

Climate Applications and Services: Bridging the Gap between Climate Information Providers and Users



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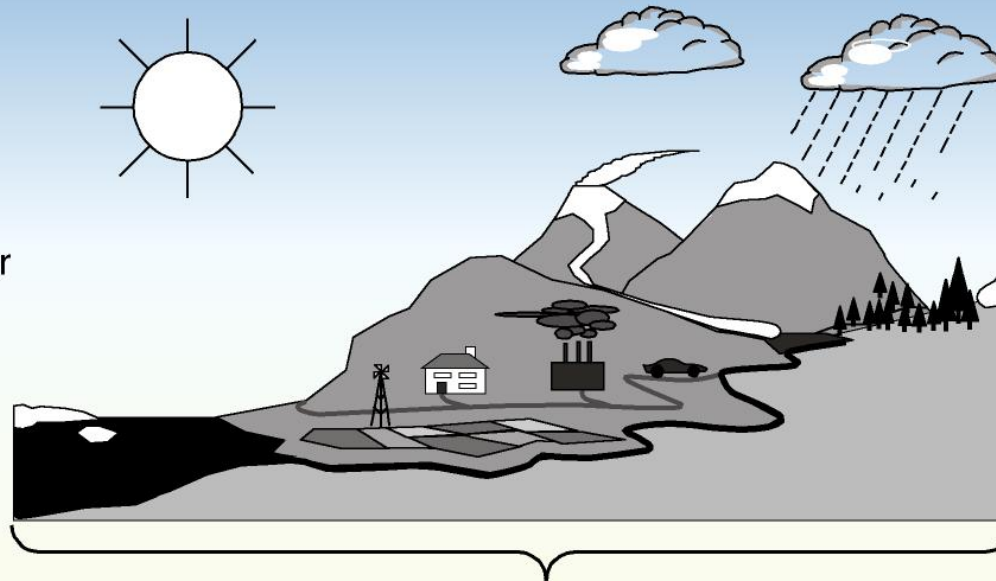
Key questions about the climate system and its relation to human kind

What changes have occurred?

Observations:

- temperatures
- precipitation
- snow / ice cover
- sea level
- circulation
- extremes

How well are the past and present climates understood?

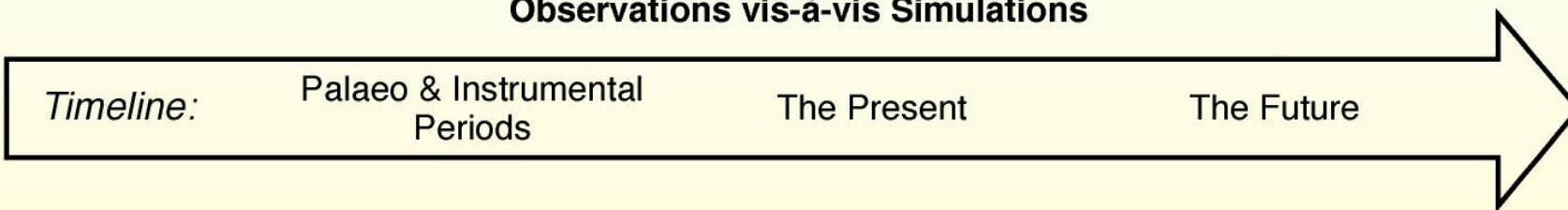


What changes could lie ahead?

Simulations:

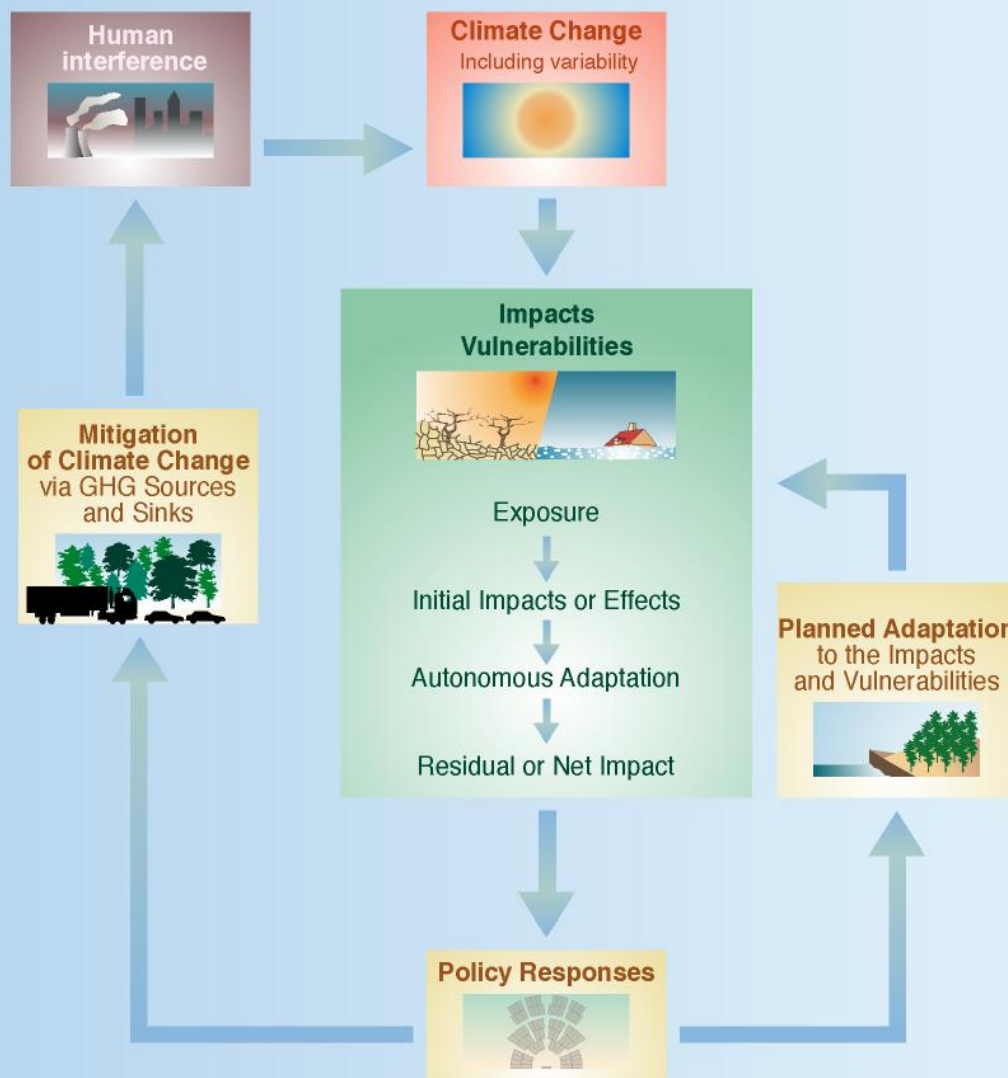
- natural variation
- forcing agents
- global climate
- regional climate
- high impact events
- stabilisation

Observations vis-à-vis Simulations



WG1 - TS FIGURE 1

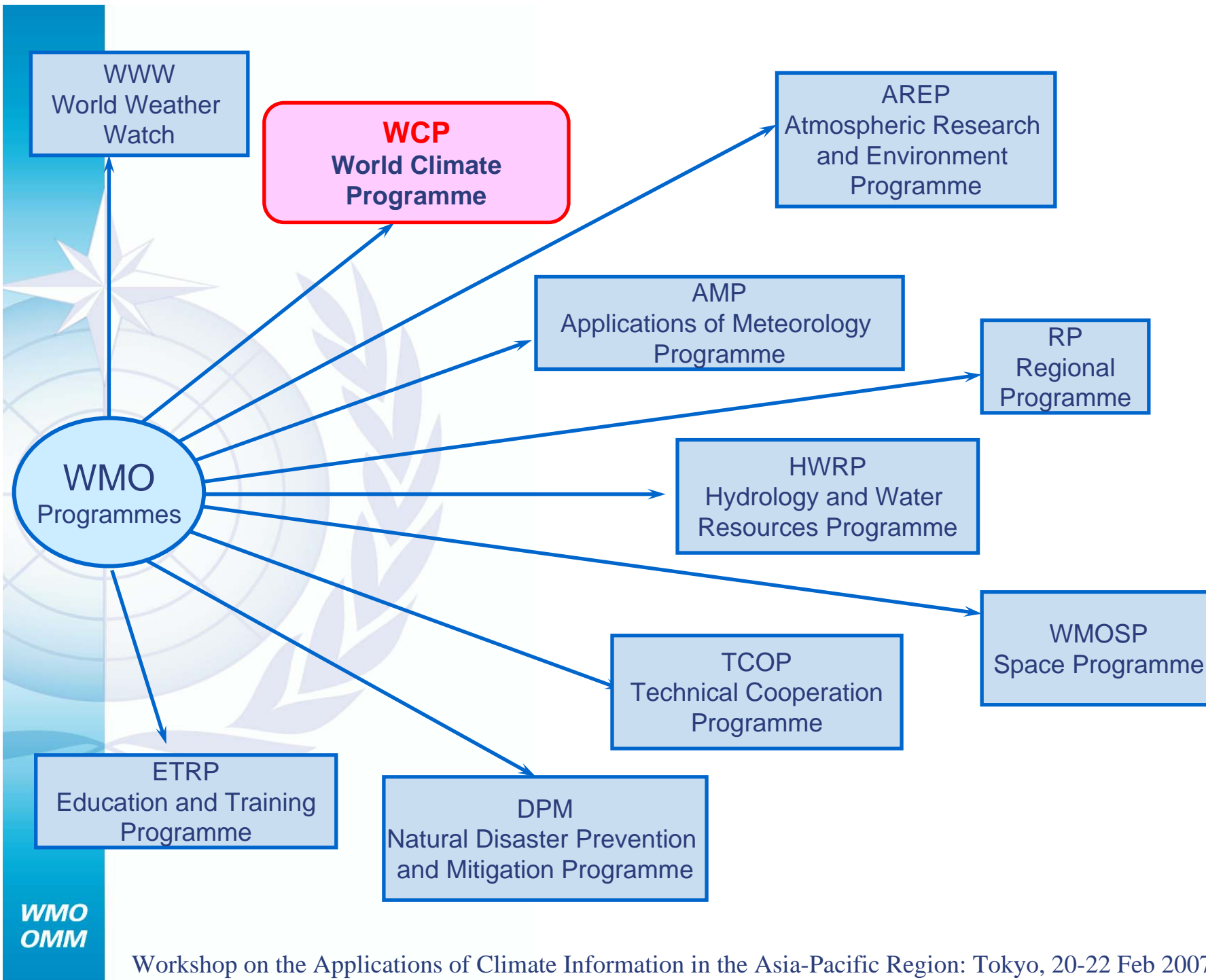
Scope of the working group II assessment



BASED ON WG2 - FIGURE TS-1

Outline

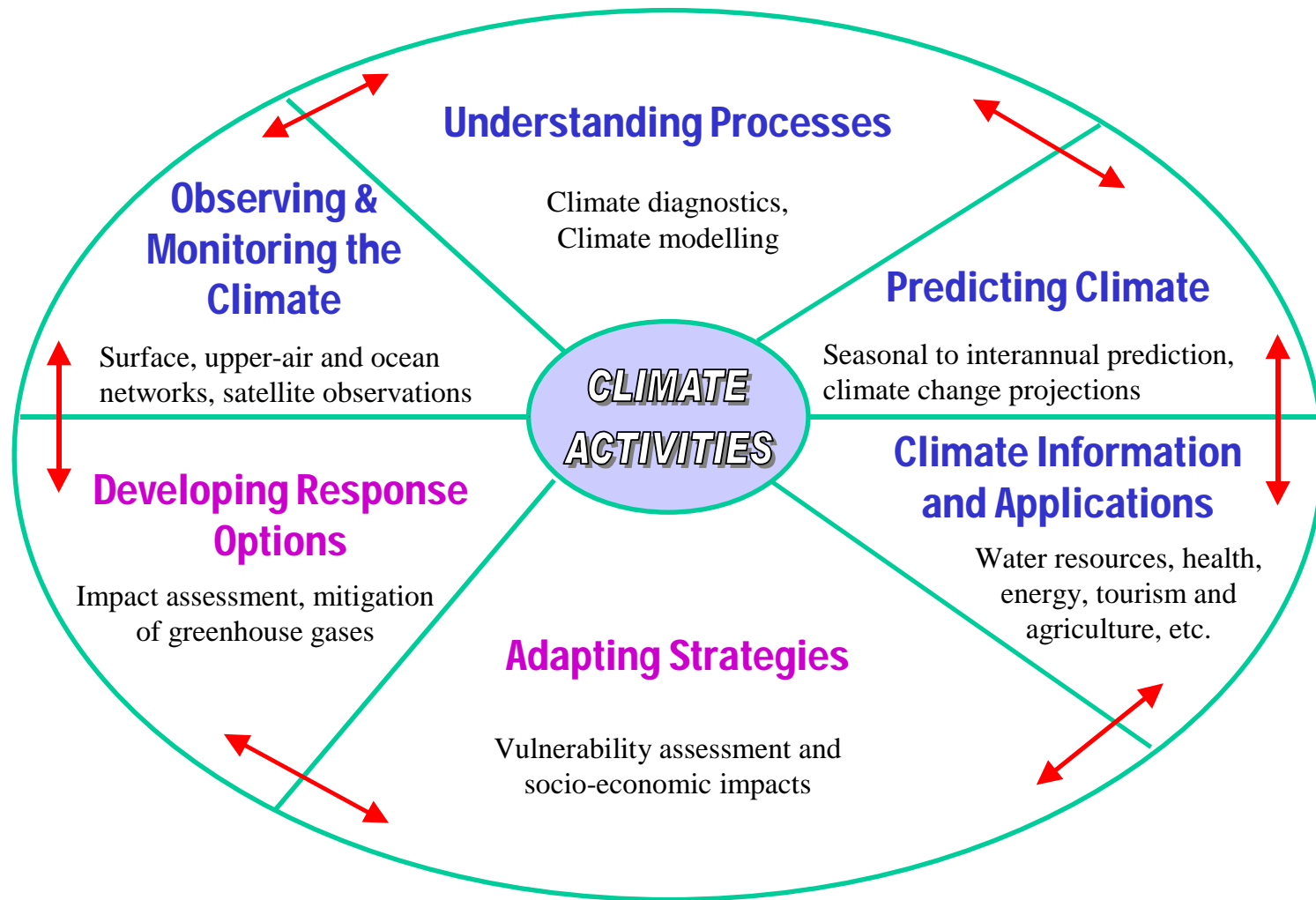
- WMO's climate activities; World Climate Programme (WCP)
- World Climate Applications and Services Programme (WCASP) and the CLIPS Project
 - Training
 - Regional Climate Outlook Forums
 - User liaison
- WMO Commission for Climatology; OPAGs 3 and 4
- Concluding Remarks



WMO's Climate-Related Activities

- Observations, data management and data exchange
- Research and predictions
- Climate products and services (for sector-specific applications)
- Capacity building, education and training
- Climate coordination

Integrated framework of WMO's climate activities



Emerging Opportunities: Towards Improved Societal Response and Sustainable Development

- Relevant climate information is expected to enhance policy and decision-making
 - Climate data
 - Climate analysis and monitoring capabilities
 - Specialized climate forecast products – Must become user centric
 - Climate risk modelling tools – Critical for decision making
- There is significant diversity in supply and demand of climate information at national level
 - Needs, requirements and capabilities of providers
 - Needs and requirements of the users related to policy and decision-making

WMO proactively pursues climate applications

- Espoo Conference (**Living with Climate Variability and Change**: July, 2006) highlights the role of users and decision makers in climate services.
- Madrid Conference (**Socio-economic Benefits of Meteorological Services**: March, 2007) highlights the quantification of socio-economic benefits of meteorological services.
- ‘**World Climate Conference Three**’ under active pre-planning discussions.
- Based on a formal statement issued for the first time at the UNFCCC COP-12 in 2006, the role of WMO and NMHSs has been officially recognized in the “**Nairobi Programme of Work on Impacts, Vulnerability and Adaptation to Climate Change**”.

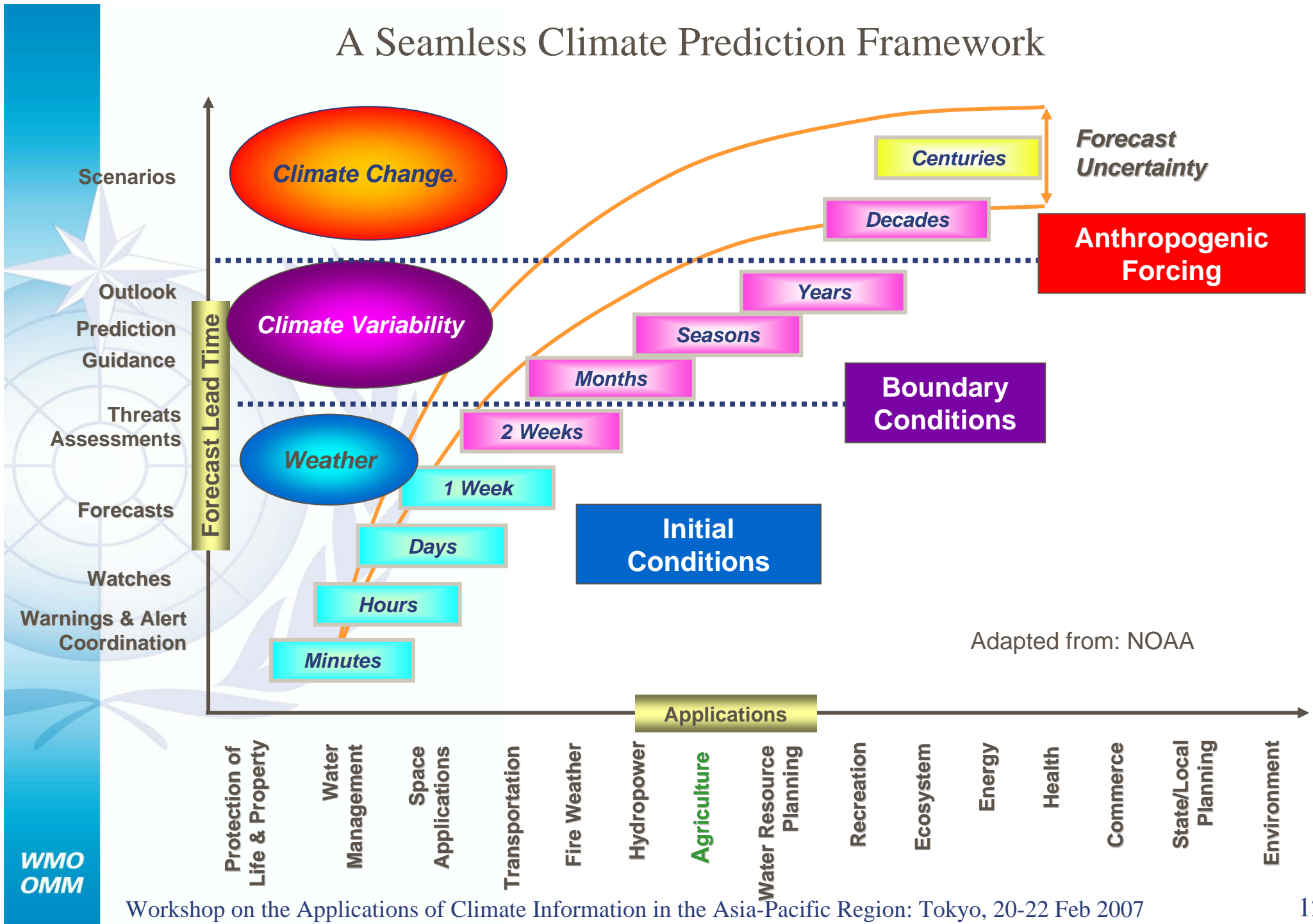
WCP: Major Areas

- Monitoring and understanding the global climate system
- Collection, rescue and management of climate data
- Detection & assessment of climate variability and change
- Guidance, techniques and methodologies for climate information
- Impacts of climate variability and change
- Prediction of climate variations and improving prediction skill
- Applications of climate knowledge and information
 - Focus on sustainable development and human well-being
- Development of climate services
- Early warning and climate alert systems
- Capacity building, technology transfer and guidance

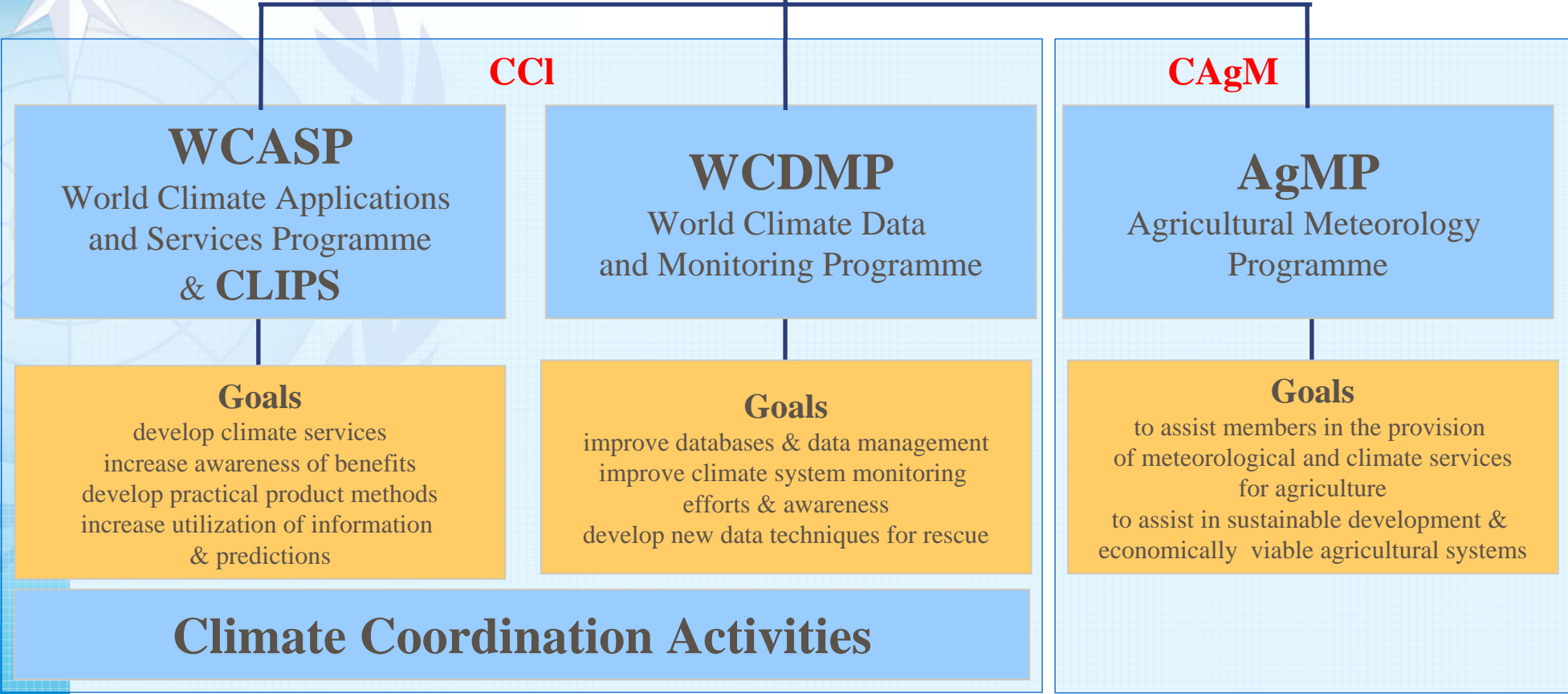
WCP Strategies

- Enhancing WMO's role as the UN authoritative voice on the state and behavior of the climate
- Promotion of user-targeted climate services
- Support delivery of accurate and reliable warnings of severe climatic events
- Increase awareness of the socio-economic benefits of climate information and services
- Promote understanding and modeling of the processes that affect the climate
- Support development of climate observations
- Build and sustain effective global/regional and provider/user partnerships

A Seamless Climate Prediction Framework



WCP
World Climate Programme
Department, WMO



World Climate Applications and Services Programme

- Applications of climate information and prediction services to support human activities and sustainable development:
 - Economic efficiency
 - Human health and well being
 - Food production, food security
 - Water resources planning and management
 - Renewable/efficient energy
 - Sustainable tourism
 - Urban and built environment



Value of Climate Information and Services to Society

- the nature of the dependence of socio-economic activities on climatic factors
- reliability of climate products including awareness of the associated uncertainties and their implications to decision-making
- accessibility of credible and useful climate information for decision making
- liaison between users and climate information providers
- the ability of users to act on the basis of climate information

WCASP Objectives

- Development of user-targeted climate services
- Services for sustainable development at national, regional and global levels
- Contribute to strategies for adapting to, and mitigating, the adverse impacts of climate and its variations
- Increased user awareness and liaison
- Partnership with national/international agencies dealing with application sectors
- Development of practical methods and techniques including climate prediction products
- Implementation through CLIPS Project

Climate Information and Prediction Services (CLIPS)

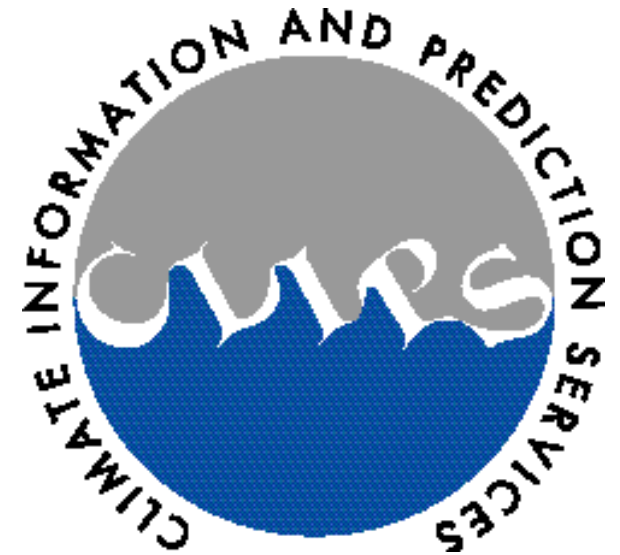
- The term “climate services” refers to the delivery of climate information and predictions from the scientific sources to end-users
- A service is a service only when it is used; our goal is to make people use climate services in real-world context
- Climate information is just one of the elements in the decision making matrix
- Databases of information gathered over many years; NMHSs have great potential to exploit these resources to provide “effective” climate services
- Predictions of climate variability over the next season or two (seasonal to interannual forecasts) are of immediate relevance

CLIPS Objectives

- To demonstrate the value and eventual socio-economic benefits of climate information and prediction;
- To provide an international framework to enhance and promote climate information and prediction, including the establishment of criteria to measure forecast quality and to permit model inter-comparison;
- To promote the development of operational climate prediction at regional and national levels;
- To support capacity building and regional/global collaboration in operational user-targeted climate services
- To facilitate the definition, development and the strengthening of a global network of regional/national climate centres;
- Collaboration with other WMO Programme and Institutions.

CLIPS Main Activities

- Enhance capacity of NMHSs in SIP and their applications and create ownership of user-targeted climate services at the local level
- Development of guidelines and methodologies for SIP and applications in climate sensitive sectors and systems
- Promote development of consensus-based regional/global outlooks
- Provide users with new climate products based on state-of-art scientific understanding and establish links between providers of and users of SIPs
- Promote joint international research with WCRP and other international climate programmes



Capacity Building



Participants of the CLIPS Training Workshop for Eastern and Southern Africa, August 2002

- Establish and network CLIPS Focal Points
 - A global network of climate scientists/service providers specially trained in climate science, statistical modelling and prediction, applications and project management.
 - These CLIPS Focal Points ensure national and regional coordination of climate information and prediction products.
 - Biannual reporting of CLIPS activities by CLIPS Focal Points, and sharing the reports through WMO portal.
- Development of CLIPS Training Curriculum
- Regional/sub-regional CLIPS Training Workshops
- User-awareness development through workshops, projects and Climate Outlook Forums

Infrastructure and Forecasting

- Access to Global Producing Centres;
- Regional Climate Centres;
- Examination of forecast presentation methods;
- Best practices;
- Downscaling and Regional Climate Models;
- Development of Regional Climate Outlook Forums;
- Joint activities with research programmes such as WCRP to bring in state-of-art science into climate services.

Applications

- Coordination of demonstration and pilot projects;
- Involvement of Focal Points in demonstration and pilot projects;
- Partnership with application sectors at national, regional and global levels
- Examination of improved project design;
- Examination of impacts of climate services on applications;
- Examination of data requirements.

Consensus Forecasting

- Need for reliable and timely forecasts of climate variability, especially related to ENSO.
- Need for global infrastructure for coordinated climate forecasting.
- Coordinated and user-targeted climate forecast development needs the expertise of:
 - oceanic, atmospheric, and social scientists,
 - regional experts in climate-forecast applications and
 - sectoral users of climate information.
- Success relies on:
 - Knowledge of global, regional and local aspects of the climate system,
 - Seasonal-to-interannual climate-forecasting skills,
 - Up-to-date modeling, computing and communications technology,
 - Extensive input data from national observation systems and
 - Understanding of the needs of the various users of the forecasts.
 - Factoring of climate related uncertainties into decision-making processes

Consensus Forecasting - Goals

- Help users of climate forecasts make decisions on aspects of their lives that are related to or dependent on climate variations.
- Develop knowledge and appreciation of respective disciplines and perspectives of each community of participants.
- Overcome barriers to effective application of climate forecasts.
- Develop 'end-to-end' systems that:
 - Produce/distribute forecasts that address the needs and requirements of user sectors, with special attention to extreme climatic events;
 - Bring forecast producers and users together to collaborate;
 - Allow iterative learning to help refine all of these objectives; and
 - Focus climate research and application activities to serve the needs of real user groups, using actual climate as it unfolds.

WMO El Niño and La Niña Update

- The WMO El Niño/La Niña Update is a consensus report prepared in collaboration with the International Research Institute for Climate and Society (IRI) and with contributions from NMHSs, regional and global prediction/research centres and individual experts.
- Seasonal climate outlooks, as produced by NMHSs, provide detailed information on expected impacts, after considering other factors that influence regional climate.
- In considering response strategies, it is important to examine regional climate outlooks and not to rely solely on the presence of El Niño or La Niña.
- The latest WMO El Niño/La Niña Update, issued on December 1, 2006, says a **“moderate” El Niño event is now established and is expected to continue until at least the first quarter of 2007.**
- Impacts already felt include severe drought conditions over Australia and Indonesia, and extremely heavy rainfall over tropical eastern Africa.
- Next Update under preparation; expected in the first week of March, 2007.

WMO El Niño and La Niña Updates: Partners

- ACMAD
- ADPC
- BOM
- CIIFEN
- CLIVAR/IOC
- CSIRO
- CMA
- COLA/IGES
- DMC-Harare
- ECMWF
- ICPAC
- Fiji Met. Svc.
- IMD
- INAMHI
- IPRC
- IRI
- JMA
- KMA
- Mauritius Met. Svcs
- Météo France
- MetOffice
- NOAA
- NIWA
- UCAR

Regional Climate Outlook Forums (RCOFs)

- A component of CLIPS
- First established in 1996: Meeting in Victoria Falls, Zimbabwe.
- Regional mechanism for the formulation and dissemination of climate forecasts and outlooks
- Bring together providers of and users of SIPs.
- RCOFs, initiated just prior to the major 1997–1998 El Niño event, constitute an important vehicle in developing regions for providing advance information on the likely climate features of the upcoming season, and for developing a consensus product from amongst the multiple available individual predictions.
- RCOFs stimulate the development of climate capacity in the NMHSs of the area, and do much to generate decisions and activities that mitigate adverse impacts of climate and help communities adapt to climate variability.

CLIPS - RCOFs

- Regular Forums in some regions where NMHSs meet to develop regional consensus on SIPs.
- More than 40 forums held throughout the world, notably in Africa, South America and Asia.



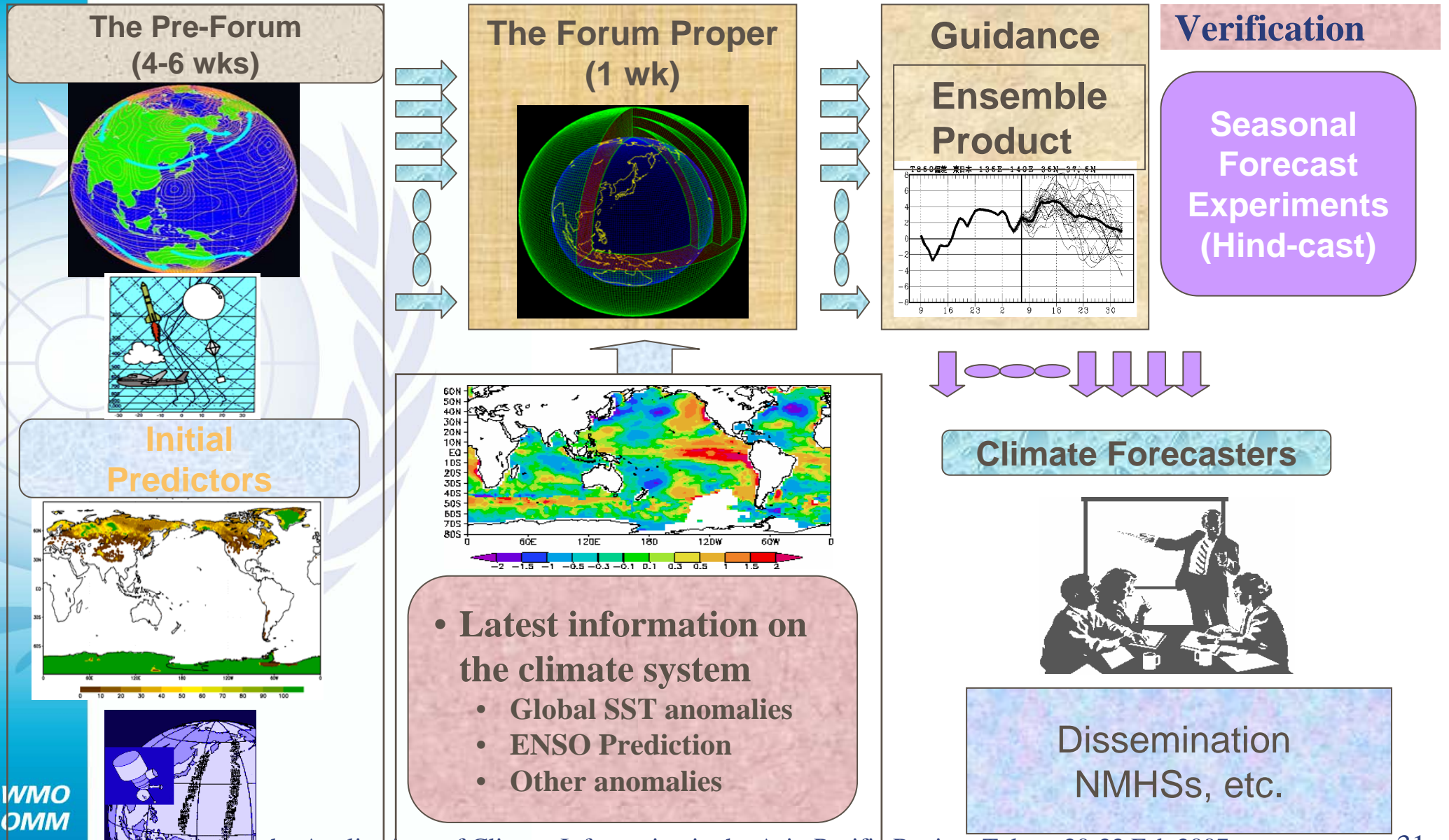
Consensus Forecast Process

- Determine the critical time for development of the climate forecast for the region in question;
- Assemble a group of experts:
 - Large scale prediction specialists,
 - regional and local climate applications and forecast specialists,
 - stakeholders representative of climate-sensitive sectors;
- Review current large scale (global and regional) climate anomalies and the most recent forecasts for their evolution;
- Review current climate conditions and their impacts at local, national and regional levels, and national-scale forecasts;
- ⇒

Consensus Forecast Process, cont'd

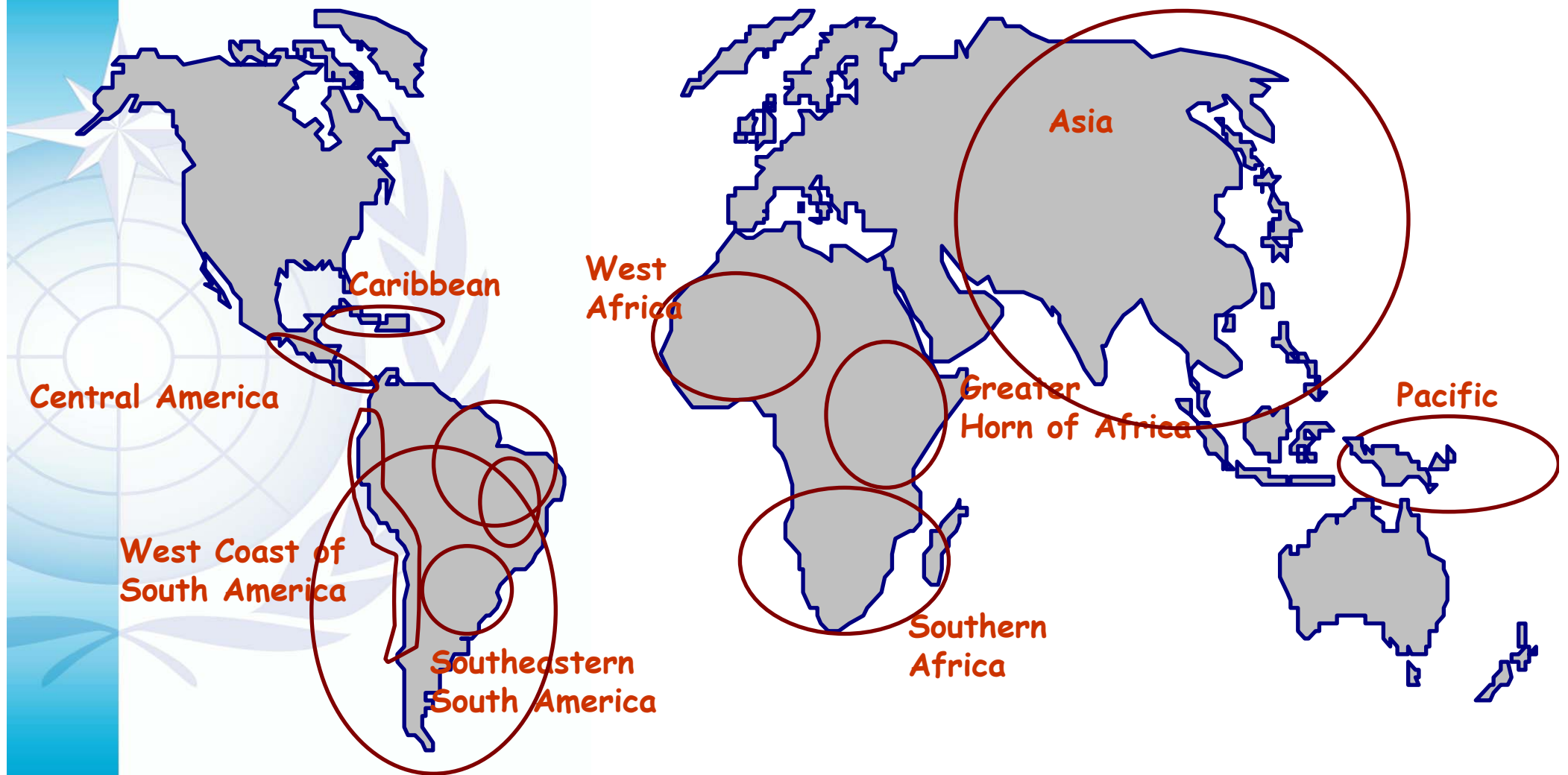
- Considering all factors, produce a forecast with related output (e.g. maps of temperature and precipitation anomalies) that will be applied and fine-tuned (downscaling) by NMHSs in the region to meet national needs;
- Discuss applications of the forecast and related climate information to climate-sensitive sectors in the region; consider practical products for development by NMHSs;
- Develop strategies to effectively communicate the information to decision-makers in all affected sectors;
- Critique the session and its results:
 - document achieved improvements to the process and any challenges encountered,
 - Establish steps required to further improve the process for subsequent sessions.

The Regional Climate Outlook Forum Process



WMO
OMM

RCOFs Worldwide



Seasonal Predictions for the summer of 2005: Asia

■ Precipitation:

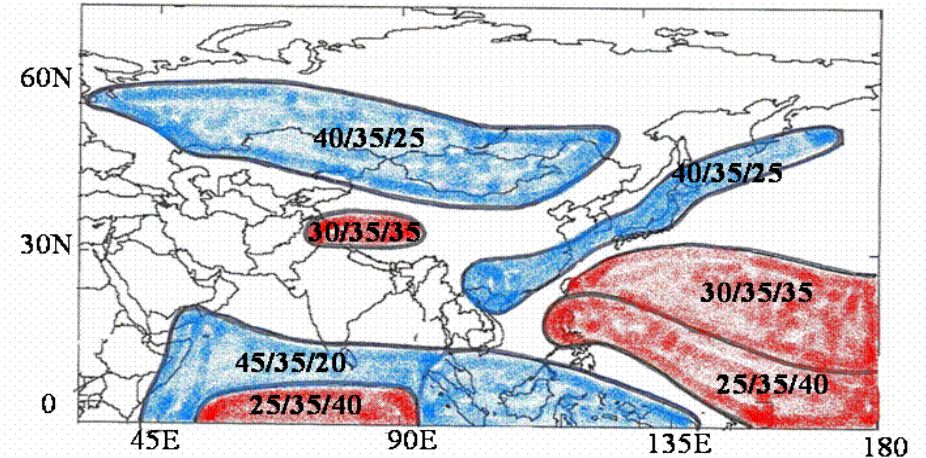
- MORE THAN NORMAL: the Yangtze River Basin, Indochina Peninsula, northern Central Asia, and southern Japan
- LESS THAN NORMAL: NE China, Korean Peninsula, Northern Japan, and India

■ Air Temperature:

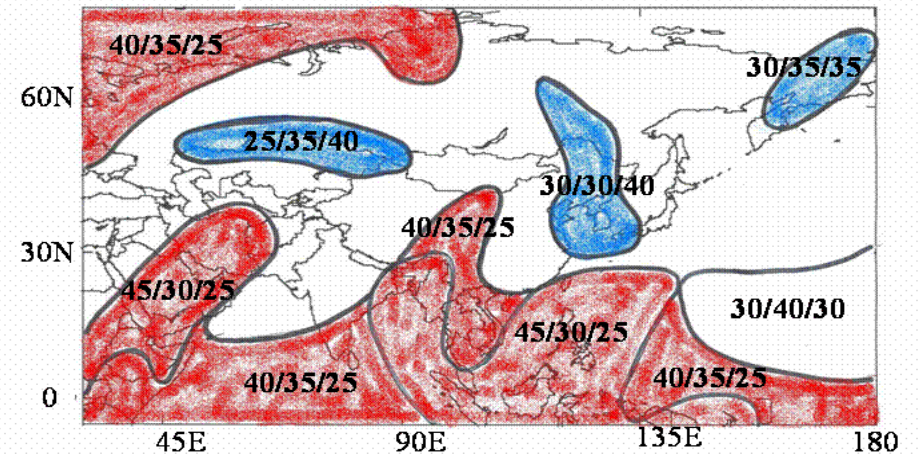
- HIGHER THAN NORMAL: the north of 40N latitude and tropical areas
- LOWER THAN NORMAL: central regions (e.g Eastern China)

■ Typhoons NW Pacific 2005:

- 27 to 29 (around normal: CN = 28)
- No of typhoons landing in China is predicted to be 6 to 8 (near normal: CN =7)



Precipitation Prediction for June to August of 2005
(Probability: Above normal/Neutral/Below normal)

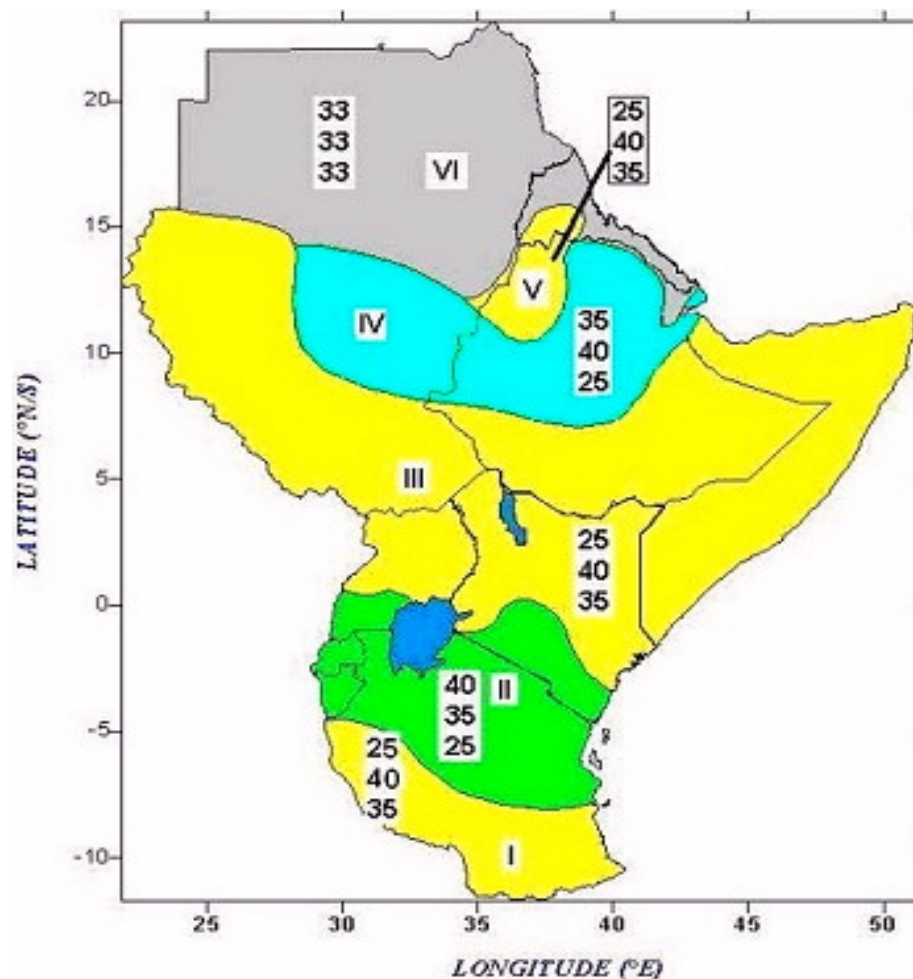


Air Temperature Prediction for June to August of 2005
(Probability: Above normal/Neutral/Below normal)

Seasonal Predictions for the summer of 2005: GHA

OUTLOOK (MAM):

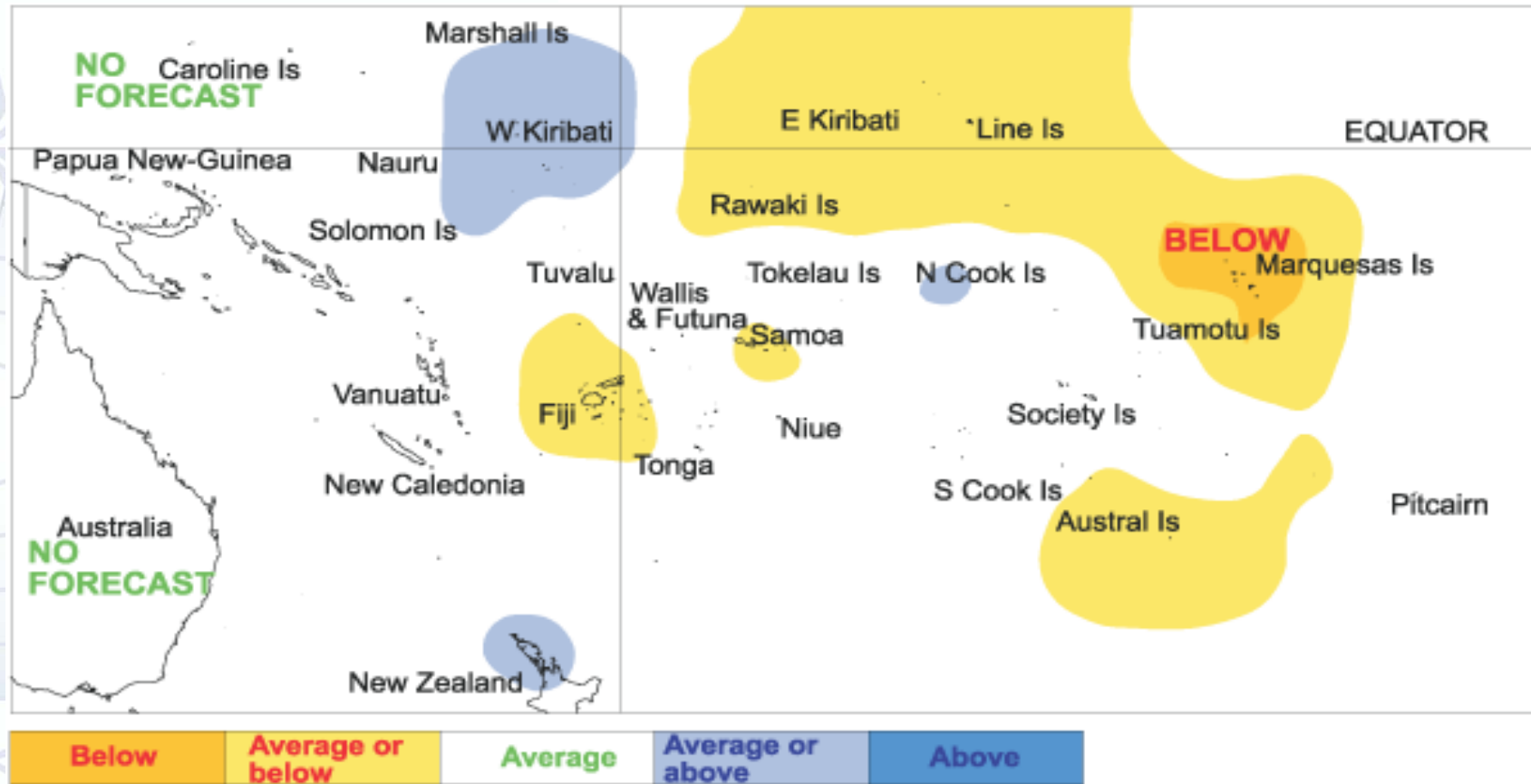
- **ZI: NBN** SSW Tanzania
- **ZII: ANN** CN Tanzania; Rwanda; Burundi; S.Uganda, CS Kenya
- **ZIII: NBN** Kenya, CN Uganda, SW Sudan, SE Ethiopia and Somalia
- **ZIV: NAN** E Djibouti, W Ethiopia and parts of eastern Sudan
- **ZV: NBN** NW Ethiopia, SW Eritrea
- **ZVI: Climatology**, N Sudan, much of Eritrea and W Djibouti



Source: 15th RCOF GHA, 2 – 4 March, 2005, Mombasa, Kenya

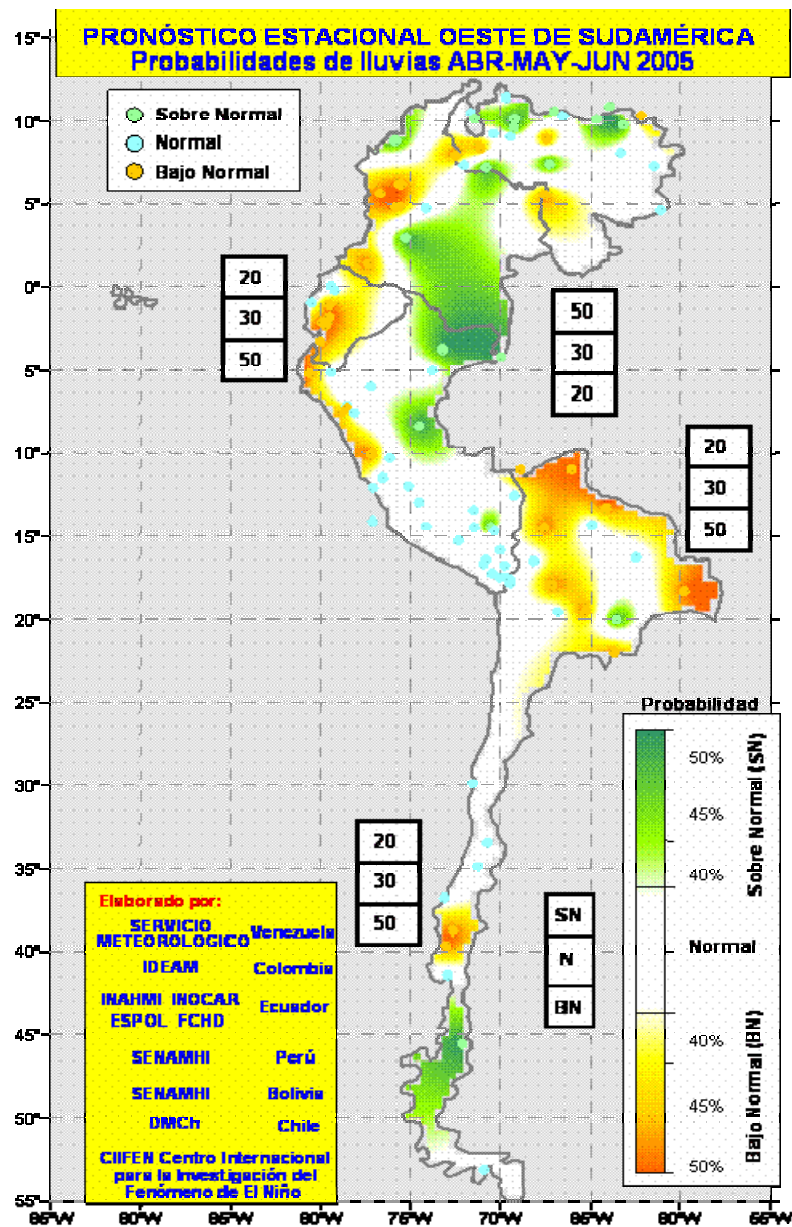
Selected Seasonal Predictions for the summer (winter) of 2005:

The Pacific Islands



Source: Island Climate Update (ICU), NIWA, NZ

Western South America (AMJ 2005)



Source: CIIFEN: Centro Internacional para la Investigación del Fenómeno de El Niño

Climate Watches

- A component of the World Climate Data and Monitoring Programme (WCDMP) with cross-cutting implications for WCASP
- Aim to enable an end user to take action to minimize the effects of an expected adverse climate-related impact, rather than simply reacting to an observed climate anomaly.
- A Climate Watch System can also be seen as an addition to an NMHS's climate forecasting system and to RCOF.
- A Climate Watch will use climate forecasts and outlooks generated by RCOF, but should be thought of as being a proactive alert of impending unfavourable climate anomalies specifically focused on the end user.
- The Climate Watch is not intended to replace the RCOF or other climate forecasting activities that NMHSs are already involved in.
- NMHSs participating in RCOF may consider how the results of the RCOF in their region can be integrated into the Climate Watches issued by the NMHSs and/or associated regional climate institutions.

CLIPS on the Internet

<http://www.wmo.int/web/wcp/clips2001/html/index.html>

Homepage - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Media

Address <http://www.wmo.ch/web/wcp/clips2001/html/index.html> Go

Links Toshiba On the Web Toshiba Support Customize Links RealPlayer Windows Windows Media Norton AntiVirus

World Meteorological Organization

World Climate Applications And Services Programme (WCASP)

CLIPS

CLIMATE INFORMATION AND PREDICTION SERVICES

Welcome to the web site of the
World Climate Applications And Services Programme (WCASP)
and
Climate Information and Prediction Services (CLIPS)

Last Updated 17.02.03

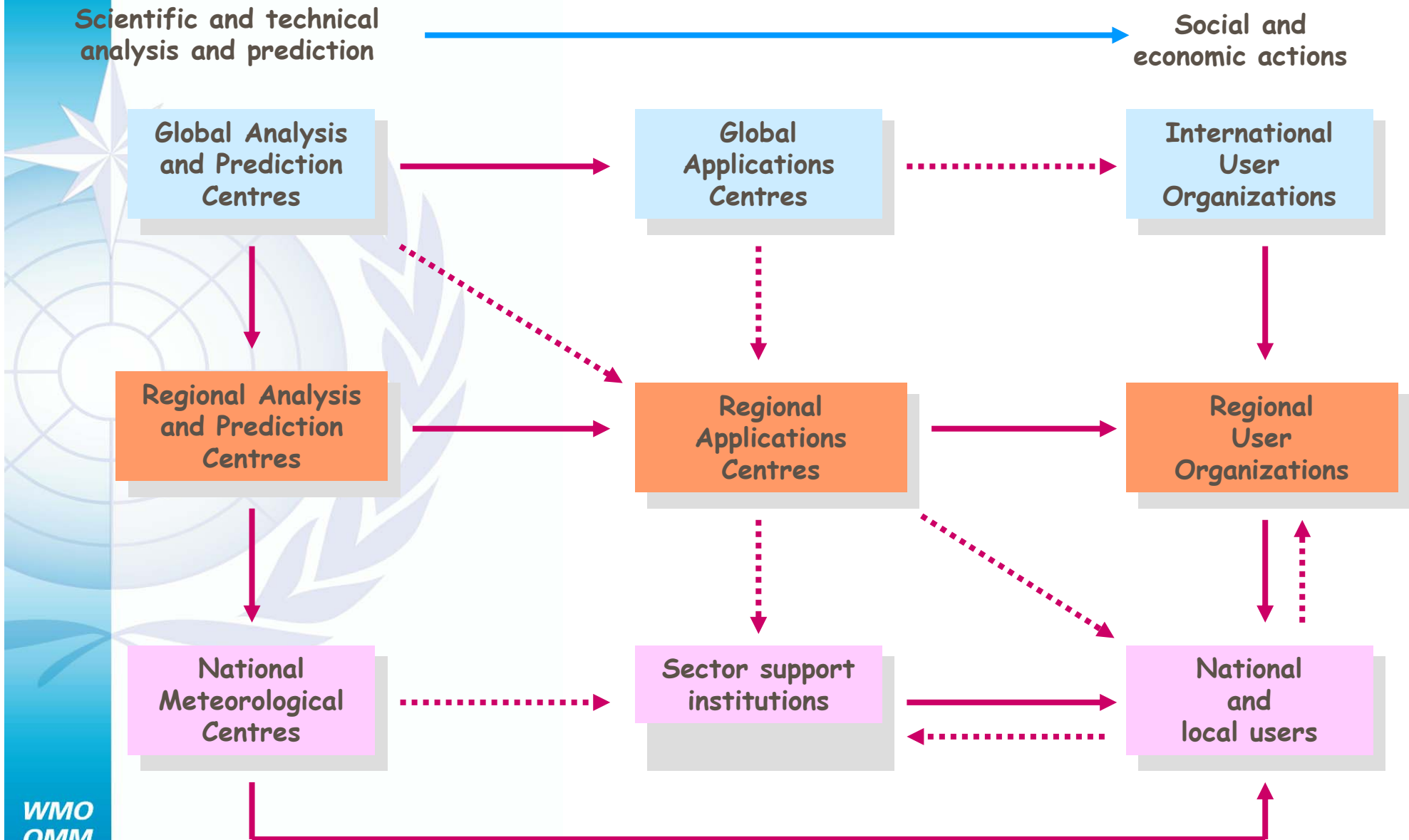
You are the visitor
18856

- What's new !
- Overview
 - Background
 - Introduction
- Structure
 - CCI Structure
 - CLIPS/WCASP Structure
- CLIPS Focal Points
- CLIPS Project and its training
- CLIPS Curriculum
 - Introduction
 - Modules
 - Other presentations
- Meetings schedule
- Documents, Reports, Publications

Global producers of long-range forecasts

- 
- A world map with a light blue grid background. Various logos of meteorological organizations are placed over their respective geographical locations. The logos include: INPE (Brazil), CPC/NCEP/NOAA (USA), ECMWF (Europe), IRI (USA), JMA (Japan), Met Office (UK), Météo-France (France), MSC (Canada), KMA (South Korea), NCC/CMA (China), SAWS (South Africa), and WMO/OMM (Australia).
- Centre for Weather Prediction and Climate Studies/National Institute for Space Research (CPTEC/INPE)
 - Climate Prediction Center, National Centres for Environmental Prediction (CPC/NCEP/NWS/NOAA)
 - European Centre for Medium-range Weather Forecasts (ECMWF)
 - International Research Institute for climate and society (IRI)
 - Japan Meteorological Agency (JMA)
 - Met Office (United Kingdom)
 - Météo-France
 - Meteorological Service of Canada (MSC)
 - Korean Meteorological Administration (KMA)
 - National Climate Centre of the China Meteorological Administration (NCC/CMA)
 - South African Weather Service (SAWS)
 - World Meteorological Centre Melbourne
 - World Meteorological Centre Moscow

INFORMATION FLOW FROM PRODUCERS TO END-USERS



Climate-related Risk Management

■ Works best if it is:

- driven by the needs and requirements expressed by relevant decision sectors
- developed within real-world decision contexts
- enabled through facilitating institutions and policies
- based on environmental, sectoral and socioeconomic data
- based on tailored climate information
- supported by local capacity
- included in planning strategies that incorporate incentives
- supported by sector-specific services from National Meteorological and Hydrological Services and related institutions.

CLIPS Initiatives

■ Capacity building:

- The CLIPS Project will continue to facilitate workshops and training, as well as development of the global network of CLIPS Focal Points.

■ Applications projects:

- Pilot Application Projects, developed in collaboration with other WMO Programmes (i.e., Hydrology and Water Resources, Agricultural Meteorology, Voluntary Cooperation), WMO Members and Regional Associations, address issues from production to dissemination of information and products, interpretation, use and evaluation of the Climate Outlook Forums.

■ Science and methodology:

- CLIPS encourages dissemination of model intercomparisons by forecast producers; works to increase temporal and spatial resolution of digital data for downscaling; helps establish operational methods for forecast verification; and helps set criteria for measurement of forecast quality.

■ Regional collaboration:

- CLIPS works with the WMO Regional Associations to facilitate the implementation of RCCs. The CLIPS Focal Points are instrumental in defining the requirements for the responsibilities of the RCCs.
- CLIPS promotes the development and sustained real-time activities of RCOFs.

WMO Technical Commission on Climatology

- Management Group
- Open Programme Area Groups
- Expert Teams
- Rapporteurs
- Implementation Coordination Team (ICT)

WMO COMMISSION FOR CLIMATOLOGY (CCI)

MANAGEMENT GROUP (MG)

Regional Representatives:
RA III: Luis Molion (*Brazil*)
RA V: Michael Coughlan (*Australia*)

President
Pierre Bessemoulin
(*France*)

Vice-president
Wang, Shourong
(*China*)

World Data Centres:
Aleksandr Sterin (*Russian Federation*)

OPAG 1
Climate Data and Data Management

Chair: Raino Heino (Finland)

Co-chair: Peter Ambenje (Kenya)

1.1 ET for Climate Data Management including Metadata
Radim Tolasz (Czech Republic)

1.2: ET on Observing Requirements and Standards for Climate
William Wright (Australia)

1.3: ET on Rescue, Preservation and Digitization of Climate Records
Joe Elms (USA)

OPAG 2
Monitoring and Analysis of Climate Variability and Change

Chair: Thomas Peterson (USA)

Co-chair: Manola Brunet India (Spain)

2.1: CCI/CLIVAR/JCOMM ET on Climate Change Detection and Indices
CCI: *Albert KleinTank (Netherlands)*
CLIVAR: *TBD*

2.2: ET on Climate Monitoring including the use of Satellite and Marine Data and Products
Zhang, Zuqiang (China)

2.3: Rapporteur on Climate Extremes
Randall Cerveny (USA)

OPAG 3
Climate Information and Prediction Services (CLIPS)

Chair: Abdallah Mokssit (Morocco)

Co-chair: José Luis Santos (Ecuador)

3.1: ET on Research Needs for Intraseasonal, Seasonal & Interannual Prediction
Jean-Pierre Ceron (France)

3.2: ET on CLIPS Operations, Verification and Applications Services
Operations: *Philbert Tibajuka (Tanzania)*
Verification: *Simon Mason (USA)*
User Liaison: *Jaakko Helminen (Finland)*

3.3: ET on El Niño and La Niña
Luc Maitrepierre (New Caledonia)

3.4: Rapporteur on Climate And Water
Nakaegawa Tosiya (Japan)

3.5: Rapporteur on Climate and Agrometeorology
Roger Stone (Australia)

OPAG 4
Climate Applications and Services

Chair: Dong, Wenjie (China)

Co-chair: Muhammed Kadi (Algeria)

4.1: ET on Climate and Health
Glenn McGregor (UK)

4.2: ET on Climate and Energy
David Wratt (New Zealand)

4.3: ET on Climate and Tourism
Dan Scott (Canada)

4.4: ET on Urban and Building Climatology
Sue Grimmond (UK)

Reporting to the President or Management Group:

5.1: Rapporteur on Climate-related Hazards (*Member of the MG, TBD*)

5.2: ET on the Guide to Climatological Practices (*Ned Guttman, USA*)

5.3: Gender Focal Point (*Juliana Ukeje, Nigeria*)

5.4: Rapporteur on GEOSS (*Stephan Roesner, Germany*)

7. Implementation/Coordination Team (ICT): CCI VP; Co-Chairs of OPAGs 1, 2, 3, 4; Chairpersons of the Working Groups on Climate-related Matters for RAs I, II, III, IV, V and VI.

Reporting to the OPAG Chairs:

6. CCI Experts serving on teams of other

Technical Commissions

OPAG: Open Programme Area Group
ET: Expert Team

CCI-XIV OPAG 3: CLIPS

- ET 3.1 Research needs: intraseasonal, seasonal and interannual prediction
 - Sector-specific needs, verification and assessment of capabilities
 - Methodologies for creation and presentation of prediction products
 - Support to user decision process
- ET 3.2 CLIPS Operations, Verification and User Liaison
 - Assess skill of climate predictions and potential to meet user requirements
 - Guide to best operational practices
 - Requirements of NMHSs, RCCs and users for verification information
 - Costs and benefits of climate products and services; user needs
- ET 3.3 El Niño/La Niña
 - Definitions and indices; Atlas of regional impacts; WMO Updates
- Rapporteurs on Agrometeorology and on Hydrology
- Coordinate with WCRP, AREP, CBS, CAS, DPM, Space/GEO, RCD (LDCs and more), Global Producing Centres of LRF, and with OPAG 4

CCI-XIV OPAG 4: Climate Applications and Services

- ET 4.1 Climate and Health
 - Heat-Health Warning Systems
 - Health-related information & early warning systems; infectious diseases; Health and climate change
- ET 4.2 Climate and Energy
 - Climate services for energy development and operations
 - Climate aspects of renewable energy sources
- ET 4.3 Climate and Tourism
 - Role of climate in touristic frequentation/destination
 - Sustainable tourism
- ET 4.4 Urban and Building Climatology
 - Urban and building climate science; Education and Training
 - Urban modelling;
- Partnership building; Guidelines; Technical Notes
- Coordination with OPAG3 – CLIPS;

Heat-Health Warning Systems

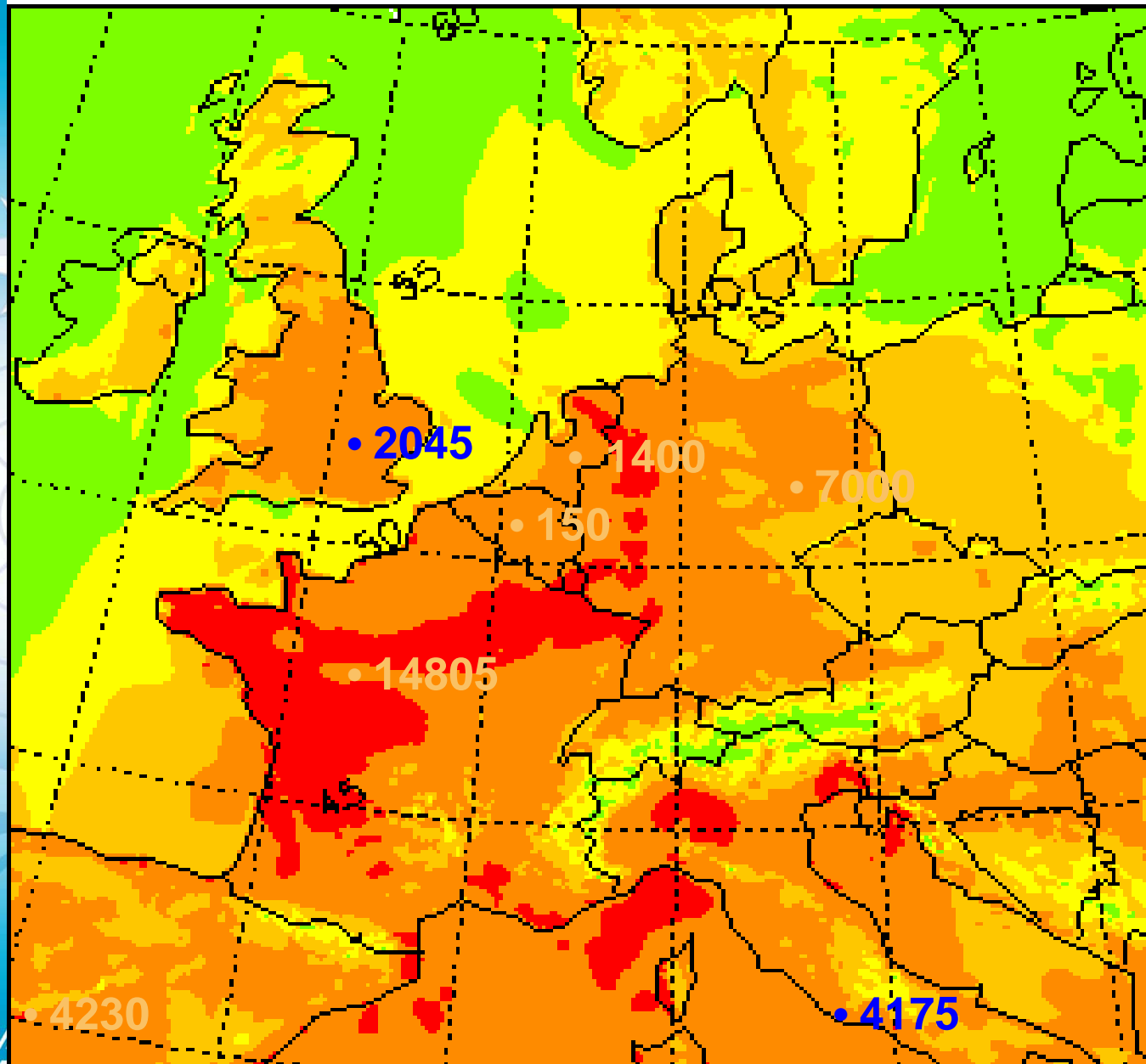
■ Goals:

- Reduce mortality and morbidity associated with life-threatening heatwaves
- Strengthen WMO/NMHS partnerships with health and social services (global, regional, national) for effective service delivery – Met forecasts alone are insufficient

■ Develop Guidance on and tools for:

- early warning and detection of health effects of extreme weather/ heat-waves;
- national/local preparedness planning for extreme heat events;
- public/media outreach;
- interventions to save lives.

Heat related extra deaths in Europe, August 2003



heat load



cold stress

PT map underlay
UTC13:00
Aug 9 2003

WM
OM

Status and Plans

■ Activities 2006:

- Meeting of CCI Expert Team on Climate and Health, with partnering agencies, 20-22 November 2006:
 - developed the outline of the HHWS Framework and Guidance;
 - set up project deliverables;
 - gained commitment of authors.
- Developed a WCP/CCI/DPM project plan for multi-country multi-agency demonstrations to lead to implementation of HHWS and scope the special needs for developing and least-developed countries (potential hosts to include Canada, France, India, China)

■ Planned for 2007:

- Authors' meeting, Feb 2007
- Draft Guidance document to be available by Cg-XV
- Resource mobilization for demonstration phase
- Planning/organizing, with partners, of the demonstration activities

Concluding Remarks

- WCASP/CLIPS will continue to promote the development of climate services with active participation of application sectors.
- CLIPS Focal Point activity will be revitalized and expanded to accomplish better involvement of application sectors.
- CCI Expert Teams are charged with re-focused strategies to help develop the regional/national capacities in developing climate services.
- Application sectors will help climate information providers in quantifying the value of climate services, and also in optimally packaging tailored climate information products for improved use in decisionmaking.
- Networking between climate information providers, research, other agencies and stakeholders is essential.
- We need to leverage climate information to exploit opportunities afforded by the climate as well as to manage the risks associated with adverse climate situations.
- FOCRAII initiatives need to be expanded; Considering the common climate information needs of Asian-Pacific countries, there is ample scope for the development of RCOFs (e.g., East Asia, Southeast Asia, South Asia).



Thank You

For more information, please contact:

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