GLOBAL CLIMATE OBSERVING SYSTEM

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WORLD METEOROLOGICAL ORGANIZATION

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION

FOURTH MEETING OF THE GCOS COOPERATION BOARD

Bonn, Germany
12 June 2008

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UNITED NATIONS ENVIRONMENT PROGRAMME

INTERNATIONAL COUNCIL FOR SCIENCE

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Fourth Meeting of the GCOS Cooperation Board

SUMMARY

The Fourth Meeting of the GCOS Cooperation Board (GCB) was held on 12 June 2008 at the German Ministry of Transport, Building, and Urban Affairs in Bonn, Germany. The meeting took place near the tail end of the 28th session of the Subsidiary Body for Scientific and Technological Advice (SBSTA) of the United Nations Framework Convention on Climate Change, which took place from 4-13 June 2008. Scheduling the meeting in conjunction with SBSTA enabled a maximum number of people to participate. Annex 1 to this report contains the agenda for the meeting and Annex 2 contains a list of the participants and their contact information.

Dr. Carolin Richter welcomed participants to the meeting on behalf of the German Ministry of Transport, Building, and Urban Affairs, and Mr. Stefan Rösner did so on behalf of the Deutscher Wetterdienst. Dr. David Goodrich, the Director of the GCOS Secretariat, followed these opening remarks with a short statement on behalf of the Chairman of the GCOS Steering Committee, who was unable to attend the meeting. Dr. Zillman's written statement is included as Annex 3. Dr. Goodrich noted that this would be his last GCB meeting as Director of GCOS, as he would be soon be returning to the United States to resume work at NOAA. He expressed thanks for the support of the GCB during his tenure as Director.

Mr. Howard Diamond agreed to chair the meeting, and his opening presentation provided a brief history of the GCOS Cooperation Mechanism (GCM). Mr. Diamond also reviewed the Terms of Reference for the GCM Donor Board and the action items that resulted from the Third GCB meeting in 2007. He stressed that overriding goal of the Fourth GCM Meeting was to try to match donor priorities with observation needs and to illustrate how GCOS activities support climate across the board. He introduced the agenda and noted that possible areas to discuss for support included GCOS Secretariat operations, GCOS science panels, GCOS network operations, regional Technical Support Projects, GCOS workshop support, and linkages to developmental goals. Mr. Diamond's presentation, as well as all other presentations made at the meeting can be found at the following FTP site: ftp://dossier.ogp.noaa.gov/GCOS/GCM-IV.

In his introductory presentation Dr. Goodrich highlighted three areas for possible special attention at the meeting: 1) the increasing interest in adaptation and some ways in which GCOS is trying to respond to the needs for climate observations for adaptation, 2) the ongoing system improvement programme managed by Mr. Richard Thigpen, and 3) a possible quick win opportunity in data rescue. He noted that the SBSTA expressed concern in Bali in 2007 that the Regional Action Plans developed under the GCOS Regional Workshop Programme remain largely unimplemented, and that SBSTA has encouraged international organizations and development partners to provide further technical and financial support through existing bilateral and multilateral cooperation programmes in order to advance implementation of priority elements identified in these plans.

Dr. William Westermeyer, Senior Scientific Officer for GCOS and Manager of its Regional Activities Programme, followed with a review of the status of GCOS regional activities. Of particular note was his review of the status of the Climate for Development in Africa Programme (ClimDev Africa). He indicated that at least eight possible donors have expressed interest in supporting the programme and that Sweden, Norway, and the United Kingdom are financing an appraisal mission on behalf of all prospective donors to review programme documents. The appraisal is intended to provide guidance on an initial six month inception phase of ClimDev Africa. It is expected that early work on priority areas could begin during the inception phase, but that a final appraisal or assessment will be

undertaken by the donors before full implementation. Westermeyer also noted the establishment of an Africa Climate Policy Centre within the UN Economic Commission of Africa, one of the principal ClimDev Africa partners.

In addition to ClimDev Africa, Westermeyer noted progress that has been made in the Central America and Caribbean region. Specifically, he introduced the GCOS–Caribbean Community Climate Change Center (CCCCC) Implementation Strategy Meeting held in Belize City, Belize in January of 2008, which was successful in engaging prospective donors in a discussion of climate observing priorities for the region. (Mr. Carlos Fuller of the CCCCC spoke in more detail about this meeting in the next presentation). Dr. Westermeyer also introduced the project, Climate Observations and Regional Modeling in Support of Climate Risk Management and Sustainable Development, for which GCOS and its partners recently received funding from the World Bank. The project consists of an integrated series of three workshops for the ten countries of the Greater Horn of Africa, designed 1) to ensure attention is given by the GHA countries to observation and data needs, 2) to demonstrate the use and value of regional models, 3) to provide advice on model limitations, and 4) to improve regional capabilities for using data records and model projections for adaptation planning. He concluded by noting the importance of improving climate observations and recovering historical data to address adaptation to climate change.

Mr. Carlos Fuller, representing Belize, was asked to make a presentation from the perspective of a developing country that has had some success in dealing with funding agencies. He gave an overview of the Caribbean Community Climate Change Center in Belize. He noted that five projects, in particular, were presented to prospective donors for funding consideration at the January 2008 meeting cited above. These included: 1) provision of additional and better upper air observations to climatological centres, 2) creating and sustaining a regional technical support centre; 3) improving access to climate data in the region, 4) an IOCARIBE-GOOS partnership to support a multi-use sea level observation network for the Caribbean region, and 5) adapting to climate change: raising awareness in Central America and the Caribbean. He noted that the Canadian Department for Foreign Affairs and International Trade has already contributed $50,000 to the setting up of the regional technical support centre and that other organizations, including the Caribbean Development Bank and the Government of Italy had expressed interest in funding data rescue projects or other projects with observing system components. The World Bank indicated that it will consider funding adaptation projects with observing system components. Hence, it is important that such components be added to appropriate projects. Fuller noted that a number of tide gauges in the region were being installed through funding support provided by the Mainstreaming Adaptation to Climate Change (MACC) project. And he noted that significant work is being done in the region on regional modelling using the Hadley Centre's PRECIS model, but that nevertheless there exists an important need to enhance national capacities for interpreting model outputs.

Mr. Hiroki Kondo spoke about regionally-detailed climate modelling as applied to adaptation studies, noting that the global Earth Simulator model could produce super-high resolution (20 km) results. Mr. Kondo also noted some of the adaptation studies that have been completed with World Bank and/or Japan International Cooperation Agency funds. Mr. Kondo expressed an interest in cooperating with GCOS, in particular, with respect to making some human resources available for specific projects, e.g., to assist in model runs.

Mr. Richard Thigpen, the GCOS Implementation Project Manager, spoke next about the status of GSN and GUAN improvement activities. He noted that major accomplishments included the first meeting of all nine GCOS Lead Centres, an upper air training workshop (supported by KNMI) in Africa for representatives of all 18 GUAN sites, and the funding of the technical support project for the Americas (see above). Mr. Thigpen also noted a few disappointments in facilitating improvements, including disappointment related to the

continuing political problems in Zimbabwe, generator problems in Dar es Salaam, Tanzania, and a station in Lima, Peru that is still not operating despite repeated attempts to address problems there. He noted plans for supporting improvements in Luanda, Angola (the AOPC's highest priority); Khartoum, Sudan; Kananga, DRC; and Nampula, Mozambique, pending the availability of funds. Mr. Thigpen also indicated that GSN station renovations are becoming more important but that many such renovations may be more difficult than can be addressed simply by buying radiosondes (as for GUAN stations). Many GSN stations are either not preparing or not preparing correctly CLIMAT messages. He noted that daily data are needed but that the minimum requirement is for a CLIMAT report. The needs of some other GCOS networks, e.g., the Baseline Surface Radiation Network, are now beginning to be considered.

GCOS, notes Mr. Thigpen, has received GCOS Cooperation Mechanism (GCM) funds from Spain to address station problems in Latin America, e.g., in Lima; from the UK Met Office for radiosondes for the Yerevan, Armenia and Seychelles GUAN stations; and from the United States to fund certain projects, support the Technical Support Project for Latin America, and to support the Implementation Project Manager. Some problems cited include: 1) a need for more constant funding, the great difficulty in supporting continuing needs, the difficulty of WMO procedures for sole source purchases, the prohibitively high cost of purchasing bottled hydrogen in Africa, and the fact that the size of some of the projects proposed is simply too big for current donations. Mr. Thigpen presented a list of candidates for GCM funding in 2008. The complete list is given in Annex 4.

Following lunch, a number of short presentations were made by representatives of prospective donor countries or organizations. The first of these was made by Mr. David Walland of Australia. Walland focused on Australian contributions to data rescue, sea level monitoring, and climate prediction within the area of most interest to Australia, the Southwest Pacific. Of note is that the Climate Prediction Project is fully funded by the Australian aid agency, AusAid and a key objective of the ten country project include is to assess and upgrade key climate observing network components in collaboration with other partner organisations. Walland noted that the Pacific Islands GCOS is very much alive and making contributions to improving the region's observing systems. He noted that sometimes end-of-year funds become available that can be applied by PI-GCOS to specific projects. He summarized his presentation by noting that Australia is involved in a number of activities in the Southwest Pacific aimed at building capacity first within the NMHSs but also with key stakeholder groups; that its aim is to help the NMHSs of the region become service providers to their communities by providing them with climate training, assisting them in product and service delivery, and shoring up their climate data; and that NMHSs, valued and locally funded, should be in a better position to contribute to GCOS in the future.

Mr. Patrick Quealey of Canada's Department of Foreign Affairs and International Trade (DFAIT) next gave a presentation of Canada's priorities. He cited Afghanistan, the Americas, and emerging economies as focus areas for Canada. Within the Americas, Haiti was noted as being of special interest at the moment. Quealey stated that it is difficult for DFAIT to support capital projects, but made it clear that funding for, *inter alia*, workshops, knowledge sharing activities, and capacity building projects could be considered. He suggested that he could put GCOS in touch with the Canadian International Development Agency (CIDA).

Mr. Mikko Strahlendorff of the European Commission's Directorate General for Enterprise and Industry provided an overview of the Global Monitoring for Environment and Security Programme (GMES). He described GMES as a joint initiative of the European Commission, EU Member States, and the European Space Agency. Its objective is to provide relevant information to policy-makers and other users, particularly in relation to environment and security. GMES encompasses three service areas. Land monitoring will initially address

European land cover and urban areas. Marine monitoring will observe sea state and ecosystem characteristics over the global oceans and European regional seas. And atmospheric monitoring will address atmospheric composition for European air quality, global climate forcing, global ozone monitoring, and solar energy. The "horizontal" components of GMES include emergency response, security, and climate change. GMES will have both *in situ* and space components. Strahlendorff spoke of the added value of GMES as: 1) enabling the sustainable and operational monitoring of long-term trends in global change, 2) ensuring free and open access to the GMES services, 3) enabling downstream services in a variety of areas at national, regional, and local levels, 4) addressing the policy needs of member states and their institutions (as well as those of the EU), 5) helping member states meet their reporting obligations under EU laws and their international obligations, and 6) providing an effective means of supporting national agencies, NGOs, and citizens in assessing and understanding problems related to the environment.

Strahlendorff noted that the GCOS Essential Climate Variables are an important guideline for what GMES wants to provide as core information and that GMES is all about European consolidation, i.e., so as to provide the main European contribution to GEOSS, which for climate means GCOS. He noted that GMES is seeking to enhance its interaction with Africa, specifying that a process started in Lisbon in December 2007, during which time an EU-AU Memorandum of Understanding was signed. The next step is for the AU to clarify what it wants, but the idea is to build on existing initiatives, including parts of GCOS regional action plans and ClimDev Africa. Finally, Strahlendorff noted that good ClimDev Africa-related proposals submitted to the Directorate General for Development might be eligible for funding through the Global Climate Change Alliance Programme (GCCA).

Mr. Stefan Rösner contributed that Germany continues to provide small amounts of money to assist GCOS. In particular, Mr. Richard Thigpen noted that Germany contributes as a CBS Lead Centre and GSN monitoring centre. Rösner noted that Germany's development cooperation agency aims to make the projects it funds climate proof, implying that there may be opportunities here for support of observing system components in some projects.

Mr. Wim Monna of the Netherlands discussed the situation in the Netherlands and, in particular, at the Royal Netherlands Meteorological Institute (KNMI). He noted that between 2007 and 2010 the Netherlands is providing 200,000 euros per year in support of observations in Africa and additional support for an atmospheric composition laboratory in Suriname. He noted that adaptation to climate change is now becoming an issue, making it important to consider the link between effective adaptation strategies and the need for high quality observations.

Mr. José Ramón Picatoste Ruggeroni, from the Spanish Climate Change Office, made a presentation on Spanish interests in GCOS and on Spain's particular interest in the 21 countries belonging to the Ibero-American Conference of Nations (which, with the exception of Spain and Portugal, are located in the Caribbean and Central and South America). He introduced the Ibero-American Network of Climate Change Offices (the Spanish acronym of which is RIOCC) and noted its objectives: 1) to guarantee constant and fluent dialogue among the countries in the region in order to foster a better understanding of priorities, needs, gaps, and experiences, 2) to promote the integration of climate change within national sustainable development strategies, 3) to develop common positions in international fora on climate change, 4) to collaborate on impacts and adaptation to climate change, 5) to facilitate the development of CDM projects in the region, and 6) to strengthen the institutional capacity of the members' climate change offices.

One of the main achievements of the RIOCC to date has been the creation of the Ibero-American *Programme of Impacts assessment, Vulnerability, and Adaptation to Climate*

Change (PIACC). This programme aims strengthen the development and implementation of adaptation strategies in the Latin American region and to facilitate assistance to RIOCC members in the assessment of impacts, vulnerability, and adaptation options tailored to the relevant sector/system/geographic areas.

RIOCC aims to enhance synergies with regional initiatives and institutions. These include CATHALAC (Centro del Agua del Trópico Húmedo para América Latina y el Caribe), CATIE (Centro Agronómico Tropical de Investigación y Enseñanza), CIIFEN (Centro Internacional de Investigación del Fenómeno El Niño), ISDR (International Strategy for Disaster Reduction - Américas), the IAI (Instituto Interamericano de Investigación), CEPAL (Comisión Económica Regional de Nations Unies para América Latina), and regional networks, such as the conference of NMHSs, National Institutes of Agrarian Researches, and the Conference of Water Directors.

Mr. Picatoste next discussed Spanish contributions to the GCM, noting Spain's efforts to improve the operating rate of GUAN stations in Ibero-America and some actions regarding GSN stations. He also noted technical missions, capacity building actions, and the upgrading and purchasing of material and equipment in areas such as Peru, the Galápagos Islands, Mexico, El Salvador, Costa Rica, and Colombia. He stated that Spain would like to begin taking some strategic actions in the Ibero-American region, including promoting the further development of GCOS frameworks in collaboration with the GCOS Secretariat. He concluded his presentation by stressing that the Ibero-American Region is the priority geographical area for Spain, that adaptation to climate change is a relevant area for Spanish cooperation in the region, and that systematic observation is needed for effective assessment of impacts and vulnerabilities and for the identification of climate change adaptation measures. A RIOCC meeting, to which a representative of GCOS is invited, will be held in Cartagena, Colombia in October 2008. Among other items to be discussed will be how to facilitate the development of GCOS frameworks in the region.

Ernesto Rodriguez Camino, Head of Evaluation and Climate Modelling at the Spanish National Institute of Meteorology (INM), gave additional information on Spanish cooperation activities in the framework of the Iberoamerican Conference of NMHSs. He noted that at least two meetings per year are held and that 10 to 15 short terms actions, including capacity building courses, are being funded by the INM. Some funds for these activities are passed through the WMO. Although Spain has traditionally focused its collaboration with Latin American countries, it is now starting to collaborate with the countries of West Africa, including capacity building exercises and instrumentation.

Dr. Gabriela Seiz of the Swiss Federal Office of Meteorology and Climatology (Meteo Swiss) next made a presentation that focused on Swiss GCOS activities outside Switzerland. She included overviews of Swiss support for ozone monitoring in Nairobi, Kenya; trace gas monitoring in Kenya, Indonesia, and Algeria; and glacier monitoring worldwide (with the World Glacier Monitoring Service (WGMS) located at University of Zurich since 1986). Seiz highlighted the decision of the Swiss Federal Council of 6 June 2008 to additionally provide about 1 million euros per year, starting in 2010, to maintain climate observations in Switzerland and to ensure the continuance of the WGMS. She indicated that the proposal to extend the observation programme for 3 global GAW stations (Mt. Kenya, Kenya; Assekrem, Algeria; and Bukit Koto Tabang, Indonesia), submitted by Empa, could possibly be partly covered by Swiss GAW funding.

Cathy Johnson of the UK's Department for Environment, Food, and Rural Affairs, gave a two-part presentation, the first part of which focused on the United Kingdom's support for observations in other countries. The presentation was prepared in collaboration with Mr. Steve Palmer of the UK Met Office. She noted that the UK funds a half-dozen GUAN sites in

the South Pacific and South Atlantic, including those on Penrhyn, Raratonga, Gough, Seychelles, Tarawa, and Funafuti Islands.

The remainder of Ms. Johnson's presentation addressed issues related to the ClimDev Africa Programme. Notably, Ms. Johnson stated that the UK's Department for International Development (DFID) has underscored its commitment to provide £5 million to help launch ClimDev Africa. She stressed that there is a keen desire to finalize and launch the programme as soon as possible, especially considering the delays to date. Initially, DEFRA was hoping to be able to provide funding to support an Addis Ababa-based meteorologist to assist with the observations component of ClimDev Africa, but this proved not to be possible. More positively, she noted that DEFRA would be able to provide continued funding in support of the work Dr. Paul Mason does for GCOS.

The last of the donor country presentations was made by Mr. Howard Diamond, the GCOS Programme Manager for the United States. Mr. Diamond reviewed the various types of US support for GCOS. These include support for international programmes, regional/bilateral programmes, data management, and, although outside the scope of the GCM, domestic programmes. At the international level the US provides some GCOS Secretariat support, including for travel, support for GCOS improvement projects and associated management, and support for the GCOS Reference Upper Air Network (GRUAN). Regional/bilateral support focuses on the Pacific region, where the US supports the Pacific Islands Regional GCOS Program, a regional maintenance center at the New Zealand Met Service, a Pacific Islands GCOS Officer, and related project work. Regarding data management, the US supports GCOS Lead Data Center work for GSN and GUAN and operation of the Global Observing Systems Information Center (GOSIC) (For information on GOSIS see: http://gosic.org).

In 2008, the United States contributed $265,000 for international programmes, including $25,000 for GCOS Secretariat support, $200,000 for improvement projects, and $40,000 for GRUAN. Of the $490,000 that supported the Pacific Islands Regional GCOS Programme, $290,000 was allocated to the regional maintenance center in New Zealand, and $100,000 each went to support of the Pacific Islands GCOS officer and related project work. For data management $200,000 went to the GCOS Lead Center for GSN and GUAN and $175,000 was allocated to GOSIC. Mr. Diamond noted that GOSIC will soon release a data matrix of Essential Climate Variables (ECVs) that one will be able to access in no more than three mouse clicks.

The concluding session of the meeting provided an opportunity for the participants to elaborate and/or stress various points that had been made in previous sessions. It was noted that that the next EU Framework Programme is expected to make available 1 to 3 million Euros for coordination between GMES and Africa. Thus, there may be an opportunity for European meteorological services, working with African partners, to develop a proposal for funding to assist observing system needs in Africa. The call for proposals will open at the end of July 2008. Mr. Strahlendorff indicated that he will ensure that GCOS is sent applicable information. Mr. Diamond noted that the US would like to provide funds for a generator for Raratonga but that he is uncertain if funds will be available in the 2009 budget. Mr. Thigpen spoke of the desirability of establishing another technical support project in Africa and pointed out that it would fit in well with the ClimDev Africa Programme. In addition, he drew attention to helping the Yerevan, Armenia GUAN station solve its electrical problems, noted that Yemen data records exist in a library in the United Kingdom that need to be rescued by someone willing to spend time in the library, and highlighted the usefulness of upper air observing workshops, such as the one that was held in Namibia.

In closing remarks the Chairman of the meeting, Mr. Howard Diamond, stressed the desirability of meeting again next year. He proposed that the GCB meeting be held either

during SBSTA or on the day after SBSTA closes (usually a Saturday) or the day before it starts. He proposed that the GCOS Secretariat could ask the UNFCCC Secretariat about feasible times and also suggested that more could be done to advertise the next meeting (e.g., through the UNFCCC Secretariat) so that more people might attend. Another idea was to insert a statement into the next SBSTA conclusion document on Research and Systematic Observation encouraging people to participate in GCM meetings. Such participation would enable attendees to review their GCOS-related activities and contributions to systematic observation. Dr. Goodrich, the outgoing Director of GCOS, noted that specific commitments are not requirements to attend the meeting but also that he was pleased to see some seeds being planted at this meeting for support of some of the projects that were discussed. Unlike previous meetings, the participants did not try to formulate a list of action items.

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Annex 1

Fourth Meeting of the GCOS Cooperation Board

German Ministry of Transport, Building, and Urban Affairs
Robert-Schuman-Platz 1
Bonn, Germany

Thursday, 12 June 2008
0900 – 1730

Meeting Goal:

Matching Observation Needs with Donor Priorities

Agenda

Welcoming Remarks and Introductions – D. Goodrich, GCOS Secretariat

- Designation of a Chairperson and Rapporteur for the meeting
- Agreement on the agenda

Introduction and objectives – H. Diamond, U.S. GCOS Manager (Interim Chair)

- Review of the 3rd GCB Meeting in Geneva 2007, including status of action items

Presentation of three tracks of GCOS needs, based on GCOS Implementation Plan, GCOS Regional Action Plans, etc (D. Goodrich)

- Continuity of operations, system improvement
- Data rescue
- Application of observational data for adaptation and development

Opportunities to leverage on other activities to benefit GCOS – (W. Westermeyer)

- World Bank proposal, ClimDev Africa and GCOS Regional Action Plans
- Belize meeting
- GEOSS, others

Coffee Break

3 tracks:

1. & 2. Observation and Data Rescue Requirements of GCOS (P. Jones)

Review of the GCOS Improvement Programme (R. Thigpen)

- Progress made to date
- Present commitments
- Upcoming plans

3. Presentation of recipient country case: better climate observations – better climate services – better policy related to climate variability and change

Donor/country priorities

Short presentations by participating donor representatives
Discussion: Use of GCM for leveraging funding opportunities

- How to make real progress
- Governance of the process

Lunch

Matching donor priorities with GCOS needs (discussion)

Next steps (discussion)

Wrap-up, Final Remarks

Adjourn

Annex 2

Fourth Meeting of the GCOS Cooperation Mechanism (GCM-IV) Donor Board
(Bonn, Germany, 12 June 2008)

PARTICIPANTS

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Annex 3

Message from Dr. John Zillman, Chairman, GCOS Steering Committee, Prepared for the Fourth Session of the GCOS Cooperation Board

On behalf of the GCOS Steering Committee, my thanks to you all for your commitment to the implementation of GCOS and for your participation in this fourth session of the GCOS Cooperation Board.

I would like to especially thank Howard Diamond for taking the initiative to reinvigorate and strengthen the GCOS Cooperation Mechanism and for his productive chairing of the previous session in Geneva a year ago tomorrow.

I believe that a mechanism such as this Board which brings key country representatives together to focus on the coordinated international implementation of GCOS will be essential for its continuing progress. It is the best mechanism that we have so far been able to devise to carry out two important roles:

(a) To help coordinate the GCOS-focused implementation activities of the main contributing countries; and

(b) To provide a forum for consensus on how the major contributors can most effectively, and collectively, assist the developing countries to participate fully in ensuring the coordinated implementation and use of the total international GCOS system.

These two roles are complementary, and both are vitally important for the eventual success of GCOS.

The climate change issue is now at the top of the international political agenda, and it is critically important that we in the UN System and ICSU, and in the international climate community, support the policy process to the full with sound and comprehensive scientific information on all aspects of climate and its impacts. There is nothing that is more essential for that purpose than an effectively operating Global Climate Observing System made up of the climate-relevant components of all the established global observing systems, reinforced and complemented as necessary to meet the totality of national and international needs on all time and space scales.

Through the items on this year's agenda of the GCOS Cooperation Board, you have the opportunity to carry that process forward along both formal and informal channels. I wish you a very successful and productive day's discussion. I am sorry that I am not able to join you this year, but I look forward to hearing and reading the outcome of the session in the near future.

My greetings and appreciation to you all and best wishes for the success of the session.

John Zillman

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Annex 4

GCM Candidate Projects 2008

(Prepared by Richard Thigpen, GCOS Secretariat)

$400K Luanda, Angola (GUAN addition)

Renovation of the upper air station at Luanda. Needs generator and u/a equipment. This is the highest AOPC priority for an additional GUAN station.

$400K Madagascar GSN (all)

Replacement of all 11 GSN stations in Madagascar with AWS. One is a new proposed station. This project can be done through MeteoFrance. The Met Service there agrees to conduct a two year parallel measurement study following installation of AWS and we would assign a CIMO expert to ensure that the study is conducted correctly.

$70K Upper Air Observing Workshop in Asia

In order to improve the operation of GUAN stations in Asia, an upper air workshop is planned (possibly in India) . Operators from all GUAN station in Asia will be invited and the workshop will include support for the hydrogen generators. The UKMO will provide the instructors.

$100K Angola GSN (all)

Replacement of all of the necessary manual instruments for the 8 GSN stations in Angola. Additionally observer training is needed as they have not operated for a long time. (KNMI supporting first phase)

$40K Renovation of GSN stations in Ecuador

The four GSN stations in Ecuador need replacement instruments. (Spain has agreed to support)

$50K Renovation of Aragats H/M (High Mountain) GSN, Armenia

The GSN station is high in the mountains and badly needs replacement instruments. The Met Service has requested Russian made instruments or at least instructions in Russian. (The US has agreed to support)

$30K Replacement/up grade GSN station at Chisinau, Moldova

The GSN station at Chisinau, Moldova needs replacement instruments. (DWD and US have agreed to support)

$75K Rarotonga GUAN (generator)

The GUAN station at Rarotonga needs a replacement generator. The upper air equipment has been refurbished through the PI TSP following a fire but a replacement generator is needed. They need a Proton because of the size of their building.

$200K Technical Support Project (TSP) for Africa

The SADC TSP contract has expired. Continuation of a TSP in Africa is a very important part of improving the operation of GCOS stations there.

$50K CLIMAT/CLIMAT TEMP Workshop in Pacific

Three of these workshops have been held so far. Based on the performance of stations, the countries in the Pacific will be addressed next.

$500K-1000K Additional radiosondes

Several GUAN stations routinely require support with radiosondes and balloons. Stations such as Costa Rica, Galapagos, Yerevan, Mauritius, Bauerfield, Laoag, Dar es Salaam, Papua New Guinea, Marambio (Antarctica Argentina) and others will need radiosondes. (About $75K/year per supported station)

$20K Yerevan electrical work

The electrical power feed to the upper air station needs repair. Frequent outages impact operations at the station. The project could be managed by the UKMO.

$65K Yemen Data Rescue

Most of the historical data from stations in Yemen is in libraries in the UK. Yemen is a high priority addition to the GSN but the historical data would be needed. A cooperative data rescue effort is needed. The staff from Yemen could do the work with some assistance for the UKMO and project support for equipment and travel.

$300K Khartoum, Sudan (GUAN addition)

Renovation of the upper air station at Khartoum, Sudan to improve GUAN coverage. One of the AOPC high priority additions. The station was operational until a few years ago. Thought to need generator and upper air equipment. A site survey will be needed.

$60K Zambia Telecoms

Up grade of the telecommunications equipment used within the country to a modern CODAN based system. This robust Australian made HF telecoms equipment would resolve most of the current internal station to station telecommunication problems and get the observations onto the GTS.

$20K Kyrgyzstan GSN (2 stations)

Replacement of the surface observing instruments at the GSN station in Kyrgyz

$60K **North Salang, Afghanistan GSN**

Renovation of the damaged GSN station at North Salang, Afghanistan. This is a high altitude station which we may be able to renovate the Iranian Met Service.

$75K **Zambia GSN (all)**

Replacement of all the manual surface observing instruments at the 6 GSN stations in Zambia.

$50K **Namibia GSN (all)**

Replacement of all the manual surface observing equipment at the 4 GSN stations in Namibia

$75K **Malawi GSN (one)**

Renovation of the GSN station in Malawi possibly with AWS.

$75K **Iraq GSN**

Renovation of the GSN station at Kut al Hai, Iraq which was badly damaged in the war. A remote station. Renovation may be managed by the Iranian Met Service.

$35K **Eritrea GSN**

Renovation of the GSN station in Asmara, possibly with AWS.

Total >$3M

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