



FIFTH MEDITERRANEAN CLIMATE OUTLOOK FORUM (MedCOF-5)

November 23-24, 2015
Kenzi Farah Hotel, Marrakech, Morocco



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Executive Summary

The MedCOF-5 forum was held in Marrakech from 23 and 24 November 2015 hosted by the Direction de la Météorologie Nationale of Morocco. The MedCOF-5 forum was held jointly with SEECOF-14 and PRESANORD-9. The coordination of all three events has been essential to distribute tasks and avoid overlaps. The MedCOF-5 forum was mainly focused on the production of the consensus large scale climate outlook for the winter 2015-2016. MedCOF-5 has finally released a large scale seasonal forecast for the whole Mediterranean region which was further refined by sub-regional COFs (PRESANORD and SEECOF) for their respective areas. Following discussions have also allowed agreeing on some features relevant for the design of the future COFs.

1. Introduction.

1.1. Background

Regional Climate Outlook Forums (RCOFs) have been the major component of WMO Climate Information and Prediction Services (CLIPS) project activities and are widely recognized to be key elements in the implementation of GFCS at regional and national scale. First established in 1996 at a Meeting in Victoria Falls, Zimbabwe, RCOFs gained momentum as a regional response to the major 1997–1998 El Niño event, since then RCOF concept was spread worldwide. WMO and a number of national, regional and international organizations (e.g., NOAA, IRI, MeteoFrance, World Bank, etc.) have continuously supported their growth and expansion.

Built into the RCOF process is a regional networking of the climate service providers and user-sector representatives. 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. Regional climate outlooks are based on input from NMHSs, regional institutions, Regional Climate Centers (RCCs), Global Producing Centers of long range forecasts (GPCs) and other climate prediction centers.

The RCOFs generally include pre-COF capacity development for the experts from NMHSs to improve their skills in long range forecasting and communicating the probabilistic information along with the uncertainties. It is followed by the Forum to interpret the available real-time seasonal prediction products from WMO GPCs and WMO RCCs, assess the skills of forecasting systems, develop the consensus seasonal climate outlook statement for the region, and discuss on the potential applications of RCOF products of the regional and international climate experts to develop a consensus for the regional climate outlook, typically in a probabilistic form. The RCOFs are widely recognized to be one of the key elements of GFCS implementation at regional level. The RCOFs then lead to national forums (NCOFs, NCFs) to downscale RCOF products and develop detailed national-scale climate outlooks and risk information including warnings for communication to decision-makers and the public.

Following the recommendations given by RA VI Task Team on RCOF and supported by the RA VI Working Group on Climate and Hydrology targeting South Western Europe/ Mediterranean basin as suitable for a RCOF implementation and considering the recommendation by the Scoping Workshop on Seasonal Climate Prediction (Algeria, January 2012) of extending the existing RA I PRESANORD to the whole Mediterranean area involving thus RA I and RA VI;

AEMET jointly with WMO -and after conversations with many parties- convened a Scoping Meeting (SC) at AEMET headquarters in Madrid from 12 to 14 June 2013 to define the features and objectives of a future Regional Climate Outlook Forum encompassing among others National and Regional Services around the whole Mediterranean region. The first formal MedCOF meeting was held in Belgrade, Serbia, 18-19 November jointly with SEECOF-10.

The Mediterranean Climate Outlook Forum (MedCOF) covers the whole Mediterranean region, cutting across the two WMO Regional Associations (RAVI and RAI). MedCOF is aimed at developing consensus based seasonal outlook for the entire Mediterranean region, strengthening the NMHSs existing capabilities in seasonal forecasting, and promoting inter-regional cooperation and partnership. It has been agreed by the 31 participating countries that MedCOF will operate as an overarching entity in support of the South-East European Climate Outlook Forum (SEECOF) and the forum of Prévisions Climatiques Saisonnières en Afrique du Nord (PRESANORD). Therefore, it is a reasonable approach that these three RCOFs be organized together, starting with 2 days of MedCOF sessions and followed by 2 days of parallel sessions for SEECOF and PRESANORD.

Following the decision taken by the plenary in MedCOF3 (November 2014), training activities -usually organized as a pre-COF session- were separated from the more operational Forum sessions aiming at developing a consensus for the regional climate outlook. This separation has the main purpose of avoiding excessively long MedCOF events which may interfere with domestic responsibilities.

Under the guidance of the MedCOF Management, the 1st MedCOF Training Workshop on the improvement of operational procedures for consensuated seasonal forecasts was held from 26 to 30 October, 2015, in Madrid, Spain. The MedCOF Training Workshop brought together experts from NMHSs of the Mediterranean region and from WMO GPCs, designated RCCs and other relevant scientific institutions. The Training Workshop comprised key note lectures, plenary discussions and hands-on training aiming at the

overall improvement of the production of consensuated seasonal forecast in the Mediterranean region. According to the foundational MedCOF agreement, this Training Workshop pointed to strengthen the NMHSs existing capabilities in seasonal forecasting, and to promote inter-regional cooperation and partnership.

MedCOF-5 comprises 3 steps; the first one will be devoted to verification of the MedCOF-4 summer forecast; the second one to the assessment of current state of climate and, finally, the third one to the building of consensus statements.

Funding for this initiative comes from WMO and AEMET through the ACMAD Trust Fund established in WMO for the North African participants and from the Direction de la Météorologie Nationale of Morocco for the logistics expenses.

1.2 Date and Venue

Following the kind invitation of the Direction de la Météorologie Nationale (DMN) of Morocco, the three meetings (MEDCOF-5, SEECOF-14 and PRESANORD-9) were held from 23 to 26 November 2015 in Marrakech, Morocco.

The meeting venue was “Kenzi Farah Hotel”, Marrakech (more details on local arrangements [in http://medcof.aemet.es/images/doc_events/medcof5/docMedcof5/Informations_Note_MEDCOF-5.pdf](http://medcof.aemet.es/images/doc_events/medcof5/docMedcof5/Informations_Note_MEDCOF-5.pdf)). The Hotel is very conveniently located in the very heart of the cosmopolitan district “L’Hivernage” only 1 km away from City Centre and 2 km away from the Airport.

1.3 Participants

MedCOF brought together representatives from all countries involved in (SEECOF): Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Georgia, Greece, Hungary, Israel, Moldova, Montenegro, the Former Yugoslav Republic of Macedonia, Romania, Serbia, Slovenia, Turkey, Ukraine; and in North African Climate Outlook Forum (PRESANORD): Morocco, Algeria, Tunisia, Libya and Egypt; as well as France, Italy, Spain, Portugal, Jordan, Lebanon, Malta, Mauritania and Syria. Resource persons from Meteo France, UK Met Office, ECMWF, DWD, Roshydromet, AEMET, as well as representatives from WMO have attended MedCOF. Most climate experts were invited to attend the three consecutive events. A list of participants is

available in Annex II and also in http://medcof.aemet.es/images/doc_events/medcof5/docMedcof5/ListParticipants_MEDCOF-5.pdf

2. Meeting Concept and Format

The MedCOF-5 was designed in a way to accommodate six sessions:

Opening Session

Session I – Verification and Climate monitoring

Session II – Production of large scale climate outlook for winter (DJF) 2015-2016 (I)

Session III – Production of large scale climate outlook for winter (DJF) 2015-2016 (II)

Session IV - Projects relevant to MedCOF

Session V - Discussion on MedCOF matters

Session VI - Conclusions and Recommendations

The formal opening session started with the previous evening (Sunday 22 November) followed by a cocktail offered to all participants by DMN.

The Session I provided climate monitoring information as well as verification of previous seasonal forecasts.

The Session II and III were devoted to the production of the climate outlook for winter 2015-2016. In these sessions all inputs received from the Global Producing Centers, the Regional Climate Centers and the climate experts of the Mediterranean countries were presented and discussed.

In Session IV some international projects relevant to MedCOF were presented and discussed.

Sessions V and VI were devoted to discussions on MedCOF matters, as well as to summarize a list of conclusions and recommendations.

2.1 Meeting Agenda and Programme

Agenda and Programme are available in Annex I.

2.2 Working Language

The working language of the meeting was English.

3. Development of the meeting

3.1 Opening

The opening session started with the welcome speech addressed by Mr Abdalah Mokssit - Permanent Representative of Morocco and Director General of DMN- on behalf of the host institution. He welcomed all countries' representatives and expressed his gratitude to the WMO, AEMET, ACMAD and SEEVCCC for facilitating the organization of the MedCOF. Then, Ms. Anahit Hovsepyan, as representative of the WMO Secretariat and on behalf of the WMO Secretary General Michel Jarraud, welcome also to participants and thanked DMN for hosting the meeting and for arranging the magnificent venue.

3.2 Session 1: Verification and Climate Monitoring

The first intervention on "*Verification of MedCOF-4*" was presented jointly by Peter Bissolli from DWD (Germany) and Soumaya Ben Rached from INM (Tunisia). The previously prepared verification document was discussed, amended and finally approved.

The MedCOF-4 temperature climate outlook for the 2015 summer season favored the upper tercile over almost the entire domain with probability of 50% over the southern part of the domain and 40% probability over Mediterranean Sea and the entire RA VI part of the MedCOF region. The Atlantic facade of African regions shows no preference for any climate defined categories. For Europe/RA VI, the MedCOF outlook was correct for most of the area, except western France, Portugal, south Italy, southern Bulgaria, southern Greece, parts of Turkey, Cyprus, and the northern Middle East, which had mean temperatures around or locally below normal. For North Africa (RAI), the summer 2015 was warmer than normal in almost all North Africa. Positive anomalies are registered over almost all North African domains except the center of Algeria which registered below normal temperature. MedCOF-4 climate outlook for the summer season

temperature has correctly predicted the positive anomalies over almost all the domains except the Atlantic facade of African regions.

For Europe/RA VI, the MedCOF-4 precipitation climate outlook for the 2015 summer season favored an above normal scenario for a region close to the Mediterranean Sea (Region 1) and no privileged scenario for the remaining parts of the RA VI MedCOF region (Region 2). This was mainly correct for Region 1, whereas Region 2 had mostly precipitation in the lower tercile and was drier than normal. A few parts of Region 2, however, were represented by one of the other two terciles. For North Africa (RAI), the MedCOF-4 precipitation climate outlook for the 2015 summer season didn't favor any scenario for the entire region of North Africa (Dry masking). Summer 2015 was drier than normal over Egypt, Libya, the center of Algeria and the extreme north of Morocco. Seasonal precipitation amounts were above normal especially in the center of Morocco, the south and north of Algeria, the center and south east of Tunisia. Elsewhere precipitation was near normal.

Peter Bissolli (DWD, Germany) presented a summary of climate monitoring previously prepared by him and Soumaya Ben Rached (INM, Tunisia) using information from the corresponding RA VI and RAI RCCs.

The oceanic analysis shows a strong El Niño event well installed now. This can be seen by a strong warm anomaly along the equator in the Pacific Ocean from the date line to the South American coasts. The SST anomaly has reinforced in October 2015 in the central part of the basin. Monthly mean index values of Niño3.4 and Niño1+2 have reached +2.5. Over the northern Pacific, there is a clear positive PDO structure with particularly strong anomalies. In the subsurface analysis, a clear east-west dipole anomaly pattern (warmer in the east, colder in the west) can be identified in the equatorial Pacific. Kelvin waves were visible in the course of recent months, most recently between mid-September and mid-October. The equatorial Atlantic has close-to-normal SST, followed by a warm anomaly in the northern tropics and along the U.S. coasts. Further north, a very persistent cold anomaly extends from 30°N to Iceland, slightly moving southward. The eastern Mediterranean is warmer than normal, whereas the western Mediterranean has SST around normal. Some northern parts of the Mediterranean are even colder than normal. SST of the Black Sea is around normal.

The atmospheric analysis shows an intense dipole of vertical motion that persists over the equatorial Pacific with a large area of upward motion anomaly over the central and eastern Pacific and downward motion anomaly over Southeast Asia and Australia, linked

with a strong ocean-atmosphere coupling related to El Niño. SOI index for October 2015 is -1.7. There is a strong teleconnection to the northern Pacific, but less in the northern Atlantic. A positive NAO pattern (index +1.0) has been established. A teleconnection to eastern parts of the Mediterranean looks probable. AMO and PDO are in a positive phase, modulating circulation via Rossby waves. A strong polar vortex exists in the stratosphere, QBO is in a westerly phase, supporting a zonal circulation over the Atlantic. In contrast, a strong ENSO, a positive NAT SST index and an increased snow cover extent in Eurasia support blocking situations. Global warming is still ongoing, 2015 will be likely the warmest year on global average. Over Europe, there is a blocking high with highest anomalies over Scandinavia since August 2015 (positive phase of SCAND pattern). A negative geopotential anomaly can be found over Russia, due a positive phase of an East Atlantic/West Russia pattern. Cold polar air moving to eastern Europe flowed south of the blocking high also to central and western parts of Europe, influencing also northern parts of the MedCOF region, whereas parts around the Mediterranean Sea were still influenced by negative geopotential anomalies. Over North Africa, sea level pressure anomalies were mainly positive in the west (except near Gibraltar) and negative in the west.

Over Europe, temperature anomalies were negative especially in northern parts of the MedCOF region, down to below -2°C in eastern France and eastern Ukraine. In some southern parts of Europe (southern Italy, southern Balkan Peninsula), and at the eastern Mediterranean (Turkey, Cyprus, Middle East) anomalies were positive and above $+0.5^{\circ}\text{C}$. Elsewhere, anomalies were around normal (1981-2010 reference). There were positive anomalies over whole North Africa. Mean anomaly was $+1.2^{\circ}\text{C}$, locally above $+3^{\circ}\text{C}$.

Over Europe, precipitation anomalies were negative in northernmost parts of the MedCOF region, especially in most of France, northeastern Spain and parts of the Ukraine. Monthly precipitation totals in the eastern Ukraine had the lowest percentage of less than 20% of the normal. In all other parts of the RA VI Region, precipitation was mostly above normal, locally more than 200% of the normal. Anomalies were mainly negative over much of North Africa; percentages were mostly less than 50% of the 1981-2010 normal. Also drought indices support the negative anomalies. Exceptions were some parts in the west and at northern coasts of North Africa, were locally high positive anomalies can be found with percentages up to more than 200% of the normal.

3.3 Session 2: Production of large scale climate outlook for winter (DJF) 2015-2016 (I).

The Session 2 was chaired by Ernesto Rodríguez (AEMET) and started with the presentation by Roxana Bojariou (Romanian Met Service) on “*Climate predictive signals for the Mediterranean Region*”. She made an observational analyses of large scale drivers for winter predictability over the Mediterranean region. El Niño will likely peak during the Northern Hemisphere winter 2015 - 16, with a transition to ENSO – neutral anticipated during the late spring or early summer 2016. A strong and mature El Niño continues in the tropical Pacific Ocean. The majority of international climate outlook models indicate that the 2015-16 El Niño will strengthen slightly before the end of the year. The Tropical Atlantic Variability measured by the South Atlantic Tropical (SAT) SST index suggests a consistent with enhanced probability for negative NAO/AO. The Cold Blob in the North Atlantic can have possible effects on the jet stream position in the Atlantic-European area with impact on winter conditions over Europe. The extended snow cover over the Southern Siberia is consistent with negative AO/NAO. The anomalies in the ice extent over Arctic regions are related with atmospheric blockings. The strong polar vortex and westerly QBO are consistent with zonal circulation prevalence over the NH in winter (e.g. mild winter conditions over Europe). 2015 is virtually certain the hottest year in archives. 2016 is very likely to be in the top 10. What could tell us these information about the prospects for the winter 2015-2016 in the MedCOF region? Unfortunately, not very much. On this scales, natural variability is still stronger than the GHG-forced one. As a summary, she pointed out that the strong ENSO, NAT SST index and the snow cover extent in Eurasia all of them point to favour blocking situation.

Anca Brookshaw (ECMWF/MetOffice, UK) presented the forecast for December 2015 - February 2016 from Exeter GPC. This included the forecast for tropical Pacific sea-surface temperatures in the Niño regions, forecasts of atmospheric circulation over the northern hemisphere and seasonal temperature and precipitation over Europe. These forecasts were presented alongside forecasts from the other systems which form part of EUROSIP, to allow easy comparison for the consensus discussion.

Damien Decremet (ECMWF) presented “Seasonal forecast from System 4” for DJF 2015/2016. El Niño is expected to peak in December with a sea surface temperature (SST) anomaly of around +2.8K. Mean sea level pressure and 500hPa geopotential height anomalies suggest a positive North-Atlantic Oscillation (NAO+) phase for early winter, suggesting a strong westerly zonal flow hitting the British isles and North-Europe. Later

in January and February, a northward movement of the Azores high is forecasted, which may force the zonal flow into a more slanted path down towards the southern Caucasus region. Note that skill for S4 circulation variables is generally not sufficient to put a lot of trust in this forecast so that the evolution through the season remains very uncertain. The westerlies might bring an anomalously high precipitation to northern Europe, which descends to the southern Caucasus region in late winter. Drier than normal conditions are expected in North Africa and over the Mediterranean Sea. Overall, an anomalously warm winter is forecasted over the whole European region, with temperature anomalies peaking over North-West Africa and the Iberian Peninsula. No strong signal is found in the Balkan region.

Jean-Michel Soubeyrou (Météo France), as representative of GPC Toulouse, presented the new version of Arpege System 5 model which will soon replace the system 4 for operational production and MF contribution in EUROSIP Multimodel: main upgrades (resolutions, coupled models), skills and some examples of outcomes relevant for MEDCOF.

Irina Kulikova (Roshydromet, Russia), as representative of GPC Moscow, presented the seasonal forecast from Roshydromet with some examples of outcomes relevant for MEDCOF.

Silvio Gualdi (CMCC, Italy) presented the seasonal forecast from CMCC for winter 2015-16 over the MedCOF domain. He started by describing the CMCC Seasonal Prediction System (version 2) focusing on the initialization strategy and experimental setup both for forecast and re-forecasts for validation. Despite its low-resolution and relatively small ensemble size, the CMCC-SPS exhibits significant skill (0.57) for winter NAO, comparable to that of the UKMO and CFSv2 prediction systems. Focusing on the Mediterranean area, temperature skill is higher in the eastern basin during the summer, while in the winter the good skill over North Atlantic favors good quality of the forecast over the western basin. The CMCC SPSv2 forecasts that strong El Niño conditions will persist, with a decay starting after the maximum of December (between 2.5°C-3°C). Most likely, the warm anomalies over Indian Ocean and W Tropical Atlantic will persist, as well as the cold anomaly in the north Atlantic sector. Equatorial Atlantic will be colder than usual too. According to CMCC SPSv2, the forecasted NAO index slightly favors negative values with negative mean sea level pressure anomalies centered over central Europe. Forecasted DJF temperature shows predominately warm anomalies with a maximum centered over the Balkans and another over South Algeria. Forecasted DJF

precipitation shows slightly wet anomalies over the Balkans and the western part of the Iberian Peninsula. Finally, he described the new CMCC Seasonal Prediction System (version 3) which improves the climate model, the initialization strategy and increases the size of the forecast ensembles.

Damien Decremet (ECMWF) presented the SPECS empirical forecast for DJF 2015/2016. The mean sea level pressure anomalies suggest a NAO- phase, which should bring westerlies towards the Iberian Peninsula and North-Africa. The probabilistic forecast of precipitation indicates a higher than normal precipitation over northern Europe, a dryer than normal situation over North-Africa and normal precipitation levels over the rest of Europe. The forecast for temperature shows a clear tendency to above-normal temperatures over Europe, while showing a milder warm signal over North-Africa. Note that the Mediterranean and European region are regions of low skill for this forecasting system.

Ernesto Rodríguez presented on behalf of Filippo Maimone (Italian Air Force, Operational Center for Meteorology (COMet)) the seasonal forecast for DJF 2015/2016 based on the Statistical Integrated Bayesian Information system for Large to Local Area analysis (SIBILLA). SIBILLA is a post-processing MOS system operational at ITAF COMet which combines ECMWF S4 fields with E-OBS or ERA-Interim datasets. For this particular outlook two different setups were used: (i) the SIBILLA-ERA setup making use of ECMWF S4 fields and ERA-interim re-analysis to compute T2m seasonal forecasts over the MedCOF area, (ii) the SIBILLA-EOBS setup using ECMWF S4 fields and E-OBS gridded dataset to compute, respectively, T2m and precipitation seasonal forecasts over Italy. Results for T2m show that the MSLP anomaly pattern in DJF seasonal predictions is, most likely, at the origin of positive anomalies of temperature over large part of Europe showing higher than normal temperatures over western and central Mediterranean. Results for precipitation show slightly drier than normal forecast over western and central Mediterranean region.

Massimiliano Pasqui (IBIMET, Italy) presented the seasonal forecast from IBIMET based on a linear multi-regressive method based on physical atmospheric indices and sea surface anomalies.

Christian Viel (Météo France) presented the “Summary from RA VI RCC-LRF”. He started by explaining that the current global climate is strongly driven by the strong and well settled El Niño event. Moreover, he pointed to some additional important forcing

coming from the ocean (positive Pacific Decadal Oscillation and a strong persistent negative anomaly in the northern part of the Atlantic Ocean). As a response, some strong features are visible in model circulation outputs in the northern hemisphere, especially over the Atlantic Ocean. Despite some noticeable differences in the positioning of the main centres of action, a clear anomaly dipole is predicted by a large majority of models: in the 500mb geopotential anomaly maps, there is a positive anomaly over north-western Africa and a negative anomaly over north-western Europe. At a large scale over our domain of interest, this circulation should lead to positive temperature anomalies and to a south-north gradient of precipitation anomalies (positive in the Northern part). And globally, he concluded that the confidence on this scenario is quite good, much more than what it is generally expected for seasonal forecast over Europe and Mediterranean regions.

Mbaiguedem Miambaye (ACMAD, Niger) presented the “Summary from RA I RCC-LRF”. After discussing some general considerations on temperature and precipitation variability and trends, he analyzed past monthly SSTs for different oceans. Also results from individual models and multimodels were presented, as well seasonal outlooks based on statistical analog techniques.

Atika Kasmi (DMN, Morocco) presented the “Summary from North African RCC-LRF”. She explained that seasonal forecast for DJF2015/2016 from RCC-North Africa was based on known teleconnections of large and regional patterns (ENSO+PDO, QBO, NAO, TNA), and on dynamical and statistical models. A strong El Niño continued during November as indicated by well above-average sea surface temperatures (SST) across the central and eastern equatorial Pacific Ocean. Most models indicate that a strong El Niño will continue through the Northern Hemisphere winter 2015-16. El Niño has already produced significant global impacts and it is expected to affect positively temperature anomalies in most regions over North Africa. These conditions associated with warm phase of PDO can drive NAO+ over the north Atlantic region. The QBO is currently in the westerly phase favouring also NAO+ over the region with the consequent reduction of precipitation over North Africa. SST patterns in the Tropical Northern Atlantic may offer some predictability for this winter, especially over Morocco, due to the anomalously warm water in the tropical region. As a summary of all information analyzed by RCC-North Africa for DJF 2015/16: i) precipitation can probably be near to below average over northern and along coastal part of southern Morocco, below average over most of Algeria, Libya, Tunisia and Egypt and near to below average over southeastern Libya and southern Egypt; ii) temperature can probably be above average over Morocco, Tunisia,

most of Algeria and western Libya and near to above average over southern Algeria, eastern and southern Libya and Egypt.

3.4 Session 3: Production of large scale climate outlook for winter (DJF) 2014-2015 (II).

Session 3 was devoted to the discussion of the material presented on the previous day aiming to produce the consensus large scale climate outlook for winter (DJF) 2015-2016. The session was conducted by Anca Brookshaw. Session 3 was intended to summarize and evaluate all relevant sources of information and reach consensus for the 2015/16 winter season climate outlook. Session ended up with the production of the final outlook statement (see Annex I).

3.5 Session IV: Projects on seasonal forecasting relevant to MedCOF

Anca Brookshaw (ECMWF/MetOffice, UK) made a presentation on the Copernicus Climate Change Service focused on the seasonal component of the service: its aims, description, time lines and plans for products. The service will be built around a multi-system forecasting framework, starting with three components at the beginning of 2016 and expanding to five by 2017. The potential contributors have been identified, but formal awards of the contracts are yet to be made. The current project covers a proof of concept phase, during which the 3 core contributors will provide forecast data and work together on defining and developing the multi-system products and additional contributors will set up their systems so they become able to comply with the requirements for full contribution by 2017. This is followed by a pre-operational phase planned to run through 2017. Data from these forecast systems will be made available to the community, free of charge, from the beginning of the service.

Damien Decremet (ECMWF) presented the SPECS project (<http://www.specs-fp7.eu>). SPECS is a project funded by the European Union's 7th research and innovation funding program (FP7). The project runs from Nov 2012 until Jan 2017. The main goal of the project are: 1) to deliver a new generation of European climate forecast systems, including initialised Earth System Models (ESMs) and efficient regionalisation tools; 2) to produce

quasi-operational and actionable local climate information over land at seasonal-to-decadal time scales with improved forecast quality; 3) to focus on extreme climate events; 4) to provide an enhanced communication protocol and services to satisfy the climate information needs of a wide range of public and private stakeholders. Under the umbrella of the project, new systems were developed, research on predictive skill and extreme events was conducted and R-based packages for verification and downscaling were produced. The main dissemination products generated by the project were: i) SPECS empirical seasonal forecasts (KNMI) (<http://climexp.knmi.nl/specs.cgi>); ii) Earth System Grid Federation portal (SPECS) (<http://pcmdi9.llnl.gov/esgf-web-fe/live>); iii) ECMWF System 4 Seasonal Forecasts: Solar Radiation and Temperature (ENEA) (<http://giotto.casaccia.enea.it/specs-solar>); iv) EUROBRISA seasonal forecast products at CPTEC (INPE) (<http://eurobrisa.cptec.inpe.br>); v) Multi-model decadal forecast exchange (Met Office) (<http://www.metoffice.gov.uk/research/climate/seasonal-to-decadal/long-range/decadal-multimodel>). Finally, also a very useful collection of dissemination fact sheets were generated (see web page): i) Tropical Cyclone Forecasts, ii) How detectable are improvements in forecast quality?, iii) Climate prediction with multiple sources of information, iv) Climate forecast reliability, v) What is a decadal prediction?, vi) What is a seasonal prediction?

Carlo Buontempo (MetOffice, UK) presented the EUPORIAS project (www.euporias.eu) focusing on the role of the users in climate service design. The European Provision Of Regional Impact Assessment on a Seasonal-to-decadal timescales (EUPORIAS) project - running from November 2012 to January 2017- is financed by the European Commission through the Seventh Framework Programme for Research (Theme Six, Environment). The project started by assessing users' needs with regard to S2DCP based on a survey with 80 interviews and 450+ responses. The survey was mainly made among private companies & government organisations and larger companies working at the national and international level. Key findings were: i) few users of seasonal forecasts in the energy, water, transport, health, agriculture, and insurance sectors; no use of decadal climate predictions; ii) perceived barriers linked to lack of reliability but also tradition of performing historical analysis and difficulty in integrating into existing operational models; lack of awareness and accessibility by some end-users. A great effort has been put in translating our climate knowledge into something more directly relevant and understandable by the users. This includes: i) going beyond specialist jargon; ii) look at relevant variables and spatial scales (indices, downscaling e.g. CORDEX, etc.). In spite

of an often extraordinary effort the general approach was still based, in most cases, on a linear model which implicitly assume all the knowledge in on one side of the climate-service interface. Outcomes of the project were climate information indices, downscaling of global seasonal forecasts, validation of river flows, water resource management services, food security and early warning services for Ethiopia, supporting transport stakeholders decision-making ahead of winter, minimization of uncertainty for future wind power generation, etc. As main conclusions he mentioned: i) there is a urgent need to develop knowledge and services which are scientifically sound, trusted, robust, usable and used; ii) we have come a long way but more effort is needed to bridge the gap that still divides climate service providers and users; iii) more effort has been put on the translation than on the co-production of knowledge; iv) within EUPORIAS a few principles of climate service development have been identified but much more effort is needed (e.g. on the mediation) to re-think the way in which climate-related knowledge can be co-developed and made relevant to decision-makers; v) climate services is a new area and we are bound to make errors, it is hoped that we can all learn from those.

Mohammed Boulahya presented on behalf of Tarek Sadek (ESCWA, Lebanon) the Establishment of an Arab Climate Outlook Forum (ArabCOF). A scoping meeting was hold in Amman, 14-16 October 2014, organized by LAS, WMO, JMD and ESCWA in pursuant to the resolutions adopted by the Arab Permanent Committee on Meteorology. Objectives for phase 1 (May 2016-May 2018) are: i) Identification of the main climate and weather related products and the timing of their release; ii) Improving methods of prediction/projection of regional climate variability and climate change and estimating theirs impacts through regional assessments of climate change over the Arab region; iii) Identification of appropriate procedures for climate data rescue and assistance of the Arab Meteorological Offices in order to help enhancing the data rescue processes and achievements within the region; iv) Production and dissemination of consolidated seasonal forecasts before the start of each season for the whole Arab region through regular expert meetings building on national, regional and global information. Objectives for phase 2 (May 2018-May 2020) are: i) Capacity building of Arab Meteorological Offices to facilitate common approaches for ArabCOF outputs; ii) Regional assessment of past climatic changes over the Arab region using station based observational datasets available from AMOs; iii) Enhancement of the capacity of the climate scientists within the Arab Meteorological Offices (AMOs) through training workshops on climate predictions/projections; iv) Development of peer reviewed climate case studies for different socio-economic sectors (e.g. agriculture, water, health, tourism, transport, energy, etc.). Among the operational arrangements he mentioned: (i) Establish an

(Interim) Steering Committee for the ArabCOF with a proposed membership of LAS, ESCWA, WMO and experts from a representative selection of the Arab Countries; ii) Form a Scientific Committee to assist in all the technical and scientific aspects related to the work of the Steering Committee for the establishment of the ArabCOF; iii) Establish a Technical Secretariat (two staff members from the Meteorological Office in the host country) to prepare for the ArabCOF sessions; iv) Determine the time and place of the first session of ArabCOF and initiate preparatory work. United Arab Emirates offered to host the ArabCOF subject to the revision of its budget.

3.4 Session 4: Discussion on MedCOF matters

The 4th session of MedCOF-5 chaired by Ernesto Rodriguez (AEMET) covered the following proposed topics:

- ToR
- Management Group renovation
- Improvement of MedCOF outcomes
- Web/Forum
- Training activities
- Maps without internal borders
- Next MedCOF-7
- AOB

ToR.

Following MedCOF3 recommendations, the initial draft of ToR was discussed and amended by the MG. A final proposal prepared by the MG was submitted to MedCOF5 for its consideration and discussion. The ToR (see Annex IV) were finally approved by the plenary.

Management Group renovation

Following the approval of the ToR, Fatima Driouech was nominated by the plenary as Vice-chair for MedCOF Management Group (MG). It was also decided to leave freedom to each RCC for deciding on the renovation of their representatives in the MG.

Web/Forum

It was discussed and decided to update the figures on verification scores by regions and months and make available on the web site.

Training activities

It was discussed and decided to explore the possibility of conducting training workshops for MedCOF participants at least once in two years (focusing on specific topics based on the requirements of participants)

Maps without internal borders

Following the proposal of Morocco, it was discussed and approved to explore the possibility of eliminating the political borders in the maps (option could be to add a disclaimer). Whatsoever solution is adopted with respect to borders it should preserve both the views of Morocco and UN resolutions.

Next MedCOF-7.

Tentatively it was agreed to conduct next face to face sessions in November 2016, in Italy, subject to formal confirmation by the host Institution.

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3.5 Session 5: Conclusion and Recommendations

Conclusions:

- The verification and monitoring documents have been discussed and approved by the participants.

- The consensus-based climate outlook for winter 2015/2016 has been produced.
- Fatima Driouech was nominated as a Vice-chair for MedCOF Management Group (MG).

Recommendations:

Nr	Action recommended	Responsible	Implementation Timeline
1	Within a week after the meeting to provide brief summary of talks to E.Rodriguez, B.Bijelic, F.Driouech, A.Hovsepyan	All presenters	4 December 2015
2	To include in ToR: Permanent representation of AEMET and WMO in MedCOF MG to ensure continuity of MedCOF process.		
3	Explore the possibility of eliminating the political borders in the maps (option could be to add a disclaimer)	MedCOF MG	Discuss at the next teleconference.
4	To prepare the relevant material in advance and make it available prior to the MedCOF session, to ensure better preparedness to the forum	RCC network	
5	To update and share the paper for revision in order to finalize and submit for publication	Roxana	
6	To update the figures on verification scores by regions and months and make available on the web site	AEMET	Before the next MedCOF session
7	To form a team of experts to discuss the appropriate approach for applying dry masking for seasons and define the areas to be masked for every season	MedCOF Management Team	
	To explore possibility of conducting training workshops for MedCOF participants at least once in two years (focusing on specific topics based on the requirements of participants)	WCAS, MedCOF MG	

It was unanimously acknowledged by participants both technical and financial support without whom this meeting would have not been possible. The meeting end up with a round of applause from everyone for Fatima Driouech in representation of the host institution in recognition of the perfect arrangements which have allowed a very pleasant, efficient and fruitful meeting.

Annex I: Consensus Statement of MedCOF-5



Step 3 of the MEDITERRANEAN CLIMATE OUTLOOK FORUM (MedCOF-5) Last updated 26th November 2015

SEASONAL OUTLOOK FOR THE WINTER SEASON 2015-16 FOR THE MEDITERRANEAN REGION

Climate experts from WMO RA VI RCC Network Node on long-range forecasting (Meteo France and Hydrometeorological Centre of Russia), WMO RA VI RCC Network Node on climate monitoring (Deutscher Wetterdienst, Germany), WMO Nord Africa developing RCC Network Node on long-range forecasting (Directorate of National Meteorology, Morocco), WMO Northern Africa developing RCC Network Node on climate monitoring (National Institute of Meteorology, Tunisia), WMO African Center of Meteorological Application for Development (ACMAD, Niger), South East Europe Virtual Climate Change Centre (SEEVCCC, Serbia), Euro-Mediterranean Center on Climate Change (CMCC, Italy), Istituto de Biometeorología (IBIMET CNR, Italy), National Hydrometeorological Services and Research Institutes of MedCOF region provided their valuable contribution to the successful implementation of MedCOF-5 by developing the relevant documents and providing scientific guidance and recommendations.

The MedCOF-5 comprised of the following steps:

- Step 1: verification of the MedCOF-4 seasonal forecast
- Step 2: assessment of the current state of the climate including large-scale climate patterns worldwide and assessments of its likely evolution in the course of the next months;
- Step 3: building the consensus forecast for 2015-16 winter season.

All relevant documentation is posted and updated in MedCOF web site:
<http://www.medcof.aemet.es> .

MedCOF- 5 CLIMATE OUTLOOK FOR THE 2015-2016 WINTER SEASON¹

This prediction is based on output from dynamical models, statistical models and known teleconnections of large-scale climate features.

A strong and mature El Niño event is now established in the tropical Pacific Ocean; ocean-atmosphere coupling has already shaped global teleconnections and will continue to play a role over the next few months. Models and expert opinion suggest that this event will peak around the end of the year, its amplitude placing it among the three strongest previous events since 1950 (1972-73, 1982-83, 1997-98). Many other ocean areas around the world are currently experiencing above-average surface temperatures, notably the extra-tropical region of the eastern Pacific and most of the Indian Ocean. By contrast, the North Atlantic is colder-than-average over a large area to the south of Greenland. These sea surface temperature patterns are predicted to persist over the next few months and may offer some predictability for winter. The Quasi-Biennial Oscillation is currently, and will remain over the next few months, in its westerly phase.

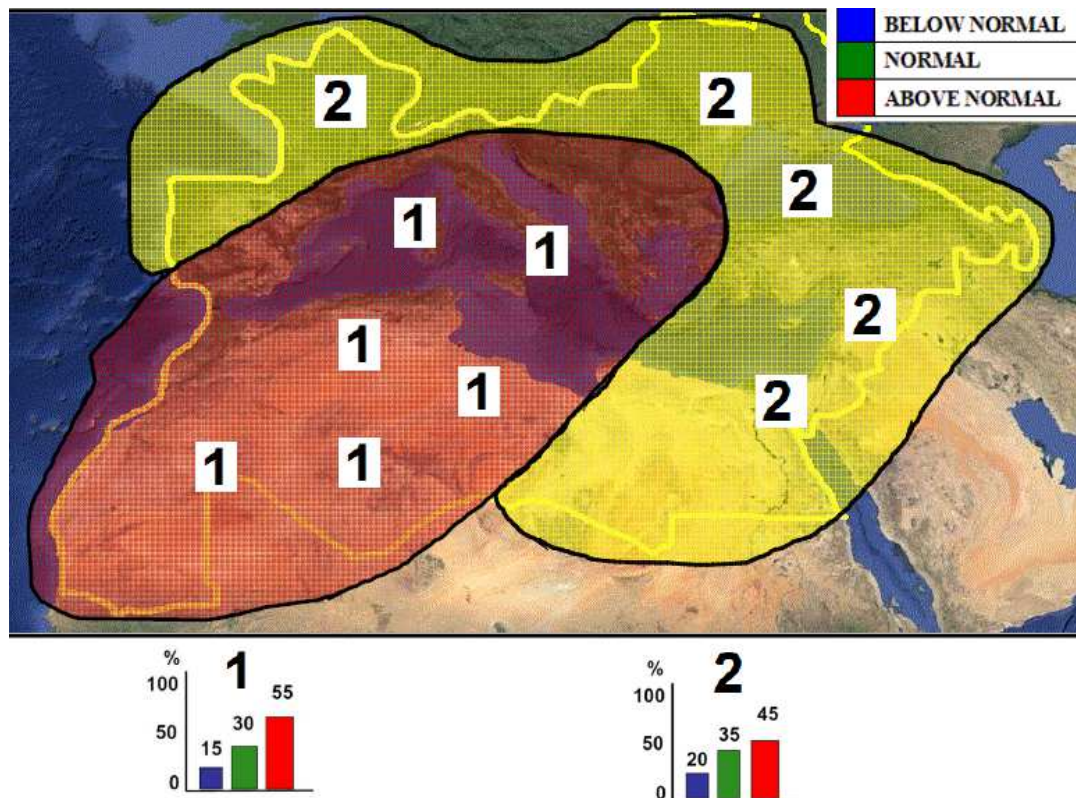


Figure 1. Graphical presentation of the 2015-16 winter temperature outlook. The maps show the probabilistic consensus forecast for tercile categories of anomalies for seasonal mean temperature,

¹The graphical representation of climate outlook in this statement is only for guidance purposes, and does not imply any opinion whatsoever concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

relative to the period 1981-2010. Due to the climate warming trend anomalies are affected by the selected reference period.

Despite the presence of strong anomalies in the oceans and stratosphere, there is uncertainty in the forecasting systems' prediction of large-scale atmospheric circulation over the North Atlantic/European sector during the winter. The most probable scenario has an anticyclonic anomaly pole over western North Africa and a cyclonic anomaly pole over northwestern Europe. Over southern Europe and northern Africa this would explain the consensus for a tendency for above-average temperature for the winter as a whole (see figure 1).

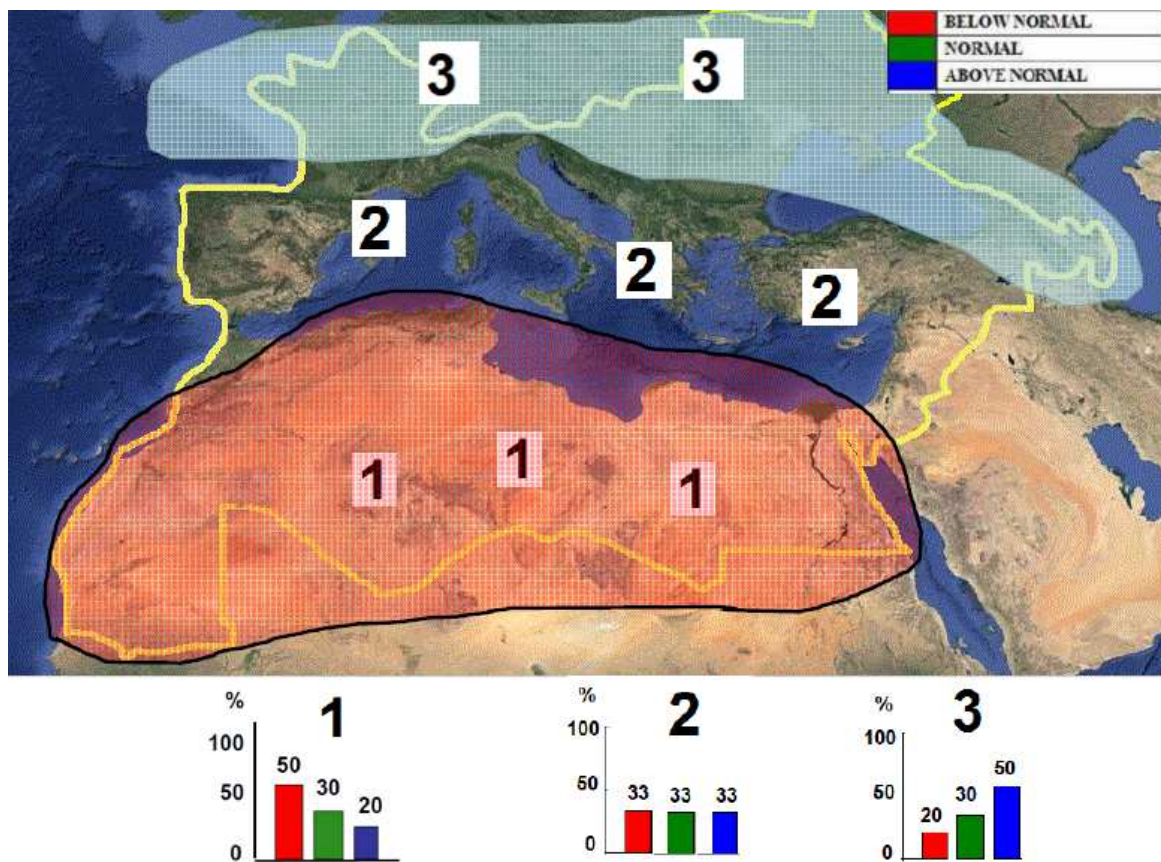


Figure 2. The same as figure 1 but for precipitation.

For precipitation uncertainties are larger than for temperature: over the northern part of the MedCOF region a wetter-than-normal winter is favoured, for most coastal areas of North Africa a drier-than-average season is favoured, but for the rest of the region no large-scale precipitation signal is present in the forecasts (see figure 2).

Sub-seasonal variations, not predictable a long time in advance, may dominate at times, so regular updates to the forecast are strongly recommended. In addition, local factors (for example SSTs in the smaller basins of the region) may shape local variability at a regional level.

Note that it is necessary to express seasonal forecasts in terms of probability due to inherent uncertainty. Any further advice on the forecast signals, smaller scales, shorter-range updates and warnings will be available throughout the winter from the National Meteorological Services, along with details on the methodology and skill of long-range predictions.

APPENDIX: Contributors to MedCOF-5

- World Meteorological Organization
- Met Office, United Kingdom
- European Centre for Medium Range Weather Forecast, United Kingdom
- Météo France, Republic of France
- Agencia Estatal de Meteorología, Spain
- Deutscher Wetterdienst, Federal Republic of Germany
- African Centre of Meteorological Applications for Development, Niger
- National Centre of Meteorology and Aeronautical Climatology, Italy
- Euro-Mediterranean Center on Climate Change, Italy
- Institute of Biometeorology, Italy
- South East European Virtual Climate Change Center hosted by Republic Hydrometeorological Service of Serbia, Republic of Serbia
- National Meteorology Office, Algeria.
- Egyptian Meteorological Authority, Egypt
- National Institute of Meteorology and Hydrology, Republic of Bulgaria
- Meteorological and Hydrological Service, Republic of Croatia
- Meteorological Service, Republic of Cyprus
- National Environmental Agency of Georgia, Georgia
- Republic Hydrometeorological Institute, Former Yugoslav Republic of Macedonia
- Ministry of Transport, National Office of Meteorology, Mauritania
- Institute of Hydrometeorology and Seismology of Montenegro, Montenegro
- National Centre for Meteorological Research, Directorate of National Meteorology, Morocco
- National Meteorological Administration, Romania
- Republic Hydrometeorological Service of the Republic of Srpska, Bosnia and Herzegovina
- Meteorological Service, Hungary
- Hydrometeorological Center, Ukraine
- Republic Hydrometeorological Service of Serbia, Republic of Serbia
- National Institute of Meteorology, Tunisia
- European Centre for Medium Range Weather Forecast (ECMWF)
- World Meteorological Organization (WMO)

Annex II

**FIFTH MEDITERRANEAN CLIMATE OUTLOOK FORUM
(MedCOF-5)**

**November 23-24, 2015
Kenzi Farah Hotel, Marrakech, Morocco**

Programme

Sunday 22 November

- 18:30 – 19:00 Registration**
- 19:00 – 19:30 Opening**
- 19:30 – 21:30 Cocktail offered by DMN at the Kenzi Farah Hotel**

Monday 23 November

- 09:00 – 09:15 Practical arrangements**
- 09:15 – 10:30 Session I – Verification and Climate monitoring**
- Peter Bissolli (DWD, Germany) and Soumaya Ben Rached (INM, Tunisia):
Presentation of MedCOF-4 verification draft.
 - Discussion and approval of step 1 document
- 10:30 – 11:00 Coffee break**
- 11:00 – 12:30 Session I – Verification and Climate monitoring (cont.)**
- Peter Bissolli (DWD, Germany) and Soumaya Ben Rached (INM, Tunisia):
Presentation of MedCOF-5 climate monitoring draft.
 - Discussion and approval of step 2 document.

12:30 – 13:30 Lunch

13:30 – 15:30 Session II - Production of large scale climate outlook for winter (DJF) 2015-2016

- Roxana Bojariu (NMA, Romania): Climate predictive drivers for the Mediterranean region
- Anca Brookshaw (ECMWF/MetOffice, UK): Seasonal forecast from GloSea5
- Damien Decremet (ECMWF, UK): Seasonal forecast from SF System4
- Irina Kulikova (Roshydromet, Russia): Seasonal forecast from Roshydromet
- Silvio Gualdi (CMCC, Italy): Seasonal forecast from CMCC

15:30 – 16:00 Coffee break/Group photo

16:00 – 18:00 Session II - Production of large scale climate outlook for winter (DJF) 2014-2015 (cont.)

- Damien Decremet (ECMWF, UK): Seasonal forecast from SPECS statistical system
- Massimiliano Pasqui (IBIMET, Italy): Seasonal forecast from IBIMET
- Filippo Maimone (Italian Air Force, Operational Center for Meteorology (COMet)): Seasonal forecast from ITAF
- Christian Viel (Meteo-France, France): Summary from RA VI RCC-LRF
- Mbaiguedem Miambaye (ACMAD, Niger): Summary from RA I RCC-LRF
- Fatima Driouech (DMN, Morocco): Summary from North African RCC-LRF

Tuesday, 24 November

09:00 – 11:00 Session III - Production of large scale climate outlook for winter (DJF) 2015-2016 (Chair: A. Brookshaw)

- Discussion

11:00 – 11:30 Coffee break

11:30 – 13:00 Session III - Production of large scale climate outlook for winter (DJF) 2015-2016 (cont.) (Chair: A. Brookshaw)

- Editing and approval of MedCOF-5 climate outlook statement (step 3 document)

13:00 – 14:00 Lunch

14:00 – 16:00 Session IV – Projects on seasonal forecasting relevant to MedCOF

- Anca Brookshaw (ECMWF, UK): Copernicus programme
- Damien Decremet (ECMWF, UK): SPECS project
- Carlo Buontempo (MetOffice, UK): EUPORIAS project
- Mohammed Sadeck Boulahya (Plan Bleu): Plan Bleu's contribution to the Fifth Mediterranean Climate Outlook Forum.
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16:00 – 16:30 Coffee break

16:30 – 17:45 Session V - Discussion on MedCOF matters

17:45 – 18:00 Session VI - Conclusions and Recommendations

Closure

Annex III: List of participants

No	NAME	AFFILIATION	COUNTRY	EMAIL
1	HALIMI, Lofti	National Meteorology Office of ALGERIA	Algeria	lotfi.halimi@gmail.com
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34	BROOKSHAW, Anca	European Centre for Medium Range Weather Forecasting	United Kingdom	anca.brookshaw@ecmwf.int
35	DECREMER, Damien	European Centre for Medium Range Weather Forecasting	United Kingdom	damien.decremer@ecmwf.int

36	BOULHAYA, Mohammed	Plan Bleau	France	msboulahya@yahoo.fr , climdevafrica@gmail.com
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Annex IV: Terms of Reference for MedCOF Management Team

To ensure that the implementation phase of MedCOF moves forward, a governance structure consisting of a Management Team (MT) was proposed during the MedCOF Scoping Meeting (June 2013). This MT would adequately represent the Mediterranean region and the related climate organisations. The MedCOF Management Team will be ruled by the following Terms of Reference (ToR):

Membership

- Membership of the MT is open to representatives of NMHSs and other institutions, relevant and active in the field of long range forecasting, from countries belonging to the MedCOF region. Membership will be designed in order to ensure the maximum representation of all the different bodies, programmes and initiatives relevant to the MedCOF activities.
- The composition of the MT would include at least one core member representative from each of the RA VI and RA I RCCs on long range forecasting and climate monitoring, one representative from the two RCOFs (SEECOF and PRESANORD) currently running in the region and one representative from a future possible South Western Europe COF.
- The members of the MT will be proposed and approved during MedCOF plenary sessions.
- Member institutions are free to replace their representatives by another person of the same institution, or, for RCCs, by another person of another RCC consortium partner institution in case of non-availability.
- Membership can be terminated any time by expression of own wish of the member institution.

Accountability

- The MT will report to the MedCOF plenary sessions and to the working groups on climate matters of both WMO RAs.

- The MT will prepare an annual action plan subjected to the approval by the MedCOF plenary.

Working methods

- The MT will elect a chair and a vice-chair, each for an alternating two-year period, one year the chair is to be elected for 2 years, and next year the vice-chair for 2 years, to ensure regional balance and an optimum of experience transfer. Reelection can be envisaged.
- The MT chair will organise and convene meetings (either on-line or face-to-face) at least twice a year to discuss and agree decisions related with MedCOF works and reports to the MedCOF plenary session. Part of his/her work can be shared with the vice-chair.
- The MT will co-operate with representatives of subregional RCOFs (currently SEECOF and PRESANORD) to ensure a good coordination between MedCOF and these RCOFs.
- The MT will work mainly through virtual meetings (on-line conferences) and it will have physical meeting during every MedCOF conference.
- The MT will organise at least two MedCOF meetings per year, one for the summer and one for the winter seasonal forecast. One of these sessions will be a face-to-face meeting, the other one an online forum. The MT will ensure the provision of technical facilities for the online forum. The MT will propose time and venue of the face-to-face meetings subject to approval by the MedCOF plenary session. The MT will be responsible for all preparations (agenda, schedule, etc) in connexion with face-to-face and on-line meetings
- The MT will propose methods and procedures -such the adoption of reference periods, reference data, tools, flow of information, products, formats, verification data and methods etc- following the WMO general guidelines to ensure an efficient preparation and development of the consensus sessions. The MT will ensure that these methods and procedures are consistent with those of RA I and RA VI RCCs. In particular, a 3-step working procedure should be maintained for each MedCOF meeting: verification of the previous meeting, state of present circulation, and consensus forecast.
- The MT will propose training activities on themes related with MedCOF works aiming at enhancing the overall knowledge and expertise of all participants. Transfer of knowledge will be a priority of such training sessions.
- The MT will foster and promote the collaboration and exchange of information, knowledge, data and best practices between the different groups contributing to the MedCOF activities to facilitate production of tailored information and guide recommendations and adaptation strategies issued at regional level.
- The MT will invite institutions relevant and active in the field of long range forecasting from countries belonging to the MedCOF region and relevant funding agencies to join MedCOF activities seeking to promote their active participation.

- The MT will be responsible for the MedCOF web-page and will update it regularly. The web page should collect all relevant MedCOF documents, including minutes from MT meetings, reports from MedCOF sessions, list of participating institutions and list of contact persons.

Review

- The MT will review annually the degree of consecution of the action plan objectives and report to the MedCOF plenary.
- The MT will review past experiences of the previous MedCOF and suggest possible improvements for the next MedCOF to ensure a continuous improvement process.