



North EurAsia Climate Centre



SEASONAL OUTLOOK FOR SUMMER 2024 OVER EUROPE

31th session of the South East European Climate Outlook Forum (SEECOF-31)

Step2

16 May 2024

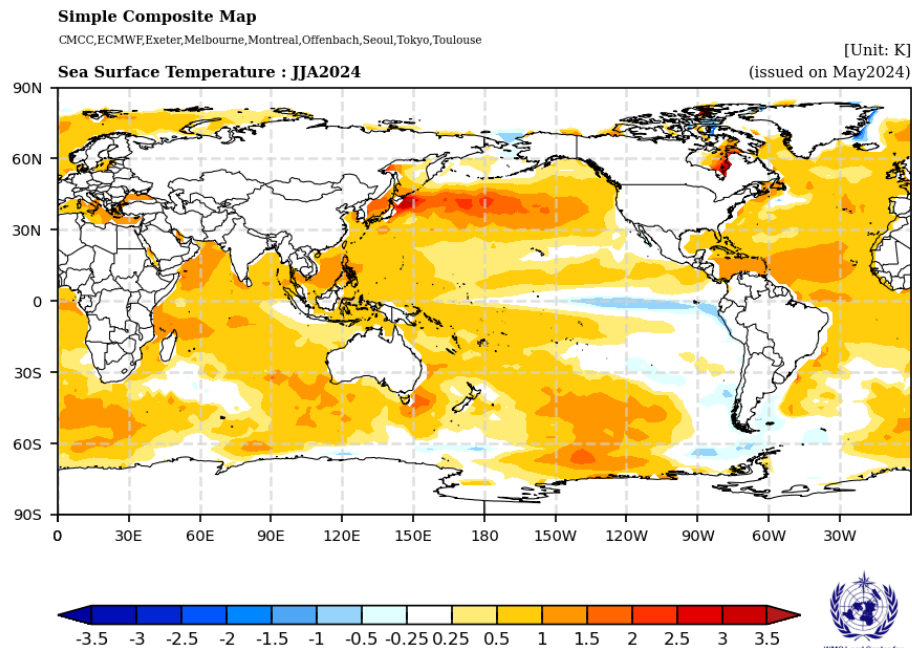
Sumerova K., Kulikova I., Kruglova E., Khan V.

email for contact: sum-ksusha@yandex.ru

<http://neacc.meteoinfo.ru>

Sea surface temperature anomalies (SSTA) forecast

LC MMELRF-WMO Lead Centre for MME LRF

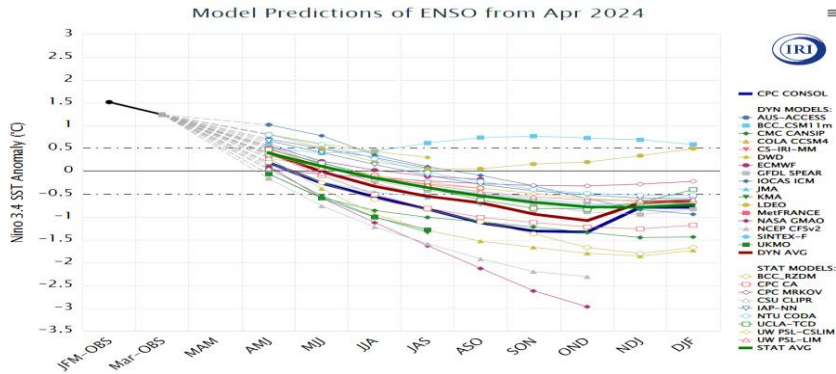


The forecasts of various centers are in good agreement with each other.

- **Indian ocean:** The positive sea surface temperature anomalies (SSTA) are expected over most of the Indian Ocean. More significant positive anomalies are predicted in the western part of the tropical zone. Against this background, according to the Australian Meteorological Bureau, a positive phase of the Indian dipole is expected in the summer of 2024.
- **Pacific ocean:** Significant positive SSTA (up to 3°C) are predicted in temperate and subtropical latitudes of the west part of the ocean. Minor negative anomalies temperatures are predicted in equatorial latitudes of the east of the ocean.
- **North Atlantic:** Most models predict positive SSTA over most of the ocean, the most significant in equatorial latitudes. Minor negative anomalies temperatures are predicted in the Gulf Stream region, along the coast of North America, as well as near the eastern coast of Greenland.

El Nino / Southern Oscillation (SOI)

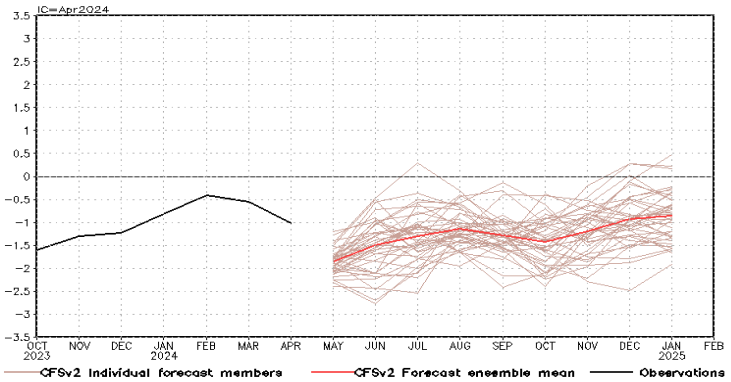
The IRI/CPC probabilistic ENSO forecast. Nino 3.4 forecasts (120°-170°W, 5°S-5°N)



<http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/>

Most of models predict **ENSO-neutral** conditions for the summer 2024 (June-August). According to the CPC/IRI Consensus Probabilistic Forecast the probabilities for La Nina, neutral and El Nino conditions (using -0.5C and 0.5C thresholds) over the coming summer season are: 32%, 62% and 6%.

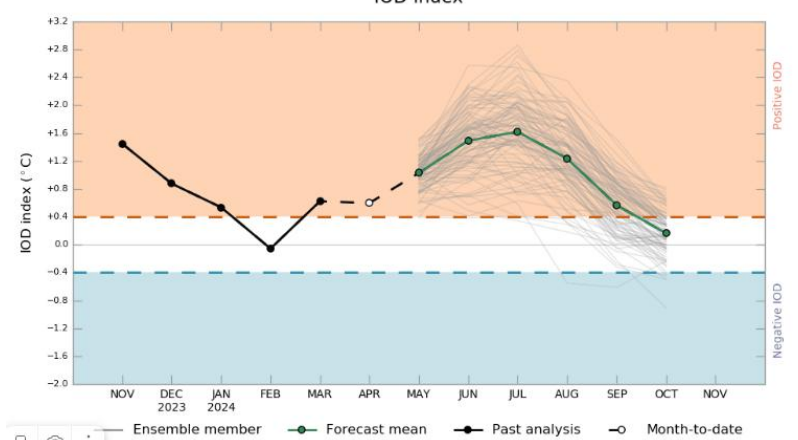
The Pacific ocean (PDO)



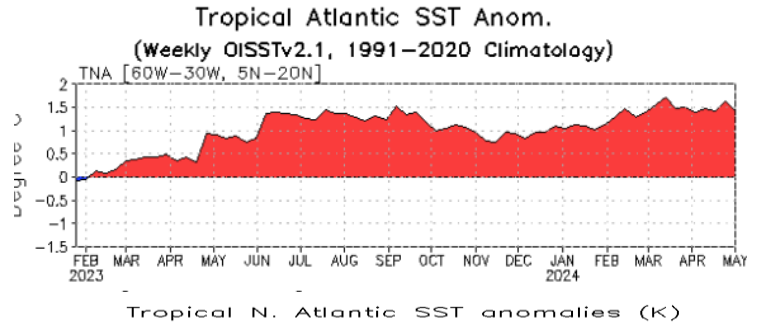
According to CFSv2 prediction, the he negative phase of PDO willcontinue through January 2025

https://www.cpc.ncep.noaa.gov/products/GODAS/ocean_briefing.shtml

The Indian Ocean Dipole (IOD).



The Atlantic ocean (TNA)



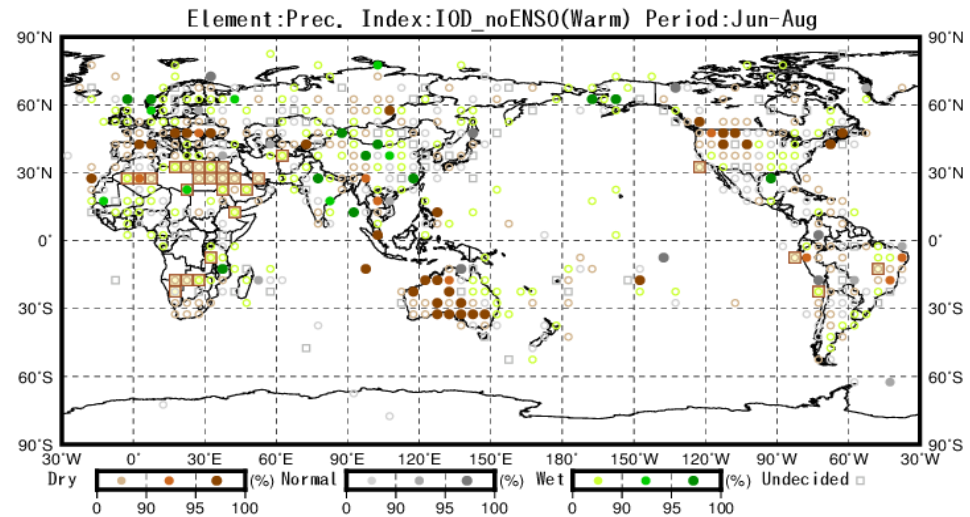
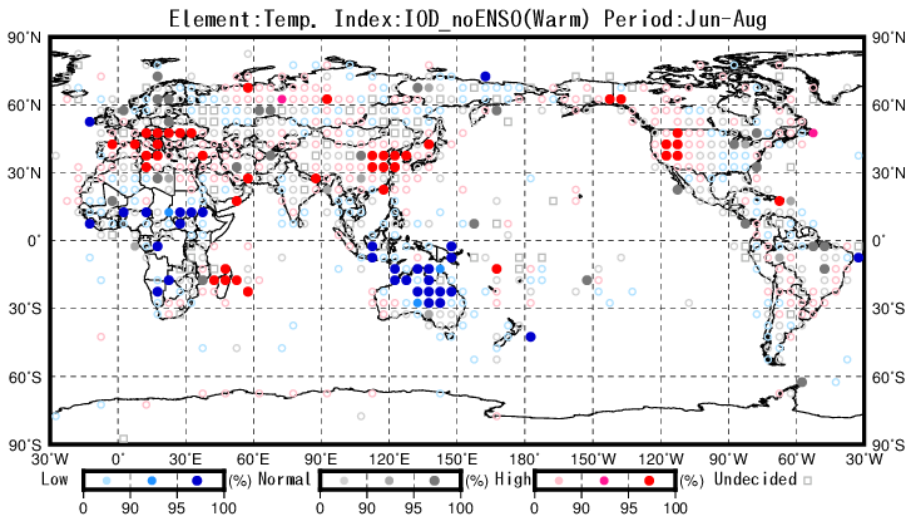
Warm tropical SST anomalies are more efficient at exciting NAO- regimes than cold anomalies are at forcing NAO+ regimes.

Cassou et. al. 2004

IOD

Tokyo climate centre

<https://ds.data.jma.go.jp/tcc/tcc/products/climate/ENSO/month.html>



The impact of +IOD over Europe:

According to the TCC, the temperature above normal is seen in the south of Europe and dry conditions are observed in the south of Europe

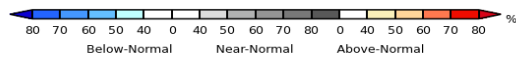
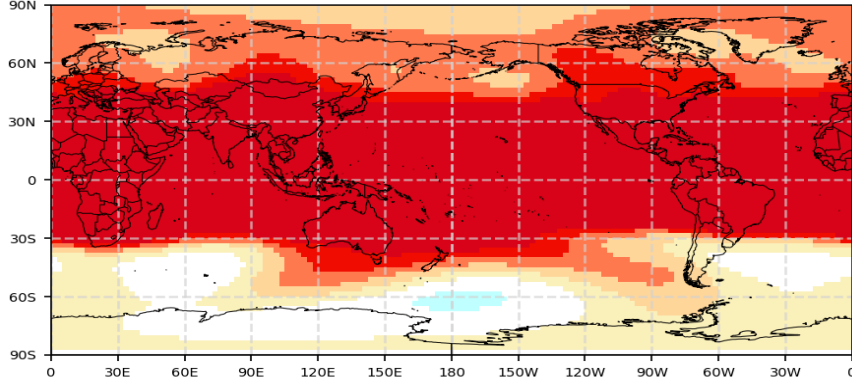
Deterministic multi-model ensemble forecasts of H-500 and MSLP

Probabilistic Multi-Model Ensemble Forecast

CMCC, CPTEC, ECMWF, Melbourne, Montreal, Offenbach, Seoul

500hPa GPH : JJA2024

(issued on May2024)

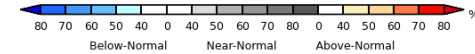
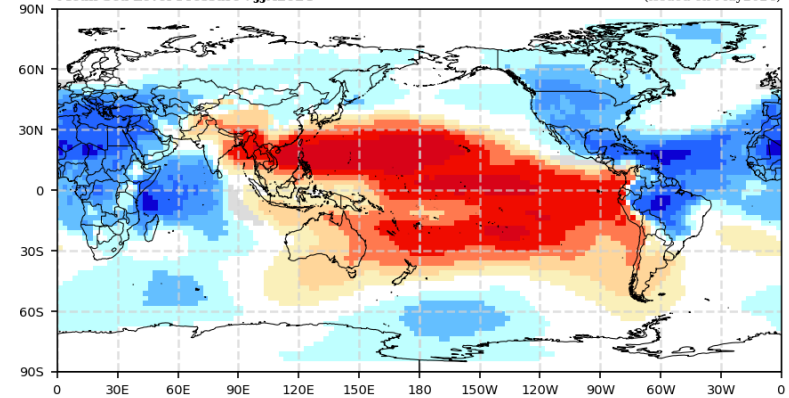


Probabilistic Multi-Model Ensemble Forecast

CMCC, CPTEC, ECMWF, Melbourne, Montreal, Offenbach, Seoul

Mean Sea Level Pressure : JJA2024

(issued on May2024)



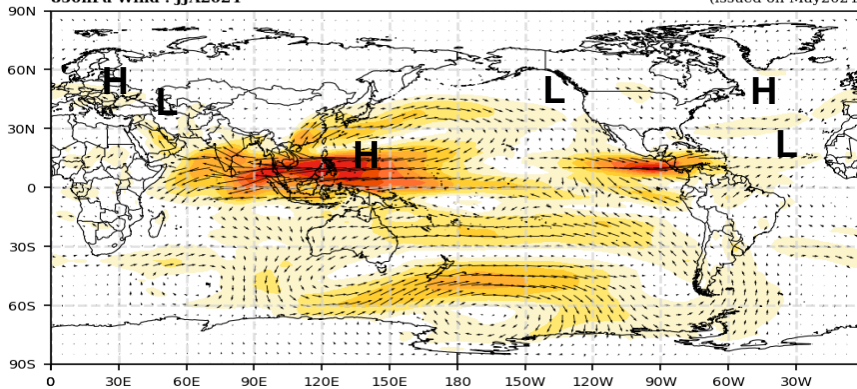
Deterministic multi-model ensemble wind forecasts at the level 850 hPa.

Simple Composite Map

CMCC, CPTEC, ECMWF, Exeter, Melbourne, Montreal, Moscow, Offenbach, Seoul, Tokyo, Toulouse

850hPa Wind : JJA2024

[Unit: m/s]
(issued on May2024)



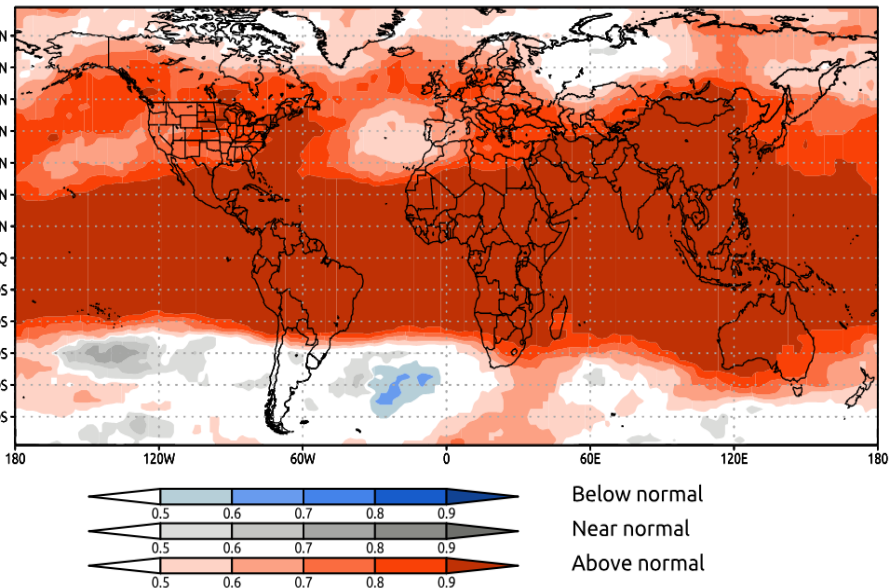
— 1 m/s



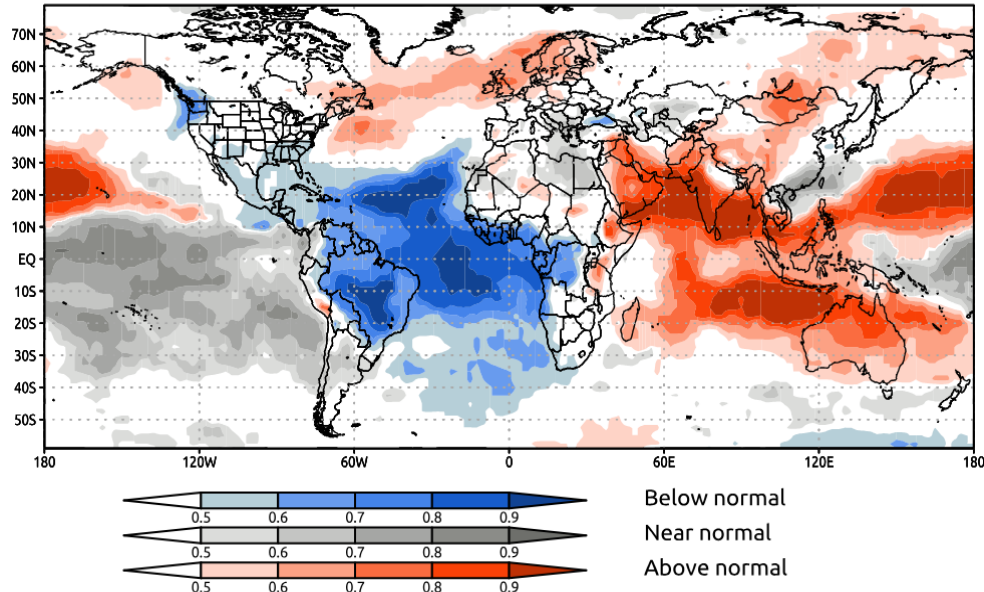
According to the multi-model forecast,, positive H-500 anomalies are expected to prevail over most of Europe, excluding Scandinavia, with high probabilities 70-80%. Judging by the 850 hPa wind forecast, we can expect a predominance of cyclonic forms of atmospheric circulation in the south and anticyclonic ones in the north of Europe. **MPSL** below normal with a probability of 50-70% is predicted in the Mediterranean Sea, Western Europe, the south of the ER, and the western part of Central Asia. With a 40% probability, negative pressure anomalies are expected in the north of Central Europe, the center of the ER, the Southern Urals.

Composite probabilities of categorical forecast outcomes for H-500 and MSLP seasonal anomalies. Producer: HMC (SL-AV) and MGO model.

Probabilistic forecast of H500 [dm] in categories
below/near/above norm. Models: PLAV:1, MGO:1
Forecast period: June/July/August 2024



Probabilistic forecast of MSLP [hPa] in categories
below/near/above norm. Models: PLAV:1, MGO:1
Forecast period: June/July/August 2024



According to the forecasts of SL-AV and MGO models, the geopotential in the middle troposphere is predicted to be above normal over north and south of Europe, south half of ER, and in the south of Central Asia, probability 70-90%.

There is some uncertainty in the MSLP forecast. A weak signal of above normal MPSL anomalies is in Scandinavia and in places in northern Europe, with a probability of 50-60%.

Teleconnection indices

Table.1. Indices oscillation forecasts.
Data from Hydrometeorological centre of Russia (SL-AV).

INDEX	JUNE-AUGUST 2024			
	JUNE	JULY	AUGUST	JUNE-AUGUST
EA	1,16	0,33	0,67	0,87
WA	0,05	0,14	0,99	0,52
EU	-1,04	-0,92	-0,25	-1,19
WP	-0,02	0,65	0,90	0,98
PNA	0,30	0,20	0,43	0,38
NAO	1,13	0,70	-0,49	0,48
POL	0,08	-1,36	-0,57	-0,56
AOS	-0,07	-0,13	-0,19	-0,13

- West Atlantic (**WA**), Eurasian (**EU**), West Pacific (**WP**), Pacific-North American (**PNA**) oscillations (Wallace J. M., Gutzler D.S. Teleconnections in the geopotential height field during the Northern Hemisphere winter. – Mon. Wea. Rev., 1981, vol. 109, pp. 784-812).
- North Atlantic (**NAO**), Polar (**POL**) and Artic (**AO**) oscillations (Climate Prediction Centre of USA).

NAO is expected to be in the positive phase. It means zonal atmospheric processes prevail over the territory of Europe and European Russia. Moreover the dry and cold air masses is likely to move to the South Europe and wet and warm - to the northern part of Europe; **NAO** is expected to be in the negative phase in August - increasing degree of meridionality in August.

EU is expected to be in the negative phase of EU. Temperatures tend to be above normal in the most of northern Europe.

Positive values of **WA** (in August) correspond to a weak jet steam over western Atlantic, a weak Icelandic low and a weak subtropical high in sea level pressure field.

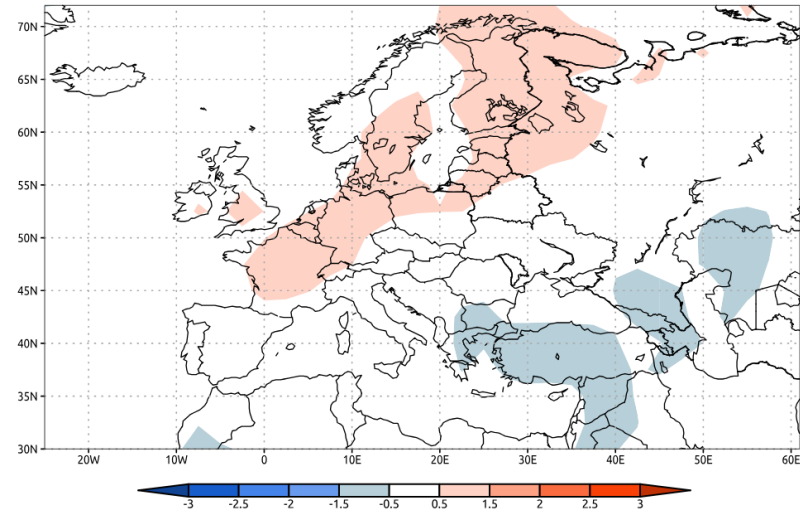
The negative phase of the **POL** index is characterized by a weakening of the circumpolar vortex.

Teleconnection indices: composites

Temperature

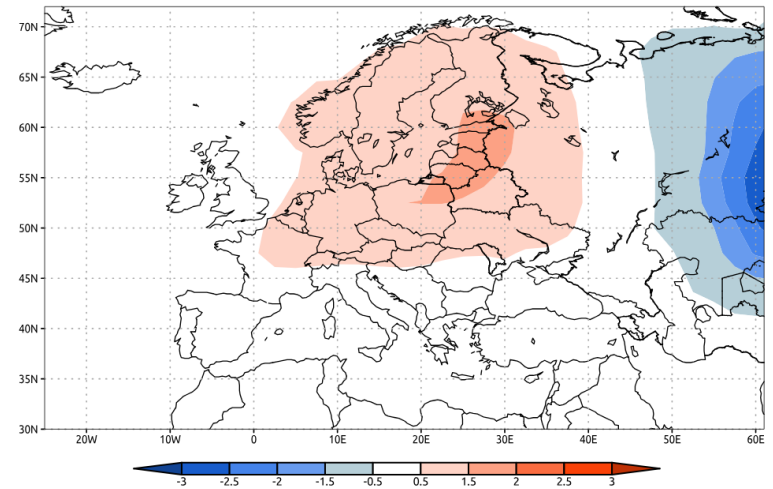
Positive phase of NAO

NAO (positive phase), parameter: T2m
Period: summer



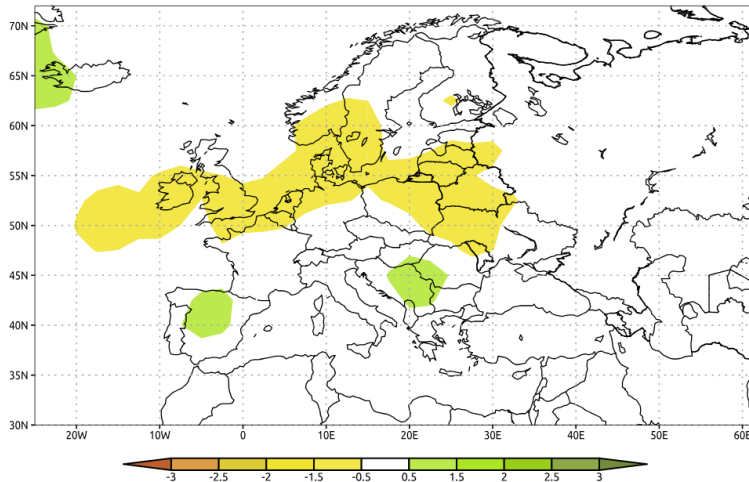
Negative phase of EU

EU (negative phase), parameter: T2m
Period: summer

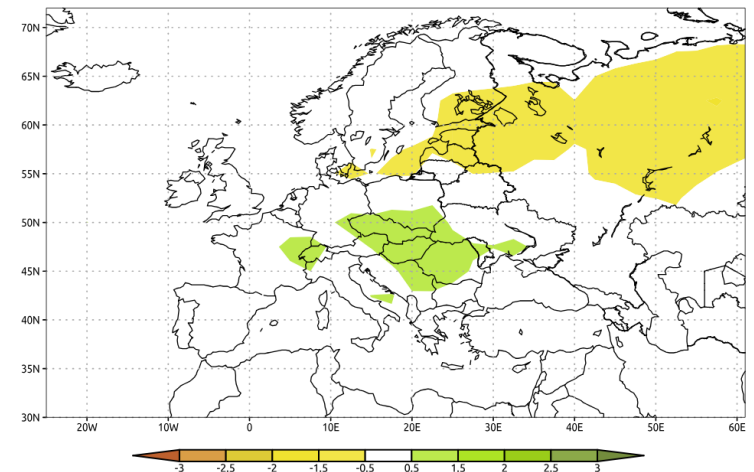


Precipitation

NAO (positive phase), parameter: precipitation
Period: summer



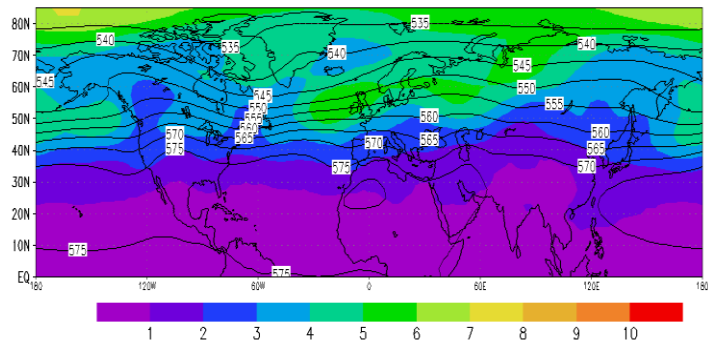
EU (negative phase), parameter: precipitation
Period: summer



Climate

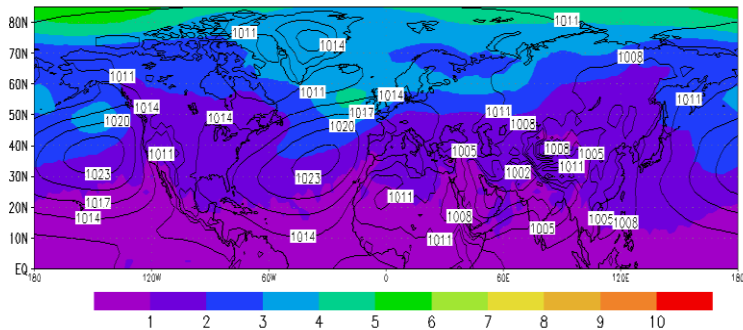
Mean H-500 (shading) and standard deviations (isolines, dm) for the summer season (norms 1981-2010)

Sigm and mean summer season
H-500 (1981-2010)

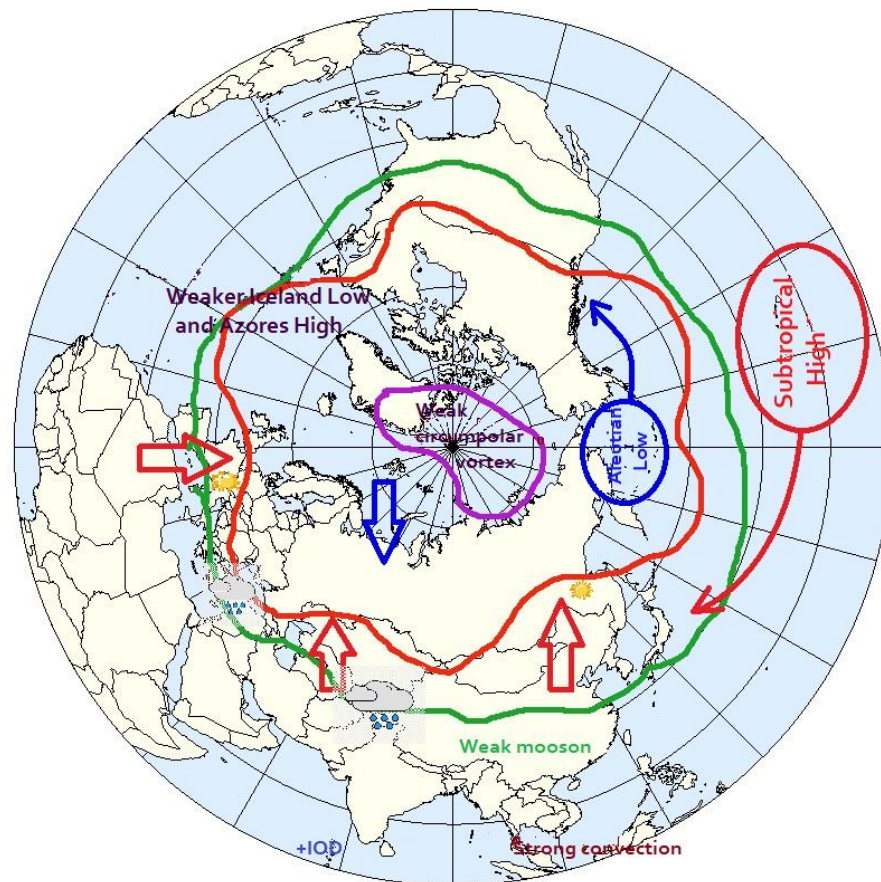


Mean atmospheric pressure (shading) and standard deviations (isolines, hPa) for the summer season (norms 1981-2010)

Sigm and mean summer season
MSLP (1981-2010)



General circulation scheme for the summer season 2024 in The Northern Hemisphere



- Planetary high-altitude frontal zonal (climate)
- Planetary high-altitude frontal zonal (forecast)
- Circumpolar vortex

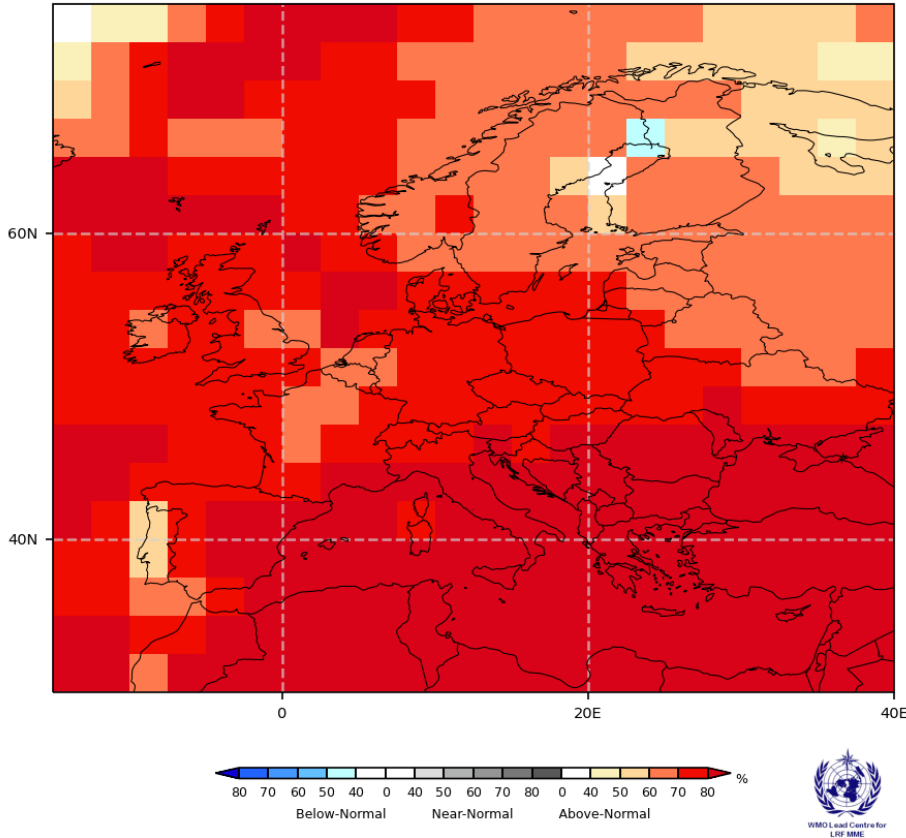
Temperature anomalies forecast

Probabilistic Multi-Model Ensemble Forecast

CMCC, CPTEC, ECMWF, Melbourne, Montreal, Offenbach, Seoul

2m Temperature : JJA2024

(issued on May2024)



According to Probabilistic Multi- Ensemble forecast positive temperature anomalies are expected over most of Europe, with high probabilities 70-90% over most of South Europe.

<https://www.wmolc.org/>

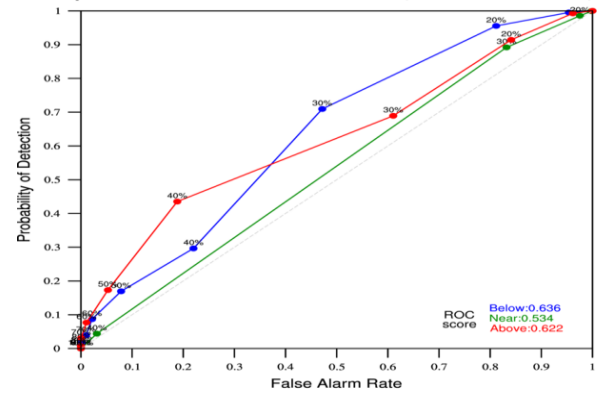
The estimation of tercile-based categorical probabilities (Europe)

ROC Curve and Score

Beijing, CMCC, CPTEC, ECMWF, Exeter, Melbourne, Montreal, Moscow, Offenbach, Pretoria, Seoul, Tokyo, Toulouse, Washington
Lat : 30-75, Lon : -15-40

2m Temperature : DJF

(Calculation Time : 1993 - 2009)

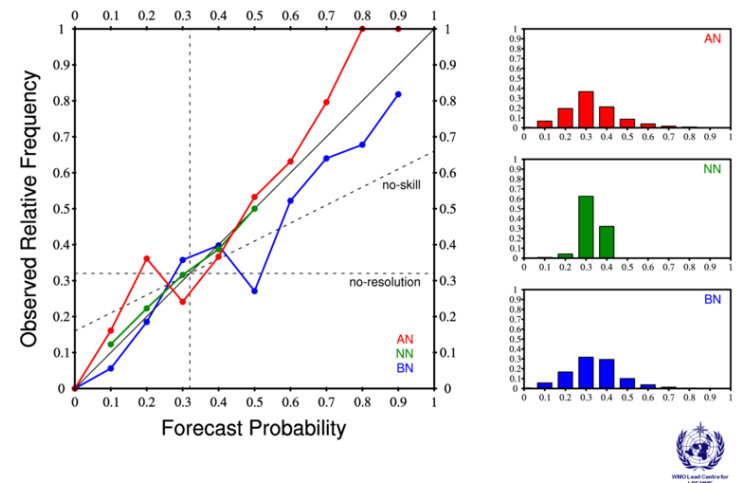


Reliability Diagram

Beijing, CMCC, CPTEC, ECMWF, Exeter, Melbourne, Montreal, Moscow, Offenbach, Pretoria, Seoul, Tokyo, Toulouse, Washington
Lat : 30-75, Lon : -15-40

2m Temperature : DJF

(Calculation Time : 1993 - 2009)

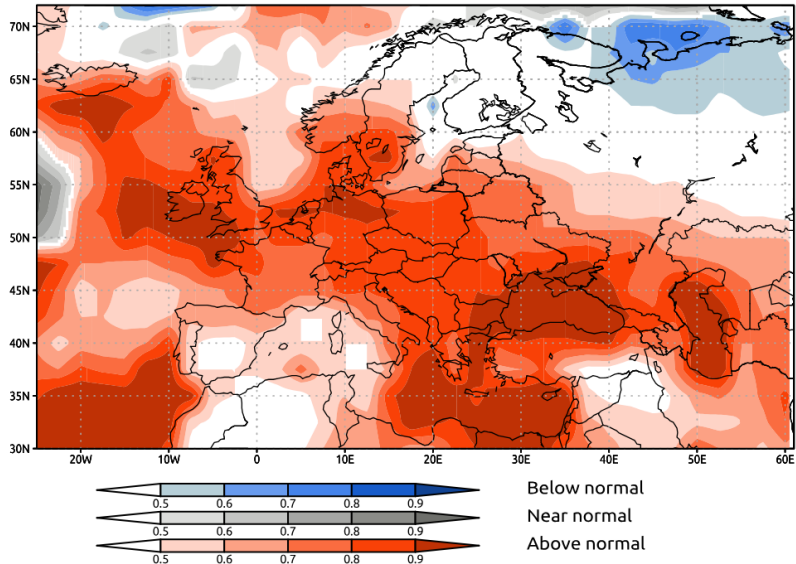


Forecast quality scores are slightly higher than climate

Temperature forecast

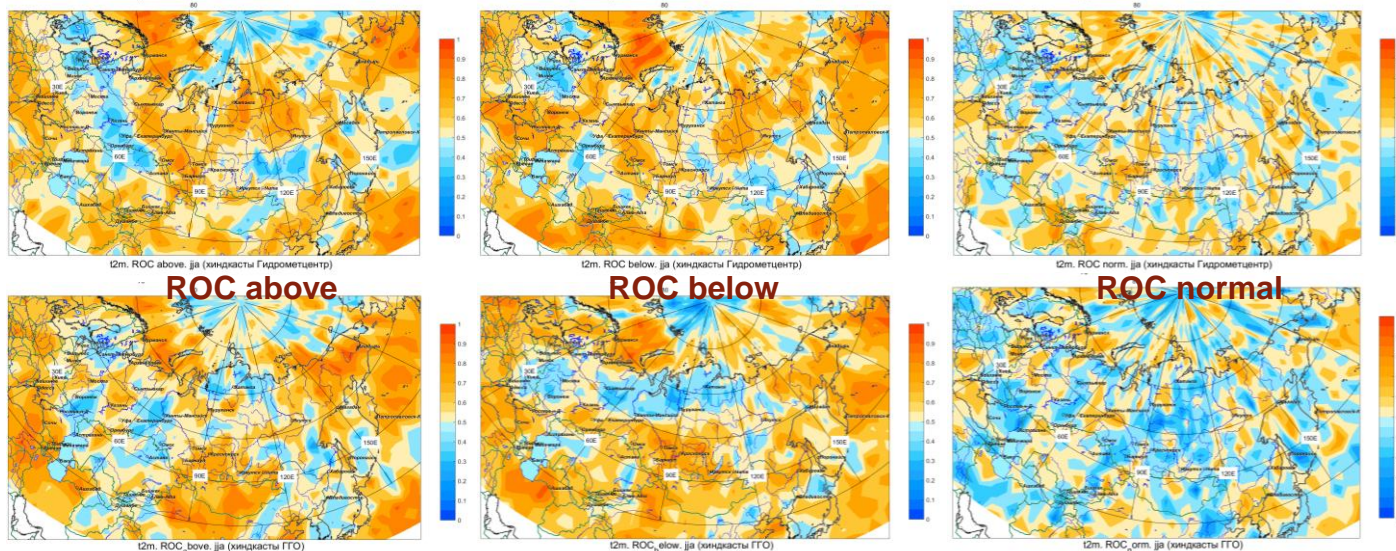
Composite probabilities of categorical forecast outcomes for T2m seasonal anomalies. Producer: HMC (SL-AV) and MGO model.

Probabilistic forecast of T2m [K] in categories
below/near/above norm. Models: PLAV:1, MGO:1
Forecast period: June/July/August 2024



According to the forecasts of SL-AV and MGO models the positive temperature anomalies are expected over most of Europe, with high probabilities 70-80% in the southern part of Europe.

ROC of probabilistic T2M forecasts (top SL-AV, bottom MGO model).



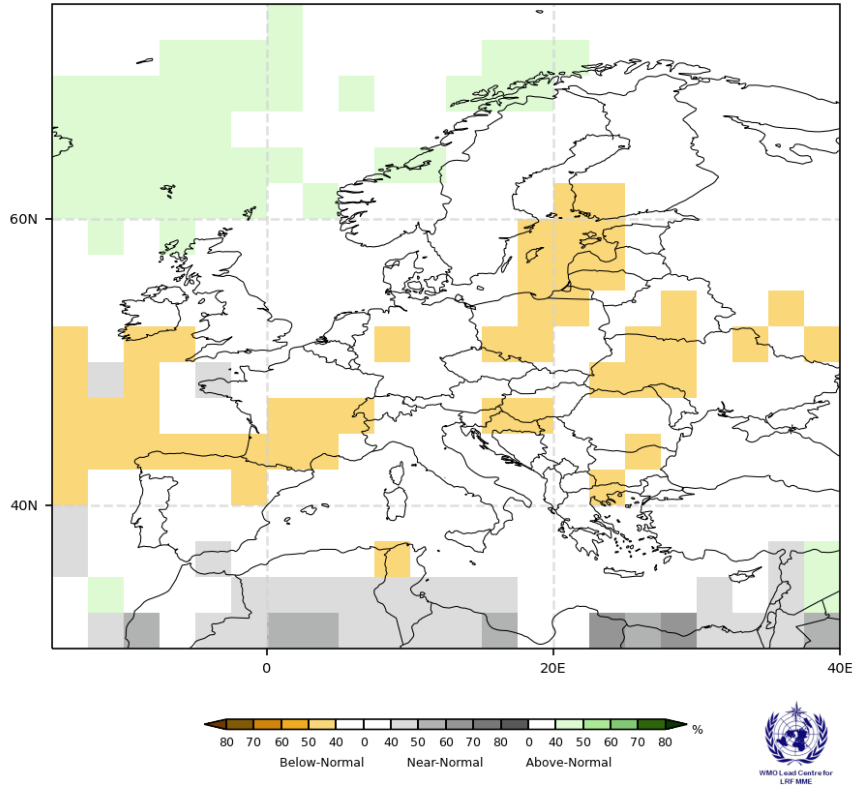
Temperature anomalies forecast

Probabilistic Multi-Model Ensemble Forecast

CMCC, CPTEC, ECMWF, Melbourne, Montreal, Offenbach, Seoul

Precipitation : JJA2024

(issued on May2024)



According to Probabilistic Multi- Ensemble forecast negative precipitation anomalies are expected over most of Europe, with low probabilities 40-50%.

<https://www.wmolc.org/>

The estimation of tercile-based categorical probabilities (Europe)

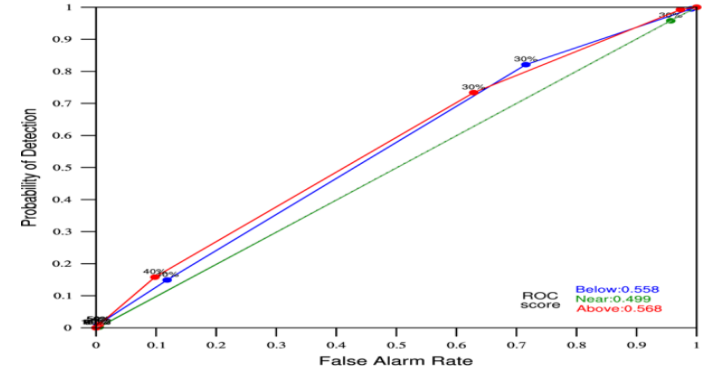
ROC Curve and Score

Beijing, CMCC, CPTEC, ECMWF, Exeter, Melbourne, Montreal, Moscow, Offenbach, Pretoria, Seoul, Tokyo, Toulouse, Washington

Lat : 30~75, Lon : -15~40

Precipitation : DJF

(Calculation Time : 1993 - 2009)



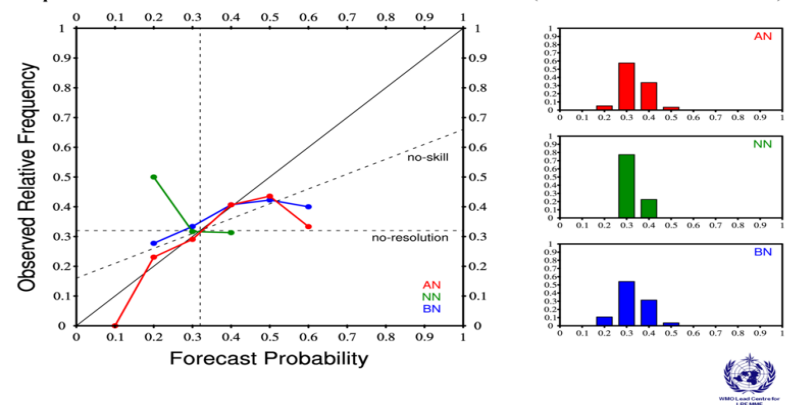
Reliability Diagram

Beijing, CMCC, CPTEC, ECMWF, Exeter, Melbourne, Montreal, Moscow, Offenbach, Pretoria, Seoul, Tokyo, Toulouse, Washington

Lat : 30~75, Lon : -15~40

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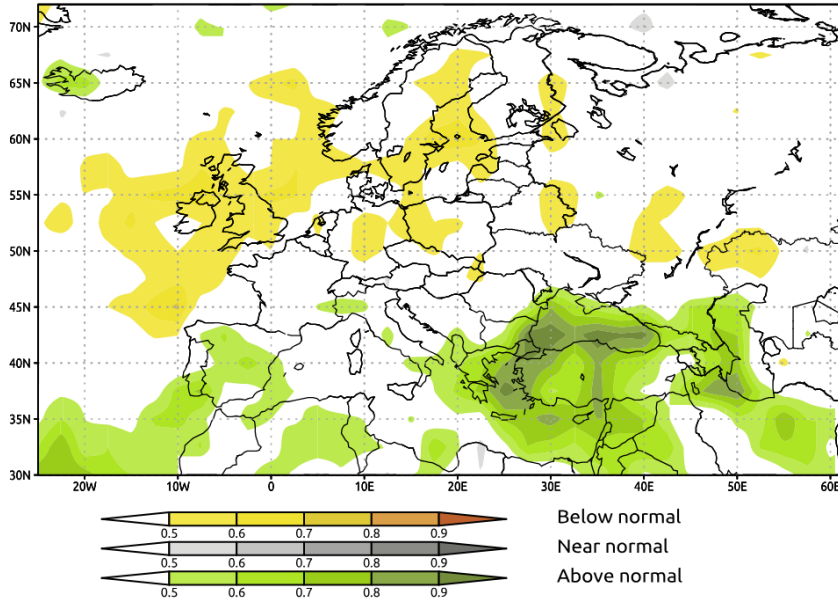


Forecast quality scores are approaching climate ones.

Precipitation forecast

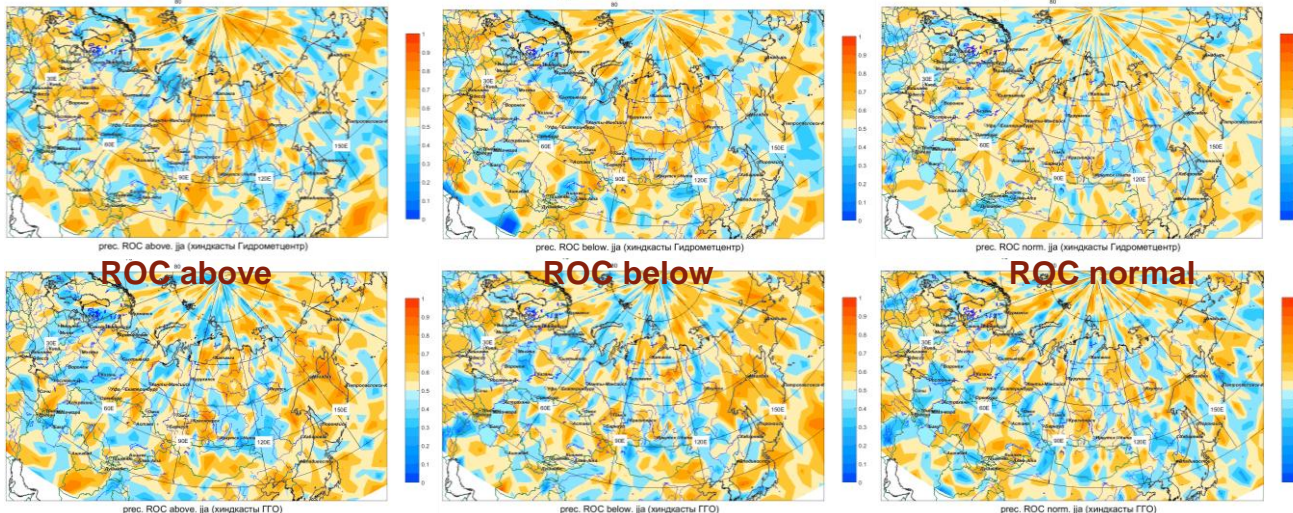
Composite probabilities of categorical forecast outcomes for precipitation seasonal anomalies. Producer: HMC (SL-AV) and MGO model.

Probabilistic forecast of precipitation [mm/day] in categories below/near/above norm. Models: PLAV:1, MGO:1
Forecast period: June/July/August 2024



From SL-AV and MGO model forecasts, precipitation below normal is seen in the north and east parts of Europe, also there is signal of positive precipitation anomalies in the Black Sea region, the Iberian Peninsula and the south of European Russia, with probabilities 60-70%.

ROC of probabilistic precipitation forecasts (top SL-AV, bottom MGO model).



Summary

- Most of models predict **neutral ENSO phase** for the summer 2024 (June-July). According to the CPC/IRI Consensus Probabilistic Forecast the probabilities for La Nina, neutral and El Nino conditions (using -0.5C and 0.5C thresholds) over the coming JJA 2024 season are: 32%, 62% and 6%.
- According to the forecasts of the Hydrometeorological Center of Russia, the prevalence of circulation regimes associated with the positive phases of NAO oscillation is expected in the coming summer 2024 . In the case of the positive phase of **NAO**, the zonal atmospheric processes is likely to prevail over the territory of Europe, especially in the first half of summer. Positive values of **EU** correspond to above normal the temperature tendency in most of northern Europe.
- **Summer season 2024** is expected to be **warmer** than normal across most of Europe, according to the most models. According to the forecasts of the HMC and MGO, the most significant positive anomalies are expected in southern Europe.
- According to the most models precipitation **below normal** is forecasted over most of Europe (probability 40-50%). According to the forecasts of the HMC and MGO, precipitation below normal is seen in the north and east parts of Europe, also there is a signal of **positive precipitation anomalies** in the Black Sea region, the Iberian Peninsula and the south of European Russia, with probabilities 60-70%. The signal from the index NAO and EU confirms excess moisture in the south of Europe.

Thank you !