



*The Abdus Salam*  
**International Centre for  
Theoretical Physics**

**World  
Meteorological  
Organization**



**REPORT OF THE SCOPING MEETING  
FOR THE LAUNCH OF  
SOUTH ASIAN CLIMATE OUTLOOK FORUM  
(SASCOF)**

**(Trieste, Italy, 6 August 2009)**

*Organized in conjunction with*

**Targeted Training Activity (TTA) on  
Predictability of Weather and Climate:  
Theory and Applications to Intraseasonal Variability**  
ICTP, Trieste, Italy, July 27 - August 7, 2009

**WCASP - No. 81**

**WMO-TD No. 1535**

**WORLD METEOROLOGICAL ORGANIZATION  
August 2009**

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## EXECUTIVE SUMMARY

Regional Climate Outlook Forums (RCOFs), established more than a decade ago and supported by WMO in partnership with a number of other agencies, bring together national, regional and international climate experts, on an operational basis, to produce regional climate outlooks based on input from NMHSs, regional institutions, Regional Climate Centres (RCCs) and global producers of climate predictions. On the occasion of the Targeted Training Activity (TTA) organized at the Abdus Salam International Centre for Theoretical Physics (ICTP) from July 27 to August 7, 2009, WMO has taken up an initiative to launch a South Asian Climate Outlook Forum (SASCOF), with the active and enthusiastic support by the National Meteorological and Hydrological Services (NMHSs) of the South Asian countries, ICTP, Center for Ocean-Land-Atmosphere Studies (COLA) and other associated monsoon experts. To take the first steps in this direction and scope out the implementation aspects of SASCOF, a meeting of the Directors General of the National Meteorological Services in South Asia and Permanent Representatives (PRs) of the respective countries with WMO, was convened at ICTP, Trieste, Italy, on 6 August 2009. The PRs of Bhutan, India, Pakistan and Sri Lanka attended the meeting and the PRs of Bangladesh and Nepal nominated their alternates. The PRs of Afghanistan and Maldives could not attend, but expressed their full support to this initiative.

The meeting received very strong high-level support from WMO, ICTP as well as COLA, with the participation of Mr Michel Jarraud, Secretary-General, WMO, Dr K.R. Sreenivasan, Director, ICTP and Prof. J. Shukla of George Mason University, USA. A Memorandum of Understanding (MoU) between WMO and ICTP was formally signed on this occasion by Mr M. Jarraud, Secretary-General, WMO and Dr K.R. Sreenivasan, Director, ICTP.

Brief appraisals were provided to the meeting of the operational activities in seasonal prediction in various countries. The meeting considered the country perspectives and expectations of the proposed RCOF implementation in South Asia, as well as several overarching issues such as data sharing, user involvement, etc.

The PRs of the South Asian countries have unanimously agreed to establish SASCOF, to be implemented from 2010 onwards. WMO Secretariat may assist in the coordination of SASCOF sessions initially, until a permanent arrangement is worked out. SASCOF sessions will be hosted by the participant countries by rotation. The offer of India Meteorological Department for hosting the first three sessions, in 2010, 2011 and 2012 was unanimously accepted by the participant countries. SASCOF will initially have exclusive focus on the summer monsoon, and the needs for covering other aspects of the sub-regional climate will be addressed in due course. The first session of SASCOF (SASCOF-1) will be tentatively scheduled to be held during 15-20 April 2010, in New Delhi or Pune, India, subject to the availability of resources and the necessary Governmental approvals. Capacity building components of SASCOF will be addressed through the ongoing training activities of ICTP.

## 1. Introduction

1.1 The past couple of decades have witnessed remarkable advances in our understanding of monsoon processes and its variability, significantly enhancing our capabilities in monsoon prediction. It is important that the latest research advances are effectively exploited to improve operational monsoon prediction to meet the societal needs for advance information on the monsoon. To facilitate this process in a coordinated manner the Abdus Salam International Center for Theoretical Physics (ICTP), and the Center for Ocean-Land-Atmosphere Studies (COLA), USA have been conducting targeted training activities at ICTP for scientists from South Asia where the countries share a common monsoonal climate and its impacts. The training activities have included both the predictability of monsoons and the scientific aspects of monsoon prediction in South Asia with special focus on the related operational aspects.

1.2 Regional Climate Outlook Forums (RCOFs), established more than a decade ago and supported by WMO in partnership with a number of other agencies, bring together national, regional and international climate experts, on an operational basis, to produce regional climate outlooks based on input from NMHSs, regional institutions, Regional Climate Centres (RCCs) and global producers of climate predictions. By bringing together countries having common climatological characteristics, the forums ensure consistency in the access to and interpretation of climate information. Through interaction with sectoral users, extension agencies and policy makers, RCOFs assess the likely implications of the outlooks on the most pertinent socio-economic sectors in the given region and explore the ways in which these outlooks could be made use of. The activities of RCOFs, which show a rich diversity evolving in response to the specific needs of the regions they serve, have been acknowledged to be quite helpful and have been used to formulate “no regrets” policies that directly safeguard the lives of communities, enhance the resilience of systems and communities to cope and adjust to climate variability and change. More detailed aspects of RCOFs are outlined in Annex I.

1.3 During the planning of the Targeted Training Activity (TTA) organized at ICTP from July 27 to August 7, 2009, Professor Shukla wrote to the Secretary-General of the WMO and the Director of ICTP suggesting to launch a South Asian Climate Outlook Forum (SASCOF). Professor Shukla’s proposal was enthusiastically received by the Secretary-General of the WMO and the Director of ICTP and they agreed to use the occasion of the TTA to launch SASCOF with the active and enthusiastic support by the National Meteorological and Hydrological Services (NMHSs) of the South Asian countries, ICTP, COLA and other associated monsoon experts.

1.4 The potential for the development of SASCOF has been discussed recently on several platforms and its importance recognized. For example, the recent international symposium on Climate Change and Food Security in South Asia at Dhaka (25-30 August 2008) called for the establishment of SASCOF, and there is a general agreement that such a process will greatly enhance regional cooperation as well as more effective engagement of the user community. WMO’s Regional Association II (Asia), while appreciating the pan-Asia RCOF activities over the past few years led by China, called for additional sub-regional RCOFs to meet the special needs of the sub-regions. This will need active participation of all the NMHSs in the sub-region including the related multi-lateral entities.

1.5 To take the first steps in this direction and scope out the implementation aspects of SASCOF, a meeting of the Directors General of the National Meteorological Services in South Asia and Permanent Representatives of the respective countries with WMO, was convened at ICTP, Trieste, Italy, on 6 August 2009. The meeting received very strong high-level support from WMO, ICTP as well as COLA, with the participation of Mr Michel Jarraud, Secretary-General, WMO, Dr K.R. Sreenivasan, Director, ICTP and Prof. J. Shukla of George Mason University, USA. A list of participants at the meeting is given in Annex II. The trainees of the TTA underway at ICTP also attended the meeting and participated in the discussions. The meeting reviewed the ongoing operational activities in seasonal prediction in South Asian countries, and discussed the plans to work towards further development of SASCOF concept and determine its implementation aspects. The agenda for the meeting is provided in Annex III.

## **2. Objective**

2.1 The objective of the meeting was to consider the applicability of RCOF concept for South Asia, jointly endorse the proposal for the development of a South Asian Climate Outlook Forum (SASCOF), and take the initial steps to scope out and prepare implementation plans for the first session of SASCOF possibly in the pre-monsoon season of 2010.

## **3. Opening Session**

3.1 Initiating the Opening Session, Prof. J. Shukla invited the dignitaries, Mr Michel Jarraud, Secretary-General of WMO and Dr K.R. Sreenivasan, Director, ICTP to the dais and gave brief introductions. He warmly appreciated the strong support provided by WMO and ICTP to this new initiative, and particularly the gesture of Mr Jarraud and Dr Sreenivasan in sparing their valuable time despite their busy schedules to be personally associated with this important event. Prof Shukla thanked the Permanent Representatives (PRs) with WMO of Bhutan, India, Pakistan and Sri Lanka for their attendance and the PRs of Bangladesh and Nepal for nominating their alternates. The PRs of Afghanistan and Maldives could not attend due to unavoidable circumstances, but have expressed their full support to this initiative. Prof Shukla also briefly described the efforts of the ongoing ICTP's Targeted Training Activities in weather and climate in collaboration with COLA and other international experts, which essentially aimed at sustained capacity building.

3.2 Dr Sreenivasan, Director, ICTP, welcomed the participants, and provided a brief overview of ICTP activities, particularly highlighting its contributions to capacity building in developing countries. He offered continued support of ICTP to the capacity building activities in weather and climate, and looked forward to enhanced collaboration with WMO in this regard.

3.3 Mr M. Jarraud, Secretary-General, WMO, appreciated the initiative to establish SASCOF, and gave a statement in support of the related activities. He outlined WMO's proactive role in promoting RCOF operations around the world, to facilitate consensus development on climate issues and networking among climate providers and users. In this context, he also highlighted the importance of the forthcoming World Climate Conference-3 (WCC-3) being organized by WMO in collaboration with a number of Governments and other partners. He referred to the contributions of ICTP in capacity building in developing countries and looked forward to greater collaboration between WMO and ICTP to complement their efforts. Full text of Mr Jarraud's statement is provided in Annex IV.

## **4. Signing of Memorandum of Understanding between WMO and ICTP**

4.1 Taking the opportunity of the presence of the executive heads of the two organizations at this event, a Memorandum of Understanding (MoU) between WMO and ICTP was formally signed by Mr M. Jarraud, Secretary-General, WMO and Dr K.R. Sreenivasan, Director, ICTP. Through this MoU, WMO and ICTP agree to the promotion of weather and climate research and modelling, predictions and applications in support of sustainable socio-economic development, protection of the environment, education and training in relevant fields including capacity building of scientists in developing countries by providing wider access to the benefits from advances and application of the sciences of weather and climate. A copy of the MoU is provided in Annex V.

## **5. Scientific Perspectives of Monsoon Prediction**

5.1 Prof. J. Shukla gave a talk outlining the scientific challenges in monsoon prediction and the potential for operational implementation of research advances in South Asia. He noted that, while the consideration of energy spectra facilitated the description of large-scale flow, the smaller-scale energy spectra continue to pose a challenging problem. The role of topography, convection, etc. is particularly important. He emphasized that there is still a large amount of unrealized predictability in the climate system, and called for concerted efforts to fully exploit the potential. However, considering the large spatial variability in the monsoon precipitation, regional prediction is a real challenge. He emphasized that there should be effective cooperation of all the concerned

countries in dealing with this, so that we can make optimal and mutually consistent use of the available prediction skills of the large-scale forcing factors such as the El Niño/Southern Oscillation (ENSO). He also noted that reliance on statistical methods continued to be very high in monsoon prediction, and cautioned that statistical approaches without adequate physical basis ran the risk of scientific credibility in prediction. Considering that wisdom or knowledge in climate prediction does not reside in any single country, he emphasized that a cooperative approach is essential to work together for mutual benefit, and strongly supported the SASCOF initiative.

## **6. Operational Seasonal Prediction in South Asia: Current Status and Future Perspectives**

6.1 This session was devoted to brief appraisals of the operational activities in seasonal prediction in various countries, and also to consider the country perspectives and expectations of the proposed RCOF implementation in South Asia. The session was chaired by Dr Ajit Tyagi, PR of India with WMO and consisted of country presentations by the PRs/Alternates, followed by discussion.

6.2 Dr Ajit Tyagi, PR of India with WMO and Director General of India Meteorological Department (IMD), made a detailed presentation on long-range forecasting (LRF) of the Indian summer monsoon, which has a significant impact on agriculture, water resources and the Gross Domestic Product (GDP) of the country. While the monsoon has not displayed a major long-term trend during the period of instrumental record, it is marked by a dominant interannual variability for which there is an increasing demand for reliable LRF. He noted the long experience of IMD in seasonal prediction, with the first operational LRF for the summer monsoon rainfall issued as far back as in 1907. He described the current operational strategy for LRF of summer monsoon rainfall, and also indicated that IMD is taking up LRF of the winter monsoon rainfall. While the operational LRF in India has mostly been based on empirical models, the available dynamical predictions are also used and efforts are underway to set up an operational dynamical seasonal prediction system as a major initiative. He considered monsoon prediction on smaller scales in space and time, particularly in foreshadowing active/break cycles, as a major operational challenge. He briefed the meeting about the facilities in IMD, including its National Climate Centre which is pursuing designation as a WMO Regional Climate Centre (RCC), National Data Centre and WMO Regional Training Centre (RTC) at Pune, India. He strongly supported the SASCOF initiative and indicated that India is willing to consider hosting the first session. Dr. Tyagi made a generous contribution to the meeting by providing copies of long-term data on daily India rainfall gridded at high resolution. India's initiative in widely sharing such important data sets was widely appreciated and the other PRs agreed to work towards similarly sharing rainfall data for their countries.

6.3 Dr Q.Z. Chaudhry, PR of Pakistan with WMO and Director General, Pakistan Meteorological Department (PMD), provided an overview of LRF activities in Pakistan. The LRF is based on regression-based models and statistical downscaling of global model predictions. Dr Chaudhry acknowledged that the training provided by ICTP has greatly helped PMD to undertake these activities. PMD also considers the impact of ENSO on the monsoon as a major input to their LRF models. He found downscaling of global model forecasts to have a good potential and suggested that the approach be pursued further to enhance skills. He enthusiastically supported the SASCOF initiative, and emphasized that WMO's support is essential for the sub-region to implement the concept effectively. From PMD side, he offered full support to pursue the RCOF process in South Asia.

6.4 Mr G.B. Samarasinghe, PR of Sri Lanka with WMO and Director General, Department of Meteorology, Sri Lanka noted that the monsoon features in Sri Lanka are quite similar to those in India, but that both the southwest and northeast monsoons are important for the island country. Sri Lanka has employed regression-based LRF models until 2008, but later shifted to the Climate Predictability Tool (CPT) developed by the International Research Institute for climate and society (IRI). An experimental forecast based on CPT was issued for the season JJA 2009. Sri Lanka has been participating in TTA activities since 2007, and considers the training to be crucial to the development of its human resources. Mr Samarasinghe strongly endorsed the SASCOF initiative,

which will require sustained regional commitment taking into account the individual capacity building needs. He suggested that SASCOF should also consider aspects of intra-seasonal variability in due course as well as having a special focus on the northeast monsoon possibly by having two SASCOF sessions in a year after the process is established in the sub-region.

6.5 Dr T. Samdup, PR of Bhutan with WMO and Director, Council for Renewable Natural Resources Research of Bhutan, presented a statement on behalf of his country in support of the SASCOF initiative. He appreciated the commitment of WMO in promoting the RCOF concept in the sub-region. He noted that Bhutan has a strong environmental policy, in which a minimum of 60% forest cover is ensured. Bhutan's economy is heavily dependent on hydropower and tourism, both of which are critically linked to weather and climate. Bhutan's meteorological services are still in a nascent stage, with the first meteorological observatory established in 1973. Bhutan now has a network of about 90 observatories. Glacial outbursts such as those that caused severe floods in 1994 as well as droughts such as in 2001 are serious climate problems for Bhutan. Monitoring of glacial lakes and early warning systems for drought are therefore considered crucial for Bhutan. He welcomed SASCOF initiative and offered full support to ensure its success. While Bhutan may not have the required technical expertise to effectively contribute to SASCOF, he said that Bhutan would be quite keen to be part of the team and use this as a capacity building opportunity.

6.6 Dr K.P. Sharma, Deputy Director General, Department of Hydrology and Meteorology, Nepal, highlighted that topographical influences on weather and climate is a major challenge for Nepal in dealing with the related information needs. Vertical variations of climatic parameters are thus of crucial importance in understanding the weather and climate variability. Agriculture and water resources are the key socio-economic sectors in the country, with disaster risk reduction being a major area of focus. Mountain sensitivity in related aspects is therefore of primary concern. Dr Sharma conveyed the full support of Nepal for SASCOF initiative.

6.7 Dr S. Das, speaking on behalf of the Bangladesh Meteorological Department (BMD), noted that the southwest monsoon is the main rainy season for Bangladesh. BMD routinely provides monthly and seasonal forecasts to a range of high-level policy needs. There is a widely felt need for LRF of extreme events, but the task is considered to be quite challenging. BMD has also taken up numerical weather prediction with assistance from MetOffice of UK, but still needs considerable capacity building support to undertake such activities effectively. Agriculture is the main sector with substantial climate information requirements. A major challenge faced by BMD is lack of adequate human and infrastructural capacity to generate and deliver the required climate information products. On behalf of the PR of Bangladesh with WMO, Dr Das conveyed the full support of the country to SASCOF process.

6.8 Dr S. Das, Head, Theoretical Division, SAARC (South Asian Association for Regional Cooperation) Meteorological Research Centre (SMRC), also provided an overview of the activities of SMRC. SAARC has a number of regional centres each covering a specific area of common interest to the region, and SMRC located in Dhaka, Bangladesh, is one of them. SMRC has an annual budget of around USD 500,000, and has a Governing Board composed of the directors of the National Meteorological Services (NMSs) of all Member Countries. While Bangladesh provides a major part of the infrastructural support, India provides a major part of the programmatic support. Dr Das also briefly appraised the meeting about a number of research projects being implemented by SMRC. He suggested that SMRC could be a potential contributor to the SASCOF process, particularly in the calibration of LRF models. However, he clarified that SMRC is essentially a research organization, and does not take up operational responsibilities. SMRC also has good experience in climate change detection and indices, including the use of RCLIMDEX software developed by a joint CCI/WCRP/JCOMM Expert Team.

6.9 The presentations were followed by a discussion of the overarching aspects under the session. Prof. Shukla noted that sharing of information and experience will be a crucial element underpinning the SASCOF process. A good practice for SASCOF could be for all countries to routinely use climatic maps covering the entire region, which might provide useful perspectives even for country-level interpretations. Also, he suggested that a single time series (e.g., rainfall,

temperature) for the entire South Asia be produced. Prof. Shukla also suggested that operational as well as research groups should be actively involved in SASCOF process (e.g., Global Change Impacts Studies Centre, Pakistan; K. Banerjee Centre of Atmospheric and Ocean Studies, University of Allahabad, India; etc.). Dr Krishna Murthy of COLA highlighted the importance of addressing data needs for climate prediction research. He cited the recent release of gridded daily rainfall data sets by IMD, which lead to a remarkable spurt in research studies on monsoon variability. He also commended the efforts of ICTP in facilitating data sharing. Mr Philip Omondi of ICPAC, who has been closely associated with the Greater Horn of Africa Climate Outlook Forum (GHACOF) in operation for the past more than 10 years, informed the meeting on how useful the process has proved to be for the sub-region. He agreed that SASCOF is a very good idea. He suggested that appropriate data coordination mechanisms, possibly through the agency responsible for holding the RCOF session, can greatly facilitate efficient operation of the RCOF process. However, Dr Sharma of Nepal cautioned that data aspects need to be examined very carefully to determine the feasibility of the various possible mechanisms. Mr Jarraud, Secretary-General of WMO, noted that the African experience was built on the existing sub-regional structure, which facilitated data sharing. He expressed his gratefulness to India for the excellent initiative in sharing gridded rainfall and temperature data. In this context, he referred to the well-known WMO Resolution No. 40 (Twelfth World Meteorological Congress, 1995), which guides WMO policy and practice for the exchange of meteorological and related data and products. According to this Resolution, all data required for the protection of life and property should be shared freely, while other specialized data may be subject to commercial considerations. Dr Chaudhry offered to bring out gridded data sets for Pakistan also. Mr Jarraud emphasized the importance of collaborative approach to address common problems, and reiterated WMO support to regional cooperation initiatives.

## **7. SASCOF: Scoping and Planning**

7.1 Keeping the country perspectives and the overarching aspects as discussed above in view, this session systematically addressed the scoping of various aspects of SASCOF implementation. The session was chaired by Dr Q.Z. Chaudhry, PR of Pakistan with WMO, and the open discussion leading to final conclusions was moderated by Prof. J. Shukla.

7.2 Dr R. Kolli, Chief of World Climate Applications and Services Division of WMO Secretariat made a detailed presentation describing the RCOF concept, including the associated linkages to WMO Global Producing Centres of Long Range Forecasts (GPCs), Regional Climate Centres (RCCs) and National Meteorological and Hydrological Services (NMHSs). He highlighted that climate information and services are crucial for sustainable development, to support climate change adaptation and mitigation, disaster risk reduction as well as national development planning. He briefly summarized WMO's early initiatives to develop climate services through its Climate Information and Prediction Services (CLIPS) project, and also the recent initiatives in putting in place well-defined global and regional mechanisms through GPCs and RCCs to support national efforts in LRF and other climate services. He also provided detailed descriptions of RCOF concept and the underlying processes. He provided several examples based on the existing RCOFs, and pointed out that, while the implementation mechanisms of the RCOFs worldwide have been varied based on the local conditions, the core concept remained the same, cutting across all the regions: delivering consensus based user-relevant climate outlook products in real-time through regional cooperation and partnership. He also referred to the expected outcomes of the forthcoming World Climate Conference-3, notably the Global Framework for Climate Services which has RCOFs as an important element in its Climate Services Information System. The presentation was followed by an open discussion on SASCOF scoping and planning.

7.3 The meeting recognized that a sustainable coordination mechanism is critical to ensure regular and uninterrupted holding of SASCOF sessions. It is preferable to have regional ownership to such coordination mechanism, but no viable regional could be identified. SMRC, though built on the foundations of regional cooperation as enshrined in SAARC Charter, is essentially a research body and may not be in a position to take up operational responsibilities. Keeping this in view, the meeting agreed that WMO Secretariat should be requested to coordinate the SASCOF process in

its initial phase, and that a permanent alternative could be identified in due course after the activity gets established. It is, however, agreed that SMRC has the potential to provide significant inputs to the SASCOF process related to research and training aspects, and that the option for SMRC to have a greater role in SASCOF implementation may be kept open. WMO Secretariat may also assist the sub-region to prepare appropriate proposals to external agencies to seek support for this important regional initiative.

7.4 The meeting then considered the hosting of SASCOF sessions, and it was agreed that the countries in the sub-region may host individual SASCOF sessions by rotation. Dr Ajit Tyagi, PR of India, offered to host the first SASCOF session in 2010 in India (either New Delhi or Pune), subject to the availability of resources and the necessary Governmental approvals. Further, he suggested that the hosting of the first three sessions be decided in the present meeting itself, so that future uncertainties can be avoided. If required, he offered to host all the first three sessions in India. The meeting welcomed Dr Tyagi's proposal, and unanimously endorsed his proposal of having the first three sessions of SASCOF in India, in the years 2010, 2011 and 2012. The necessary logistics will be worked out in due course.

7.5 The meeting agreed that SASCOF will have an exclusive focus on the southwest monsoon to start with. However, the meeting recognized that there is also strong need for winter monsoon prediction. Considering that the winter season is also marked by substantial winter precipitation that is not part of the winter monsoon, it has been suggested that the SASCOF session for winter season should develop a "winter climate outlook" rather than a "winter monsoon outlook". In any case, the meeting agreed that SASCOF should gradually evolve to consider the general climate aspects of relevance to the region in addition to the predominant summer monsoon.

7.6 The timing of the SASCOF session was then considered, and it has been agreed that the early part of April is practically the most suitable time. From a technical point of view, though it is desirable to time the session to coincide with the period when predictability is the greatest, members recognized that countries have their own national schedules for issuing LRFs, and that the SASCOF should precede such national forecasts. This will also facilitate the incorporation of regional/global consensus into the preparations for national forecasts. Further, it was pointed out that the policy makers in all South Asian countries would need an outlook for the summer monsoon by the middle of April. After much discussion, it has been agreed that the window 15-20 April 2010 is the most suitable period for holding the first session of SASCOF. In this context, the meeting also noted that FOCRAII, a Pan-Asia RCOF regularly being organized by China since 2005, is usually timed around the first week of April. Appropriate coordination with FOCRAII planning is therefore considered essential. Dr N.H. Saji of Asia-Pacific Economic Cooperation Climate Centre (APCC), offered to process global inputs for SASCOF expeditiously.

7.7 While the meeting noted that capacity building is an integral component of RCOFs, it was agreed that the existing training activities within the ICTP might be continued so that the SASCOF session might only focus on preparing and disseminating the consensus-based regional climate outlook. Thus, SASCOF may need 3-4 days for its outlook generation, dissemination and user interaction components. However, the meeting noted that efforts be made to suitably re-orient ICTP's training programmes to address the core requirements of capacity building for RCOFs, such as downscaling (both dynamical and statistical; e.g., RCMs, CPT, etc.).

7.8 The meeting also discussed the participant composition for SASCOF. It was agreed that, in addition to the country participants, efforts should be made to invite international experts from GPCs and other global centres active in global-scale seasonal predictions (e.g., IRI, APCC, etc.). Also, some key user representatives need to be involved in SASCOF sessions to articulate their needs as well as to facilitate user-provider interaction.

7.9 It has been agreed that the process would start with a formal confirmation of the PR of India about hosting the first session of SASCOF in 2010, communicated to the Secretary-General of WMO with copies to the PRs of all other countries in South Asia, and requesting assistance from WMO Secretariat in coordinating the further steps. It has also been agreed that all SAARC

countries should be invited to participate, including Afghanistan and Maldives which could not be represented at this meeting. Professor Shukla made a generous offer to help organize a gathering of monsoons experts in conjunction with the first SASCOF.

7.10 The meeting also discussed some data sharing aspects which might be relevant to SASCOF development. Collaborative gridding using a standardized approach has been considered as a useful strategy to produce South Asia wide gridded data sets. APCC and ICTP may consider developing such a strategy.

## **8. Conclusions and Recommendations**

8.1 The PRs of countries in South Asia have unanimously agreed to establish a South Asian Climate Outlook Forum (SASCOF), to be implemented from 2010 onwards.

8.2 WMO Secretariat may assist in the coordination of SASCOF sessions initially, until a permanent arrangement is worked out.

8.3 SASCOF sessions will be hosted by the participant countries by rotation. The offer of India Meteorological Department for hosting the first three sessions, in 2010, 2011 and 2012 was appreciated and unanimously accepted by the participant countries.

8.4 SASCOF will initially have exclusive focus on the summer monsoon, and the needs for covering other aspects of the sub-regional climate will be addressed in due course.

8.5 The first session of SASCOF (SASCOF-1) will be tentatively scheduled to be held during 15-20 April 2010, in New Delhi or Pune, India, subject to the availability of resources and the necessary Governmental approvals. [Action: PR of India to formally confirm hosting of the session to WMO and the PRs of other participant countries].

8.6 Capacity building components of SASCOF will be addressed through the ongoing training activities of ICTP.

8.7 WMO may provide technical guidance and facilitate international expert participation, GPC and other global inputs as well as assist the sub-region in developing project proposals for extra-budgetary resource mobilization. [Action: WMO Secretariat to formally confirm arrangements to provide technical guidance and coordination arrangements].

8.8 SMRC may actively be involved in contributing to the research and training aspects of SASCOF.

8.9 All possible efforts should be made to ensure user participation in SASCOF.

## South Asian Climate Outlook Forum (SASCOF)

### A Concept Note

The idea of “climate outlook forums” originated at a Workshop on Reducing Climate-related Vulnerability in Southern Africa, held at Victoria Falls, Zimbabwe, in October 1996. Recognizing that climate predictions could be of substantial benefit to many parts of the world in adapting to and mitigating the impacts of climate variability and change, planning was initiated to establish a regional climate outlook forum (RCOF) with an overarching responsibility to produce and disseminate a regional assessment (using a predominantly consensus-based approach) of the state of the regional climate for the upcoming season. Built into the RCOF process is a regional networking of the climate service providers and user-sector representatives. Recognizing its vulnerability to extreme climatic variability, Africa has been a pioneering and enthusiastic participant in the RCOF process. Participating countries recognize the potential of climate prediction and seasonal forecasting as a powerful development tool to help populations and decision-makers face the challenges posed by climatic variability and change. National and Regional capacities are varied but certainly inadequate to face the task alone. Since 1997, when the Forum process started at Kadoma in Zimbabwe, Africa has benefited from a significant amount of capacity building and funding which has enabled the Southern Africa Climate Outlook Forum (SARCOF) to meet twice a year, the PRESAO (Prévision Saisonnière en Afrique de l’Ouest) once a year and the Greater Horn of Africa (GHA) two/three times each year. In parallel, National Meteorological and Hydrological Services (NMHSs) and some decision makers have come to realize the potential benefits to be gained and have played larger roles in the processes. Ownership now lies largely with national and regional players, but there is a continuing need for support at all levels to ensure that the momentum gained to date is maintained.

The World Meteorological Organization (WMO), through its Climate Information and Prediction Services (CLIPS) project and Regional Programme, made an important contribution towards the development and activities of the forums, alongside an array of bilateral and multilateral sources providing financial and in-kind contributions. These include: the Office of Global Programs of the US National Oceanic and Atmospheric Administration (OGP/NOAA), US Agency for International Development (USAID), the European Union (EU), the International Research Institute (IRI), the UK Meteorological Office, Meteo France, the World Bank, many NMHSs and several others including universities and research institutes. One important aspect of the forums is to bring together experts in various fields, local meteorologists and end users of forecasts in an environment that encourages interaction and learning. CLIPS developed a curriculum as part of the forums which aims at enhancing the climate prediction capabilities of the staffs of the NMHSs. The RCOF process has subsequently been extended to South America, Central America, Asia and the Pacific Islands and more recently to Southeastern Europe. While the implementation mechanisms of the RCOFs worldwide have been varied based on the local conditions, the core concept remained the same, cutting across all the regions: delivering consensus based user-relevant climate outlook products in real-time through regional cooperation and partnership.

Among the challenges identified in the process to date, a key area is the design and delivery of climate information and prediction products that satisfy the needs of end-users. Achieving this will require concerted efforts to demonstrate benefits. This challenge, together with that of sustainability, indicates the continued need to improve the scientific underpinnings of the forecasts, for capacity building, and for sustained support.

The consensus prediction process that underlines RCOF operations consists of the following elements:

- 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/downscaling 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;
- 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.

RCOFs stimulate the development of climate capacity in the NMHSs and do much to generate decisions and activities that mitigate adverse impacts of climate and help communities adapt to climate variability. It may also be noted that, in addition to directly supporting the RCOFs along with other partners, WMO has been making concerted efforts to put in place a number of global and regional mechanisms that would further strengthen the RCOF activities. WMO has established formally designated Global Producing Centres (GPCs) of Long Range Forecasts, which provide real-time global seasonal forecasts accessible to all WMO Members. WMO, along with its Regional Associations, is also at an advanced stage of establishing several Regional Climate Centres (RCCs) to cater to the special needs of regions. NMHSs, the regions and the users of the products must contribute to the sustainability of RCOFs (e.g., demonstrate utility of the forums and value of the products to those who need the information). Additionally, research capacities at the regional level need to be enhanced, to assess the forecast skills as well as to work towards their improvement. Media has an important role to play in RCOF process, which needs to be factored in.

The RCOF process has facilitated a better understanding of the links between the climate system and socio-economic activities. An increasing demand for climate services has been recorded in many parts of the world as a result of these developments. Awareness has been created that climate information, including short-range climate predictions, is an essential element in mitigating against the impacts of climate variations. RCOFs have fostered interactions and exchange of information between the climate scientists and users of climate information. More importantly, they have facilitated the mainstreaming of regional cooperation and networking, and effectively demonstrated the immense mutual benefits of sharing of information and experience.

While the RCOFs were originally conceived with the main focus on seasonal prediction, the same RCOF mechanisms can be effectively expanded to cater to the needs of developing and disseminating regional climate change information products. Such initiatives are already being taken up by some RCOFs (e.g., Greater Horn of Africa). Regional assessments of observed and projected climate change, including the development of downscaled climate change scenario products for impact assessments, can be included in the product portfolio of RCOFs.

The past couple of decades have witnessed remarkable advances in our understanding of monsoon processes and its variability, significantly enhancing our capabilities in monsoon prediction. It is important that the latest research advances are effectively exploited to improve operational monsoon prediction to meet the societal needs for advance information on the monsoon. To facilitate this process in a coordinated manner the International Center for

Theoretical Physics (ICTP), and the Center for Ocean-Land-Atmosphere Studies (COLA) have conducted targeted training activities at ICTP for scientists from South Asia where the countries share a common monsoonal climate and its impacts. The training activities have included both the predictability of monsoons and the scientific aspects of monsoon prediction in South Asia with special focus on the related operational aspects. This year the training activity is taking place at ICTP during the period of July 27 – August 7, 2009. It is in this context that the initiative to launch a South Asian Climate Outlook Forum (SASCOF) has been taken up, with the active and enthusiastic support by the National Meteorological and Hydrological Services (NMHSs) of the South Asian countries.

The potential for the development of SASCOF has been discussed recently on several platforms and its importance recognized. For example, the recent international symposium on Climate Change and Food Security in South Asia at Dhaka (25-30 August 2008) called for the establishment of SASCOF, and there is a general agreement that such a process will greatly enhance regional cooperation as well as more effective engagement of the user community. WMO's Regional Association II (Asia), while appreciating the pan-Asia RCOF activities over the past few years led by China, called for additional sub-regional RCOFs to meet the special needs of the sub-regions. This will need active participation of all the NMHSs in the sub-region including the related multi-lateral entities. To take the first steps in this direction and scope out the implementation aspects of SASCOF, a meeting of the Directors General of the National Meteorological Services in South Asia was convened at ICTP, Trieste, Italy, on 6 August 2009. The aim of the meeting was to review the ongoing operational activities in seasonal prediction and work towards further development of SASCOF concept and determine its implementation aspects.

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**South Asian Climate Outlook Forum (Inception Meeting)  
August 6, 2009**

**AGENDA**

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**OPENING SESSION**

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- 09:00     **Introduction**  
Dr. J. Shukla, Professor, George Mason University (GMU) & President, Institute of Global Environment and Society (IGES), USA
- 09:10     **Welcome**  
Dr K.R. Sreenivasan, Director, ICTP
- 09:20     **WMO Statement of Support for establishing an RCOF in South Asia**  
Mr M. Jarraud, Secretary-General, WMO
- 09:30     **Challenges in Monsoon Prediction and Potential for Operational Implementation in South Asia**  
Dr. J. Shukla, Professor, GMU
- 09:50     **Signing of Memorandum of Understanding between WMO and ICTP**  
Mr M. Jarraud, Secretary-General, WMO and Dr K.R. Sreenivasan, Director, ICTP
- 10:00     *Coffee Break*

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**Session I :       Operational Seasonal Prediction in South Asia : Current Status and Future Perspectives**  
**Chair: Dr A. Tyagi, Permanent Representative of India with WMO**

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- 10:30     **Short Presentations/Statements on National Perspectives**
- Speakers:
- Dr A. Tyagi, Director General of Meteorology, India Meteorological Department and Permanent Representative of India with WMO
  - Dr Q.Z. Chaudhry, Director General, Pakistan Meteorological Department and Permanent Representative of Pakistan with WMO
  - Mr G.B. Samarasinghe, Director General, Department of Meteorology, Sri Lanka and Permanent Representative of Sri Lanka with WMO
  - Dr T. Samdup, Director, Council for Renewable Natural Resources Research of Bhutan and Permanent Representative of Bhutan with WMO
  - Dr K.P. Sharma, Deputy Director General, Department of Hydrology and Meteorology, Nepal
  - Dr S. Das, Nominee of Director, Bangladesh Meteorological Department
- 11:45     **Introduction to SMRC and its activities : Potential contributions to SASCOF Implementation**  
Dr S. Das, SMRC
- 12:00     Discussion
- 12:30     *Lunch Break*
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**Session II : South Asian Climate Outlook Forum : Scoping and Planning**  
**Chair: Dr Q.Z. Chaudhry, Permanent Representative of Pakistan with WMO**

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14:00 RCOF Concept, including GPC, RCC and NMHS Linkages : Role in the developing Global Framework for Climate Services  
Dr R. Kolli, WMO

14:30 **Open Discussion on Seasonal Prediction in South Asia:**

- Needs, requirements and capabilities of providers
- Needs and requirements of users/policy- and decision-makers

15:30 *Coffee Break*

16:00 **Open Discussion on Implementing a South Asian Climate Outlook Forum (SASCOF)**

- Scoping
- Implementation perspectives
- User engagement
- Endorsement of SASCOF
- Capacity Building
- Tentative Work Plan

17:30 *Closure of Meeting*

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**STATEMENT AT THE OPENING OF THE MEETING TO LAUNCH THE  
SOUTH ASIAN CLIMATE OUTLOOK FORUM (SASCOF)**

by  
**M. Jarraud**  
**Secretary-General**  
**World Meteorological Organization**  
**(Trieste, 6 August 2009)**

**Professor Katepalli Sreenivasan, Director of the Abdus Salam International Centre for  
Theoretical Physics (ICTP),  
Permanent Representatives with WMO of South Asian Countries,  
Professor Jagadish Shukla,  
Distinguished Experts and Participants,**

**Dear Colleagues, Ladies and Gentlemen,**

On behalf of the World Meteorological Organization (WMO), it is a pleasure for me to address this meeting, which has been convened to launch the development of the South Asian Climate Outlook Forum (SASCOF). I would like to express my appreciation to the Abdus Salam International Centre for Theoretical Physics (ICTP), through its Director, Professor Katepalli Sreenivasan, for hosting this key event. I am pleased to note that ICTP continues to be at the forefront in fostering advanced studies and research in the physics of weather and climate, especially for the benefit of developing countries.

Indeed, the ICTP has a longstanding reputation in capacity-building, including a wide range of topics which are especially relevant to WMO's programmes and activities. I am also pleased to note the presence of Professor Jagadish Shukla, who in 2007 was awarded the prestigious International Meteorological Organization (IMO) Prize. I wish to thank Prof. Shukla for his personal initiative to accelerate operational exploitation of research advances in the South Asia monsoon region, which also provided momentum for this event. I am also pleased that a number of the Permanent Representatives of South Asian WMO Members have responded positively to this initiative and I am confident that they will contribute to the sustainability of the SASCOF process over the coming years.

**Dear Colleagues, Ladies and Gentlemen,**

Seasonal weather and climate fluctuations can have significant impacts on society through agriculture, food security, water, health natural disasters and the environment. In the developing world, these impacts have the potential to set back economic progress, so climate issues are highly relevant to poverty alleviation and sustainable development. I wish to recall that Regional Climate Outlook Forums (RCOFs) were initiated by WMO in 1996, when they provided timely momentum to regional responses to the El Niño event of 1997/98. They have since become key regional mechanisms for the formulation and dissemination of seasonal forecasts to decision-makers and other climate information end-users.

WMO has been closely involved with the RCOF process from its inception, in partnership with the National Meteorological and Hydrological Services (NMHSs), regional institutions and other international organizations. The RCOFs provide the platform to bring together experts from climatologically homogeneous regions and to generate consensus-based climate predictions and information with critical socio-economic significance.

More recently, WMO has established Global Producing Centres for Long Range Forecasts, which provide real-time global seasonal forecasts fully accessible to all WMO Members. There are now eleven Global Producing Centres in different parts of the world, of which three are located in Asia, in Beijing, Seoul and Tokyo. Of these, Seoul also hosts a WMO Lead Centre for Long Range Forecasts Multi-Model Ensemble, whereas Beijing and Tokyo have been designated Regional Climate Centres following the procedure established by the WMO Executive Council at its sixty-first session (Geneva, June 2009).

Although RCOFs were originally conceived to focus on seasonal prediction, they significantly contribute to climate variability adaptation and the concept has also the potential to be extended to climate change adaptation, since there is considerable overlapping in the relevant scientific approach, tools and methods, as has already been recognized by the United Nations Framework Convention on Climate Change (UNFCCC) Subsidiary Body on Science and Technology Advice. Accordingly, the model constitutes a key element of WMO's actions in support of the Nairobi Work Programme on impacts, vulnerability and adaptation to climate change.

**Dear Colleagues, Ladies and Gentlemen,**

As you are aware, from 31 August to 4 September 2009 WMO will hold in Geneva a third World Climate Conference (WCC-3), in collaboration with Switzerland, the UN System delivering as One and other partners, under the main focus "*Climate prediction and information for decision-making*". The Conference aims to establish a global framework guiding the development of climate services, linking science-based climate predictions and information with climate risk management and adaptation to climate variability and change.

The two earlier World Climate Conferences are still remembered as landmark events, which led to the establishment of the World Climate Programme (WCP), World Climate Research Programme (WCRP), the UNFCCC, the Global Climate Observing System (GCOS) and the Intergovernmental Panel on Climate Change (IPCC), which WMO and UNEP cosponsor since 1988 and which at the end of 2007 received the prestigious Nobel Peace Prize for its Fourth Assessment Report.

From the last IPCC Report, I would like to highlight two aspects of climate change which are especially relevant in the present context. Firstly, while we have achieved a relatively greater level of confidence at the global and continental scales, we still have a considerable way to go in providing reliable regional detail; secondly, some impacts of climate change will be clearly inevitable, so societies have no option but to prepare appropriate adaptation strategies.

**Dear Colleagues, Ladies and Gentlemen,**

South Asian nations are collectively home to more than a quarter of the global population and share a common climatological setting, dominated by monsoons which account for almost the entire annual precipitation. Accordingly, monsoon prediction holds great value for decision-making at all levels and the past two decades have exhibited some remarkable advances in our understanding of monsoon processes and variability. It is therefore vital that the latest research advances are effectively exploited to improve operational monsoon prediction according to societal needs, to ensure that South Asian nations achieve a common level of understanding on the available information and options.

The potential for the development of a South Asian Climate Outlook Forum (SASCOF) is being concurrently discussed on several platforms. For example, the recent international symposium on Climate Change and Food Security in South Asia, held in Dhaka from 25 to 30 August 2008, has called for the establishment of SASCOFs and there is widespread agreement that such a process will greatly enhance regional cooperation, as well as a more effective engagement of the wider user community. This will require very active participation of the concerned WMO Members and I am pleased to highlight well-established regional cooperation through the South Asian Association for Regional Cooperation (SAARC), which has appropriately recognized meteorology as a major aspect of regional cooperation through the establishment of its SAARC Meteorological Research Centre (SMRC) in Dhaka.

In addition, over the last four years China has been actively organizing an RCOF for the entire RA II (Asia), known as FOCRAII, which will be expanded through the establishment of a number of subregional RCOFs, as agreed by the RA II at its fourteenth session last December.

I am confident that this session will take all the necessary steps to proceed in this direction and WMO will be pleased to facilitate the required technical support and guidance for SASCOF implementation. I therefore wish to thank ICTP once more for hosting this key event in Trieste.

Thank you.



The Abdus Salam  
International Centre for  
Theoretical Physics

World  
Meteorological  
Organization



## MEMORANDUM OF UNDERSTANDING

BETWEEN

THE WORLD METEOROLOGICAL ORGANIZATION (WMO)

AND

THE ABDUS SALAM INTERNATIONAL CENTRE FOR THEORETICAL PHYSICS (ICTP)

The World Meteorological Organization (herein referred to as WMO) and the Abdus Salam International Centre for Theoretical Physics (herein referred to as ICTP), Parties to this Memorandum of Understanding (MOU),

**Noting** the Working Arrangement between the United Nations Educational, Scientific and Cultural Organization (UNESCO) and WMO approved in 1954;

**Noting** the Agreement between the International Atomic Energy Agency (IAEA) and WMO which entered into force in 1960;

**Noting** that the ICTP, founded in 1964, operates under a tripartite agreement between the Government of Italy, the UNESCO and the IAEA;

**Noting** the interagency cooperation in climate related activities under the World Climate Programme (WCP), including the longstanding collaboration between WMO, the International Council for Science (ICSU) and the Intergovernmental Oceanographic Commission (IOC) of UNESCO through co-sponsored programmes such as the World Climate Research Programme (WCRP) and the Global Climate Observing System (GCOS), and the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM);

**Noting** that the ICTP has fostered research groups in several areas of physical sciences and mathematics including the physics of weather and climate;

**Noting** the recent collaborations between the ICTP and WMO in efforts to launch the South Asian Climate Outlook Forum (SASCOF) and the continued partnership with the Centre for Ocean-Land-Atmosphere Studies (COLA) on Targeted Training Activities (TTA), and to develop a high impact weather information system for Africa and on research to develop strategies to numerical weather prediction systems and river flow modeling over the continent;

**Considering** the mutual interest of WMO and ICTP in cooperative activities in the fields of weather, climate, and water, especially with particular regard to research and modelling for understanding and prediction, and capacity building in environment-related issues, especially in developing countries;

**Recalling** the purposes of WMO to coordinate the activities of its Members in the generation, processing and exchange of meteorological, hydrological and related geophysical and environmental observations according to internationally agreed standards, to promote research and training in these fields at national, regional and global levels, and to facilitate the development and application of related services that contribute to the improvement of the well-being and safety of communities and nations;

**Recalling also** the ICTP principal missions: to foster the growth of advanced studies and research in physical and mathematical sciences, especially in support of excellence in developing countries; to develop high-level scientific programmes keeping in mind the needs of developing countries, and provide an international forum of scientific contact for scientists from all countries; to conduct research at the highest international standards and maintain a conducive environment of scientific inquiry for the entire ICTP community;

**Recognizing** the need to develop further close cooperation between WMO and ICTP in areas of mutual interest;

Therefore WMO and ICTP agree, as set out in this MOU, to the promotion of weather and climate research and modelling, predictions and applications in support of sustainable socio-economic development, protection of the environment, education and training in relevant fields including capacity building of scientists in developing countries by providing wider access to the benefits from advances and application of the sciences of weather and climate.

**Paragraph 1** Exchange of information, representation and consultation

1. The ICTP and WMO will keep one another informed of their activities that might be of common interest.
2. Each organization will invite the other to take part in any meetings that address issues of common interest, and will make available the reports of such meetings.
3. The ICTP and WMO will exchange their catalogues of publications to enable both organizations to be aware of publications related to their activities. The ICTP and WMO will encourage exchange of documents and publications on subjects of mutual interest, free of charge or on appropriate concessional terms.
4. The Parties will endeavour to expand their cooperation by means of formal and informal consultations on issues of common interest, notably on the physics, modelling and prediction of weather and climate, coupling of weather and hydrological models, assessment of climate variability and change and the associated impacts, education and training including promotion of scientific expertise in developing countries in weather and climate prediction; to this end, they may decide, if necessary, to establish appropriate joint mechanisms to pursue specific tasks and objectives.

**Paragraph 2** Cooperation arrangement

1. Within the framework of their respective mandates and activities, the Parties may agree to the design and implementation of joint cooperation projects for the benefit of their constituents, which may, more specifically, take the form of:
  - Training courses, seminars, workshops and related activities,
  - Scientific and technical studies,
  - Relevant socio-economic studies,
  - Preparation and implementation of projects,
  - Disseminating literature and relevant information, and
  - Any other activities the Parties agree upon.
2. Such projects shall be designed and implemented in accordance with specific arrangements, to be determined jointly by the relevant organs of both Parties and approved by each Party through an exchange of Letters of Agreement, setting the practical, technical and financial conditions for the participation of both Parties, whose availability and visibility shall be duly ensured.
3. Specific projects for the implementation of this MOU, between ICTP and WMO, or ICTP, WMO and any other parties, shall address all those areas included in the broad range of functions needed for the execution of studies, pilot projects or other relevant activities.
4. The Secretary-General of WMO and the Director of ICTP shall adopt appropriate administrative measures to facilitate effective cooperation and liaison between the Secretariats of both Organizations.

**Paragraph 3** Publications

The Parties recognize the benefits of exchanging publications as well as the advantages of joint collaboration on relevant publications with a view to promoting the best use of these in each others' work.

**Paragraph 4** Entry into effect, amendment and duration of this Memorandum of Understanding

1. This MOU will take effect upon signature by both Parties.
2. When jointly agreed, this MOU may be implemented through specific additional annexes, each of which will indicate the objectives, activities, forms of participation and financial and other contributions of each of the Parties.
3. This MOU will be valid for an initial period of three years, and can be renewed for successive three-year periods after a joint evaluation, discussed at least 60 days before the date of expiration.
4. This MOU may be amended in writing at any time, by mutual agreement.
5. Nothing in or related to this MOU shall be deemed a waiver, express or implied, of any of the privileges or immunities of either WMO or the ICTP-UNESCO.
6. Any dispute arising between the parties over the interpretation or implementation of this MOU will be settled by friendly negotiations between the parties. Should the case arise that a dispute cannot be settled with friendly negotiations, then arbitration rules applied should be in accordance with the United Nations Commission on International Trade Law (UNCITRAL) Arbitration Rules in force at the date of the dispute.
7. This MOU can be terminated by either party, with three months' notice, advising the other party in writing of its desire to end it. Any decision to terminate the MOU should not affect the operation or conclusion of projects which are already underway or any other obligations which have been undertaken prior to the notice of intention to terminate.
8. The ICTP Secretariat and the WMO Secretariat will monitor and periodically review the implementation of this MOU, and raise relevant issues for the consideration of the ICTP Steering Committee or its Scientific Council and the relevant constituent bodies of WMO, as appropriate.

IN WITNESS WHEREOF, the undersigned have signed this MOU.

For the World Meteorological Organization



Mr Michel Jarraud  
Secretary-General

Trieste, Italy 6 August 2009

For the Abdus Salam International Centre for  
Theoretical Physics



Mr Katepalli R. Sreenivasan  
Director

Trieste, Italy 6 August 2009

