



WMO RA I



WMO RA VI
RCC-Network



MEDITERRANEAN CLIMATE OUTLOOK FORUM MEDCOF-4 MEETING

ANALYSIS AND VERIFICATION OF THE MEDCOF-3 CLIMATE OUTLOOK FOR THE 2014-15 WINTER SEASON FOR THE MEDITERRANEAN REGION (MED)

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The following MedCOF verification report is based on

- the outcome of the consensus forecast of MedCOF 3,
- climate monitoring results of RA I NA RCC and RA VI RCC networks,
- the analysis and verification report of SEECOF-12 CLIMATE OUTLOOK for 2014/2015 winter season for southeast Europe (SEE) provided by SEECOF-13 Online Meeting
- national verification reports posted in RCOF forums of MedCOF, SEECOF or PRESANORD.

1. MedCOF-3 Climate outlook for the 2014-15 winter season

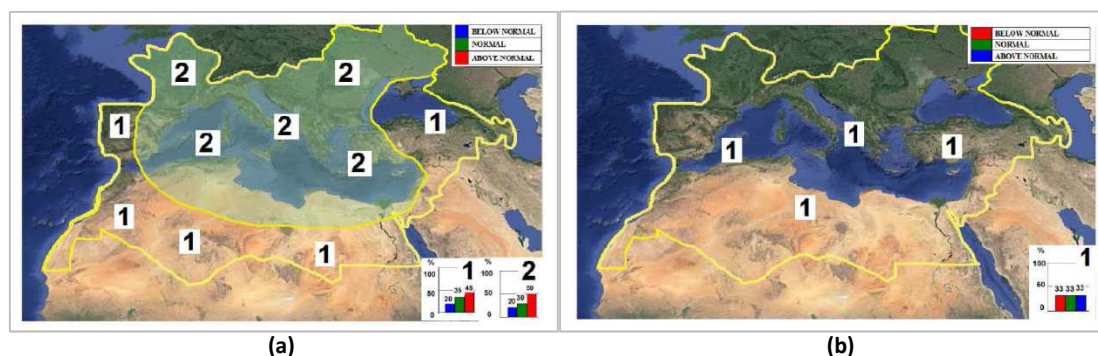


Figure 1: Graphical presentation of the climate outlook for the 2014-15 winter season for the Mediterranean region (a) Temperature Outlook; (b) Precipitation Outlook

Temperature

For the 2014/15 winter temperature outlook, two regions were defined both with above-normal temperature as privileged scenario (45% and 50% probability, respectively, Fig.1(a)). This means that an above-normal scenario is assumed for the whole MedCOF region.

As stated in MedCOF-03 consensus statement for the seasonal climate outlook for 2014-15 winter season for the Mediterranean region, uncertainty for the temperature prediction in most of the MedCOF domain is high. There is a tendency for the upper tercile with probability of 50% over the entire domain. It's more marked over the Mediterranean Sea and the Northern part of the domain including Europe and North African coasts. (Region 2 in figure 1 (a)). The Caucasus region and the Atlantic facade of African and South European regions show slight tendency for the upper tercile with probability of 40%. (Region 1 in figure 1 (a)).

Precipitation

For the 2014/15 winter precipitation outlook, one region was defined covering the whole MedCOF area with no privileged scenario (Fig. 1(b)). This means that climatology is assumed for the whole MedCOF region.

Uncertainty in precipitation predictions is very large. There is no preference for any climate defined categories in the whole MedCOF domain. (Region 1 in figure 1 (b)).

2. Analysis of the 2014-15 winter season

Analysis of the winter season temperature and precipitation anomalies are based on seasonal bulletins on climate in the WMO region I and VI for the winter of 2014-15 (WMO RA I RCC Node on Climate Monitoring: <http://www.meteo.tn/htmlen/donnees/climatemonitoring.php>; WMO RA VI RCC Node on Climate Monitoring: <http://www.dwd.de/rcc-cm>), contributions from Regional Climate Outlook Forums for Southeastern Europe (SEECOF, <http://www.seevccc.rs/?p=1466>) and North Africa (PRESANORD, <http://nwp.gov.eg/index.php/rcof/presanord>) and national reports from MedCOF participants.

2.1. Temperature

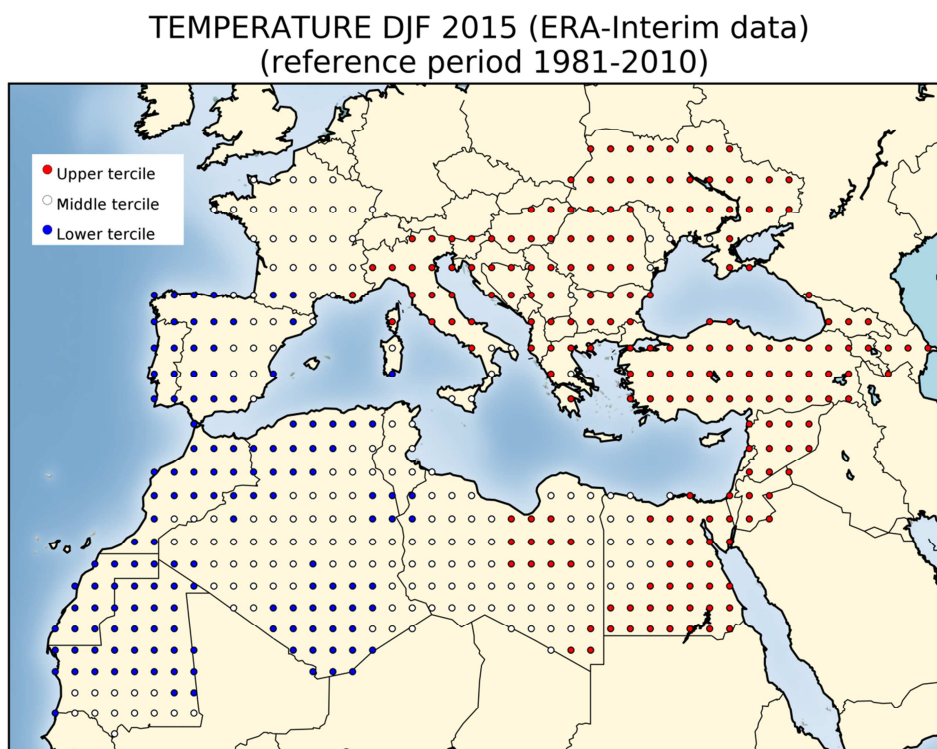


Figure 2: Terciles of surface air winter 2014/15 temperatures based on interpolated ERA-INTERIM grid data, 1981-2010 reference. Source: AEMET, data reference: <http://old.ecmwf.int/publications/library/do/references/show?id=90276>

Europe and Middle East (RA VI)

Tercile analysis of both gridded E-OBS and ERA-INTERIM data and individual ECA&D station data (Fig. 2 and 3) shows that winter 2014/15 temperatures especially in Portugal, the western half of Spain and in the Pyrenees region were in the lower tercile, temperatures in the eastern half of Spain, and most of France in the middle tercile, and most of the remaining areas in the RA VI part had temperatures in the upper tercile.

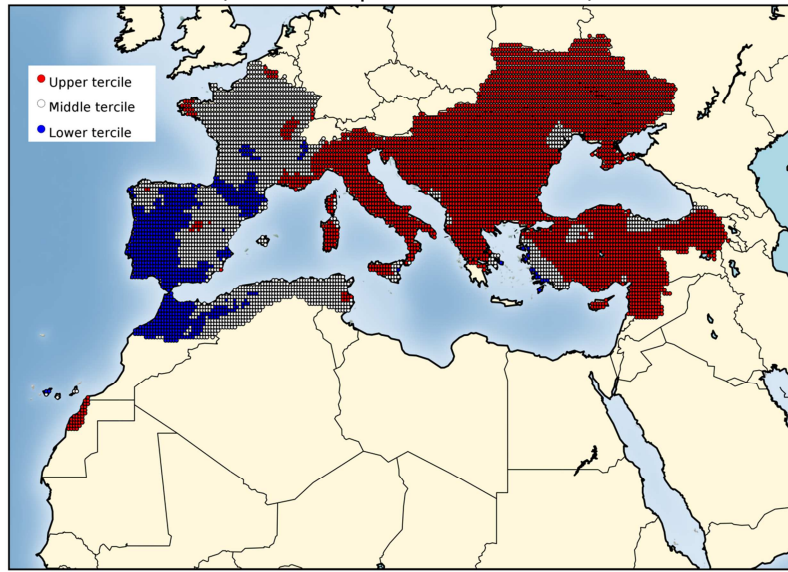
Temperature anomaly data (Fig. 4) mainly confirm the percentile data. Both 1961-1990 and 1981-2010 anomalies are negative for winter 2014/15 over large parts of the Iberian Peninsula, for 1981-2010 reference anomalies are even lower compared to 1961-1990 reference. In France, anomalies are close to normal, whereas anomalies are clearly above normal in the rest of the MedCOF RA VI area except southern Italy, islands in the western and central Mediterranean and some more local places, which had around-normal anomalies. Highest positive anomalies were recorded in northern and eastern parts of the MedCOF RA VI area, exceeding up to more than +4°C (1961-1990 reference) in parts of eastern Turkey and Armenia.

The anomaly distribution over the MedCOF region is part of a large-scale anomaly pattern, which shows a very strong gradient between northeastern Europe (positive anomalies) and the eastern North Atlantic / SW Europe / NW Africa (negative anomalies).

The winter 2014/15 temperature distribution had impact on the number of frost days in parts of the MedCOF region. Especially in northern Italy and the northern Balkan Peninsula the number of frost days was much lower than normal, whereas it was around normal in other parts of the region (Fig. 5).

For the individual months of the winter season (December 2014 to February 2015), it can be noted that especially February was relatively cold in southwestern Europe, whereas particularly the Balkan Peninsula and northeastern parts of the MedCOF region were affected by some very mild periods, e.g. Serbia in mid-January and Moldova in late January and late February. On the other hand there were also some cold spells especially in January and February in eastern parts of the MedCOF region causing even snowfall e.g. in Turkey and Israel.

TEMPERATURE DJF 2015 (EOBS data)
(reference period 1981-2010)



TEMPERATURE DJF 2015 (ECA&D data)
(reference period 1981-2010)

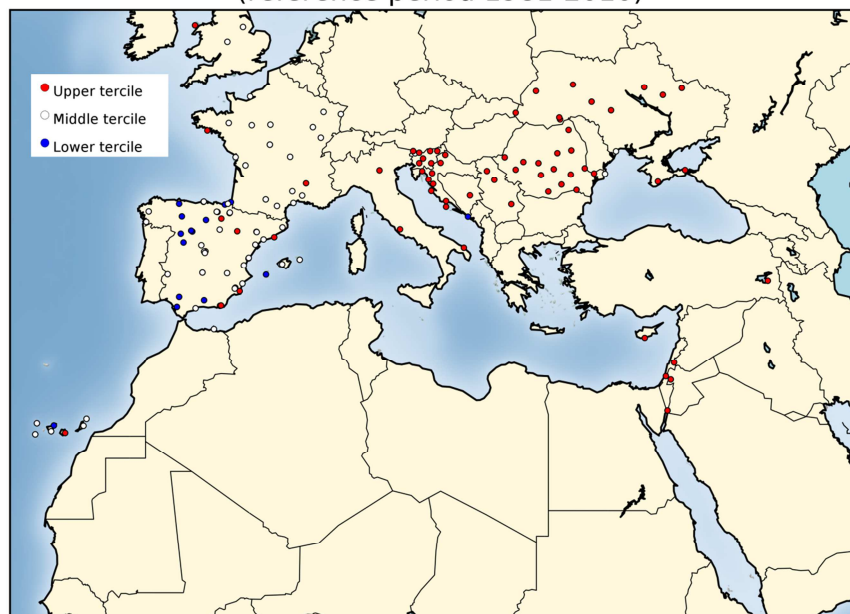


Figure 3: Terciles of surface air winter 2014/15 temperatures based on interpolated E-OBS grid data (upper graph) and individual station data (lower graph), 1981-2010 reference. Source: AEMET, data source: <http://www.ecad.eu/>

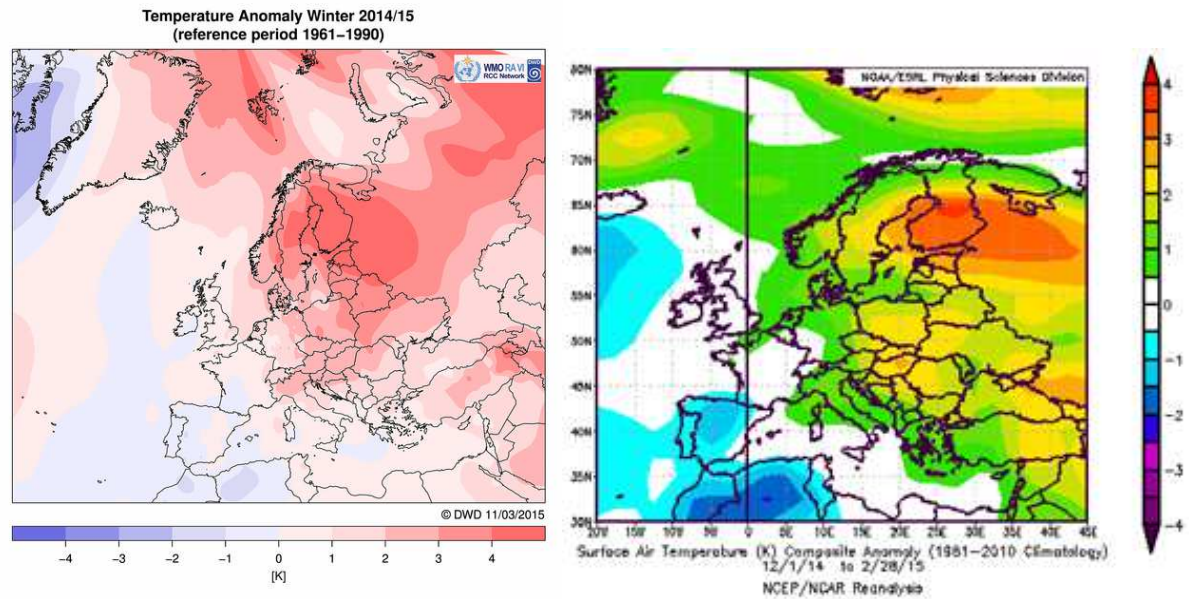


Figure 4: Surface air temperature anomalies for winter 2014/15. Left: Europe, 1961-1990 reference, source: WMO RAVI RCC, www.dwd.de/rcc-cm, right: Europe, 1981-2010 reference, source: NCEP/NCAR Reanalysis, <http://www.esrl.noaa.gov/psd/data/composites/day/>

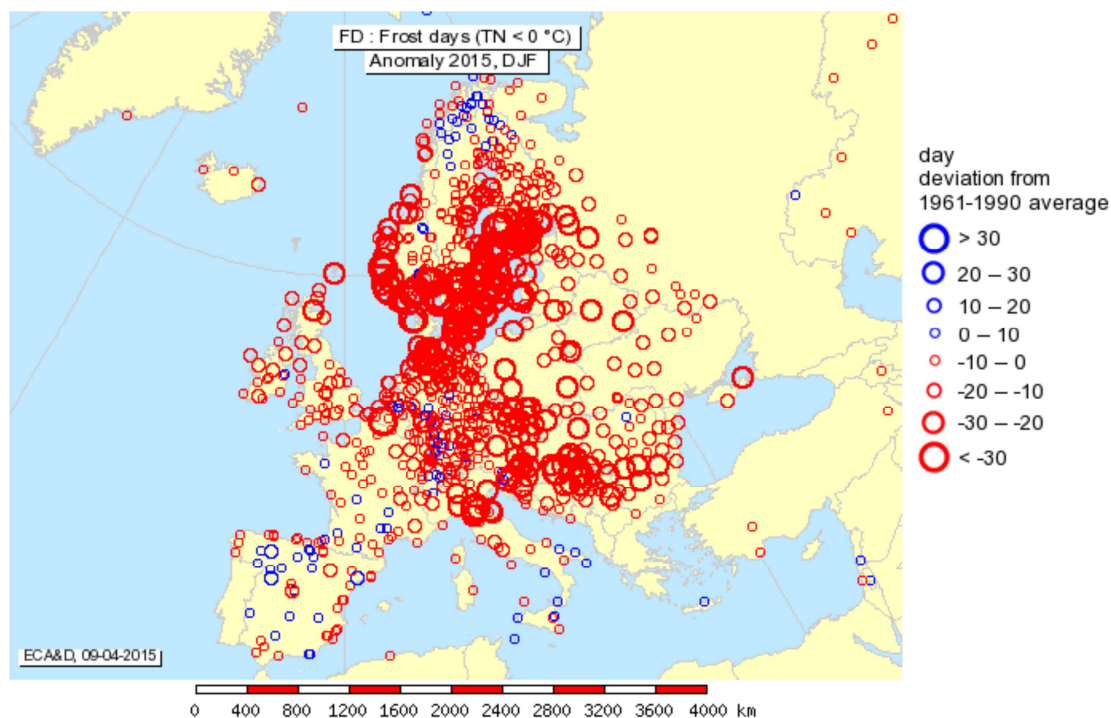


Figure 5: Anomalies of the number of frost days (1961-1990 reference) in winter 2014/15. Source: WMO RAVI RCC De Bilt Node on Climate Data, <http://www.ecad.eu>

North Africa (RA I)

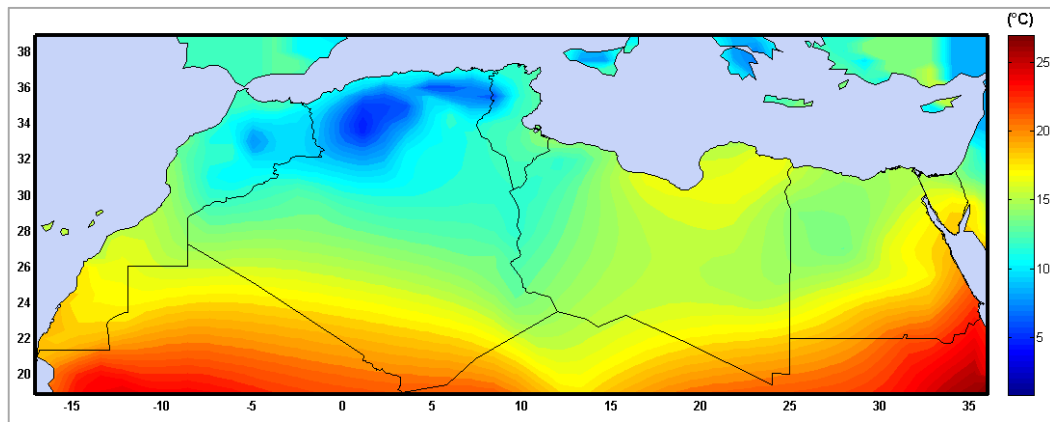


Figure 6: Mean temperature for winter season in North Africa (in °C)

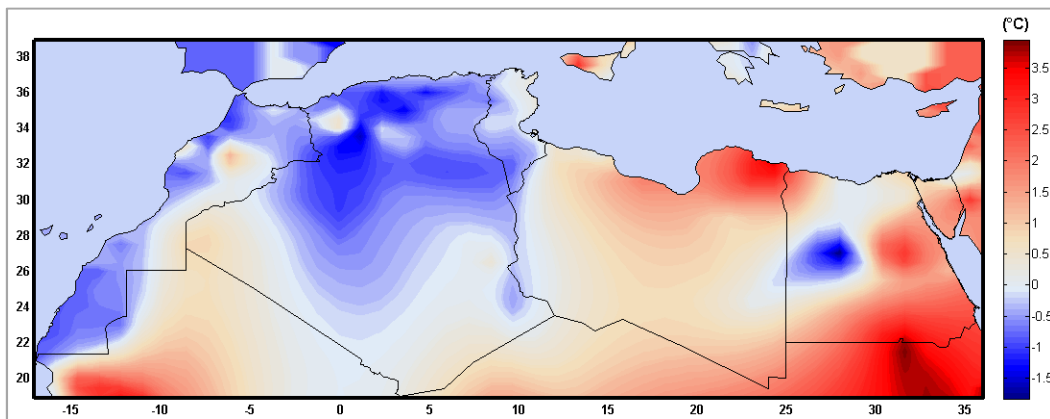


Figure 7: Temperature anomaly for winter season in North Africa (In °C) Reference period 1981-2010

Winter 2014-2015 was colder than normal in much of North Africa. Mean temperatures were ranging between 6°C and 18°C (Fig. 6). Negative anomalies were recorded over Morocco, Algeria, Tunisia and most of Libya (Fig. 7). According to ERA-INTERIM reanalyses, winter temperatures were in the lower or middle tercile in western parts of North Africa, and in the middle or upper tercile in eastern parts.

In Libya, mean temperature of this season was around 13.0 °C. The lowest mean was at the western parts with 11.5° C. The mean seasonal temperature anomaly over the whole country was -0.8°C showing the negative trend registered. The northeastern parts of the country reported a positive anomaly (+0.3 C). In Tunisia, the winter season mean temperature is at its minimum in the west regions, especially in the north-west of Tunisia. The lowest value of mean minimum temperature was 5.5°C measured in Thala in the north-west of Tunisia. The south-east of Tunisia was the hottest in 2014-2015 winter season. The highest value of mean maximum temperature was 21.9°C registered in Medenine. Mean temperature was above normal in the north-east with anomalies ranging between 0.5°C and 1°C. It was below normal in the west regions. Although the south of Tunisia was the hottest especially the eastern parts,

temperatures were below normal by 0.5-1.2°C. Winter season was also colder than normal in most Moroccan regions. The eastern regions recorded normal temperature. Many countries reported the occurrence of some cold waves by the end of December and the beginning of January.

2.2. Precipitation

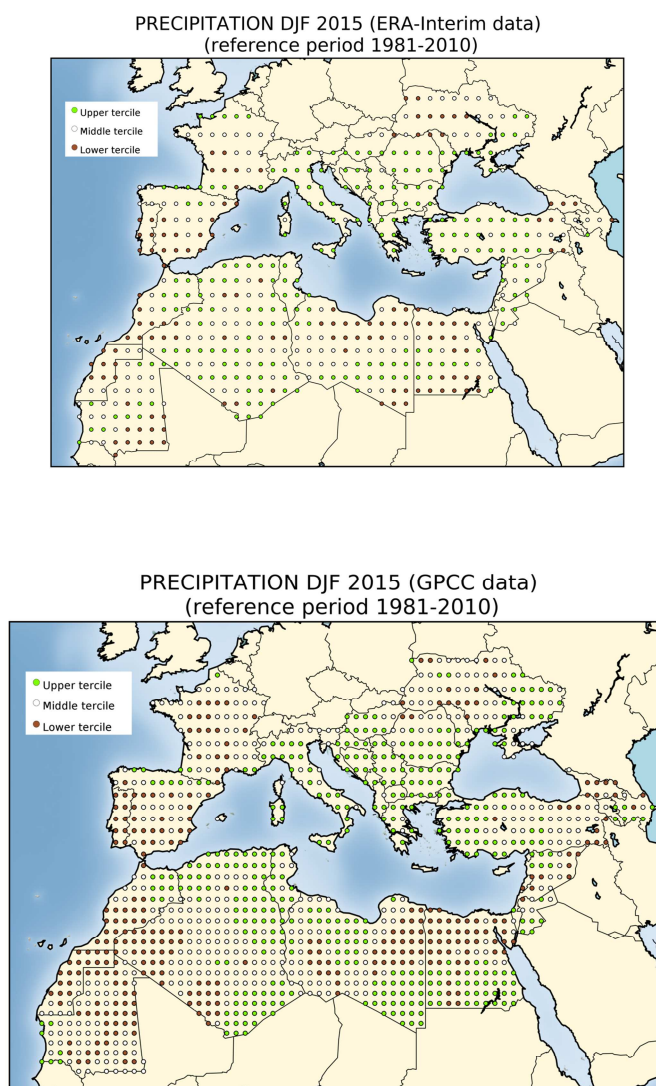


Figure 8: Terciles of surface air winter 2014/15 precipitation based on interpolated ERA-INTERIM (upper graph) and GPCC (lower graph) grid data, 1981-2010 reference. Source: AEMET, data reference:

ERA-INTERIM: <http://old.ecmwf.int/publications/library/do/references/show?id=90276>

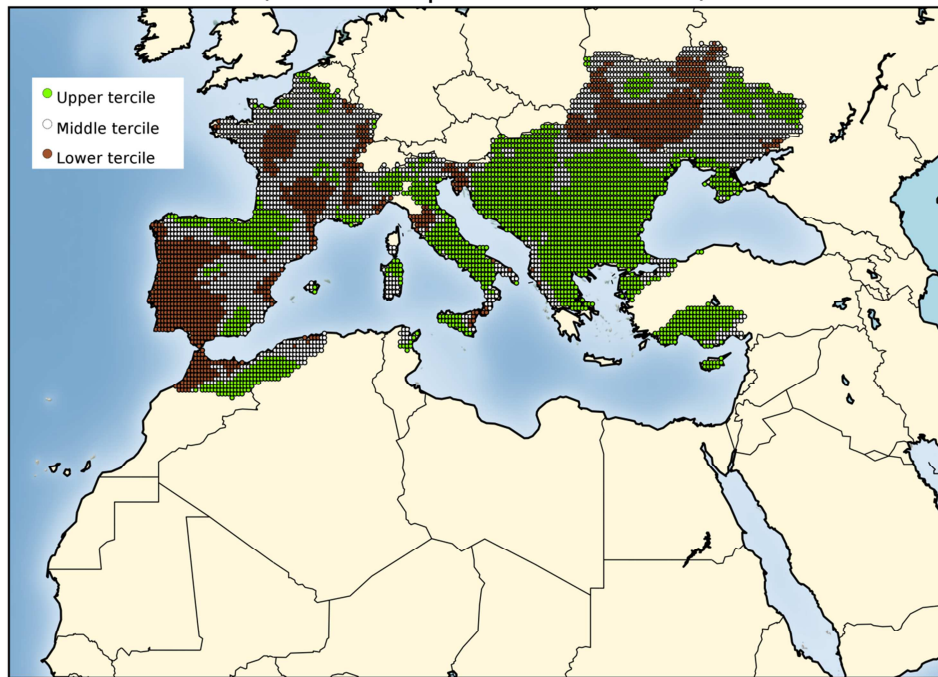
GPCC: <http://gpcc.dwd.de>

Europe and Middle East (RA VI)

Precipitation anomalies (Fig. 10) show that winter 2014/15 was dry especially on the Iberian Peninsula except the northern coastal and Pyrenees region and parts of France. Locally less than 40% of the normal precipitation fell in Portugal and southern Spain. Most of the rest of the area had above-normal precipitation. Especially in parts of Italy, most of the Balkan Peninsula and western Turkey, seasonal precipitation was well above normal, locally even more than twice the normal. Local areas were classified as extremely wet in some countries. Some of these parts suffered from some heavy precipitation events, partly even with new local daily precipitation records and with heavy snowfall. Northernmost parts of the MedCOF region (parts of northern Italy, Slovenia, northern Croatia, Hungary, northern Romania, Moldova and Ukraine) had partly close-to-normal precipitation, and also Israel. Central and eastern Turkey and parts of Armenia had below-normal precipitation.

Tercile analysis of gridded E-OBS, ERA-INTERIM, GPCC data and individual ECA&D station data (Fig. 8 and 9) confirms these results.

PRECIPITATION DJF 2015 (EOBS data)
(reference period 1981-2010)



PRECIPITATION DJF 2015 (ECA&D data)
(reference period 1981-2010)



Figure 9: Terciles of winter 2014/15 precipitation based on interpolated E-OBS grid data (upper graph) and individual station data (lower graph), 1981-2010 reference. Source: AEMET, data source: <http://www.ecad.eu/>

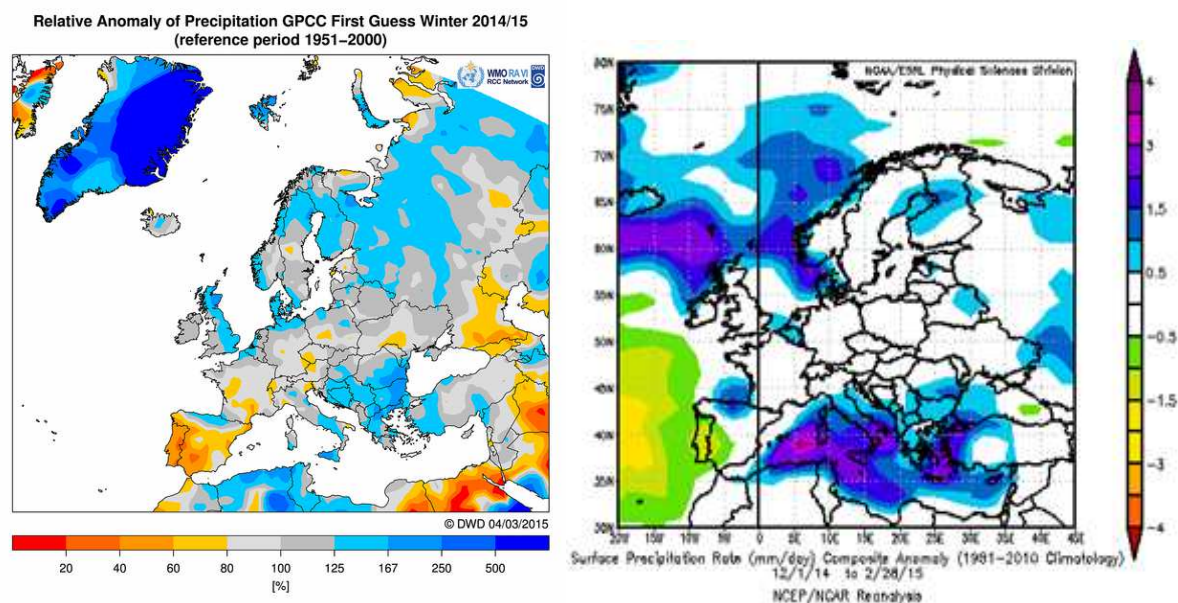


Figure 10: Precipitation anomalies for winter 2014/15 in Europe. Left: relative anomalies, 1951-2000 reference, source: WMO RAVI RCC, www.dwd.de/rcc-cm, data source: GPCC, <http://gpcc.dwd.de>; right: absolute anomalies of precipitation rate, 1981-2010 reference, source: NCEP/NCAR Reanalysis, <http://www.esrl.noaa.gov/psd/data/composites/day/>

A more detailed analysis for south-eastern Europe, including high impact events, is given in the analysis and verification report of SEECOF-12 CLIMATE OUTLOOK for 2014/2015 winter season for southeast Europe (SEE), provided by SEECOF-13 Online Meeting: <http://www.seevccc.rs>

North Africa (RA I)

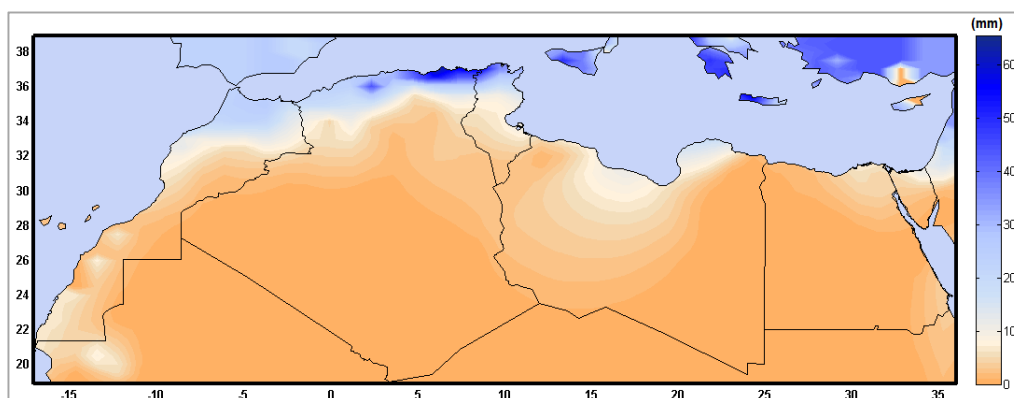


Figure 11: Total precipitation for winter season in North Africa (in mm)

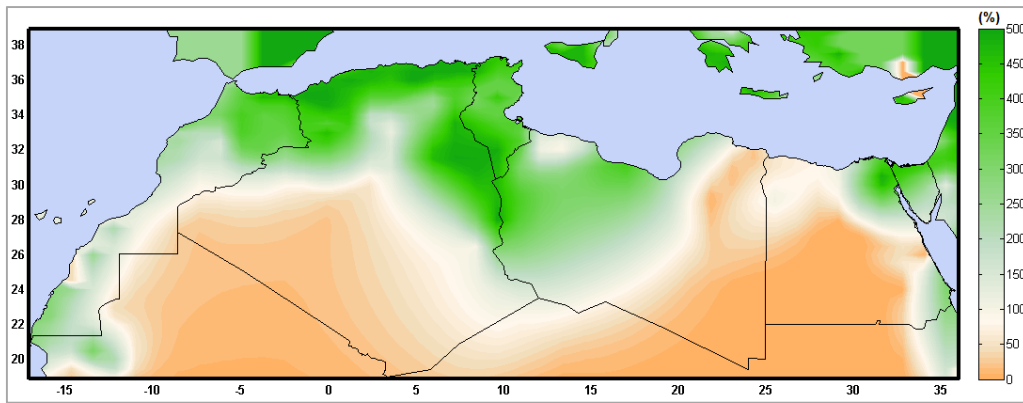


Figure 12: Precipitation anomaly for winter season in North Africa (in %) (Reference period 1981-2010)

Winter 2014-2015 was wetter than normal in north of Morocco, north of Algeria, almost all of Tunisia and especially the south, the west of Libya and the west of Egypt. It was normal to below normal elsewhere (Fig. 12).

Maximum total amount of precipitation was registered in the extreme northwest of Tunisia and northeast of Algeria (Fig. 11).

In Libya, winter season precipitation was around 120 mm over the rainy country region. All precipitation was concentrated over the northern parts of the country. The north eastern mountains reported the highest seasonal precipitation amount with 180 mm. Precipitation in Tunisia was at its maximum total in the north-west. Extreme values were registered in Tabarka such as the highest 24 hours total precipitation with a total of 75mm. With reference to 1981-2010 period, total precipitation amount were slightly below normal in the eastern north parts of territory, ranging between 50-80% of the normal. It was above normal in the south-west and extreme south with percentages of 200-250% of normal. Elsewhere total precipitation amount were normal to slightly above normal. In Morocco, precipitation was above normal to normal in the northern regions. All remaining parts recorded total amount of precipitation below normal.

2014-2015 winter season has recorded, by the end of December and the beginning of January, heavy snow fall in Algeria, Tunisia and Libya. In some countries, the occurrence of floods in February caused damages in agriculture, transportation and settlements.

3. Verification of the MedCOF-3 climate outlook for the 2014-15 winter season

3.1. Temperature

Europe

The MedCOF outlook favored an above-normal scenario for the whole MedCOF region. This was correct for northern and eastern parts of the MedCOF region, especially most of Italy, the Balkan Peninsula, Black Sea region, Turkey, South Caucasus and the eastern Mediterranean region. However, it failed particularly for the Iberian Peninsula, which had clearly below-normal temperatures and for the remaining areas (especially France), which had close-to-normal temperatures.

North Africa (RAI)

The MedCOF-3 climate outlook for the 2014-15 winter season favored the upper tercile over all North Africa with probability of 50% over Mediterranean coastlines and 40% over Atlantic facades of African regions. In fact, in almost all regions of North Africa, temperature anomalies were below normal except the East of Libya and Egypt.

This indicates that the MedCOF-3 climate outlook for the winter season temperature was not able to predict temperature anomalies registered for most of North African regions.

3.2. Precipitation

Europe

Since no privileged scenario could be identified by the MedCOF outlook, normal mean precipitation was to be assumed. In fact there were some areas in the MedCOF region which had large deviations from normal, particularly the western Iberian Peninsula, which was very dry, and the western and central Mediterranean, most of the Balkan Peninsula and western Turkey, which were clearly wetter-than normal, partly even extremely wet. The MedCOF-3 outlook did not give these partly extreme anomalies.

North Africa (RAI)

MedCOF-3 didn't favor any scenario for the entire region of North Africa.

Winter 2014-2015 was wetter than normal over almost the entire region. It has recorded the occurrence of extreme and heavy snowfall and floods. It was a critical season for nearly all countries of North Africa. MedCOF-3 precipitation prediction didn't give valuable information for the region.

4. Users' perceptions of the MedCOF-3 outlook

MedCOF-3 winter outlook was disseminated during the February meeting at the “Technical-scientific board for monthly and seasonal forecast at National scale” managed by the Italian National Civil Protection Department (Rome 12 February 2015) in the framework of the operational water management activities.

The seasonal outlook for Bulgaria is updated monthly and is available on the website of the institute for general public use. However, it is not advertised widely for practical reasons related to low reliability and theoretical reasons related to low predictability in Europe. Nevertheless occasionally there is some public interest to long-term forecasting going through the media which gives another way of communicating the seasonal outlook to a wider public. There are no individual contractual costumers for the seasonal outlook. However, governmental or industrial customers may use the forecast available on the website without giving feedback.

Also in Israel, seasonal forecasts are provided for the wide public, but not directly to decision makers in the government or public services. The most important forecast is for precipitation. Since no privileged scenario was given in MedCOF-3, end users were not satisfied.

Some NMHSs provide seasonal forecasts only internally due to little predictability at the time being. Others did not receive any feedback from users.

Appendix A: Contributors to the Pre-COF of MEDCOF-4

Europe and Middle East (RA VI)

- National Meteorological and Hydrological Services of Armenia, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Georgia, Greece, Israel, Italy, Moldova, Montenegro, Serbia, Slovenia, Spain, The Former Yugoslav Republic of Macedonia, Turkey, Ukraine
- WMO RA VI RCC Offenbach Node on Climate Monitoring, Deutscher Wetterdienst, Germany

Country	Seasonal temperature (DJF)		Seasonal precipitation (DJF)		High impacts events
	Observed	MedCOF-3 climate outlook for temperature	Observed	MedCOF-3 climate outlook for precipitation	
Portugal (1) *	Below normal	Above normal	Below normal	Normal	No events reported
Spain (1)	Below normal in the north and west, around normal in central parts and in the east	Above normal	Above normal in the north, below normal in the west and in some eastern regions, mostly around normal elsewhere	Normal	Storms in northern Spain particularly in February with heavy snowfall in mountains and even at low altitudes
France (1) *	Mostly around normal	Above normal	Mostly below normal to normal, locally above normal	Normal	No events reported
Italy (3)	Above normal, in Sicily locally below normal	Above normal	Mostly above normal, locally below normal to normal	Normal	No events reported

Slovenia (1)	Above normal	Above normal	Around normal	Normal	One bora wind event with heavy snowfall, but without significant economic damage
Hungary (1)*	Above normal	Above normal	Mostly above normal	Normal	No events reported
Ukraine (1)	Above normal	Above normal	Mostly around normal	Normal	Heavy snowfall on December 29-30 in some places in the southern and eastern part, 20 to 45 mm of precipitation fell in 12 hours. Snowfall was accompanied by increased wind speeds of up to 16 - 20 m/s, some places 25-38 m/s and blizzards with duration 14-16 hours, snow cover 25-57 cm. Unfavorable weather conditions caused power losses, Damage in telecommunication, utilities and transport.
Moldova (1)	Above normal	Above normal	Mostly around normal, in the north below normal	Normal	Heavy snowfall on 29 Dec, sometimes with blizzards, causing traffic road problems. During the season some fog, sleet, rime, ice on roads
Romania (1)*	Above normal	Above normal	Mostly above normal, in the north below normal	Normal	No events reported
Serbia (1),(2),(3)	Mostly above normal, locally normal	Above normal	Above normal	Normal	No events occurred
Croatia (2)	Mostly above normal, locally normal	Above normal	Mostly above normal, around normal in the northwest and parts of the southeast	Normal	Some local flooding due to extreme daily rainfalls. Heavy snowfall at the end of December and at the beginning of February, partly with strong wind causing traffic disruptions. Several storms with gusts up to 45m/s causing damage due to fallen trees etc.
Bosnia-Herzegovina (2)	Mostly above normal, in the south around normal	Above normal	Mostly above normal, near the eastern boundaries	Normal	No events reported

			around normal		
Montenegro (2)	Above normal	Above normal	Above normal in western parts, normal in the rest of the country	Normal	Heavy precipitation and strong wind on 1-3 December and 30 January, strong blizzard on 9-11 February. Interruption of electrical supply, impact on traffic
Albania (1)*	Above normal	Above normal	Around normal	Normal	No events reported
Macedonia (1)	Normal to above normal	Above normal	Above normal	Normal	Heavy rain especially end of January / beginning of February causing floods affecting agricultural areas and parts of villages, traffic interruptions on bridges and roads.
Bulgaria (2), (4)	Above normal	Above normal	Above normal	Normal	Heavy icing at the beginning of Dec. damaging electrical infrastructure and road traffic. Rain in the south, wet soils, snow in the north caused river overflow near the border to Turkey.
Greece (3)	Mostly above normal, locally in Peloponnese region below normal	Above normal	Mostly above normal, locally below normal	Normal	No events reported
Turkey	Normal to above normal	Above normal	Above normal particularly in the west, below normal in most of the east	Normal	Due to several events of heavy snowfall, roads blocked or closed, flights cancelled in Istanbul. January: Due to storm, agricultural damage and transportation stopped in some areas in Antalya.
Georgia (2)	Above normal	Above normal	Below normal in most of the country, in some regions near normal	Normal	Heavy snowfall with snow cover up to 180cm and avalanches on 6-7 January. Roads were blocked, damage of electricity power lines
Armenia (1)	Above normal	Above normal	Mostly below normal, in the northwest and	Normal	Several strong wind events of 12-14h duration. Local heavy snowfall on 9 February. Thick fog in Ararat valley in January and February.

			southeast normal to above normal		
Azerbaijan (1)*	Above normal	Above normal	Below normal in the northwest, above normal in the southeast	Normal	No events reported
Syria (1)*	Above normal	Above normal	Mostly around normal, in the northwest above normal	Normal	No events reported
Lebanon (1)*	Above normal	Above normal	Around normal	Normal	No events reported
Cyprus (1)	Normal to above normal	Above normal	Below normal to normal	Normal	Snowfall and ground frost causing schools closed and transportation affected.
Israel (1)	Above normal	Above normal	Around normal	Normal	Two major cold spells with heavy snow or rain and record-breaking minimum temperature (since 1978)
Jordan (1)*	Above normal	Above normal	Around normal	Normal	No events reported

Note:

- (1) - Basic climatological period (1981-2010)
- (2) - Basic climatological period (1961-1990)
- (3) - Basic climatological period (1971-2000)
- (4) – Basic climatological period (1980-2009)

* Data sources: E-OBS, NOAA NCDC, GPCC

North Africa (RA I)

National Institute of Meteorology, Tunisia

Libyan National Meteorological Center, Libya

National Meteorological Directorate, Morocco

Country	Seasonal temperature (DJF)		Seasonal precipitation (DJF)		High impacts events
	Observed	MedCOF-3 climate outlook for temperature	Observed	MedCOF-3 climate outlook for precipitation	
Algeria*	Normal to slightly above normal in the south Below normal elsewhere specially in the north	Above normal in the north Slightly above normal elsewhere	Above normal in the north Below normal to normal elsewhere	No clear signal	No comment
Egypt*	Below normal in the center Above normal to normal elsewhere	Above normal in the north Slightly above normal elsewhere	Above normal in the north-east Below normal to normal elsewhere	No clear signal	No comment
Libya (1)	Below normal	Above normal in the north Slightly above normal elsewhere	Above normal	No clear signal	Extreme snow and hail storm overspread in large parts of the north western country in 31 December and 01 of January. The thickness of snow in high lands (above 500m) was about 5-10 cm while the hail accumulated over lower places around Tripoli

					<p>region for 24 hours. 3 peoples died and 7 people were injured due to traffic accident.</p> <p>Unusual sea storm (little Tornado) on 20 January hit some places in Tripoli shoreline without causing damages.</p> <p>Some flash floods and local flood events occurred during December in some places of Tripolitania region in the western and the eastern mountains of the north. Damages in agriculture and buildings were reported.</p>
Morocco (1)	Below normal over all stations except Casablanca and the oriental where normal tercile was observed.	Slightly above normal	Normal on the western north Above normal on the East Below normal elsewhere	No clear signal	No comment
Tunisia (1)	Above normal in the north-east Below normal in the west and south.	Above normal	Slightly below normal in the eastern north parts of territory. Above normal in the south-west and extreme south. Normal to above normal elsewhere.	No clear signal	<p>In December, a cold wave hit the entire country in particular the north-west. It caused a high drop of temperature and the occurrence of snow in the north of the country. It was heavier in the north-west region.</p> <p>In January, heavy snow occurred in the north-west regions. Transportation was damaged.</p> <p>In February heavy rain occurred, causing floods in north-west regions of Tunisia. It caused the overflow of Medjerda river in Ghar Dimaou and Boussalem in Jendouba, and Medjaz el Beba in Beja. Citizens were evacuated. Transportation, agricultural area, settlements and houses were damaged.</p>

Note:

(1) Basic climatological period (1981-2010)

* Data source: The National Climatic Data Center (NCDC)

References:

MedCOF 3 Outlook: <http://medcof.aemet.es/Medcof/events/medcof3/docMedcof3/Consensus%20Statement%20MedCOF-3.pdf>

SEECOF 13 Online Forum: <http://www.seevccc.rs/?p=1466>

PRESANORD: <http://nwp.gov.eg/index.php/rcf/presanord>

WMO RA I RCC Node on Climate Monitoring Website with monitoring results: <http://www.meteo.tn/htmlen/donnees/climatemonitoring.php>

RA VI RCC-CM Website with monitoring results: <http://www.dwd.de/rcc-cm>

NOAA ESRL composite maps: <http://www.esrl.noaa.gov/psd/data/composites/day/>

NOAA NCDC percentile maps: [http://www.ncdc.noaa.gov/temp-and-precip/global-maps.php?imgs\[\]=map-percentile-prcp&year=2014&month=16](http://www.ncdc.noaa.gov/temp-and-precip/global-maps.php?imgs[]=map-percentile-prcp&year=2014&month=16)

IRI climate library: <http://iridl.ldeo.columbia.edu/docfind/>

ECA&D, E-OBS: <http://www.ecad.eu>

GPCC: <http://gpcc.dwd.de>