

**REPORT OF TRAINING WORKSHOP ON CLIMATE INFORMATION AND
PREDICTION SERVICES FOR REGIONAL ASSOCIATION VI**

(Erfurt, Germany, 12 - 18 June 2003)

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1 Introduction

- 1.1 The Workshop on Climate Information and Prediction Services (CLIPS) for Regional Association VI (RA VI) was held in Erfurt, Germany from 12 to 18 June 2003. The Workshop was organized by the World Meteorological Organization (WMO), in collaboration with Deutscher Wetterdienst (DWD) and the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT).
- 1.2 The main objective of this workshop was to initiate CLIPS-related activities in RA VI in accordance with the concept of a regional network of CLIPS Focal Points. This objective was achieved through training the participants in the provision of climate information and prediction products; discussing opportunities, challenges, capabilities and needs of CLIPS related activities, and discussing the role of Regional Climate Centres (RCCs) in delivering CLIPS-related services to Members of RA VI. The programme of the workshop is given in ANNEX I. The participants included CLIPS Focal Points from thirty-four WMO RA VI Member countries and invited experts (ANNEX II).

2 Opening Remarks

- 2.1 Mr Volker Vent-Schmidt, Head of the Department of Climate and Environment, DWD, and Vice President of the Commission of Climatology welcomed the participants on behalf of Mr Udo Gärtner, the Permanent Representative of Germany with WMO, and himself. Furthermore, he expressed DWD's appreciation for hosting the first CLIPS workshop in RA VI. He informed the participants that Germany has always supported the initiatives of CLIPS since it bridges the gap between providers of climate services and users of climate information as well as the gap between historical and traditional climatological data management along with information on the past climate and the prediction of near future climate from months to seasons. He also emphasized the important role CLIPS would play in the provision of infrastructure for exchanging climate information and products – a problem that needs international solution. In this regard, he informed the participants that Mr Stefan Mildner, Chairman of RA VI Task Team on Provision of Seasonal to Interannual Forecasts and Regional Climate Centre Services (TTSIRCC), would be presenting the results of this team to the workshop.
- 2.2 Dr Buruhani S. Nyenzi, Chief, World Climate Applications and CLIPS Division on behalf of WMO, through DWD, thanked the Government of Germany for hosting the workshop and the local organizing committee for the good arrangements made for the workshop. He further expressed WMO's gratitude to DWD and EUMETSAT for their contribution in supporting the workshop. He elaborated that effective, accurate and timely prediction and well-established early warning mechanisms are important for taking appropriate actions for mitigating the adverse impacts brought by climate-related extreme events. In this respect, the goal of CLIPS is to support WMO member countries to optimize the use of climate information and prediction products. He urged participants to use this opportunity to come up with appropriate recommendations on CLIPS-related activities in the region.
- 2.3 Detailed workshop proceedings, including statements and other detailed presentations, can be found in a CD-ROM specifically prepared for the workshop. The proceedings will also be posted on the CLIPS web site.

3 Keynote Lectures

- 3.1 Dr Nyenzi gave a presentation on the activities of the WMO's CLIPS Project. He briefed the participants that the project had the objective of building capacities of National Meteorological and Hydrological Services (NMHSs) in the provision of climate services to

users. This has so far been achieved by training climate experts and users through workshops and Regional Climate Outlook Forums organized in collaboration with international organizations and institutions. A global network of Focal Points has already been established. Most information on CLIPS is available and accessible from the CLIPS web-site (<http://www.wmo.ch/web/clips>). He further provided the future plans for the project.

- 3.2 Dr E. Akent'eva from the Russian Federation presented a detailed description on the potential of climate information for current and future climate services. She explained the various methods for climate data analysis, system monitoring and applications. She further discussed the various approaches that can be utilized in systematic monitoring and analyzing climatic data for applications. These included developments in the field of climate data and metadata and perfection of the method of homogeneity control of time series. She also presented the method of monitoring extremes, which has been developed in the Main Geophysical Observatory, Russia. The method takes into account the intensity and spread of climate anomalies. She further pointed out that the code of climatological characteristics could help users to formulate user requirements for the specialized climate information. Finally, Dr Akent'eva referred to the concept of "Climate as a resource" as a systematic approach to deal with users of climate information and climate services.
- 3.3 Dr M. Harrison, UK, made a presentation on the potential of seasonal to interannual predictions for current and future climate services. He pointed out that a survey conducted by CLIPS had shown that there are a number of WMO Members providing Long Range Forecast (LRF) or Seasonal to Interannual Prediction (SIP) at different levels. There is no doubt of the potential for future improvements in numerical model forecasts, especially from ensembles, but at the present time the optimum solution is to blend forecasts from several sources, including statistical. He also pointed out that although there is skill in long-range forecasts, especially in the tropics, there are still many challenges that need to be addressed. These challenges include, among others, understanding the chaotic nature of the atmosphere, validation of the models and forecasts, development of forecast verification methods both from a scientific and user perspective. There are also challenges in the application of forecasts. These include downscaling and the determination of the value of forecasts. He pointed out that most of these issues are currently being addressed in different expert groups and teams such as CLIVAR, and Open Programme Area Groups (OPAGs) of the Commission of Basic Systems (CBS) and Commission for Climatology (CCI).
- 3.4 Prof. Hartmut Graßl, Director of the Max-Planck Institute for Meteorology, Germany, was invited to deliver a special lecture on Climate Variability in Europe. His lecture covered the following issues: Variability, variations, oscillations and trends; New climatological observations; Changes in variability: Consequences of these various changes; European Climate Outlook; and How should societies react to climate variability and changes. He pointed out that analysis of European climate variability has shown the existence of a 20-year oscillation without a significant trend. However, a strong increase in precipitation has been observed. The variability in climate has been associated with the various extreme meteorological events such as droughts and floods. An increasing number of people has been affected by these events since the 1930s, especially in the last decade. This calls for cities to adapt to this variability which is very expensive for governments due to catastrophic impacts associated with this variability on human life and infrastructure.

4 Country Presentations

- 4.1 The climatological activities of 35 countries were presented in three sessions. In many presentations, an overview of the station network was given and problems with declining station numbers were reported. In some countries, a number of different climate zones

exist because of the size and/or topography of the countries whereas others are characterized by only one type of climate.

- 4.2 Climatological services available in the region include, among others, risk assessment studies, reports on building climatology, analyses of extreme events, and climate atlases as well as monthly and annual bulletins of the recent climate conditions. Users of that kind of information are power and heat supply, building, and insurance companies as well as the agricultural sector and the mass media. It was stressed that there should be a differentiation between extreme and hazardous events since not all extreme events lead to severe damage.
- 4.3 From the country presentations, it was noted that some of them already had some kind of long-range forecast product, i.e. monthly and/or three-monthly outlooks. Others are interested in developing SIP capabilities. Sources used for long-range forecasts are products from the Global Producing Centres. The methods used for the analysis of the information obtained from these centres are mainly statistical.
- 4.4 For data management, either CLICOM, CLIDATA or an ORACLE-based CDMS is used by the countries present. Regarding CLICOM, the necessity to replace this system with a more powerful CDMS was expressed. The need for DARE was stressed since there exists a lot of valuable climate data in the archives but not yet in digital form. Also, there are long time series available from some stations, for example the oldest records date back to 1778 in Lithuania, 1843 in Armenia, and the 1830s in Georgia.
- 4.5 With regard to the needs and expectations from CLIPS, training received the most recognition in the presentations, i.e. training of *national* experts in database management, SIP, statistics, CLIPS, and interpretation of ECMWF and similar products. The need of feedback from users was also repeatedly mentioned. In order to meet this need, meetings similar to Climate Outlook Forums were suggested. Furthermore, Members asked for the improvement of the information exchange within RA VI stressing the need to overcome language barriers in that process.

5 Training on Long Range Forecasting (Seasonal to Interannual Predictions)

- 5.1 The training on LRF conducted during the workshop aimed at introducing basics in LRF. Drs M. Harrison and J.P. Céron were the experts who led the training using modules from the CLIPS web-site. The training covered statistical aspects and fundamentals of LRF. More specifically, the training covered issues on atmospheric chaos and its impact on LRF, the various LRF models with their limitation, the atmospheric dynamics, and evaluation of the quality of LRF through various statistical approaches.
- 5.2 The idea of atmospheric chaos and how it affects LRF was demonstrated using simple examples. It was emphasized that chaos was important in determining LRF initial conditions. Small changes in initial conditions can cause large changes in the forecast. However it was cautioned that model outputs are expected to improve with time but in any case will not be completely deterministic. A need to know how good the forecasts are was highlighted. It was pointed out that questions that elaborate forecast quality like how correct, accurate, reliable and skilful are the forecasts are common and need to be addressed. In this respect various statistical approaches for evaluating forecast quality were discussed and illustrated using practical exercises. These approaches included, among others, verification procedures on Relative Operating Characteristics (ROC). Other statistical issues including cognitive illusions and their impacts on LRF were also discussed.
- 5.3 The fundamentals of LRF were discussed with clear explanation given on issues related to the vocabulary such as forecast range, period and lead time, types of prediction models,

and verification procedures. Participants were informed that the scientific consideration taken in forecasting is based on the fact that the evolution of the atmosphere is partly driven by an external forcing, and the evolution of the external forcing is often slow and predictable. Further more the mean atmospheric circulation in the tropical region is strongly influenced by the large-scale circulation. Limitation of numerical forecasts and the different aspects of predictability on LRF were highlighted. The evolution of external forcing conditions such as SSTs and continental surface conditions were given as important input to LRF.

- 5.4 A brief review was given on statistical and numerical models used in LRF. The various aspects of statistical models were discussed. These aspects included contingency tables, discriminant analysis, regression equations and the use of various predictors. Although there is no universal rule, it was pointed out that the more complex a prediction model is, the better its expected results, but the less robust the model itself. Different aspects of numerical models were discussed. It was pointed out that numerical models have greater potential in LRF than statistical models. However, they need much input from the climate system. It was further emphasised that, for both statistical and numerical models, the need to understand clearly the variability of climate in the region where LRF is being performed is important. This is because climate variability has major influence on the atmospheric general circulation thus affecting global weather patterns. A need for verification of LRF products from both models was emphasised.
- 5.5 Interpretation of the LRF for the benefit of the users in terms of actions, risks and other scenarios is very important. In this respect, products of seasonal forecasts need to be put in a format that can be useful to the users. Main sources of forecast products in RA VI are ECMWF, the UK Meteorological Office, Météo-France and the World Meteorological Centre, Moscow. Their products are available on websites whose addresses are given in ANNEX III.
- 5.6 A brief overview of the Regional Climate Outlook Forum process that have been developed in various parts of the globe was presented. The Forums have become a common feature in Africa, South and Central America, and the Pacific. The Forums have contributed to building capacity of NMHSs in provision of climate services including LRF. Both positive and negative aspects of these Forums were elaborated. However, the Forums were suggested as a possible option to be adopted in RA VI for implementing seasonal forecasting activities.

6 Report of the Meeting of the RA VI Task Team on the Provision of Seasonal to Interannual Forecasts and Regional Climate Centre Services

- 6.1 In summarizing the results of the meeting of the RA VI Task Team on the Provision of Seasonal to Interannual Forecasts and Regional Climate Centre services (TTSIRCC), which took place in Reading, UK, in April 2003, Stefan Mildner, on behalf of DWD, welcomed the participants and expressed his appreciation for the good response to the CLIPS workshop. The final report of this meeting was given as part of the workshop documentation and is available on the CLIPS website. He gave an overview of the Terms of Reference of the Task Team, the team members, and the activities leading to the establishment of TTSIRCC. It was stressed that the most important task of the team is to provide guidance on the implementation of an operational framework for LRF in RA VI. Furthermore, he informed participants that the team had proposed a realistic list of current LRF products for RA VI and agreed on the need to involve the World Meteorological Centre in Moscow more actively in research activities. It was pointed out that the team has still some activities remaining that need more work. With regard to arrangements for training and capacity building, input was expected from the workshop participants for the

implementation process of CLIPS activities in the region, which also include the workshop itself.

- 6.2 Dr R. Graham, UK, presented the LRF activities on product development of the UK Meteorological Office (UKMO). These included long-term climate prediction, seasonal climate prediction, data services and consultancy. The UKMO has large experience and investment in global and regional climate and has tools to assist assessment of regional climate change impacts and long term climate monitoring. The UKMO has dynamical and statistical seasonal forecast systems. Its operational coupled ocean-atmosphere Global Circulation Model (CGCM) is known as GloSea and is operated from ECMWF. The seasonal forecast products are available on the web and are password protected for WMO Members' use only. It was further pointed out that UKMO participates in regional seasonal forecasting activities such as the DEMETER and ENACT projects.

7 Climate Information and Prediction Services Related Requirements in RA VI

- 7.1 The CLIPS Focal Points discussed the requirements of RA VI for climate services on the basis of the presentations given by the countries during the workshop. Key requirements were identified in the climate data domain in order to ensure the availability of high quality data sets as a basis for CLIPS-related services. In the climate monitoring domain the availability of regional climate monitoring results was discussed. With respect to climate extremes the CLIPS Focal Points required e.g. common definitions, regional projects to study extreme and hazardous events and considerations to develop a climate warning system. The need for a general improvement of the countries' ability to efficiently deal with long-range forecasts was expressed. Training and capacity building requirements in various domains were also expressed. ANNEX IV provides an overview of the set of requirements concluded from the workshop.
- 7.2 Further input for a more detailed analysis of the requirements is expected from the outcome of a questionnaire on the countries' needs and capabilities which had been provided to the workshop participants beforehand. It was decided to do the exercise again with an updated questionnaire, taking into account the knowledge provided during the workshop. The CLIPS Rapporteur for RA VI is invited to present the results to the next RA VI Session in 2006.

8 Climate Information and Prediction Services Related Projects in RA VI: Widening the ECSN as an option for the way forward

- 8.1 The workshop was informed by Dr A. van Engelen, Netherlands that the European Climate Support Network (ECSN) provides an opportunity for cooperation in the field of climatology in Europe. The network enhances cooperation in activities related to climatological data processing and exchange, application of climatological information, and climate research. It also promotes collaboration in various activities with RA VI Working Group on Climate-Related Matters. It further promotes cooperation with countries in Eastern Europe.
- 8.2 The network addresses three main projects. These projects include the European Atlas Project, which is a EUMETNET/ECSN project with an objective to present new climatological normal for the reference period 1971-2000. The second project is the Generate Climate Monitoring Products (GCMP) project. Activities of this project focus on the whole of RA VI with the aim of monitoring climate change and the associated regional impacts. The third among these projects is the European Climate Assessment and Dataset (ECA&D) project. A significant number of European countries are already participating in this project, which has proved to be very successful.

9 RCC-related Services in RA VI

- 9.1 Mr Peer Hechler presented an optional systems approach to provide the RA VI Members with RCC-related services on the basis of a distributed network of RCC-related functionalities. He referred to regional requirements and capabilities already identified and existing in RA VI within the domains of regional data sets, climate monitoring, climate assessments and provision of LRF. Furthermore the potential role of RCCs in the context of the WWW GDPS structure was introduced. RCCs, either established under the umbrella of an already existing RSMC or as a new functionality, need to follow the GDPS centres' designation procedure. As a general approach within RA VI the following stepwise way forward was outlined: definition of RA VI RCC-related requirements and capabilities (starting on the basis of the outcome of the RA VI CLIPS Workshop and the related questionnaire), identification of capabilities within RA VI to meet the requirements, co-ordination of the provision of services (example: see paragraph 6.1), identification of missing capabilities, invitation to Members to offer measures to provide these capabilities and finally, if agreed upon, application of the RCC-related service providers for a RCC label following the WWW GDPS designation procedure.
- 9.2 First specific efforts with respect to RCC-related services in RA VI were offered with the provision of LRF (see paragraph 6.1) and the operational phases of the current ECSN projects, Generate Climate Monitoring Products (GCMP) and the European Climate Assessment and Dataset (ECA/D).
- 9.3 Finally the co-ordinating role of the CLIPS Focal Points in the RCC domain was stressed.

10 The European GCOS Regional Workshop

- 10.1 The meeting was informed by S. Rösner from Germany that preparations are underway to organize a European GCOS Regional Workshop in accordance with Decision 5/CP.5 of the United Nations Framework Convention on Climate Change (UNFCCC) in Spring 2005. The workshop is being organized by the GCOS Secretariat, with the support of DWD. The meeting was further informed that the aims of this workshop would include, among others, identification of regional deficiency on observation networks for climate; to assess priority needs and funding requirement to overcome the observation deficiency; initiate the development of a Regional Action Plan; establish a network of national GCOS Focal Points/Coordinators; establish a permanent EuroGCOS; to consider the development of a EurOSIC (European Observation Systems Information Centre). Participants to the workshop will include people from NMHSs, National Oceanographic Services and other relevant agencies as well as the National Climate Change Focal Points. In order to prepare this workshop, active participation in an international organizing committee of representatives from Eastern European countries is sought.

11 Training on Climate Extremes

- 11.1 Dr E. Khlebnikova, Russian Federation, gave a comprehensive review on the statistical methods used to derive extremes in climatology. She considered the questions connected to the application of the classical approach, which is based on the Generalized Extreme Value (GEV) distribution. She also introduced the Threshold Exceedances method, which had become more and more important in climate analysis during the past years and which is based on the Generalized Pareto distribution for excesses. She stressed the impossibility to use the traditional concept of return periods under climate change conditions and called to develop new approaches to the interpretation of climate variability for applications in non-stationary conditions, which could be based on combining extreme

value models, advanced statistical descriptions of influences on the meteorological processes, and Monte-Carlo simulation.

- 11.2 Dr A. van Engelen, The Netherlands, presented three projects carried out within the framework of the European Climate Support Network (ECSN), a cooperative platform. The projects mentioned, which are not restricted to ECSN member countries, are the European Climate Atlas, the European Climate Assessment & Dataset, and Generate Climate Monitoring Products (see paragraph 8.2).
- 11.3 Dr A. Klein-Tank, The Netherlands, touched on how to define and report extreme events, indices for daily temperature and precipitation extremes in the European Climate Assessment and Data (ECA&D) project, and observed trends in Europe from 1946 until today. He further mentioned that a new project phase of ECA&D started in January 2003 and that the next report from the project is planned for 2006. He urged members to become part of this project. The session ended with a practical training for the workshop participants during which they used ClimDex, a software tool available from NOAA/NCDC, to analyze data sets prepared for demonstration purpose.

12 Climate Information and Prediction Services and Regional Climate Centres in RA VI: The next steps

- 12.1 During the discussion the workshop participants analyzed the statement of requirements (ANNEX IV) in order to identify to whom the different requirements should be addressed for further consideration. The following bodies were identified as potential addressees: WCDMP, WCASP, RA VI WGCRM, CCI, WCRP, NMHSs, and CLIPS Focal Points. It was, however, felt that further considerations are necessary to finalize this task.
- 12.2 In general, the workshop participants expressed their encouragement to the NMHSs not represented at the workshop to nominate CLIPS Focal Points as soon as possible. It was furthermore proposed to elaborate – on the basis of the knowledge provided by the RA VI CLIPS Workshop – a second questionnaire addressing in more detail the requirements provided in ANNEX IV.
- 12.3 The CLIPS Focal Points agreed to provide a minimum set of national climate monitoring products in the English language to be accessible via Internet by the other RA VI Members. In this regard, the need for guidelines on LRF products for countries with limited experience in LRF was expressed.
- 12.4 CLIPS-related information should be accessible through RCC or NMHS websites or in print, e.g. as a periodical bulletin.
- 12.5 With respect to the two paragraphs above, dedicated measures are necessary to ensure that each RA VI Member is provided with a sufficient Internet capability to take part in co-operation efforts proposed.
- 12.6 In order to determine the list of CLIPS-related products to be provided by the NMHSs, information on the end-user requirements is helpful. Such information could be gathered in the form of a list of “Frequently Asked Questions” (FAQ) gleaned from existing inquiries to the NMHSs.
- 12.7 It was discussed to hold further workshops in RA VI to deal with LRF. Proposals will be made before the next meeting of RA VI in 2006. The RA VI WG on Climate-Related Matters will take care of this.

- 12.8 Finally, opportunities of CLIPS showcase projects have been discussed (e.g. in the Mediterranean and the Caucasian/Black Sea areas). It was agreed to prepare specific proposals for further consideration.
- 12.9 As a workshop conclusion, it was felt that a starting point for a network of RA VI CLIPS Focal Points is now being initiated.

13 Closure of the Meeting

- 13.1 In his closing remarks, Mr Vent-Schmidt, on behalf of DWD, thanked the participants for the contributions they made in the discussions during the workshop. He reminded them the importance of working together in order to improve the provision of climate services in the Region. He emphasized the need to have follow-up activities on the deliberations made during the workshop. The meeting closed at 12:30 p.m. on Wednesday, 18 June 2003.
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ANNEX I

AGENDA

Morning Sessions: 09:00 – 10:30; 11:00 – 12:30
Afternoon Sessions: 14:00 – 15:30; 16:00 – 17:30
Coffee Breaks: 10:30 – 11:00; 15:30 – 16:00
Lunchtime: 12:30 – 14:00

Thursday, 12 June

Morning

Welcome / Opening Addresses

- V. Vent-Schmidt, Germany
- Dr B. Nyenzi, WMO/Switzerland

Keynote lectures

- Introduction of WMO's CLIPS Project by Dr B. Nyenzi, WMO
- The potential of climate information for current and future climate services by Dr E. Akent'eva and Prof. N. Kobysheva, Russia
- The potential of seasonal to interannual predictions for current and future climate services by Dr M. Harrison, UK

Afternoon

- *Presentations of RA VI member countries on their Climate Service's capabilities and needs (5 minutes each in alphabetical order of the countries' English names orientation on the questionnaire prepared by Dr A. Gocheva, Bulgaria, and P. Hechler, Germany)*

Friday, 13 June

Morning

- *Training on Long-range Forecasts (Seasonal to Interannual Predictions) by Dr J. P. Céron, France; Dr M. Harrison, UK*

Afternoon

- *Training on Long-range Forecasts (Seasonal to Interannual Predictions) by Dr J. P. Céron, France; Dr M. Harrison, UK*
- *Cont.: Presentations of RA VI Member countries on the capabilities and needs of their climate services*

Evening

- *Scientific lecture on "Climate Variability in Europe – Current Status and Implications on the Society" by Prof. Dr. H. Graßl, Germany*

Saturday, 14 June

Morning

- *Training on Long-range Forecasts (Seasonal to Interannual Predictions) by Dr J. P. Céron, France*
- *Cont.: Presentations of RA VI Member countries on the capabilities and needs of their climate services*

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Monday, 16 June

Morning

- *Training on Long-range Forecasts (Seasonal to Interannual Predictions)* by Dr J. P. Céron, France
- *Outcome of the RA VI Task Team Meeting on the Provision of SI forecasts and RCC Services* by S. Mildner, Germany
- *The UK Met Office's LRF activities* by Dr Richard Graham

Afternoon

- *Training on Long-range Forecasts (Seasonal to Interannual Predictions)* by Dr J. P. Céron, France
- *Discussion: CLIPS-related (user) requirements in RA VI* chaired by V. Vent-Schmidt, Germany

Tuesday, 17 June

Morning

- *Training on climate extremes* by Dr E. Khlebnikova, Russia
- *The European GCOS Regional Workshop* by S. Rösner, Germany
- *CLIPS-related projects within RA VI: Widening the ECSN idea as an option for the way forward* by Dr A. van Engelen, The Netherlands

Afternoon

- *RCC – related Services in RA VI* by P. Hechler, Germany
- *Discussion: CLIPS and RCC in RA VI: The next steps* chaired by V. Vent-Schmidt, Germany

Wednesday, 18 June

Morning

- *Training on Climate Extremes* by Dr A. van Engelen, The Netherlands; Dr A. Klein-Tank, The Netherlands; Dr E. Khlebnikova, Russia
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ANNEX II

LIST OF PARTICIPANTS

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ANNEX III

LIST OF WEBSITES FOR ACCESS TO LONG-RANGE FORECAST PRODUCTS

European Centre for Medium-Range Weather Forecasts (ECMWF)

Homepage: <http://www.ecmwf.int/>
Forecasts: <http://www.ecmwf.int/products/forecasts/>
DEMETER data distribution: <http://www.ecmwf.int/research/demeter/data>

Met Office (United Kingdom)

Seasonal forecasting (research): <http://www.metoffice.com/research/seasonal/>
Password-protected section for NMSs and similar organisations:
<http://www.metoffice.com/research/seasonal/nms/>
Seasonal forecasting (products): <http://www.metoffice.com/weather/seasonal/index.html>

World Meteorological Centre Moscow (WMC)

Forecasts – Russian version: <http://hmc.hydromet.ru>
(Password for access is to be provided on request)
Forecasts – English version: http://hmc.hydromet.ru/english/index_e.html

Météo France

Seasonal forecasts, internal only: <http://www-int.meteo.fr/scem/cbd/dev/>
Model anomalies (in French): http://www.meteo.fr/special/CLIM/clim_model.html
Password-protected section for NMHSs, similar organizations and specific users: ftp site

World Meteorological Organization (WMO)

EPS/LRF producing centres: <http://www.wmo.ch/web/www/DPS/EPS-HOME/Long-range>
Definitions of forecast ranges:
<http://www.wmo.ch/web/www/DPS/GDPS-Supplement5-Appl-4.html>
Verification system for Long-range forecast:
<http://www.wmo.ch/web/www/DPS/LRF-verification-systems.html>

Other useful websites

Climate Prediction Center

Homepage: <http://www.cpc.ncep.noaa.gov/>
CPC Forecasts, Outlook maps, graphs, tables: <http://www.cpc.ncep.noaa.gov/products/forecasts/>
NCEP Data Repository ENSO forecasts: <ftp://ftp.ncep.noaa.gov/pub/cmb/Forecasts/enso>
Monthly Atmospheric and SST indices: <http://www.cpc.ncep.noaa.gov/data/indices/index.html>

International Research Institute for Climate Prediction

Homepage: <http://iri.ldeo.columbia.edu/>
IRI Net assessment forecasts: http://iri.columbia.edu/climate/forecast/net_asmt/
IRI Global map room: <http://iridl.ldeo.columbia.edu/maproom/.Global/>

ANNEX IV

STATEMENT OF REQUIREMENTS

The following requirements for climate services were expressed by CLIPS Focal Points from 34 RA VI countries on the occasion of the RA VI CLIPS Workshop (12-18 June 2003, Erfurt, Germany).

General requirements:

- Systematic exchange of knowledge, experiences and information in NMHSs' climate-related matters (especially with neighbouring countries);
- Infrastructure improvements in the domain of climate services (e.g. Internet access capability);
- Strengthened links to the users of climate information as well as to the research community;
- Standardization of climate service products and methods/procedures;
- Exploitation of GIS potentials for climate service activities.

Special requirements with respect to training

- LRF training (to be specified);
- Further development of the CLIPS-Curriculum;
- General training in climate matters including opportunities to attend related workshops.

Requirements with respect to climatological data

- Availability of carefully generated and maintained Metadata;
- Generation, maintenance and continuation of long and homogenised time series as well as (European) climate data sets;
- Availability and use of guidelines on standardised:
 - Quality control/quality assurance methods for climate data processing;
 - Methods on homogenization and interpolation;
 - Metadata formats;
 - Methods for gridded data sets in particular for downscaling purposes.
- Rescue of data from paper archives and others;
- Provision of easy access to data (especially from neighbouring countries);
- Improvements in climate data management tools/systems (update of CLICOM systems towards CDBMS);
- To ensure that observation networks meet the needs of climatology.

Special requirements with respect to climate extremes

- Elaboration of common definitions for climate extremes and related indices in terms of scale and thresholds (e.g. to differentiate between extreme and hazardous events);
- Provision of normalized descriptions of climate-related socio-economical damages/losses to allow for comparisons;

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- Initiation of regional projects with respect to studies on climate extremes and complex disaster events;
- Definition and development of climate warning systems;
- Provision of methodologies on state-of-the-art extremes' analyses and enhancement of extremes' indicators;
- Elaboration of methods to take in account the non-stationary of our climate in the calculation of statistical characteristics of climate parameters;

Requirements with respect to climate monitoring

- Provision of access to climate monitoring products at NMHS's Websites;
- Elaboration of seasonal climate monitoring capabilities as well as an RA VI annual statement on the status of the climate (analogue to the WMO annual statement), both in a timely way;
- Definition of climate indices describing monthly and yearly variations to allow detecting possible climate trends and change.

Requirements with respect to Long-range Forecasting

- Capacity building (training, methodologies, technical equipment, infrastructure);
 - Provision of access to GPC's LRF model raw and hindcast data;
 - Guidance on the use and interpretation of GPC's LRF products;
 - Improvements in RA VI LRF products' general reliability as well as in terms of climate extremes forecasts;
 - Initiation of showcase projects on the potentials of LRF services for different user applications.
-