WEATHER CLIMATE WATER
TEMPS CLIMAT EAU

Climate Monitoring, Climate Watch Advisory

E. Rodríguez-Camino, AEMET

WMO OMM

World Meteorological Organization
Organisation météorologique mondiale

WMO International Workshop on Global Review of Regional Climate Outlook Forums, Ecuador, 5 – 7 September 2017

Outline

- Introduction.
- Elements of climate monitoring. Catalogue of products.
- Climate monitoring as part of the RCOF process: example of RA VI
- Climate Watch Advisories
- Elements for discussion.
- Way forward

Introduction (1)

- What is a **Regional Climate Centre (RCC)** ? RCCs are Centres of Excellence that **assist WMO Members** in a given region to deliver better climate services and products including regional long-range forecasts, and to strengthen their capacity to meet national climate information needs.
  - WMO activity (with **mandate of WMO**)
  - **Regional component** of the Global Framework for Climate Services (GFCS) in the GFCS - pillar "Climate Service Information System (CSIS)"
  - Users: other **RCCs and the NMHSs** (end users are customers of the NHMSs)

WMO RCC-CM shall perform the following minimum set of functions, criteria and products:

- Perform **climate diagnostics including analysis of climate variability and extremes**, at regional and sub-regional scales;
- Establish an historical **reference climatology** for the region and/or sub-regions;
- Implement a regional **Climate Watch**.

Manual on the GDPFS (Global Data-Processing and Forecasting System), WMO No. 485 (updated in 2013)

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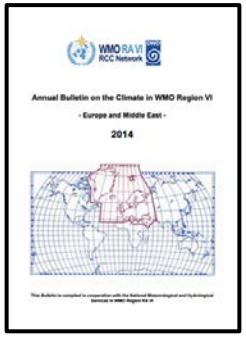
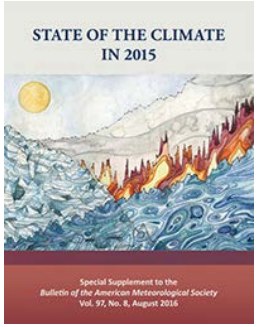
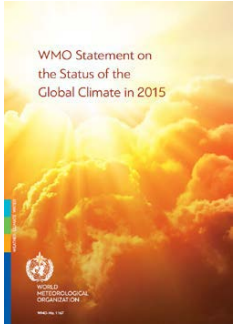
Elements of climate monitoring. Catalogue of products (1)

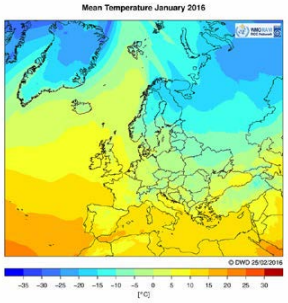
- Bulletins / Reports

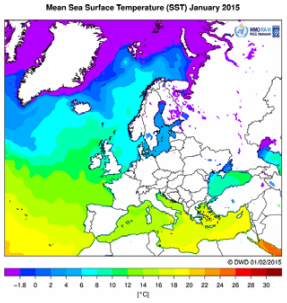


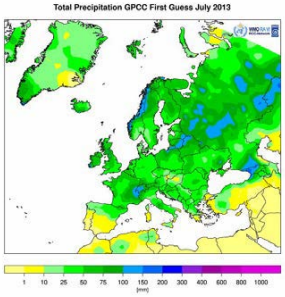


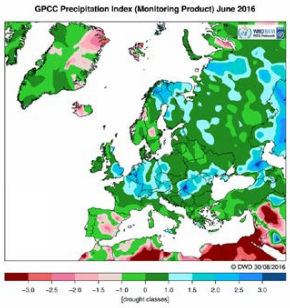


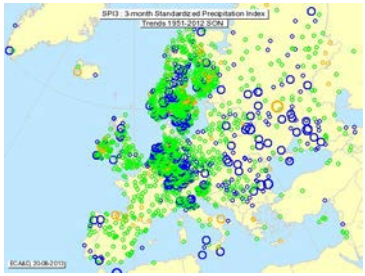
- Maps: Monthly maps of Ta, RR, mslp, CC, SM, Alb, WV, drought index, etc (direct variables and indicators), reference climatology, station based products (maps, graphs, trends)











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Elements of climate monitoring. Catalogue of products (2)

- Event monitoring

- Gridded data
- Products from members of consortiums
- **Specific products requested by RCOFs**

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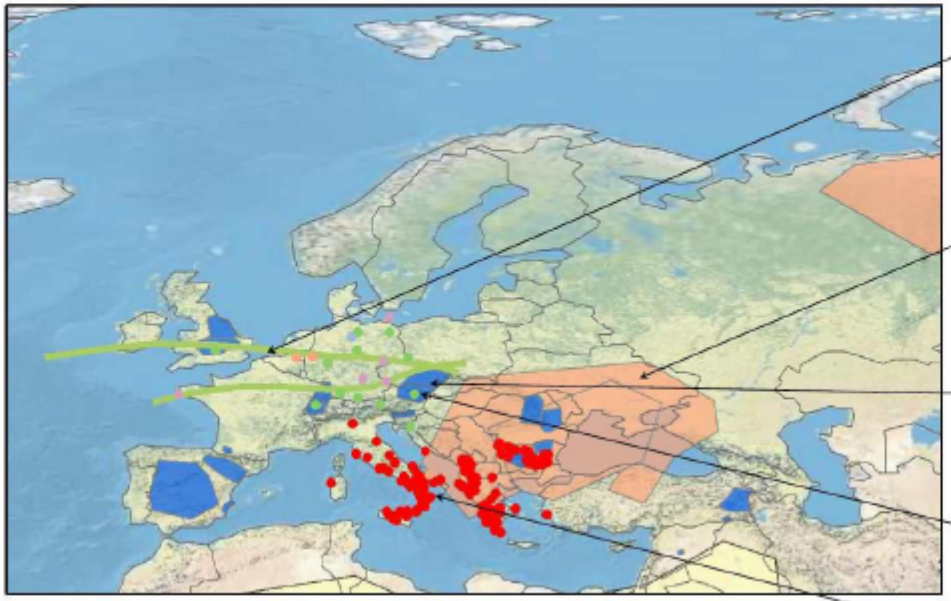
Climate Knowledge Database

WMO RA VI
RCC-Network

Deutscher Wetterdienst
Wetter und Klima aus einer Hand
DWD

RCC-CM products: The Climate Knowledge Database

extreme weather events in 2007 in Europe



field	value
category	storm
begin	2007-01-17
end	2007-01-19
killed	46
damage (Milion US$)	9,010
cyclone	Kyrill
source	EM-DAT
affected countries	NL, PL, SI, DK, AT, BY, BE, FR, DE, CH, GB, DE, CZ, UA

field	value
category	heat
begin	2007-07-01
end	2007-07-31
killed	506
source	EM-DAT
affected countries	MK, RS, SK, AL, AT, BA, HU

field	value
category	flood
begin	2007-09-06
end	2007-09-10
source	DFO
affected countries	CZ

field	value
category	rainfall
begin	2007-09-05
end	2007-09-08
source	KIT
cyclone	Xavier
affected countries	AT

field	value
category	wildfire
begin	2007-07-01
end	2007-08-31
source	EM-DAT
killed	11
affected countries	IT

Thanks to P. Bissolli (DWD)

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Climate monitoring as part of the RCOF process: example of RA VI (1)

- MedCOF process consist of 3 steps:
  - Step 1: verification of previous seasonal forecast
  - **Step 2: current state of the climate system**
    - The assessment of current state of the climate, including the relevant large-scale climate patterns, is the **starting point for the consensus process.**
    - Then discussions on the main relevant drivers and model outputs allow to reach to a **common view in terms of evolution of climate variability patterns (VP)** affecting the region.
  - Step 3: consensus outlook

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MedCOF Mediterranean Climate Outlook Forum

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RELEVANT LINKS

APCC APEC Climate Center
ECMWF Seasonal Forecast
IRI Climate and Forecast Products
JMA Stratospheric Circulation
NOAA CPC ENSO
WMO LC LRF MME
World Meteorological Organization

RCCs

Other RCOFs

Other Links

The Eighth MedCOF

MedCOF-8 On line

Eighth MEDITERRANEAN CLIMATE OUTLOOK FORUM (ON-LINE)

April 17 - May 30, 2017

>> Online Forum

MedCOF-8 comprises 3 steps. The first one has been devoted to verification of the MedCOF-7 winter forecast; the second one to the assessment of current state of climate and, finally, the third one to the building of consensus statements.

Read more ...

The Seventh MedCOF

MedCOF7

The Seventh MedCOF

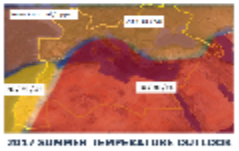
The Second Training Workshop

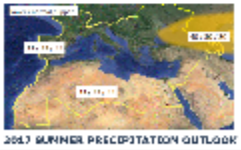
MedCOF 2016 Training Workshop

Rome, Italy, 15-18 November 2016

Second Training MedCOF Workshop on Seasonal Forecasting has taken place in Rome, Italy, on 15-18

Latest Consensus Outlook





On-Line Forum

MEDITERRANEAN CLIMATE OUTLOOK FORUM
MEDCOF-7 MEETING

MONITORING SUMMARY MEDCOF-7

for October 2016

Draft version

Last update: 20 November 2016

Compiled by

WMO RA I North Africa RCC Tunisian Node

Institut National de la Météorologie (INM)

Tunis, Tunisia

WMO RA VI RCC Offenbach Node on Climate Monitoring

Deutscher Wetterdienst (DWD)

Offenbach, Germany

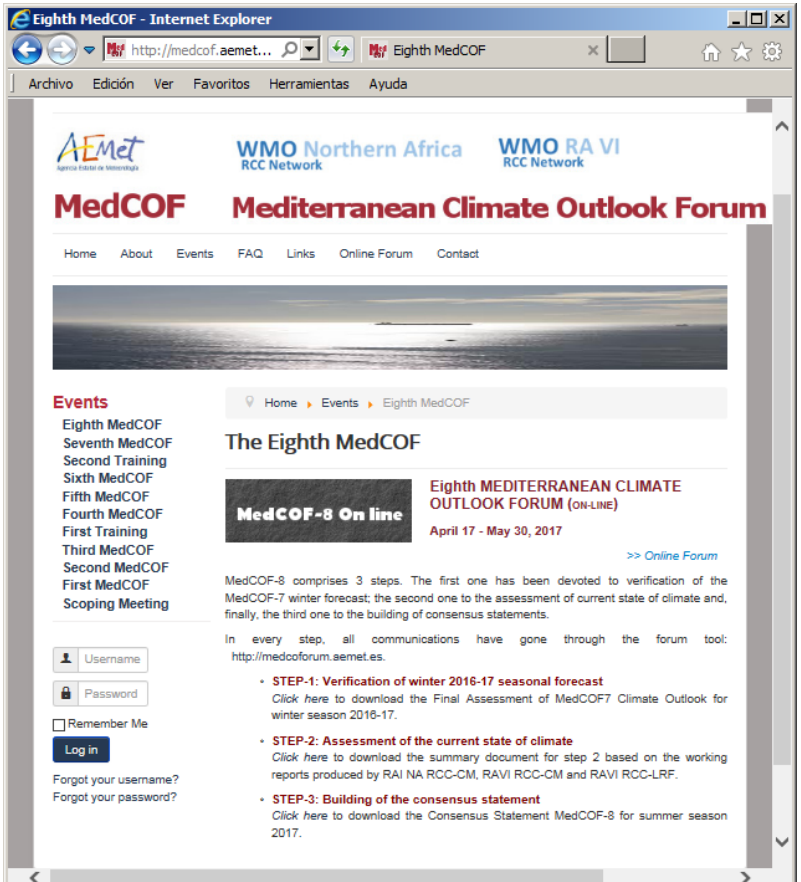
WMO RA VI RCC Toulouse Node on Long Range Forecasting

Météo France

Toulouse, France

The following MedCOF monitoring summary is based on

- climate monitoring working reports from RA I NA RCC-CM, RA VI RCC-CM and RA VI RCC-LRF



Climate monitoring as part of the RCOF process: example of RA VI (2)

- Monitoring summary for step 2 based on RCC-CM and RCC-LRF products:
  - Ocean analysis
  - Atmospheric analysis
  - Sea ice/Snow Cover
  - Temperature anomalies
  - Precipitation anomalies

Climate monitoring as part of the RCOF process: example of RA VI (3)

- **Ocean analysis including:**
  - Equatorial SST → ENSO
  - North Pacific Ocean → PDO
  - Indian Ocean → DMI
  - North, Tropical and Equatorial Atlantic Ocean
  - Mediterranean basin
  - 3D structure

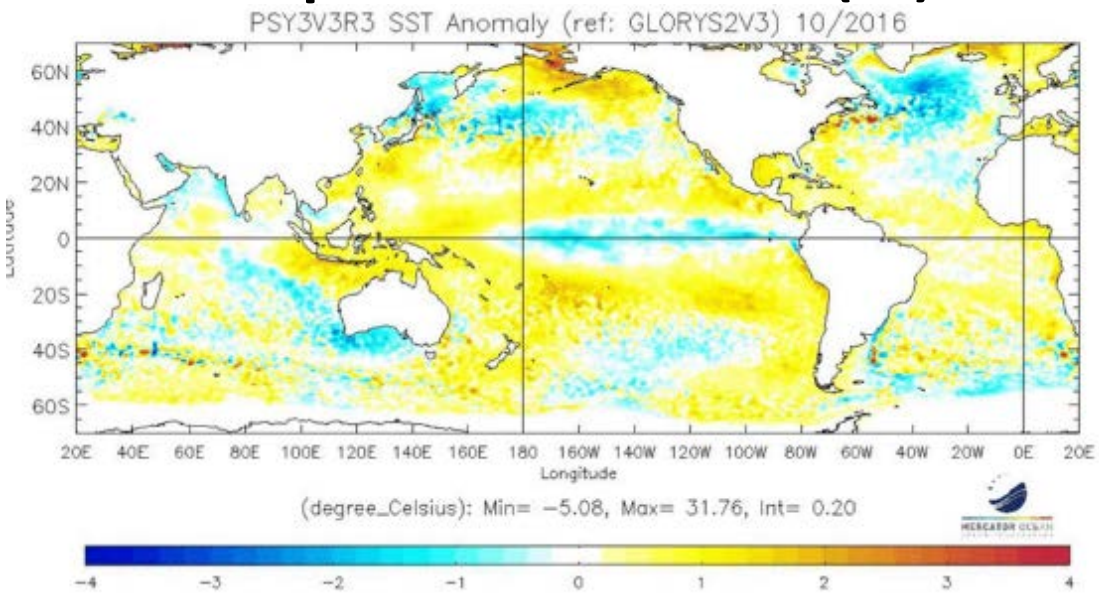


Figure 1: SST anomalies (°C) (reference Glorys 1992-2009). http://bcg.mercator-ocean.fr/

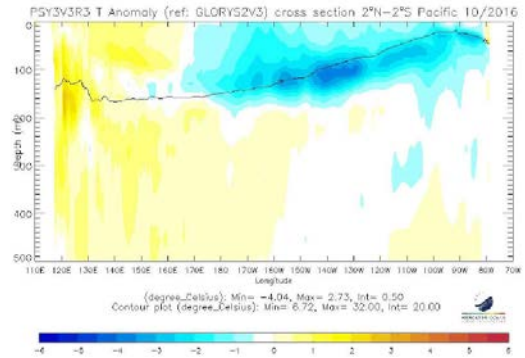


Figure 2: Oceanic temperature anomaly in the first 500 meters in the Equatorial Pacific (October 2016). http://bcg.mercator-ocean.fr

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Climate monitoring as part of the RCOF process: example of RA VI (4)

- **Atmospheric analysis including:**
  - **Velocity Potential** Anomaly field in the high troposphere (insight into Hadley-Walker circulation anomalies)
  - **Stream Function** anomalies in the high troposphere (insight into teleconnection patterns tropically forced)

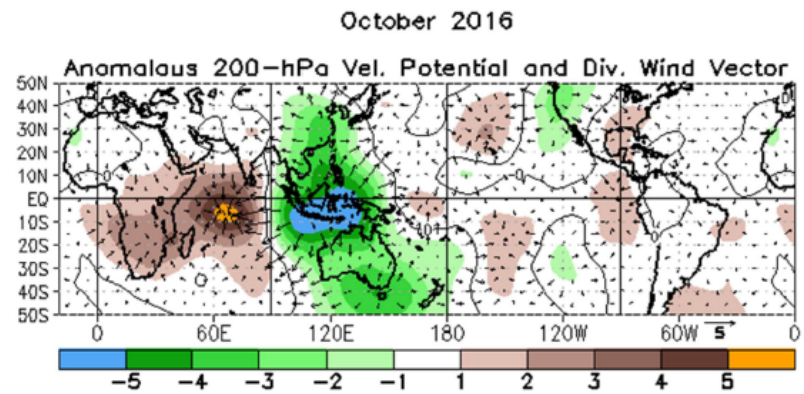

Figure 4: Velocity Potential Anomalies at 200 hPa and associated divergent circulation anomaly. Green (brown) indicates a divergence-upward anomaly (convergence-downward anomaly).

http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt24.shtml

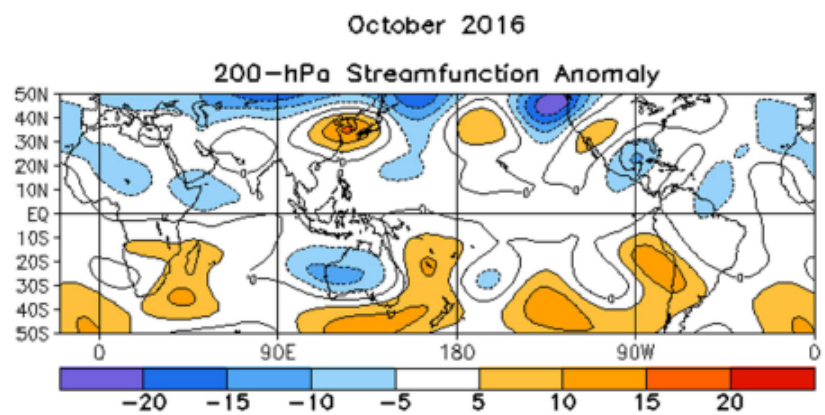

Figure 5: Stream Function Anomalies at 200 hPa. http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt22.shtm

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Climate monitoring as part of the RCOF process: example of RA VI (5)

- **Atmospheric analysis including:**
  - **500 hPa Geopotential and msl pressure** anomalies (insight of mid-latitude general circulation including relevant patterns, e.g., AO, NAO, SCAND, EA-WR, …)
  - Evolution of the main **atm. indices in NH** (last 10 months)

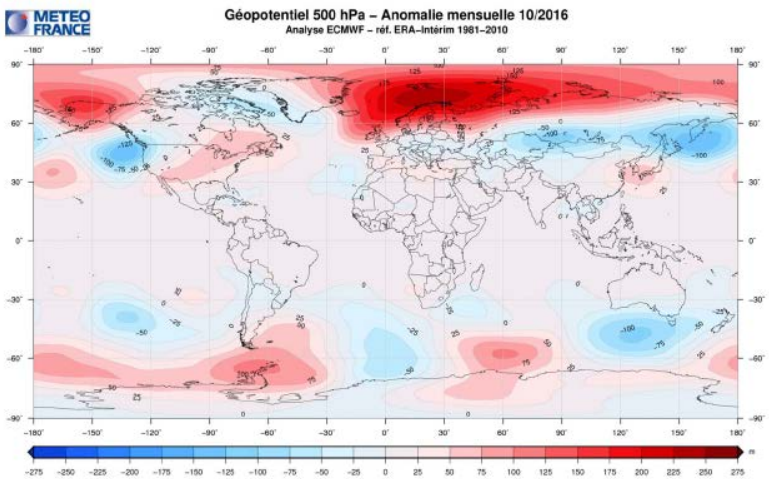

Figure 6: Anomalies of Geopotential height at 500hPa (Meteo-France)

MONTH	NAO	EA	WP	EP-NP	PNA	TNH	EATL/WRUS	SCAND	POLEUR
OCT 16	1.0	0.4	0.5	-0.8	1.5	---	-1.3	1.1	-2.9
SEP 16	0.7	3.5	-1.8	-1.4	0.1	---	0.1	-1.0	-1.3
AUG 16	-2.2	2.1	-0.4	-0.4	-0.9	---	-3.3	-0.4	2.4
JUL 16	-1.7	1.8	-1.4	-0.4	0.5	---	-1.0	-0.7	-0.2
JUN 16	-0.1	0.4	-0.6	1.3	-0.6	---	-1.9	-1.0	-1.1
MAY 16	-0.7	0.2	0.6	0.1	-0.9	---	-2.0	1.1	-0.4

Table 1: Evolution of the main atmospheric indices for the Northern Hemisphere for the last 10 months
http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/table3.shtm

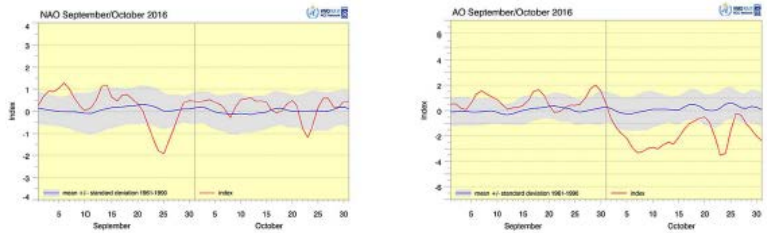

Figure 7: North Atlantic Oscillation (NAO, left) and Arctic Oscillation (AO, right) indices with 1961-1990 mean standard deviation (shading). http://www.dwd.de/rcc-cm, data from NOAA CPC: http://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/teleconnections.shtm

Climate monitoring as part of the RCOF process: example of RA VI (5)

- **In the end, step 2 tries:**
  - To elucidate if there is some **predictability coming from different forcings** (singularly from the tropics)
  - Express **current state** of the climate system **in terms of variability patterns**

- **Information updates between RCOF** events are produced and disseminated only at national level. **Climate Watch is routinely done by RCCs and alerts/warnings** (if any) are disseminated through national focal points and using a dedicated web page.

Climate Watch Advisories as complement of RCOF outlooks

- Climate watch system (CWS) provides advisories (CWA) and statements to **inform NMHSs about evolving or foreseen extreme climate anomalies.** They are based on any climate information available from NMHSs, Global Producing Centres for long-range forecasting (GPCs) and Regional Climate Centres (RCCs) including observations on current conditions and weekly, 10-day, monthly, seasonal and annual monitoring and forecasting products.

Climate Watch Advisories (example from RA VI)

Climate Watch Advisory

WMO RA VI RCC Network DWD

Guidance on heat wave / above-normal temperature

Area concerned: Italy, southern Central Europe, Balkans, southern Caucasus

Initial statement issued on 03 August 2017
First update issued on 15 August 2017
Second update issued on 25 August 2017

Valid: Begin: on 29 August 2017 End: 4 September 2017

To: Climate Watch focal points of NMHSs: Spain, Italy, Austria, Czech Republic, Poland, Slovakia, Hungary, Slovenia, Croatia, Bosnia and Herzegovina, Serbia, Montenegro, Albania, Former Yugoslav Republic of Macedonia, Greece, Bulgaria, Romania, Moldova, Ukraine, Russia, Georgia, Armenia, Azerbaijan, Turkey, Cyprus, Lebanon, Syria, Israel, Jordan

The RA VI RCC Network Offenbach Node on Climate Monitoring (RCC Node-CM) is responsible for providing Climate Watch guidance information for NMHSs' own consideration for issuing climate advisories for their territory.

After having consulted the consortium partners of the RCC Node-CM and RCC Node-LRF (RA VI RCC Network Toulouse and Moscow Node on Long-Range Forecasting), RCC-CM issues the following guidance information:

Due to the results from monthly forecasts we expect a continuation of:

"The period with significantly above-normal temperatures and heat waves, at least for the next week, is expected for southern and south-eastern RA VI (from southern France - Italy – south-eastern Central Europe, Balkans). The weekly anomalies are forecasted with +3°C to +6°C; daily temperature maxima up to 40°C are expected due to advection of warm air from Africa and/or high pressure influence. The probability for this anomaly is estimated to be above 90%. This warm period could come along with drought, local thunderstorms, partly with hail, or forest fires. Severe impacts such as water shortage and heat stress particularly for vulnerable persons are to be expected. Temperatures in Greece and Turkey are expected to be mostly around normal the next week."

This information should be used as guidance for the National Meteorological and Hydrological Services (NMHS) in a pre-operational mode. It is up to the above mentioned NMHSs to closely monitor the status and evolution of the current climate conditions and to consider issuing a national Climate Watch Advisory. RCC Node-CM would appreciate feedback from NMHS whether this information was helpful. Also, any suggestion on further pieces of information needed by NMHSs is highly welcomed!
Attached we provide you with a template for a national climate watch advisory as agreed among the climate watch pilots and RCC Node-CM.

Please note that further information can be obtained from RCC Node-CM website (http://www.dwd.de/rcc-cm) concerning Climate Monitoring and from RCC Node-LRF websites (http://seasonal.meteo.fr/en , http://neacc.meteoinfo.ru/forecast) concerning Long-Range Forecast or by e-mail to rcc.cm@dwd.de or rcc-lrf-mf@meteo.fr.
For ECMWF members further information on monthly forecasts after logging in is provided at http://www.ecmwf.int/ ->Forecasts

We will monitor the evolution of the anomaly, issue updates if significant change arise and close the advice when no clear signal can be detected in the forecasts.

On behalf of the RCC Node-CM Team

Foreseen climate extreme

Concerned area

Validity

Short description

This information should be used as guidance for the NMHS. It is up to the above mentioned NMHSs to closely monitor the status and evolution of the current climate conditions and to consider issuing a national Climate Watch Advisory.

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Elements for discussion (1)

- Need to improve links between RCCs, RCOFs and NMHSs
  - **Many RCOFs are not exploiting the full potential of RCC-CM**
  - Improve access of RCC-CM to national data
  - Better feedback from NMHSs
  - **RCCs production schedule in accordance with RCOFs and national needs**

- Interaction/harmonization with other RCCs
  - Wide biodiversity among RCC-CM and RCOFs even complying with the basic requirements from the GDPFS Manual
  - Better harmonization needed

- Clarify **time scales** (weather versus climate warnings)
  - Frequent overlap of scales (e.g., medium range vs monthly range)
  - Needed clarification between weather and climate extremes

Elements for discussion (2)

- Improve user friendliness and interactivity of webpages
  - **Too much static information**, e.g., precomputed maps over big domains
  - Need of tools for **zooming and filtered downloading** of data
- Increasing of **visibility**
  - Dilemma between being provider mainly of NMHSs (not general public!) and having wide visibility
  - Possible selection of some material for media and general public

Elements for discussion (3)

- New products:
  - Those related with real time **climate change attribution**.
    - Always that an extraordinary or extreme event occurs NMHSs have to give a quick answer to the possible link with climate change.
  - Those related with record breaking observations
    - Media are eager for news on record breaking and NMHSs are forced to provide such information.
  - Those related with **local monitoring**
  - Those requested by **RCOFs for a better description of current status of the climate system**

World Weather Attribution (WWA)

- World Weather Attribution (WWA) is an international effort designed to **sharpen and accelerate the scientific community's ability to analyze and communicate** the possible influence of climate change on extreme-weather events such as storms, floods, heat waves and droughts.

- The program — a partnership of Climate Central, the University of Oxford Environmental Change Institute (Oxford ECI), the Royal Netherlands Meteorological Institute (KNMI), the University of Melbourne, and the Red Cross Red Crescent Climate Centre (the Climate Centre) — was initiated in late 2014 after discussions within the scientific community concluded that the emerging science of extreme-event attribution could be operationalized.

- WWA applies a unique scientific approach that combines observational data, analysis of a range of models, peer-reviewed research, and on-the-ground reports. to conduct more rapid analyses and provide faster answers to pressing questions about high-impact events – how strong the likelihood is, for example, of similar weather-related disasters in the future.

- There are four possible findings of attribution analysis of an event:

    - **Global warming increased its likelihood.**
    - **Global warming reduced its likelihood.**
    - **Global warming had no detectable role.**
    - Our analysis methods were unable to give information.

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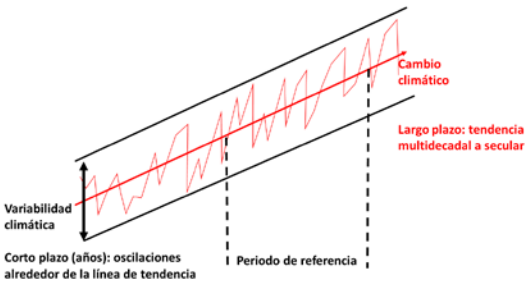
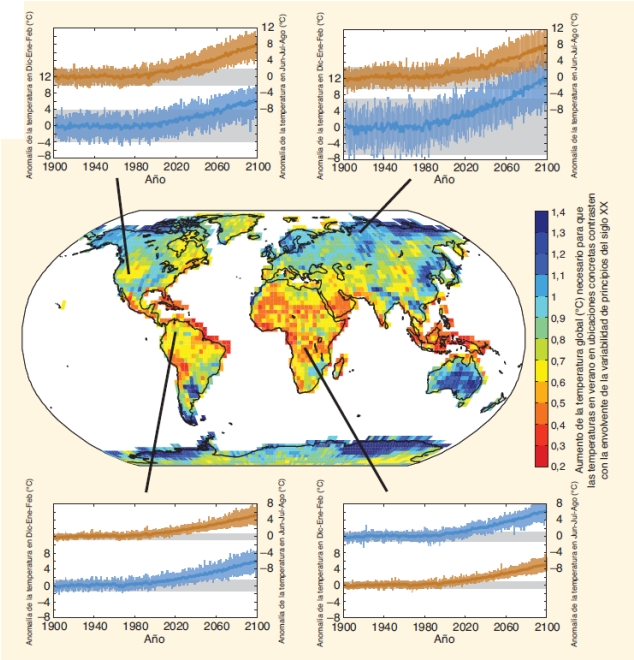
FAQ 10.2 | When Will Human Influences on Climate Become Obvious on Local Scales? (IPCC 2013)





Human-caused warming is already becoming locally obvious on land in some tropical regions, especially during the warm part of the year.

Warming should become obvious in middle latitudes—during summer at first—within the next several decades. The trend is expected to emerge more slowly there, especially during winter, because natural climate variability increases with distance from the equator and during the cold season. Temperature trends already detected in many regions have been attributed to human influence. Temperature-sensitive climate variables, such as Arctic sea ice, also show detected trends attributable to human influence.

Time series of projected temperature change shown at four representative locations for summer (red curves, representing June, July and August at sites in the tropics and Northern Hemisphere or December, January and February in the Southern Hemisphere) and winter (blue curves). Each time series is surrounded by an envelope (of ±2 standard deviations) projected changes yielded by 24 different model simulations, emerging from a grey envelope of natural local variability simulated by the models using early 20th century conditions. All calculations are based on CMIP5 simulations forced by the Representative Concentration Pathway 8.5 (RCP8.5) emissions scenario.

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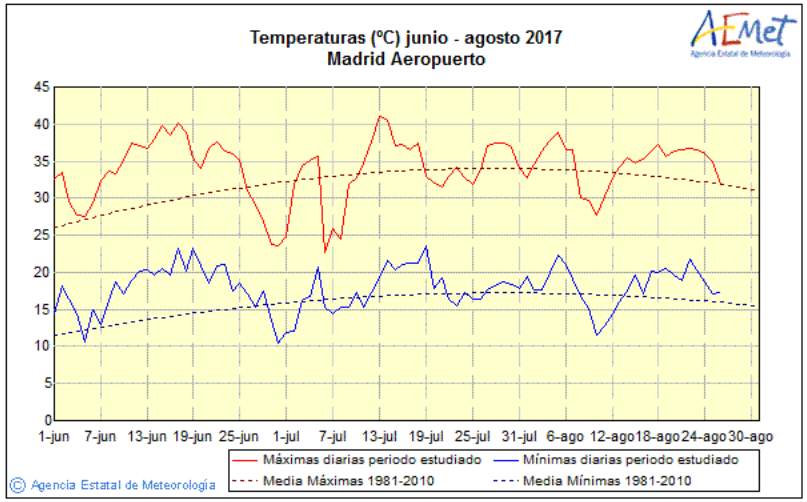
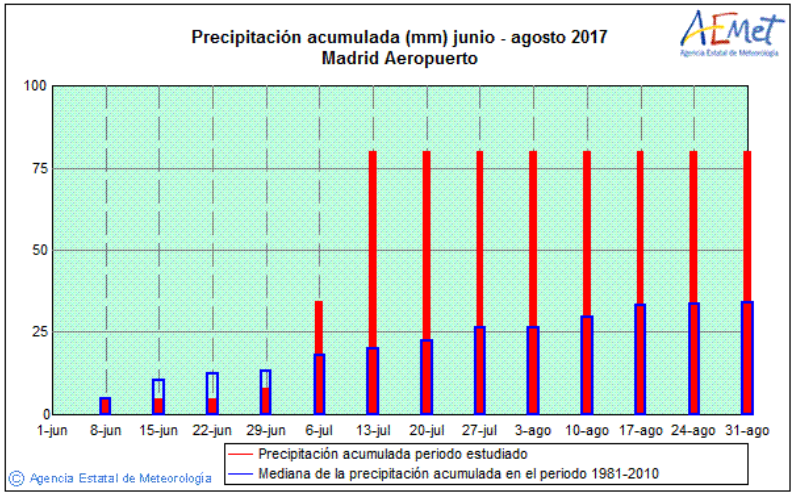
Local monitoring

- Seasonal evolution of temperature



- Seasonal evolution of precipitation



[http://www.aemet.es/es/serviciosclimaticos/vigilancia_clima/analisis_estacional]

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Way forward

- Need to **rethink RCC-CM products and services and their use by RCOFs**
- Need of **harmonization among different RCC-CMs**
- **Scales** are always an issue
- Need of **online tools to select/manipulate** information relevant for RCOFs and NMHSs
- General problem of RCC's **visibility**

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Thank you
Merci
Gracias

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