

# Report of the CLIVAR VACS Southern and Eastern African Climate Predictability Workshop

Tanzania Meteorological Agency, Dar es Salaam  
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## **1. Introduction**

The CLIVAR Variability of the African Climate System (VACS) panel of the World Climate Research Programme (sponsored by WMO, ICSU and IOC) ran a training workshop at the Tanzania Meteorological Agency (TMA) in Dar es Salaam, Tanzania during 10-13 July 2006. The workshop was entitled Predictability and prediction of southern and eastern African climate variability and impacts of the neighbouring oceans. The workshop ran for four days and was aimed at senior operational staff responsible for long range forecasting at national meteorological services (NMS) and operational staff from related agencies (hydrology, water resources, oceans). Senior research scientists and operational meteorologists from groups around the world presented the material to the participants.

The workshop was sponsored by the World Climate Research Programme (WCRP), the World Meteorological Organization (WMO)/ Climate Information and Prediction Services (CLIPS), the Tanzania Meteorological Agency (TMA), the Global Change System for Analysis, Research and Training (START), the National Oceanic and Atmospheric Administration (NOAA)/ US Agency for International Development, the Benguela Current Large Marine Ecosystem Programme (BCLME), the Benguela Environment Fisheries Interaction and Training Programme (BENEFIT) and the South African Weather Service.

In all there were around fifty participants from over twenty countries (see Appendix A). All of those originally invited were able to attend. Local logistics were well organised by staff at TMA. The workshop was officially opened by Hon Basil P. Mramba, Minister of Infrastructure Development for the United Republic of Tanzania. He emphasised the need for more accurate meteorological information, capacity building of meteorological experts and provision of more support to the National Meteorological and Hydrological Services in the region. Other speakers at the opening ceremony included Dr. Mohamed Mhita, Director General of the Tanzania Meteorological Agency and Permanent Representative of Tanzania with WMO, Dr. Buruhani Nyenzi, Director of the World Climate Programme, World Meteorological Organisation, Geneva, Switzerland and Prof. Chris Reason, Co-chair of the VACS Panel and a Professor in the Dept. of Oceanography, University of Cape Town, South Africa. Dr Emmanuel Mpetta from TMA ably served as the master of ceremonies for this part of the workshop.

An interactive CD was put together for the participants (copy with this report) which includes the agenda (with links to all the talks and practicals) as well as all the background documents, useful links, participant lists etc. A workshop website is also available at:

[http://www.clivar.org/organization/vacs/VACS\\_workshop.php](http://www.clivar.org/organization/vacs/VACS_workshop.php)

and an interactive discussion forum hosted by TMA is currently under development (see Section 4)

## **2. Workshop Format**

The emphasis of the workshop was very much on training and interaction. The agenda can be seen in Appendix B.

Most of the first day was spent on background lectures and tutorials in order to give the participants the background information needed for the later practical sessions. These covered topics such as basic climate dynamics, regional physical oceanography and ocean-atmospheric interaction, atmospheric variability, statistical prediction, forecast evaluation and climate variability and predictability.

Several practical sessions on e.g. malaria and DEMETER seasonal ensemble predictions were held, but the major emphasis was on using the Climate Prediction Tool (CPT) in order to try to improve forecasting in the different agencies across Africa. The CPT was developed at the International Research Institute for Climate and Society (IRI) and enables users to produce a sophisticated seasonal forecast of rainfall, temperature or other parameters using a range of observational and model datasets that are supplied as part of the software package (<http://iri.columbia.edu/outreach/software/>); copy also on the enclosed CD). The package is easily implemented and run on standard PCs and is therefore ideally suited for institutions in developing countries with limited computing facilities.

An important part of the workshop involved parallel sessions aimed at refining the research programmes for the East African and Southern African regions. These programmes are aimed at better understanding of the mechanisms and societal impacts of climate variability over these large areas of Africa and in working towards improved seasonal to interannual climate prediction. The workshop provided an opportunity for input from

operational scientists from each NMS/ ocean agency throughout East and southern Africa allowing synergies to be built between them. An example of the type of questions posed for the Southern African group is shown in Appendix C. This was felt to be a useful exercise both for the researchers involved and the operational agencies in order to facilitate framing the research programmes around operational requirements and to take account of the needs of various user groups so that appropriate funding requests can be developed.

The networking opportunities provided during the workshop were something we felt to be important – e.g. trying to get different countries to share resources and predictions etc. This seemed to be successful with the participants keen to work closer together in the future, e.g. the South African Weather Service will now expand its seasonal prediction website to include the predictions made by Mozambique and linkages between the ocean agencies and the NMS will be further developed.

The first half an hour of each day was given over to a question and answer session, when the participants could bring up queries they had about the previous days work. The participants were also given feedback forms to fill in and we had a half hour session on the last day when they discussed and wrote a feedback summary (see Appendix D). During this time all the teachers etc. left the room and the participants were encouraged to be as critical as possible. This provided useful input for the workshop organisers.

### **3. Recommendations and lessons learnt**

For many of us this was the first time we had been involved in organising such a workshop. In general, we felt that the workshop went well and was very worthwhile. However, as always there is room for improvement. There were several things that the organisers/ teachers felt could have been done better and useful critical feedback was given by the participants themselves (see Section 2 and Appendix D).

Originally, the workshop was meant to be five days rather than four, but unfortunately the time had to be cut due to funding constraints. We felt that an extra day would have made a huge difference and the participants obviously felt the same. They commented that the time for the hands on sessions and discussions should have been increased and that more time needed to be spent on forecasting the onset and cessation of the wet season as well as on the interpretation of results. The participants also felt that a hard copy/ CD of the lecture material could have been given at the beginning of the workshop rather than towards the end, which is something we should try to do in any future workshops.

### **4. Follow up and possible future workshops**

All of us involved in the workshop felt that follow-up is extremely important in order to build on the good will, contacts and skills obtained during the four days. Since some funds are available for post workshop follow-up activity, it should be possible to achieve this to some extent. After consulting with the participants, it was felt that a good use of some of this money would be to put together an internet discussion forum for the participants and other users of CPT. This would allow the participants to discuss any problems and possible solutions as well as post their predictions for comparison etc. and thereby “kick-start” a seasonal prediction network for southern and East Africa which could ultimately extend to the continent as a whole. Such a website is being put together by TMA for this purpose.

It was felt that another workshop should be a priority. During the VACS panel meeting that followed the workshop this aspect was discussed in some detail. It was felt that the future emphasis of any workshop should be on “training the trainers” i.e. that people are trained in CPT with the idea that they would then act as local trainers in their region. These workshops could be linked to the Seasonal Outlook Fora (SARCOF for southern Africa, GHACOF for East Africa and PRESAO for West Africa). A detailed proposal to train a pool of Africa-based CPT-competent teachers is currently being put together by the CLIVAR VACS panel.

### **5. Summary and Acknowledgements**

The workshop was jointly organised by the CLIVAR VACS panel, the International CLIVAR Project Office and the local organising committee at TMA. Special thanks should go to Mr Matitu and his team at TMA for their superb organisation and friendly welcome. We would also like to thank the sponsors of the workshop: START, TMA, WCRP, WMO/CLIPS, NOAA/USAID, BCLME, BENEFIT and the South African Weather Service.

## Appendix A. Workshop Invitees

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## Appendix B – Agenda

### Monday, July 10th

8.30-8.45 Welcome and Introduction to goals of workshop (Chris Reason)

8:45 – 9:05 Basic Climate Dynamics (Kerry Cook)

- Description of the climate dynamics of southern and eastern Africa, placing the region in a global context
- Observations of rainfall and its seasonal cycle
- Role of and formation of the major features of the atmospheric circulation

9:05 – 9:40 Regional Oceanography (Chris Reason)

- The SST climatology and variability
- Base state and circulation
- Annual cycle of SST, thermocline depth
- Contrasts between the Indian and Atlantic Oceans and implications for African climate
- Focus on important features for African climate such as the cold tongue, the thermocline ridge NE of Madagascar, the Agulhas retroflexion, the tropical - subtropical cells
- The Benguela Nino

9:40 – 10:00 Introduction to Regional Variability (Richard Washington)

- Distinguishing between internal variability and forced variability
- The elements of the mean circulation and SST that are prone to variability and how the rainfall time series changes

10.00-11.30 Tea, opening ceremony

11.30-13.00 Variability related to the Indian and Pacific Oceans (inc. ENSO) (Kerry Cook & Ale Giannini)

- ENSO
- Indian Ocean dipole modes
- Overall warming
- Feedbacks with upwelling
- Subtropical SST modes and their influence on southern Africa south of about 10oS in JFM

14.00-14.45 Statistical prediction (Willem Landman)

14.45-15.45 Evaluating Forecasts (Simon Mason)

- Aspects of forecast quality (accuracy, skill, reliability, resolution value etc)
- Attributes of verification scores (propriety, equitability, effectiveness, and locality)
- Differences between verification of discrete vs. continuous forecasts, and between deterministic vs probabilistic forecasts
- Forecast scoring recommended in the WMO SVSLRF, emphasizing probabilistic verification, reliability (reliability diagrams) and resolution/ discrimination
- Example of constructing reliability and ROC diagrams using DEMETER forecasts□

15.45-16.15 Additional talk from TMA and discussion

16.15-16.45 Tea

16.45-18.00 Climate Variability and its Predictability (Richard Washington)

- Practical session

**Tuesday, July 11th**

8.30-9.00 Question and Answer session

9.00-9.20 RANET (Rosemary Mchihiyo)

9.20-9.50 Dynamical prediction, including a theoretical/practical demonstration of dynamical model based prediction (Joseph Intsiful)

9.50-10.35 Climate Prediction Tool theory, assumptions, constraints (Simon Mason)

10.35-17.30 Climate Prediction Tool – hands on training & applications. (Simon Mason)

**Wednesday, July 12th**

8.30-10.30 Further details of CPT (Simon Mason and Richard Washington)

1.30-2.00 Recent Large-scale Climate Anomalies (Wassila Thiaw)

- The very wet summer 05/06 in Namibia, Botswana, most of South Africa, parts of Angola
- The ongoing drought in Kenya, Uganda, Sudan
- Connections with the variability modes discussed above
- Note that the contrasting East and southern African rainfall anomalies in '06, especially OND, are a recurring pattern.

Rest of day: Climate Prediction Tool – hands on training & applications (Simon Mason)

**Thursday, July 13th**

8.30-9.00 Question and Answer session

9.00-9.40 Seasonal Ensemble Prediction: Applications for Malaria (Andy Morse)

9.40-12.30 Practical: Malaria and DEMETER seasonal ensemble predictions (Andy Morse) OR

9.00-12.30 Climate Prediction Tool – hands on training & applications (Simon Mason)

- Examples of potential applications during Tuesday, Wednesday and Thursday morning – wet and dry spell frequency and intensity during the rainy season, variability in onset and cessation of the rainy season, impacts on health conditions, tourism, agriculture, fisheries, forestry and water resources, development of climate indices useful for agricultural, health, water resource and other applications.

12.30-13.30 Lunch

13.30-14.00 Dynamical model based prediction (Joseph Intsiful)

14.00-14.30 Student feedback session

14.30-16.00 Parallel sessions aimed at refining the East African programme & Southern African research programme (SAGRADEX). Linkages with other programmes (eg IOGOOS, IOP, WGSIP). Development of a collaborative research network between NMS's and universities in Africa and appropriate international institutions (Laban Ogallo/ Fred Semazzi et al. for East and Chris Reason/ Richard Washington et al for Southern)

16.00-16.20 Tea

16.20-17.20 Plenary – report backs from parallel sessions

17.20-18.00 Summary and closing ceremony

## **Appendix C – Questions posed during the Southern African discussion session**

- What is your job description?
- How much time do you spend on seasonal rather than weather forecasting/data management or other non-seasonal forecasting related tasks?
- Is there a dedicated seasonal forecasting group at your institute/NMS? If so, how many are in the group?
- List the seasonal forecasting priorities of your institute/NMS.
- List the seasonal forecasting problems experienced by your institute/NMS
  
- Can you list the users/potential users of seasonal forecasts in your area?
- What limits the delivery of forecasts and their uptake by the user groups (e.g. farmers, health officials)? (is it lack of tailored product? Is it a lack of the general inclusion of climate in decision making process? Is it the lack of skill in the forecasts? Would your region be able to benefit from a forecast with perfect skill now?)
- What single thing would make the biggest difference to progress with seasonal forecasting in your region?

## Appendix D – Participant Feedback

The below is a summary document produced by the participants themselves:

### 1. Introduction

The VACS Southern and Eastern African Climate Predictability Workshop was held in Dar es Salaam Tanzania from 10th-13th July 2006. A number of countries in Southern and Eastern Africa were represented at the workshop. Participants were introduced to various methodologies for climate prediction and validation using Global Data Sets as well as observed data from individual participating countries. In addition to presentations by various resource persons, hands on sessions were also conducted particularly on the Climate Predictability Tool (CPT).

### 2. Organisation

Organisation was excellent right from the airport on arrival, accommodation and meals. Participants expressed their appreciation to the organising committee

### 3. Training Materials and presentations

The material presented was very good and relevant to the work of seasonal forecasters over Eastern and Southern Africa. However, participants observed that the time for the presentations was rather short to fully understand the CPT concepts and techniques. Furthermore, participants with oceanographic background needed extra explanations concerning the possibilities of forecasting the onset and cessation of oceanic processes, such as the Benguela Niño. The time spent on regional climate modelling was found to be short and hence was not well covered and also the interpretation of results was not clear.

The workshop has equipped participants with significant useful skills of climate predictability, however there are still some challenges; for example predicting the onset/cessation and extreme events of rainfall in Southern and Eastern Africa .

### 3. Recommendations

- Time for hands on sessions and discussions should be increased.
- Time should be dedicated to forecasting the onset and cessation of the season.
- Interpretation of results should be emphasized.
- Networking amongst participating countries should be established for sharing CPT experiences.
- Follow-up workshop is recommended
- The lecture material should have been given out as hard copy straight away during the workshop
- CPT was seen to be a very powerful tool which requires to be further worked with.
- Future workshops should accommodate time for sightseeing

**CLIVAR's mission is to observe, simulate and predict the Earth's climate system, with a focus on ocean-atmosphere interactions, enabling better understanding of climate variability, predictability and change, to the benefit of society and the environment in which we live.**

Information about CLIVAR,  
its plans, its organisation, its publications, its research  
can be found on the CLIVAR web site:

<http://www.clivar.org>

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