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Climate and Small Island Developing States

CONTENTS

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CALENDAR

13-15 February
Cape Town, South Africa
Technical Conference "Improving Predictability of High Impact Weather with Emphasis on Southern Hemisphere"

16-24 February
Cape Town, South Africa
Commission for Atmospheric Sciences—14th session

13-17 March
San José, Costa Rica
International Conference on Flood Forecasting

24-28 April
Geneva
EC Working Group on the Evolution of NMHSs and WMO—1st session

9-16 May
Adelaide, Australia
Regional Association V (South-West Pacific)—14th session

12-16 June
Göteborg, Sweden
Sixth International Conference on Urban Climate

17-21 July
Espoo, Finland
Living with Climate Variability and Change: Understanding the Uncertainties and Managing the Risks

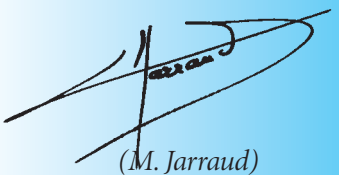
Cover photos (clockwise from top left): Martin Ferm/IVL Swedish Environmental Research Institute; G. Tortoli/FAO; NASA; Nation Publishing Company Ltd., Barbados; H. Kootval/WMO; International Coral Reef Information Network

Foreword

Small Island Developing States (SIDS) are highly vulnerable to variations in weather and climate. By virtue of their geographic location, they face additional challenges such as limited land and water resources. The exposure of SIDS to the impacts of hydrometeorological hazards puts considerable constraints on their social and economic development. In particular, weather-, climate- and water-related disasters affect their socio-economic activities every year.

As the specialized agency of the United Nations responsible for fostering international cooperation in meteorology, climatology and operational hydrology, WMO has been providing support to SIDS in essential areas concerning environmental management and sustainable development, with special regard to natural disaster mitigation, monitoring of climate variability and projection of climate change (especially in areas influenced strongly by the El Niño-Southern Oscillation), monitoring and management of water resources, and institution building.

The UN Global Conference on the Sustainable Development of SIDS, held in Barbados from 25 April to 6 May 1994, led to the adoption of the Barbados Programme of Action for the Sustainable Development of Small Island Developing States (BPoA). The status of implementation of the Programme and its achievements were reviewed at BPoA+10 in Mauritius in January 2005, when a number of priority areas deserving more attention were identified. Among these were climate change and sea-level rise, natural and environmental disasters, management of wastes, coastal and marine resources, freshwater and land resources, energy resources, and tourism and biodiversity. Other priority areas included capacity building, institutional development at national, regional and international levels, cooperation in the transfer of environmentally sound technologies, trade and economic diversification, and finance. WMO is helping SIDS make progress in these priority areas through the use of expert advisory services and other cooperation programmes. Aspects of these activities are highlighted in this issue of World Climate News.



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CLIMATE AND SMALL ISLAND DEVELOPING STATES

Climate is an integral part of the natural resource base of Small Island Developing States (SIDS). Marine resources, agriculture, tourism, freshwater availability, energy security and the natural environment are the backbone of SIDS' livelihoods, all of which are highly dependent and vulnerable to climate and climate- related hazards (see box below). In an increasingly interdependent world, SIDS are no longer able to depend solely on maintaining their livelihoods by what can be produced locally. The economic implications of hurricane *Katrina*, through rising oil prices, were just as challenging to SIDS in the Pacific as were the hurricane's direct effects. One hurricane can destroy whole SIDS communities, as in the case of Niue in the South Pacific in 2004.

Recognizing these challenges, the international community adopted the Barbados Programme of Action for the Sustainable Development of SIDS (BPoA) in 1994. In the climate area, BPoA recommended the creation or strengthening of programmes and projects at the regional level, aimed at monitoring and improving predictive capacity for climate change, climate variability and sea-level rise, and assessment of impacts on marine resources, freshwater, and agricultural production. The BPoA also urged the international community to support the activities of intergovernmental, regional and subregional organizations aimed at helping SIDS to cope effectively with climate change, climate variability and sea-level rise. This includes providing systems for research, monitoring, surveying and data collection, as well as assessments, in all relevant areas, such as the role of the oceans in modulating the climate system, sea-level variations and saltwater intrusion of freshwater. These commitments were reaffirmed at the 2005 Mauritius Conference to review the implementation of the BPoA.

WMO, as the specialized agency of the United Nations in matters pertaining to weather, climate and water, has been supporting its 37 SIDS Members (see list right) in implementing the BPoA. Monitoring the key processes which modulate their microclimates and teleconnection links to other parts of the world, and the provision of early warnings and locally tailored climate services are typical examples of support provided by WMO.

In the area of institutional strengthening, WMO, in 1999, in collaboration with the Secretariat of the Pacific Regional Environment Programme and NMHSs of SIDS in the Pacific, developed the Strategic Action Plan for the Development of Meteorology in the Pacific (SDMP), 2001-2009, aimed at building the capacity of NMHS of SIDS in the Pacific. The Plan focuses on improving the accuracy and timely dissemination of severe weather warnings and production of seasonal climate outlooks and their applications in climate-sensitive sectors.

Since the adoption of SDMP, a number of projects have been implemented. These include the Island Climate Update (www.niwascience.co.nz/ncc/icu), a regional climate bulletin providing an overview of current climates in each of the tropical South Pacific Islands, with an outlook for the coming months (see map on page 4), the Pacific Islands GCOS project (www.pi-gcos.org/) and the Pacific Islands Climate Prediction Project (www.bom.gov.au/climate/pi-cpp). The US National Oceanic and Atmospheric Administration/National Weather Service Pacific ENSO Applications Centre (lumahai.soest.hawaii.edu/Enso/index.html)

Reasons for SIDS' vulnerability to climate-related hazards

- Geographic isolation
- Sensitivity and exposure to natural disasters
- Small land masses
- Ecological uniqueness and fragility
- High rates of human population growth and densities
- Limited resources
- High dependence on marine resources
- Small economies with low diversification
- Economic openness
- Susceptible to climate variability and change
- Poorly developed infrastructure

SIDS Members of WMO

States

Antigua and Barbuda
Bahamas
Bahrain
Barbados
Belize
Cape Verde*
Comoros*
Cook Islands
Cuba
Cyprus
Dominican Republic
Fiji
Guinea-Bissau*
Guyana
Haiti*
Jamaica
Kiribati*
Maldives*
Malta
Mauritius
Micronesia, Federated States of
Niue
Papua New Guinea
Saint Lucia
Samoa*
São Tome Principe*
Seychelles
Singapore
Solomon Islands*
Suriname
Tonga
Trinidad and Tobago
Vanuatu*

Territories

French Polynesia
Netherlands Antilles and Aruba
New Caledonia

* Least Developed Countries (LDCs)

Polar science

The Arctic climate exhibits the fastest pace of warming on the planet and 2005 brought another record: the area of Arctic Ocean sea ice in September was the smallest since satellite observations began.

The year 2005 was also one of intense debate on the future of polar research. The Second International Conference on Arctic Research Planning (Copenhagen, Denmark, November) identified five major research challenges for polar science:

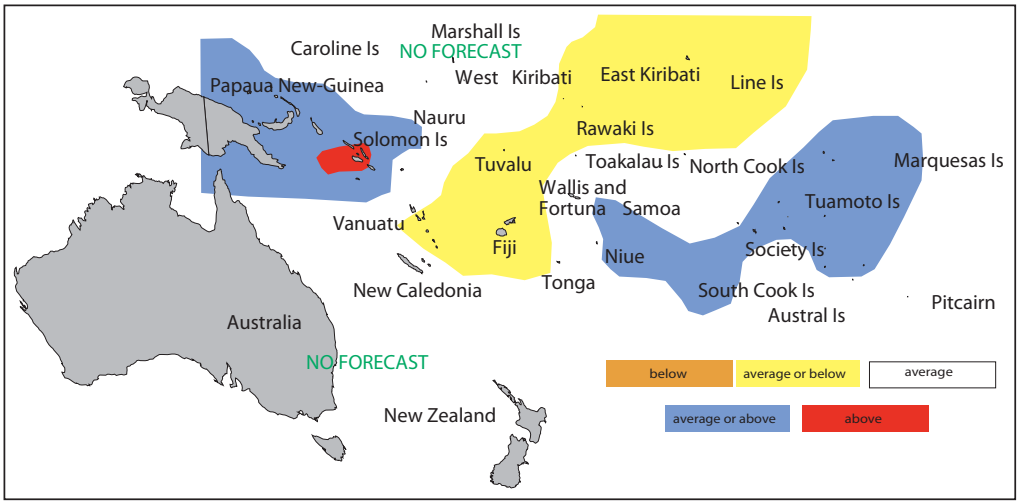
- Climate and environmental regimes of the Arctic region
- Arctic societies and change
- Arctic cryo-hydrological systems and global interactions
- Arctic terrestrial and marine life and systems
- Adapting and coping with change in the Arctic.

WMO participates with international partner organizations and programmes in the Climate and Cryosphere project, which addresses several of these challenges. It seeks to enhance and coordinate efforts to monitor the cryosphere, to study climate-related processes involving the cryosphere, to model and understand the cryosphere's role in the climate system, and to develop cryosphere-based indicators of the global change.

provides climate information and prediction services for US-affiliated SIDS and Territories.

In the Caribbean, WMO supports the implementation of a region-wide project "Preparedness to Climate Variability and Global Change in SIDS Developing States, Caribbean Region: The SIDS-Caribbean Project". The project involves 18 Caribbean SIDS in an effort to enhance weather and climate knowledge and improve scientific capabilities to allow better planning for sustainable development. In the South-West Indian Ocean, WMO supports five SIDS in monitoring activities to provide accurate and timely meteorological information and products in support of early warning and disaster mitigation.

WMO is currently exploring the development of a strategic action plan for all SIDS. It is clear that the challenges lie not only in the need to manage their vulnerable natural environments but also to minimize the risks associated with events outside their control, such as the impacts of climate- and weather-related disasters in other parts of the world far removed. WMO, through WCP and other climate-related activities, will continue to provide the relevant assistance to meet the challenges facing SIDS.



Rainfall outlook map for September to November 2005 for SIDS in the tropical South Pacific

Source: ICU, NIWA Science

WATER SUPPLY IN SIDS

The Caribbean comprises more than 100 small populated islands, Indonesia has more than 13 000. Fiji, Jamaica, Mauritius, the Seychelles and Tonga are examples of island nations and are all Members of WMO.

High population densities, rapidly expanding populations and booming tourist industries add to the growing demand for freshwater and contribute to pollution and environmental problems.

Most small islands receive abundant rainfall but it is seasonal and varies considerably. Some are arid with even more acute freshwater shortages. Groundwater storage capacity is limited and susceptible to pollution, as well as overpumping and subsequent salination.

For all these reasons, the limits of utilizable freshwater resources can be reached quickly. Alternative options to increase quantity, for example by desalination, are extremely costly for the economy of many small islands. Transportation of water by tankers is another—but also costly—measure. While tourism exerts considerable pressure on scarce water resources, it also opens up opportunities to finance projects on multiple water re-use and demand management.

The adoption of best practices in integrated water-resources management (e.g. optimizing production by scavenger-well pumping and the use of underground retention structures in

ephemeral streams), as well as alternative supply options (e.g. waste-water re-use and closed water circuits), are currently the most cost-effective measures.

Concerns about the vulnerability of small island freshwater resources arising from climate variability and change are focused on increasing rainfall variability and occurrence of extreme events. The anticipated rise of sea-level, which is thought to be due in large part to ocean thermal expansion from rising temperatures and melting of glaciers and ice caps, is another major concern. It would have a severe negative impact on the availability of utilizable freshwater due to the intrusion of seawater and brackish water into aquifers.

The rate of sea-level rise, changes in rainfall patterns and the occurrence of extreme events are all challenging the adaptive capacity of small island societies to secure the operation of sustainable water-supply systems.

WOCE ATLAS

The World Ocean Circulation Experiment (WOCE) atlas on the Southern Ocean is the first of four such atlases. It will be followed by those on the Indian, Pacific and Atlantic Oceans. The atlases map temperature, salinity and chemical composition, thus providing a baseline against which all future changes can be assessed.

The Southern Ocean is given a separate volume because of the importance of the circumpolar flow on the transport of heat, freshwater and dissolved components. The volumes each have three main components: full-depth sections, horizontal maps of properties and property-property plots. The vertical sections feature potential temperature, salinity, potential density, neutral density, oxygen, nitrate, phosphate, silicate, CFC-11, d3He, tritium, 14-C, 13-C, total alkalinity and total carbon dioxide. The horizontal maps combine the WOCE data with the best available historical data for each ocean.

The atlases contain between 265 and 310 plates each and around 1 500 copies will be produced. In addition, electronic versions will be prepared which will contain additional parameters.

The initial production of the Southern Ocean, Pacific and Indian atlases is funded by the National Science Foundation and the Atlantic atlas by the German Federal Ministry for Development and Research. Publication costs are being supported by British Petroleum.

Although the atlases are free, a £30 contribution is requested for postage costs, with discounts for bulk orders. Order forms are available from Jean Haynes at jchy@noc. soton.ac.uk.

WOCE was a 10-year, US$ 1 000 million project, carried out by research agencies in some 30 countries during 1990-2002. A component of the World Climate Research Programme (WCRP), WOCE was the most ambitious oceanographic experiment ever undertaken. Its aims were to establish the role of the oceans in the Earth's climate and to obtain a baseline dataset against which future change could be assessed.

Sophisticated numerical ocean models were also developed to provide a framework for the interpretation of the observations and for the prediction of future ocean state. Research ships, satellites and moored and drifting instruments were used to build up an inventory of the physical state of the world's oceans. WOCE is being followed by other large-scale projects including CLIVAR, the Global Ocean Data Assimilation Experiment (GODAE) and ARGO—a global array of temperature/salinity profiling floats.

Forthcoming Open Science Conference

The Earth System Science Partnership (ESSP), a collaboration between DIVERSITAS, IGBP, IHDP and the World Climate Research Programme, is organizing an Open Science Conference in Beijing, China, 9-12 November 2006, to present progress in understanding of the natural and social systems of global environmental change and to highlight the ESSP approach to the study of the Earth System.

The themes of the conference will include:

- Advances in our understanding of the physical, biogeochemical, biodiversity and human dimensions aspects of global environmental change;
- Science in support of sustainability with emphasis on global environmental change as it relates to food, water, carbon and human health;
- Dynamics, impacts and consequences of the interactions between natural and social systems at regional scales, including extreme events, and how they connect to global-scale phenomena; and
- Global environmental change in monsoon Asia.

Scientists, policy-makers, practitioners, scholars, members of the private sector and journalists are invited to participate and to submit proposals for sessions and abstracts.

www.essp.org/essp2006
www.essp2006osc.com

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GCOS IMPLEMENTATION PLAN IN RELATION TO SEA-LEVEL RISE

Sea-level rise, as predicted by climate models, is one of the best-known consequences of global climate change, with immediate impact on low-lying coastal regions and small island States. Thermal expansion of the oceans, melting of ice sheets and glaciers and vertical movement of land all influence sea-level change along coastlines. Proper assessment of these factors is needed to predict reliably sea-level change on global and regional scales. These predictions and associated measures of uncertainty are fundamental for adaptation measures addressing possible sea-level rise. Model predictions are critically dependent on high-quality, long-term observations, such as those taken by satellite altimetry or by a global network of tide gauges.

GCOS and the climate community have recognized the scientific and socio-economic relevance of sea-level rise, as well as the technical feasibility of its measurement (both by satellite and *in situ*), in the Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC (GCOS-92, GCOS Implementation Plan). This Plan was endorsed by the Conference of the Parties (COP) to the UNFCCC at COP-10 in December 2004 and recommends four specific actions regarding the observation of sea level:

- Coordinated through the Joint WMO-IOC Commission for Oceanography and Marine Meteorology, countries should fully implement the Global Sea Level Observing System (GLOSS) Core Network of 290 *in situ* gauges, including at least the subset having a long-term record, using geocentrically located instruments of high accuracy (both are currently about 50 per cent complete); this action also includes real-time data exchange, archiving and recovery of historical records;
- One high- and two low-precision but high-resolution satellite altimeters should be operated by Space Agencies at all times;
- National agencies coordinated through GLOSS and the Global Ocean Observing System (GOOS) Coastal Ocean Observations Panel should ensure the availability of high-frequency sea-level observations for all coastal regions in the light of extreme events and regional sea-level change, including historical records and central archiving;
- Objectives related to sea-level should be included in national and international agencies' capacity-building programmes.

Generally, sampling and global coverage of sea-level measurement is inadequate. The above recommended actions from the GCOS Implementation Plan provide an integrated strategy to address the most pressing issues in terms of sea-level observations, data management and support by countries and organizations. GCOS is working with its sponsoring agencies, countries and other relevant partners towards their implementation.

TOURISM AND SIDS

In many SIDS, tourism has become the principal economic activity through direct and indirect contributions to the domestic economy, and through inflows of foreign currency including tourism receipts and foreign direct investment. While communities can reap great benefit from the improved livelihood made possible by tourism, potentially harmful environmental and social impacts can arise.

To be competitive, SIDS' governments and businesses are under increasing pressure to provide a wide range of high-quality goods and services and a greater diversity of activities, including eco-tourism attractions related to the natural environment and cultural heritage. Travellers increasingly demand high levels of quality environmentally friendly facilities and services at their destinations. However, their needs also require opening new

Hurricane Ivan left a trail of devastation across the Caribbean in 2004.

airports in more tourist market areas, increasing the capacity and frequency of transportation services, expanding airport infrastructure, developing hotels and resort facilities, using increased amounts of electricity for refrigeration and air conditioning, and importing expensive goods, including food and water. These factors are exacerbated by the fact that most SIDS have limited land into which to build new infrastructure, limited natural resources and are generally isolated. Meeting the needs of clients can lead to increased pollution, land degradation, deforestation, desertification, loss of species habitat and over-exploitation of natural resources.

SIDS are particularly vulnerable to natural disasters, some suffering repeatedly from tropical cyclones, flooding, drought and storm surge. Direct and indirect impacts of climate variability and change, such as beach erosion, sea-level rise, saltwater intrusion into the freshwater supply, coral bleaching and changes to fish stocks caused by changing ocean temperatures must be taken into account in the concept of sustainable development of the tourism sector.

TRAINING IN CLIMATE REPORTING

WMO is organizing a series of seminars to provide training in generating and exchanging climate data. The first Training Seminar on CLIMAT and CLIMAT TEMP Reporting was held in Moscow in November 2004. A second was held in Casablanca, Morocco, 20-22 December 2005. The major goal was to address national observing network managers or coordinators with training and practical exercises that will improve the availability of climate data from the respective region. Step-by-step procedures for compiling and transmitting CLIMAT and CLIMAT TEMP messages were presented, in accordance with the WMO Handbook on CLIMAT and CLIMAT TEMP Reporting (WMO/TD No. 1188).

In addition, the specialized climatological software CLIREP, which has been developed to automate the process of encoding the observations for CLIMAT and CLIMAT TEMP messages, was presented, with instructions on its use and application.

Climate data quality control was discussed with examples of applications, and issues concerning the transmission of climatological data over the GTS were presented. The available documents as well as other information related to the meeting are posted on the WMO Website: http://www.wmo.int/web/www/BAS/CBS-meetings.html.

Coordination of GUAN and GSN

The second Commission for Basic Systems (CBS)/Global Climate Observing System (GCOS) Expert meeting on the Coordination of the GCOS Surface Network (GSN) and the GCOS Upper-Air Network (GUAN) was held at the National Climate Data Centre in Asheville, USA, 28-30 September 2005. The major issues reviewed were related to the status of the GCOS Implementation Plan, priorities for the Open Programme Area Group on Integrated Observing Systems (AOPC), results of the World Weather Watch monitoring of availability of climate reports, and implementation of the Regional Basic Climatological Network in all regions including the Antarctic. The meeting also discussed the performance of GCOS basic networks and interaction with countries presented in the reports of GCOS Monitoring Centres and CBS Lead Centres for GCOS data.

The meeting was updated on the current status of revitalization of the GSN and GUAN stations, including reports on activities by GCOS Technical Support Projects in the Pacific, the Caribbean and Africa. The meeting discussed expected improvements in generation and exchange of GSN and GUAN data over the Global Telecommunication System and plans for establishment of additional CBS Lead Centres for GCOS data. The meeting developed specific recommendations to improve the availability and quality of GCOS atmospheric data.

See http://www.wmo.int/web/www/BAS/CBS-meetings.html

Fifth GEWEX conference

Nearly 300 scientists from 23 countries attended the fifth International Scientific Conference on the Global Energy and Water Cycle, held 20-24 June 2005 in Costa Mesa, California. The 158 oral and 170 poster presentations demonstrated the significant progress made in GEWEX-related research since the last conference in 2001.

The new WCRP strategy, COPES (Coordinated Observation of the Earth System), was a leading thread in the Programme, one the major questions being how GEWEX can best evolve and contribute to a common long-term goal, jointly with the other WCRP core projects. GEWEX has now entered the second phase of its activities, which focuses on its role in climate mechanisms, forecasts for seasonal or longer time-scales and the consequences of global change for precipitation, extreme events and water availability.

Invited talks set the stage for presentations on the role of clouds and their effects on the radiation budget in climate prediction, predictions for water management, roles of land fluxes in water and energy cycles, the role of modelling in predictability and prediction studies, new strategies for characterizing and predicting energy and water budgets, and measuring and predicting precipitation.

OZONE UPDATE

The phase-out of ozone-depleting substances carried out as a result of the Montreal Protocol and its amendments manifests itself through a slow decline in the so-called Equivalent Effective Stratospheric Chlorine (EESC). This parameter includes all the chlorine- and bromine-containing substances. The EESC peaked around 1997 and is expected to be back to pre-1980 levels around the middle of this century. This means that the Antarctic ozone hole will recur annually for some 50 years.

The question of ozone recovery and turn-around has been a topical theme of discussion among ozone scientists over several years. Ozone recovery has three phases:

- The first phase, the onset of recovery, is when the decline in total ozone becomes less rapid;
- The second phase, turnaround, is when total ozone has passed through a minimum and starts to increase again; and
- The third phase, full recovery, is when total ozone is back to the level observed before 1980.

Scientific papers have been published that show signs of the first phase of recovery in middle latitudes. In the polar regions, however, there is as yet no clear sign that the situation is improving.

The 2005 Antarctic ozone hole passed its maximum size of 27 million km^2 in mid-September. This is significantly larger than the 23 million km^2 maximum reached in 2004, but is still smaller than the ozone holes of 2000 and 2003, which peaked at 28.5 and 29 million km^2, respectively. Interannual dynamical variability makes it difficult to detect ozone recovery in the polar regions and probably many more years of observations will be needed before phase 1 or 2 can be detected.

Mother-of-pearl clouds over southern Norway on 5 January 2005. They contain ice crystals that are of similar size and form. Diffraction of light around them gives rise to a variety of colours.

On the surface of the ice crystals, chemical reactions take place that convert inactive halogen-containing compounds to active forms (ClO) that destroy ozone. Clouds in the stratosphere are responsible for the substantial ozone loss that can occur in the Arctic during cold winters. The same applies to the Antarctic ozone hole, but there it is much colder and stratospheric clouds are much more common.

Photo: Geir Braathen/WMO

UNDERSTANDING SEA-LEVEL RISE

Factors contributing to observed sea-level rise are still poorly understood and projections of future rise vary greatly.

The World Climate Research Programme is planning a sea-level workshop to be held at the Intergovernmental Oceanographic Commission of UNESCO, Paris, in 2006. Given the present and projected future rates of global sea-level rise and the associated variability ranging from long time-scales (decades to centuries, for example due to climate change) to short time-scales (hourly to daily, for example due to storm surges), the workshop aims to identify the factors contributing to observed sea-level rise and variability, as well as that projected, and to organize a systematic effort to identify the major sources of uncertainty and what can be done to reduce them.

A workshop report will summarize the current state of the science, outline future research requirements for improving our understanding of sea-level rise and variability, and describe the observations needed both for research and sustained, systematic observations.

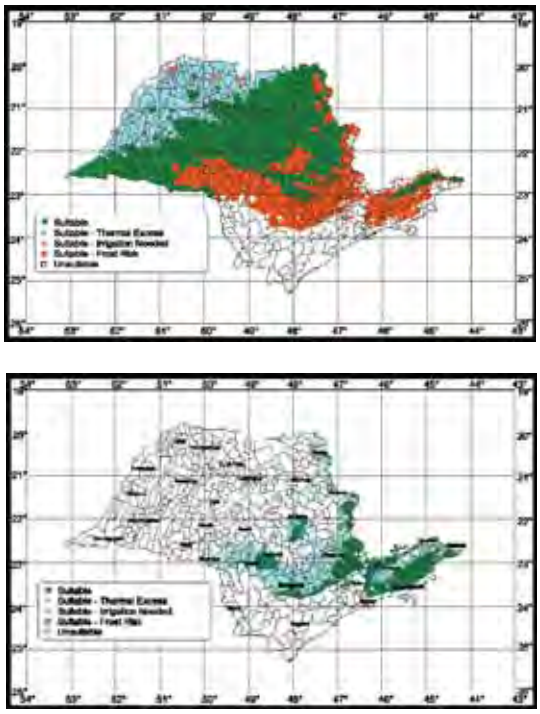
APPLICATIONS OF CLIMATE FORECASTS IN AGRICULTURE

Agriculture is affected by climate variability which influences the decisions farmers have to make to manage their farms. The consequences are often not known with certainty until long after the decisions are implemented. Recent advances in understanding the teleconnections between the ocean and the atmosphere, coupled with rapid developments of numerical atmosphere-ocean general circulation models (AOGCMs), have led to new and improved methods and skills in seasonal climate forecasting. Traditionally, climate forecasts were based exclusively on empirical/statistical techniques that provide limited understanding of the physical processes modulating the climate system. Both these and numerical methods are now being use for climate forecasting. While the science of climate forecasting using AOGCMs is relatively new, the tradition of agriculture is quite ancient. Blending a new science with an ancient tradition is not always easy.

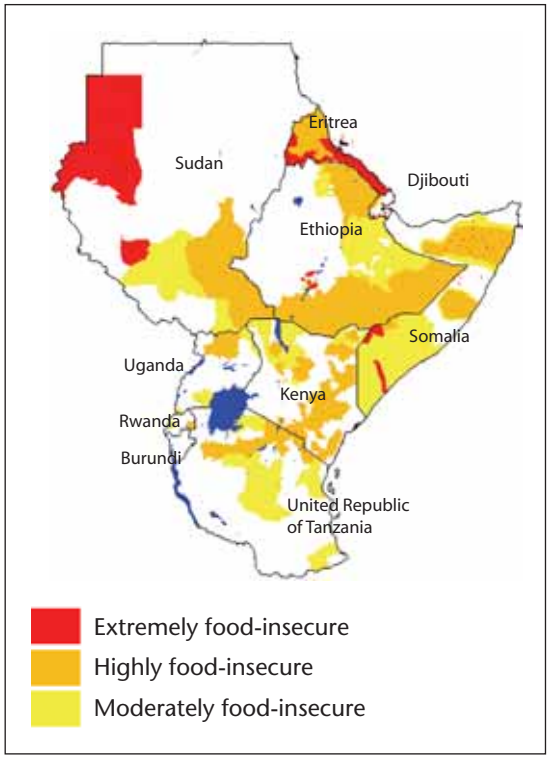
The Agricultural Meteorology Programme and the World Climate Applications and CLIPS programme of WMO are implemented through the WMO Technical Commissions for Agricultural Meteorology and Climatology, respectively. These programmes, implemented at national level through National Meteorological and Hydrological Services (NMHSs), have long supported the efforts to increase the applications of climate forecasts in farmers' decision making.

Two WMO meetings held recently in Brazil and Kenya reviewed the experiences in applications of climate forecasts in agriculture and food security. The Brazil meeting assessed the success of the Agritempo (www.agritempo.gov.br) project, coordinated by the Ministry of Agriculture and the National Institute for Agricultural Research. Agritempo was launched in 1995 with the dual goals of reducing economic losses associated with dry spells during the reproductive phase (flowering and grain filling, when 60 per cent of the 1995 losses occurred) and excessive rain during the harvesting phase (accounting for 30 per cent of crop losses in 1995). Agribusiness in Brazil accounted for 30 per cent of the GDP (US$ 500 billion), 30 per cent of jobs and 40 per cent (US$ 30 billion) of exports in 2003. Climate risks were reduced to less than 20 per cent since the project began, resulting in savings of US$ 637 million over the past five years. Crops covered include maize, soybean, beans, rice, wheat, sorghum, barley, cotton, fruits and coffee. The figure shows examples of climate zoning for coffee in Brazil under different climate conditions. The project has about 40 million customers, mostly farmers.

Climate outlooks and other factors are used to prepare a Food Insecurity Outlook for the Greater Horn of Africa sub-region. An example for 2005 is shown below. Similar work is being carried out in other regions.



Climatic risk zone areas for coffee, normal (top) and with a 15 per cent increase in precipitation and a 3°C temperature rise (immediately above) for São Paulo, Brazil



Climate and Food Insecurity Outlooks for Africa (SOND 05)

Sources

C. Fraisse, D. Zierden, N. Breuer, J. Jackson and C. Brown, 2005: *Climate Forecast and Decision Making in Agriculture,* retrieved 23.09.2005 from http://edis.ifas.ufl.edu/AE267

G. Hammer and H. Meinke, 2000: *Linking Climate, Agriculture, and Decision-Making: Experiences and Lessons for Improving Applications of Climate Forecasts in Agriculture,* retrieved 23.09.2005 from http://www.earthscape.org/

Sivakumar, M.V.K. *Climate Prediction and Agriculture: Current Status and Future Challenges*. Paper presented at the International Workshop on Climate Prediction and Agriculture: Advances and Challenges, 11-13 May 2005, WMO, Geneva, Switzerland

WMO Regional Technical Meeting on CLIPS and Agrometeorological Applications for the Mercosur Countries, São Paulo, 13-16 July, 2005

WMO Sixteenth Climate Outlook Forum (COF16), Greater Horn of Africa, Nairobi,

IMPLICATIONS OF THE G-8 SUMMIT FOR AFRICAN CLIMATE

Climate change and Africa were addressed directly in the Gleneagles Plan of Action, the document that summarizes the commitments made by the G-8 countries at their July 2005 meeting in Scotland. In paragraph 34, G-8 members "made a commitment at Evian to strengthen international cooperation on global Earth observations," that they will "continue to exercise leadership in this area," and welcome the adoption of the 10-year implementation plan for the development of the Global Earth Observation System of Systems (GEOSS).

Two specific commitments with implications for Africa were to:

- "... support efforts to help developing countries and regions obtain full benefit from GEOSS, including from the Global Climate Observing System (GCOS), such as placement of observational systems to fill data gaps, developing of in-country and regional capacity for analysing and interpreting observational data, and development of decision-support systems and tools relevant to local needs"; and
- "work to strengthen the existing climate institutions in Africa, through GCOS, with a view to developing fully operational regional climate centres in Africa".

The G-8 Gleneagles commitment to support efforts to help developing countries generally, and African countries in particular, is most welcome. The Gleneagles statement, however, does not provide details about how this commitment will be implemented. Greater clarity should be forthcoming by the end of 2005 after additional consultation among G-8 members.

CLIMATE RESEARCH AND WATER MANAGEMENT IN ARID REGIONS

In response to a request from the Arab states to WMO, a special workshop was held in Cairo, Egypt, 18-20 April 2005, to examine the applicability of climate research and information for water resource management in semi-arid and arid regions. The workshop was hosted by the World Climate Research Programme (WCRP) and the United Nations Educational Scientific and Cultural Organization (UNESCO), and organized by the GEWEX Water Resources Applications Project (WRAP) and the UNESCO-International Hydrological Programme (IHP) Cairo Office.

It brought together operational hydrology and water-management stakeholders from the arid and semi-arid regions of North Africa and the Middle East with hydroclimate scientists engaged in observation, modelling and analysis.

The principal actions identified in the workshop include the need to:

- Increase awareness of the significance of climate change and variability in water resource planning and management across the region;
- Improve sharing of hydroclimatological data across various national and international jurisdictions;
- Access and develop tools to bring global and regional data into a form suitable to support decision-making;
- Apply climate forecasts and data products to specific water management and planning issues; and
- Improve the interface between regional institutions and the international community, in order to enhance the regional capacity to address the above issues.

The workshop recommended that a regional network of professional and academic scientists be formed. Existing institutional capacity within the region should be used as much as possible to develop and support such a network and UNESCO was identified as having a lead role.

In brief ...

■ A joint team from the British Antarctic and US Geological Surveys in a study covering 244 glaciers on the Antarctic peninsula has found that 87 per cent of the glaciers have shown retreat since the earliest records. The team used more than 2 000 aerial photographs dating from 1940 and more than 100 satellite images from the 1960s onwards to assess the change in position of glacier fronts over time. The past five years have seen the greatest losses in mass, with an average shrinkage of 50 metres a year.

Source: *Science,* 22 April 2005, Volume 308, Number 5721

■ Satellite meteorology made a step forward in November 2005 with the installation of the ground system for the JASON-2 Ocean Altimetry Programme. Partners in JASON-2 are the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), the Centre National d'Etudes Spatiales (France), the US National Oceanic and Atmospheric Administration and National Aeronautics and Space Administration.

Jason-2 will collect global ocean surface data to increase understanding of the forces behind global climate change and seasonal weather changes.

■ Tropical Storm *Zeta* was the 27th named storm of an exceptional Atlantic hurricane season. *Zeta* developed on 30 December 2005 and persisted until 6 January 2006. The previous record was for 21 named storms, set in 1933. The Atlantic hurricane season usually runs from 1 June to 30 November.

■ During 2005, water was rationed in about half of Spain. Many swimming pools remained empty, city fountains were turned off and golf courses reduced watering. Many reservoirs in the south-east were still more than three-quarters empty at the end of October. The Costa Brava in the north-east and the region south of Alicante were among the worst-affected areas. Some 95 per cent of towns in Catalonia, which experienced its worst drought since 1945, imposed restrictions. The environment minister, Cristina Narbon, has announced an emergency €370 million package to reduce impacts. Spain recently cancelled plans to divert water from northern rivers such as the Ebro to the parched south-east and to build desalination plants along the east coast.

■ Melting of sea ice in the Arctic has accelerated to record levels, according to experts at the US National Snow and Data Centre in Boulder, Colorado, USA. Satellite images show that the extent of Arctic sea ice in September 2005 dipped some 20 per cent below the long-term average—melting an extra 1.28 million km^2 or an area twice the size of Texas. Arctic sea-ice cover reaches its minimum extent each September at the end of the summer melting season. On 21 September, the mean sea-ice extent dropped to 5.25 million km^2, the lowest on record. This is the fourth consecutive year that melting has been greater than average and it pushed the overall decline in sea ice per decade to 8 per cent, up from 6.5 per cent in 2001.

AUTOMATED WEATHER SERVICE FOR THE CARIBBEAN

A pilot project for an automated weather service production system for the Caribbean area is being developed, building on the capacity that has been made available at National Meteorological Services in the region under the Small Island Developing States (SIDS)-Caribbean Project. To this end, the Association of Caribbean States (ACS) has requested additional funds from the Government of Finland to develop a pilot project aimed at developing an automatic weather service production system in selected Caribbean countries.

The objective is strengthen and improve the role of the National Meteorological Services, provide them with new tools, products and services for the local public and private sectors, and meteorological information and early warnings in the selected countries and in the region in general.

The pilot project will be implemented with the collaboration of the Finnish Meteorological Institute (FMI) in Cuba, Jamaica, and Trinidad and Tobago. It will be executed and completed within a year of the signing of the agreement between FMI and WMO.

POTENTIAL BENEFITS OF GEOSS TO DEVELOPING COUNTRIES

A new international partnership, known as the Group on Earth Observations (GEO), is leading a worldwide effort to build a Global Earth Observation System of Systems (GEOSS) over the next 10 years. GEO was formally established at a ministerial-level summit in Brussels in February 2005, and held its inaugural meeting in Geneva in May 2005. GEO involves 58 countries, the European Commission, and 47 international organizations. In December 2005, GEO will adopt its 2006 Work Plan, representing the first year of the 10-year effort.

The GEOSS vision, articulated in a 10-Year Implementation Plan, represents the consolidation of a global scientific and political consensus: the assessment of the state of the Earth requires continuous and coordinated observation of our planet at all scales.

As a "system of systems", GEOSS will work with, and build upon, existing national, regional, and international systems to provide comprehensive, coordinated and sustained Earth observations from thousands of instruments worldwide, transforming the data they collect into vital information for society. GEOSS will yield a broad range of basic social benefits, including the reduction of loss of life and property from tsunamis, hurricanes and other natural disasters; improved water-resource and energy management; and improved understanding of environmental factors significant to public health.

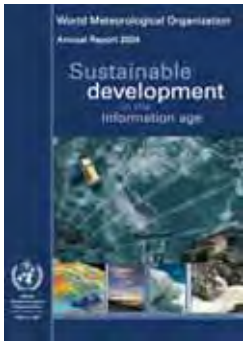
The need is acute. During the decade 1990-1999, disasters killed 500 000 people and caused US$ 750 billion in damage worldwide. Although damage cannot be completely avoided, better coordination of observation systems and data will improve preparedness and thus reduce these losses and help protect other resources. Improved monitoring of hazards and delivery of information are critical to prevent hazards from becoming disasters.

The ultimate objective of GEO is to develop the use of Earth observations by user communities—in both developed and developing countries—ranging from decision- and policy-makers to scientists, industry, international, governmental and non-governmental organizations. The engagement of these communities in identifying their needs for new or improved data is essential to enhancing the adequacy of provided services and products for a wide diversity of applications.

WMO is working with other UN bodies, such as FAO, UNESCO and UNEP, to develop coordinated mechanisms for participation in GEOSS activities.

Recently issued by WMO

The April, July and October 2005 issues of the new-look WMO Bulletin (English, French, Russian and Spanish)



Annual Report of WMO for 2004 (English, French, Russian and Spanish)

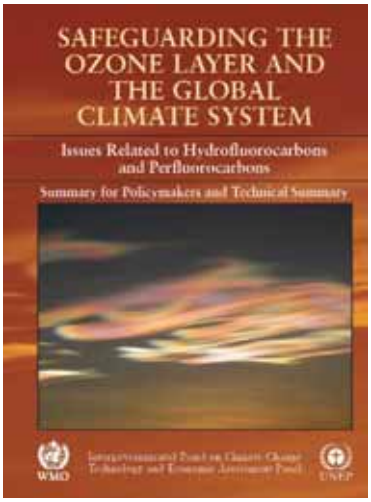
Protecting the ozone layer: A priority for WMO (English)
4 pp.
Free upon request

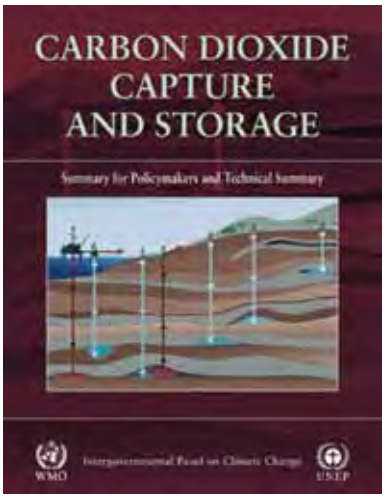
IPCC UPDATE

In 2005, the Intergovernmental Panel on Climate Change (IPCC) completed two Special Reports. The Special Report *Safeguarding the Ozone Layer and the Global Climate System—Issues Related to hydrofluorocarbons and Perfluorocarbons* was prepared jointly with the Technology and Economic Assessment Panel of the Montreal Protocol. It considers the effects on the climate system and the ozone layer of total emissions of ozone depleting substances (ODS) and their substitutes. It provides the scientific context required for consideration of choices among alternatives to ODS, summarizes methodologies for assessing options, describes technical issues relating to greenhouse-gas emission reduction opportunities for each of the sectors involved, and addresses future availability of hydrofluorocarbons.

The Special Report on *Carbon Dioxide Capture and Storage* considers CO_2 capture and storage (CCS) as an option in the portfolio of actions for stabilization of greenhouse-gas concentrations and assesses the status of CCS technologies that are in various stages of development, including capture, transportation, geological storage, ocean storage, mineral carbonation and industrial uses of CO_2. The assessment also covers the cost, technical and economic potential for capture and storage, the local health and environment risks, legal issues for implementing CCS, and the implications for emissions inventories and accounting in the United Nations Framework Convention on Climate Change and Kyoto Protocol contexts. The summaries for policy-makers of both reports are available on the principal IPCC Website http://www.ipcc.ch.

The *Fourth Assessment Report* (AR4) and related activities are progressing well. The first order drafts of the Working-Group contributions to the AR4 are currently being reviewed by experts. The three Working Group contributions to the AR4 and the Synthesis Report will be finalized in 2007. The second draft of the *2006 Guidelines for National Greenhouse Gas Inventories* is currently being reviewed by governments and experts and will be submitted to the Panel for adoption in April 2006.





World Climate News is available on the Internet (http://www.wmo.int, then select "Catalogue of the WMO Publications"). Printed copies are now sent only on specific request. Please fill in the form below and send to WMO (see page 2 for details)

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