoc* Task Group was established in early 1994 with a one-year mandate to prepare a report for the Boards of the Canadian Climate and Global Change Programs. The report is to be a policy document, setting the scene for Canadian involvement in the international GCOS effort, identifying practical initiatives and indicating the benefits to both the providers and users of the data. It is to serve as a reference document for policy- and decision-makers.

The report will contain a summary of the components of the international programs (atmosphere, ocean, terrestrial system), a rationale and context for national participation, and a strategy and draft implementation plan for national involvement in GCOS. A series of annexes will be included which will describe: (i) Canadian observational systems (atmosphere, oceans, terrestrial and space), (ii) data management and technological considerations related to national observing systems and to GCOS, and (iii) statements of resource and client needs, contributions and benefits related to GCOS, organized by sectors, including forestry, agriculture, water resources, fisheries, energy, health, transportation, insurance, recreation and tourism, municipalities, environmental technologies, and others as appropriate. Drafting of the report is on schedule with completion expected in early 1995.

The *ad hoc* Task Group is also to serve as a source of advice to Canadian members and representatives of relevant international committees and agencies, in particular as regards ensuring harmonization among GCOS, GOOS, and GTOS nationally and internationally. The group is also to serve as the national contact point with the GCOS Joint Planning Office in Geneva.

2) Workshop on Climate System Data

A national workshop on Canadian climate system data was held in Quebec City from 16-18 May, 1994. The aim was to build consensus for future data management policies and strategies among data producers, managers, modellers, scientists, and other users. The workshop attempted to give equal attention to all components of the **terrestrial-ocean-cryosphere-atmosphere-biological** system to ensure that data and information from all five components were equally accessible, preserved and documented. One session was devoted to data management aspects of Canadian participation in the GCOS.

The following are the main action issues to emerge from the workshop. They represent a consensus among the climate community in Canada at present.

Acceptance of a broad view of “climate system data” (including atmosphere, ocean, land surface including freshwater and biota, cryosphere, paleoclimate and proxy data) and need for coordination of relevant networks;

Promotion of the value of climate system data as an essential foundation for good science and sound decision making;

The goal of producing seamless access to climate system data from **all** components; a request that agencies and granting councils eliminate barriers to access of data sets which they support;

The free and open availability of climate system data directories, inventories, and basic (“raw”) data for national and international exchange on a timely and reciprocal basis; processed and value-added products to be subject to charges developed in consultation with clients and users;

Canada to play an active role in developing GCOS, GTOS and GOOS: to this end, a national Climate Observing System in Canada and adjacent oceans to be defined based on agreed design specifications and within GCOS framework to ensure that Canadian needs are met at minimum cost; a subset of the national climate observing system to form Canada’s contribution to GCOS;

The maintenance and use of sites that make climate-related multi-component measurements for study of ecosystem impacts of climate variability and change and of chemical and mass exchanges between climate system components;

Efforts to ensure compatibility, common standards for **meta-data**, data preservation, sharing, and directories;

Participation of data producers and users early on, and at all stages.

3) Canadian views on GCOS

Canadian scientists have been active in the design and planning of GCOS and related climate programs. The Canadian community is clearly supportive of the international GCOS initiative. However, constraints on government funding remain cause for caution and concern.

The cryosphere is a significant part of the climate system in Canada. It must also be an important element in the international GCOS program.

National groups require a clear vision of the international GCOS program (and GOOS and GTOS) with specific areas where countries can confidently buy in or make changes in their national operations to support the international GCOS effort.

Submitted by Dr. Whelpdale

2. **Germany**

The following information updates that given in the report to the 3rd Meeting of the JSTC for GCOS in November 1993.

1) **Organizational matters**

An International BALTEX Secretariat has formally been implemented at the GKSS Research Centre Geesthacht.

As a contribution to the GEWEX (Global Energy and Water Cycle Experiment) the BALTEX Meteorological Data Centre has been established at the Deutscher Wetterdienst (**DWD**), Offenbach as a regional data centre. Dr. **Bengtsson** will chair the BALTEX Science Steering Committee for the next 3 years.

The Bundesamt für Seeschifffahrt und Hydrographie in Hamburg has been charged with the function of the German GOOS Secretariat.

2) **Present activities**

The Global Precipitation Climatology Centre (GPCC) operated by the DWD in Offenbach provides global analyses of monthly precipitation based on all suitable observation techniques. This centre will provide a contribution to GCOS as a specialized global data centre.

The Global Runoff Data Centre (GRDC) presently is developing a technique for data quality control to improve its service to data users. A monitoring technique is being worked out which will allow the global and continental monitoring of grid based runoff on a mean monthly basis on a 2.5 degree (global) and 1.5 degree (continental) grid size using a simple algorithm. This technique will be implemented based on the GRDC databank programme. Both techniques are expected to be operational by mid 1995.

At the Seewetteramt in Hamburg of the DWD, preparations are underway for the beginning of the operational phase of the Global Collecting Centre (GCC) for marine meteorological observations in autumn 1994, in concert with the corresponding GCC at the UK Meteorological Office.

Collection, quality control, exchange and archival of marine meteorological data from the German Voluntary Observing Ships (**VOS**) operating world-wide, as well as the marine climatological statistics and analyses within the framework of Marine Climatological Summaries Scheme are being continued.

Germany supplies two drifting buoys per year in the framework of the European Group on Ocean Stations (EGOS). At present Germany chairs the EGOS Technical Sub-group.

The GAW station Hohenpeissenberg in Bavaria of the DWD is preparing an extended observational programme with instruments also located on top of the Zugspitze. Some new instruments have already been installed and measurements started.

The **Potsdam** Institute for Climate Impact Research (**PIK**) has started to assess present and future perturbations of the relationship between **ecosphere** and anthroposphere. The PIK will have strong links to the universities and related institutes in the Berlin area. The Institute also seeks cooperation with other national global change centres and intends to contribute to the main international programmes.

Recently a new modern supercomputer (CRAY **C916/12-256**) has been installed at the German Climate Computer Centre established at Max-Planck-Institute for Meteorology in Hamburg.

At the DWD, a prediction scheme for uv-B radiation became operational in summer 1994. It is planned that forecasts, giving guidance to the public concerning sun exposure time, will be issued from April to August each year.

DWD will continue its contributions to the WMO monthly global Climate System Monitoring Bulletin and the Biennial Review of the Global Climate System.

A **catalogue** has been published (Klimarelevante Beobachtungen in Deutschland) at the Kemforschungszentrum Karlsruhe (**KfK**). This catalogue answers "who, what, and where" questions concerning climate relevant observations in Germany. This catalogue has been included under the **homepage** of ZUDIS (**Zentrales Umwelt~~daten~~ Informations System**) on a WWW (World Wide Web) server at the **KfK**.

3) Short-term activities

Further contributions in the near future will include:

expansion of the GCC activities:

- i) establishment of a climate data bank for observations and simulations with appropriate retrieval facilities;

- ii) development of algorithms for massive **parallel** computers.

DWD plans to co-ordinate and publish an annual RA-VI-CSM Bulletin containing contributions of members of the WMO-Region VI.

a metadata catalogue which is being developed as a project of the European Climate Support Network (**ECSN**) for Europe. The DWD will contribute actively to this catalogue.

Submitted by Mr. Rosner and Dr. **Zollner**

3. **Japan**

Since the last JSTC meeting, there has been considerable activity in Japan:

1) Japan GCOS Study Committee

The Science and Technology Agency (STA) and Japanese Meteorological Agency (JMA) jointly established a GCOS Study Committee in August 1994. The first session was held in September. The Committee consists of 18 scientific and technical experts and is chaired by Professor Matsuno of Tokyo University. In the first session, the members exchanged information which they had individually, and recognized the important role that GCOS was playing in climate change studies. The members also recognized that they should be considering a Japanese role in GCOS in co-operation with the GCOS JSTC and its panels and working groups.

2) Personnel Support

The National Space and Development Agency (NASDA) of Japan has been supporting the GCOS Joint Planning Office by dispatching a satellite engineer, Mr. Naoto Matsuura. He is developing the GCOS Space Plan in co-operation with members of the Rutherford Appleton Laboratory and the UK Meteorological Office. NASDA is considering the continuation of this support to the JPO.

3) GCOS Space-based Data Requirements Study

NASDA has supported the development of a report for GCOS on the space-based data requirements . The study is being performed by Smith System Engineering, Ltd and **METSTAR** consultants. The report, tabled at this JSTC meeting, focuses on the users' requirements for data and products, and identifies actions which could enable greater utilization of space-based data. NASDA is considering the continuation of the survey of GCOS data requirements.

4) JSTC-V and GCOS Meetings

STA, JMA, and NASDA have offered to host the JSTC-V Session in Japan. The agencies have agreed to provide a regional secretariat to support the session. In addition, Japan will host the second meeting of the Atmospheric Observation Panel in March.

Submitted by Mr. Haruyama

4. **Nigeria**

1) Introduction

In the last two years, a general awareness about GCOS and its aims and objectives has been established among Nigerian scientists who were engaged in climate related activities at the universities and government institutions. Climate related national symposia and conferences have been used as **fora** to disseminate information about GCOS. The JPO provided the necessary informational material for that purpose. Up to the present, effort was made to capture the attention of those who might be interested in GCOS. Now, the emphasis is on the real scientific values of GCOS, and the benefit of GCOS to economic development.

2) GCOS Office

At present, information about GCOS in Nigeria can be obtained from the Director, Institute of Ecology and Environmental Studies, Obafemi Awolowo University, Ile-Ife Nigeria, or from the Director, Nigerian Meteorological Services Headquarters, Lagos, Nigeria. A national office for GCOS has not yet been established in Nigeria because it is not clear how such an office should be funded, and what its function should be. It is also not clear what the relationship between such an office and the government and private institutions interested in climate related activities should be. It is hoped that general guidelines from such an office may be set down. They would facilitate the establishment of an office, not only in Nigeria, but in other countries. There is a need to organize the activities of those who have shown interest in GCOS into a coherent and productive effort.

3) National Climate Conference

Earlier this year, symposia on the impact of climate change on hydroelectric generation in Nigeria, and on water resources potential for agriculture and rural development in Nigeria were held. The GCOS plan was discussed at sessions of these symposia at which copies of the Draft Plan were made available. The National Climate Conference planned for this year has been postponed until 1995. It is being supported by the Nigerian Meteorological Services, the Nigerian Meteorological Society, the Federal Environmental Protection Agency, the International Centre for Theoretical Physics, Trieste, Italy, and other interested private agencies within the country. Manufacturers of weather instruments and

climate monitoring instruments have been invited to mount exhibitions at the conference. The focus of the conference will be the **inadequacy** of the climatological and meteorological data in Nigeria and how the situation can be remedied. Such a focus will address the aims and objectives of GCOS, and pave the way for a meaningful national participation in GCOS.

Submitted by Dr. Balogun

5. United States of America

1) U. S. Contribution to GCOS

In 1994, U.S. programs contributing to the Global Climate Observing System (GCOS) have focused on continuing efforts to provide long-term, systematic observations of the Earth -- both from satellite and ground-based sensors -- and to make those data fully and openly available to national and international users. Examples include: (1) long-term ocean observations, 2) atmospheric and surface observations, and 3) information management.

Ocean observations

Long-term ocean observations with an emphasis on *in situ* measurements include:

ocean time-series including sea-level, sea surface temperature, **XBT's**, salinity, ocean color, plankton recorders;

Tropical Ocean-Global Atmosphere (TOGA) research observing systems.

Atmospheric and surface observations

The development, validation, and implementation of high-quality, climate-relevant data products derived from operational observing systems, with a primary emphasis on operational meteorological satellite measurements. Contributions include:

Global Precipitation Climatology Project (GPCC) for blended precipitation analysis using satellite gauge, and model output;

International Satellite Cloud Climatology Project (**ISCCP**);

Baseline Surface Radiation Network (**BSRN**) measurements from the Surface Radiation Network stations;

Global Water Vapor Project (**GVap**), including development of **SSM/T2** water vapor profiles and upper troposphere humidity from NOAA polar and geostationary satellite sensors.

Information management

A significant number of activities are underway in the data management arena that **will** contribute to GCOS, most notably, the development of the interagency Global Change Data and Information System. Other examples include:

Interagency efforts to reconstruct long-term climate records, including precipitation and surface and subsurface ocean parameters;

Data from NOAA's polar-orbiting spacecraft are now stored in the Satellite Active Archive and made available via Internet. Data can be browse, ordered, and received over the network, or mailed on various media. Additional types of satellite and ground data are planned for this type of archive and accessing system.

Other contributions

The United States provides a significant portion of the common infrastructure and databases supporting climate-related programs of the WMO, IOC, UNEP, and ICSU.

In addition, the U.S. provides advice, assistance, and participation in GCOS-related meetings and activities. For example, the U.S. has seconded a specialist to the WMO to provide expertise to the GCOS Joint Planning Office, and U.S. experts participated on each of the GCOS Panels and Task Groups this year. Moreover, U.S. expert provided additional support by chairing the Data System Task Group and the Socioeconomic Benefits Working Group.

Finally, the U.S. will be hosting a number of GCOS-related meetings in the year ahead, including an expert workshop, "Documenting and Detecting Long-term Climate Change: Monitoring Requirements", January 9-11 in Asheville, North Carolina. In addition, NOAA as offered to host the first meeting of the DMP in February, 1995.

2) National Focal Point for GCOS

In late 1993, President Clinton established a cabinet-level National Science and Technology Council (**NSTC**) to co-ordinate science, space and technology policies throughout the Federal government. The NSTC established nine committees, one of which is the Committee on Environment and Natural Resources Research (CENR), to prepare co-ordinated research and development (R&D) strategies across U.S. government agencies and budget recommendations for accomplishing national goals.

The CENR, chaired by Dr. Raker, Administrator of NOAA, provides a formal mechanism for interagency science policy co-ordination relevant to environmental and natural resources issues. It acts to improve the link between science and policy and to develop and oversee policies and strategies that respond to national and international concerns and agreements. The CENR is also in the process of developing an interagency budget crosscut and priorities for environmental and natural resources R&D.

The CENR also established a structure of subcommittees along broad, but largely distinct areas of research. The CENR Task Force on Observations and Data Management is a cross-cutting entity that performs an integrating function across the CENR subcommittees.

Earlier this year, Dr. Raker designated Mr. Winokur, Assistant Administrator for Satellite and Information Services, NOAA to be the national focal point for GCOS, and it was decided to use the CENR Task Force as a mechanism for national GCOS co-ordination. It is also intended that this Task Force act as a point of contact for international global observing system programs such as GCOS, GOOS, and GTOS.

While the focus of CENR Task Force is, by mission definition, directed toward research activities, it is intended that the interagency co-ordination should bridge to relevant operational activities of the participating agencies. The fact that the Task Force Chairman is Dr. Kennel, the Associate Administrator of NASA's Office of Mission to Planet Earth, and Mr. Winokur is the vice-chairman, should help to link the research and operational communities in the U.S.

3) Summary

The U.S. stands ready to continue its support for GCOS activities and intends to work together with our international partners to provide a useful contribution to the world's climate community through GCOS.

Submitted by Mr. Winokur

ANNEXVI

Terms of Reference of GCOS Panels and Working Groups

1. Atmospheric Observation Panel

Recognizing the need for specific scientific and technical input concerning atmospheric observations, the Joint Scientific and Technical Committee for GCOS hereby establishes an Atmospheric Observation Panel for climate with the following terms of reference.

Terms of Reference:

- o In accordance with the GCOS Plan, and in consultation with relevant existing bodies, to formulate and design a long-term systematic observing system for the atmosphere as an integrated part of GCOS, with the objective to monitor, understand and provide information for the possible prediction of the dynamical, physical and chemical processes that determine the state of the atmosphere from seasonal to multi-decadal time scales;
- o To collate, review, prioritize, and publish data requirements and observing system specifications to ensure the best possible support for GCOS;
- o To solicit implementation support from the relevant research or operational programmes (e.g., WWW, GAW, WCRP);
- o To co-ordinate the activities with other GCOS panels and task groups to ensure consistency of requirements with the overall programme;
- o To report regularly to the JSTC.

Chairman: Dr. L. Bengtsson

2. GCOS/GTOS Terrestrial Observation Panel

Recognizing the need for specific scientific and technical input concerning terrestrial observations, the Joint Scientific and Technical Committee (JSTC) for the Global Climate Observing System (GCOS) and the ad *hoc* Scientific and Technical Planning Group (STPG) for a Global Terrestrial Observing System (GTOS) have jointly established a Terrestrial Observation Panel with the following terms of reference.

Terms of Reference:

- o In accordance with the GCOS Plan, and in co-operation with the GTOS STPG, to plan, formulate and design a long-term observing system for those terrestrial properties and attributes which control the physical, biological and chemical processes affecting climate, are affected by climate change or serve as indicators of climate change; and which are essential to provide information concerning the impact of climate and climate change;
- o To review the needs of the user communities for climate related data and to ensure timely provision of data sets at appropriate space and time scales and in suitable forms, paying particular attention to the needs of developing countries;
- o To develop a strategy based on the concept of the Initial Operational System (IOS) which includes the assessment of existing operational systems, the determination of deficiencies and the recommendation of necessary enhancements, and a comprehensive data system;
- o To seek review and support for implementation from other relevant research and operational programmes (e.g., WCRP, IGBP, WWW, GAW, WHYCOS, GEMS, GRID, etc.) and to collate, review, publish, and prioritize data requirements and observing system specifications;
- o To co-ordinate activities with other GCOS and GTOS panels and task groups to ensure consistency of requirements with the overall GCOS programme;
- o To recommend actions to address the gaps in present and planned systems;
- o To report regularly to the JSTC of GCOS and the STPG of GTOS.

Chairman: Dr. John Townshend

3. **Ocean Observation Panel for Climate**

[NOTE: These terms of reference were developed by the JSTC, and must be reviewed by the other potential sponsoring organizations before being final.]

Recognizing the need for specific scientific and technical input concerning ocean observations needed for a Global Climate Observing System and for the climate module of the Global Ocean Observing System, the GCOS-JSTC and J-GOOS hereby establish an Ocean Observation Panel for Climate with the following terms of reference.

Terms of Reference:

- o To formulate and evaluate the design for a systematic long-term ocean observing system:
 - to monitor, describe and understand the physical and biogeochemical processes that determine ocean circulation and the effects of the ocean on seasonal to multi- decadal climate change, and
 - to provide the observations needed for climate predictions,
- as required to plan and implement the common module of GCOS and GOOS;
- o To define, review, prioritize and publish data requirements and observing system specifications to ensure the best possible support for the common module of GCOS and GOOS;
- o To coordinate activities and observing system design with other panels and task groups to ensure consistency of requirements for the common module of GCOS and GOOS;
- o To liaise with other groups and institutions as needed to assist in the observing system development;
- o To report regularly to the JSTC and the J-GOOS. The JSC will have a liaison member on the Panel.

Chairman: To be named.

4. Data and Information Management Panel

Recognizing the need for a comprehensive approach to formulate, implement, and oversee the GCOS data and information management system, the JSTC established a Data and Information Management Panel.

As the GCOS data and information system should be developed to be a common system that accommodates data and products from the climate modules of GOOS, GTOS, and the WWW, the DIMP must include representatives of these programmes. Furthermore, the DIMP should be constituted of a core group of members (6-8) representing the different GCOS communities, and a number of representatives from related backgrounds and disciplines. The DIMP should possess a broad range of expertise including research scientist who use and understand GCOS data sets, and data management experts responsible for significant components of the overall GCOS information management system. The DIMP should be a highly focused “problem solving” group, concentrating on resolving crucial issues affecting the quality of GCOS data sets, and access to them. Individual agenda items could require additional participants as well.

Terms of Reference:

- o In concert with GCOS science panel requirements and the GCOS user community, formulate and develop the GCOS Data and Information Management Plan;
- o Monitor the overall implementation of the GCOS Data and Information Plan;
- o Make reports and present recommendations, as required, to the JSTC on information management issues.

The DIMP has the following specific responsibilities:

- o Based on requirements from the GCOS science panels and the climate community, to solicit data sets relevant in meeting GCOS objectives;
- o To identify gaps in available GCOS data sets and co-ordinate efforts to redress data deficiencies;
- o To consider and develop a process whereby data sets be identified and included as GCOS Data Sets. The process should include an assessment addressing, ***inter alia:***

that the data quality meets standards acceptable to peers of the submitting scientists using that type data,

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that the data contain documentation (metadata) of a standard acceptable to peers using similar data;

- o To review and provide oversight of the GCOS information management system to ensure:

that deficiencies in data sets are addressed,

that access to data and products is provided as required,

that archiving activities are adequate.

Chairman: Mr. G. Withee

5. Space-based Observation Panel

Recognizing the need for a comprehensive approach to the various space-based observational activities for the Global Climate Observing System, the JSTC established a Space-based Observation Panel. The Panel has the following terms of reference.

Terms of Reference:

Based on guidance in the ***Draft Plan*** for GCOS, the Task Group will be established with the primary tasks:

- o To maintain and further develop the plan for the space-based observation components of GCOS, considering the GCOS requirements from the science panels;
- o To develop, integrate, and promote the space-based observational requirements of the user communities carrying out climate studies and providing related advice and services;
- o To recommend how these requirements may be met;
- o To identify and evaluate problems, and advocate solutions;
- o To report regularly to the JSTC and planning groups for GCOS.

The Space-based Observation Panel will be the focus for exploiting space systems in meeting the objectives of GCOS. The Panel must continually refine, update, and interpret the implications of the requirements of the user communities carrying out climate studies, and provide related advice in terms of space instruments and satellite payloads flown by the data providing agencies.

Chairman: Dr. P. Ryder

6. Working Group on Socio-economic Benefits

All the nations of the world should derive socioeconomic benefits from the climate system observations proposed as part of the Global Climate Observing System (GCOS). Specific assessments of these socioeconomic benefits are essential to obtain a commitment by governments to the resources needed for the development and operation of a GCOS. As a result, the JSTC established a Working Group on Socio-Economic Benefits¹ with the following terms of reference.

Terms of Reference:

- o To review and summarize the work already done by nations and international bodies that is relevant to the problem of assessing the socioeconomic benefits of the GCOS;
- o To advise the sponsoring bodies (**WMO**, IOC, UNEP, **ICSU**) and participating groups (GOOS, GTOS) on those studies that should be undertaken to further the understanding of the socioeconomic benefits of the GCOS and the means by which the studies can be accomplished;
- o To develop and maintain liaison with **IPCC** Working Group II, the OECD Environment Directorate, international and intergovernmental agencies such as WMO, UNEP, and FAO, and other such professional/expert groups with interest in socioeconomic matters as may be appropriate;
- o To act on behalf of the JSTC for GCOS as a point of oversight, communications and information in matters relating to the socioeconomic benefits of a GCOS, whenever designated;
- o To report progress and recommendations to the JSTC.

Chairman: Dr. M. Briscoe

¹ Socioeconomic benefits are interpreted as including societal and economic benefits beyond fiscal matters, such as preservation of life and property, improved quality of living standards, and health matters. Where possible, non-fiscal benefits will be translated into fiscal equivalents using standard methods.