

North EurAsia Climate Centre



SEASONAL OUTLOOK FOR SUMMER 2025 OVER EUROPE

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Sumerova K., Kulikova I., Khan V.

email for contact: sum-ksusha@yandex.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: Positive sea surface temperature anomalies (SSTA) are expected over most of the Indian Ocean, except for the northeastern part of
 the ocean and the area south of Madagascar. More significant positive anomalies are predicted in the eastern part of the tropical zone. Against this
 background, according to the Australian Meteorological Bureau, a transition to neutral phase of IOD in June and a negative phase of IOD in July and
 August of 2025.
- Pacific ocean: In equatorial latitudes, sea surface temperature (SST) in the eastern and central parts of the ocean is expected to be near normal.
 Positive SSTA are expected across most of the northern half of the ocean, excluding equatorial regions. Significant positive SSTA (up to 3°C) are predicted in temperate and subtropical latitudes of the northern part of the ocean.
- North Atlantic: Most models predict positive SSTA over most of the ocean, the most significant in the northeastern ocean and off the east coast of the United States.

https://www.wmolc.org/



El Nino / Southern Oscillation (SOI), IOD and PDO

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



Most of models predict **ENSO-neutral** conditions for the summer 2025 (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: 10%, 66% and 24%.

The Indian Ocean Dipole (IOD)



Australian Bureau predicts transition to neutral phase of IOD in June 2025 and a negative phase of IOD in July and August

Data by the Bureau of Meteorology of the Australian Government http://www.bom.gov.au/?ref=hdr

The Pacific ocean (PDO)



According to CFSv2 prediction, the he negative phase of PDO will continue through January 2026

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



According to the ensemble forecast of the ACCESS-S2 model (Australian Bureau) the beginning of the summer season 2025 will be marked by the phases 3 and 4 of the Madden-Julian Oscillation with ensemble mean amplitude less then 1. The influence of the MJO (Madden-Julian Oscillation) on the East Atlantic (EA) and North Atlantic Oscillation (NAO) is not as clearly pronounced as in the previously examined cases. Nevertheless, Phase 3 (Indian Ocean) and Phase 6 (Western Pacific) can be interpreted as precursors to circulation regimes associated with the negative and positive phases of the EA, respectively.(Kulikova I.A., Nabokova E.V., Khan V.M., Volodin E.M., Tarasevich M.A. Madden–Julian Oscillation in the Context of Subseasonal Variability, Teleconnections, and Predictability, DOI:10.3103/S1068373923080010)

Sea ice extent in the Arctic region





Overview ice map of the Arctic Region for 04/25/2025 – 04/29/2025 (color scheme for general cohesion) based on the ice analysis of NOVA Alaska (04/29/2025), AARI (04/29/2025), National Ice Center of the USA (04/25/2025) and the repeatability of the edge for the nearest pentad for the period 1991-2020. according to observations of SSMR-SSM/I-SMS (NASATEAM algorithm).



Sea ice thickness for 13/05/2025 and seasonal variation of sea ice volume in the Arctic based on calculations of the weighted average ice thickness of the joint sea ice-ocean model HYCOM/CICE of the Danish Meteorological Institute.

Top 10 lowest Arctic sea ice maximum extents

RANK	YEAR	MAXIMUM SEA ICE EXTENT		
		IN MILLIONS OF SQUARE KILOMETERS	IN MILLIONS OF SQUARE MILES	DATE
1	2025	14.33	5.53	March 22
2	2017	14.41	5.56	March 7
3	2018	14.47	5.59	March 17
4	2016 2015	14.51 14.52	5.60 5.61	March 23 Feb. 25
6	2023	14.62	5.64	March 6
7	2011 2006	14.67 14.68	5.66 5.67	March 9 March 12
9	2007 2021	14.77 14.78	5.70 5.71	March 12 March 12

Table 1. Top 10 lowest maximum Arctic sea ice extents (satellite record, 1979 to present)

The National Snow and Ice Data Center (NSIDC) <u>https://nsidc.org/home</u>, Russian Arctic and Antarctic Research Institute (AARI)) <u>http://www.aari.ru/</u>

- The picture on the left side shows the position of sea ice edge in the Arctic region for 04/25/2025-04/29/2025. The deviations occurred in the Bering sea;
- On March 22, 2025, Arctic sea ice reached its maximum extent for the year. This is the lowest maximum in the 47-year satellite record, with previous low maximums occurring in 2017, 2018, 2016, and 2015;
- The graph on the central side points out the changes of sea-ice volume (km3) from 2004 to 2025. In the winter 2025, March and April 2025 (black line) the values was below the normal relative to the average (2004-2013) and below the last 5 years. The ice thickness in the Russian Arctic sector is low;
- The table on the right side shows lowest Arctic sea ice maximum extents;
- The melting sea ice in turn promotes cloud development in the marginal ice zones and enhances downwelling longwave radiation at the surface toward the end of the season. A positive cloud feedback emerges. In midlatitudes, the more zonally tracking cyclones give stormier, cloudier, wetter, and cooer summers in most of northern Europe and around the Sea of Okhotsk. Farther south, the region from the Mediterranean Sea to East Asia experiences significant surface warming, possibly linked to changes in the jet stream. (Knudsen E.M.; Orsolini, Y.J, Furevik T., Kevin E.H. Observed anomalous atmospheric patterns in summers of unusual Arctic sea ice melt, 2015. https://doi.org/10.1002/2014JD022608)



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

Probabilistic Multi-Model Ensemble Forecast

CMCC, CPTEC, ECMWF, Exeter, Melbourne, Montreal, Moscow, Offenbach, Seoul, Tokyo, Washington, CMCC, CPTEC, CMWF, Exeter, Melbourne, Montreal, Moscow, Offenbach, Seoul, Tokyo, Washington, Montreal, Moscow, Montreal, Mont



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



Probabilistic Multi-Model Ensemble Forecast

CMCC, CPTEC, ECMWF, Exeter, Melbourne, Montreal, Moscow, Offenbach, Seoul, Tokyo, Washington, CMCC, CPTEC, CMWF, Exeter, Melbourne, Montreal, Moscow, Offenbach, Seoul, Tokyo, Washington, Montreal, Moscow, Offenbach, Seoul, Tokyo, Washington, Montreal, Moscow, Offenbach, Seoul, Tokyo, Washington, Montreal, Moscow, Montreal, Montr



According to the multi-model forecast, positive H-500 anomalies are expected to prevail over most of Europe, excluding the northern Scandinavia, with the highest probability (70–80%) concentrated over southern Europe and southern ER.

According to **the 850 hPa wind forecast**, anticyclonic winds are expected to prevail over northern Europe and the northern Pacific Ocean.

MPSL below normal with a probability of 60-80% is predicted in in southeastern Europe, southern Europe of Russia and the countries of Central Asia.

https://www.wmolc.org/

The forecast is issued in May 2025



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

Composite probabilities of categorical forecast outcomes for H500 seasonal anomalies (dm). Producer: SLAV+MGO Forecast period: June_July_August_2025 Composite probabilities of categorical forecast outcomes for mslp seasonal anomalies (mb). Producer: SLAV+MGO Forecast period: June_July_August_2025



According to the forecasts of SL-AV and MGO models, the geopotential in the middle troposphere is predicted to be above normal over south of Europe and European Russia, probability 60-70%.

There is some uncertainty in the MSLP forecast. A signal of below normal MPSL anomalies is in Scandinavia and in places in northeast Europe, on the Kola Peninsula, west of European Russia with a probability of 60-80%. The positive MPSL anomalies are expected on the Iberian Peninsula, probability 60-70%.

https://seakc.meteoinfo.ru/en/

The forecast is issued in May 2025



Composite probabilities of categorical forecast of Institute of Numerical Mathematics RAS (INM)

Composite probabilities of categorical forecast outcomes for

mslp seasonal anomalies (mb). Model: INM



Composite probabilities of categorical forecast outcomes for H500 seasonal anomalies (dm). Model: INM Forecast period: June_July_August_2025

According to the forecasts of INM models, the geopotential in the middle troposphere is predicted to be above normal over most of Europe and in European Russia, with high probabilities 90% in the Iberian Peninsula, southeast of Europe and southern European Russia.

In the MSLP anomaly about normal is predicted in northern part of Europe. A signal of below normal MPSL anomalies is in places in southeast Europe, with a probability of 70-80%.

The forecast is issued in May 2025

Teleconnection indices

NEACC North Eurasia Climate Centre

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

	JUNE-AUGUST 2025				
INDEX	JUNE	JULY	AUGUST	JUNE- AUGUST	
EA	-0,42	-0,12	-0,67	-0,52	
WA	-0,38	0,25	-0,32	0,14	
EU	-0,18	-0,11	-0,58	-0,35	
WP	0,49	0,49	0,10	0,49	
PNA	-0,43	-0,77	-0,86	-0,75	
NAO	0,27	0,18	0,19	0,30	
POL	0,25	0,36	-0,02	0,17	
AOS	-0,06	-0,12	-0,11	0,06	

- 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).

According to the SL-AV model forecasts, in the June-August 2025 period values of atmospheric circulation indices exhibits statistically insignificant values for analysis. This could indicate increased variability in atmospheric processes during the summer of 2025. The negative phase of the PNA does not show any significant impact on the territory of Europe.





120'W 100'W 10

Mean H-500 for the summer season (norms 1991-2020), ERA5



General circulation scheme for the summer season 2025 in The Northern Hemisphere



Mean atmospheric pressure for the summer season (norms 1991-2020), ERA5

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

http://neacc.meteoinfo.ru



Probabilistic Multi-Model Ensemble Forecast

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



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.

The estimation of tercile-based categorical probabilities (Global)

ROC Curve and Score

Beijing,CMCC,CPTEC,ECMWF,Exeter,Melbourne,Montreal,Moscow,Offenbach,Seoul,Tokyo,Toulouse,Washington Lat: -90-90, Lon: 0-360



Reliability Diagram

Beijing, CMCC, CPTEC, ECMWF, Exeter, Melbourne, Montreal, Moscow, Offenbach, Seoul, Tokyo, Toulouse, Washington Lat: 90-90, Lon: 0-360



Forecast quality scores are slightly higher than climate

https://www.wmolc.org/

Temperature forecast



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





From SI-AV and MGO model forecasts is some uncertainty in Central Europe. The positive temperature anomalies are expected in northeastern, western and southern Europe, with high probabilities 60-80% Composite probabilities of categorical forecast outcomes for T2m seasonal anomalies (grad K). Model: INM Forecast period: June_July_August_2025



According to the forecasts of INM model the positive temperature anomalies are expected over most of Europe, with probabilities 90%.

Temperature forecast



ROC of probabilisticT2M forecasts (top SL-AV, bottom MGO model).



Precipitation forecast



Probabilistic Multi-Model Ensemble Forecast

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



The estimation of tercile-based categorical probabilities (Global)

ROC Curve and Score

Precipitation : JJA

0.9

0.8

07

0.6

0.4

03

0.2

0.1 0.2 0.3

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Beijing, CMCC, CPTEC, ECMWF, Exeter, Melbourne, Montreal, Moscow, Offenbach, Seoul, Tokyo, Toulouse, Washington Lat: -90-90, Lon: 0~360

(Hindcast Periods : 1993 - 2009)



Beijing, CMCC, CPTEC, ECMWF, Exeter, Melbourne, Montreal, Moscow, Offenbach, Seoul, Tokyo, Toulouse, Washington Lat: -90-90, Lon: 0~360



According to Probabilistic Multi- Ensemble forecast negative precipitation anomalies are expected in northern France, Germany, eastern Europe and southeastern Europe, excluding the Balkan Peninsula, with low probabilities 50-60%. Forecast quality scores are approaching climate ones.

Precipitation forecast



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



From SI-AV and MGO model forecasts is some uncertainty. Precipitation above normal is seen in the British Isles, the Scandinavian Peninsula and north-eastern Europe, with probabilities 60-70%. Isolated areas of below-normal precipitation are expected in southern Germany, Switzerland, northern Italy, and the southern Balkan Peninsula. Composite probabilities of categorical forecast outcomes for Precipitation seasonal anomalies (mm/day). Model: INM Forecast period: June_July_August_2025



From INM model forecasts is some uncertainty. Normal amount of precipitation is seen in places in Central Europe and south-eastern Europe , with probabilities 60-80%. In some areas of the Iberian Peninsula and Scandinavian Peninsula, precipitation will be above average.

Precipitation forecast



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





Summary

- Most of models predict neutral ENSO phase for the summer 2025 (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 JJA 2025 season are: 10%, 66% and 24%.
- According to the forecasts of the Hydrometeorological Center of Russia, Circulation indicators forecast for the summer season exhibits statistically insignificant values for analysis. This could indicate increased variability in atmospheric processes during the summer of 2025.
- Summer season 2025 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 positive temperature anomalies are expected in
 northeastern, western and southern Europe, with high probabilities 60-80%. According to the INM model
 forecast, positive temperature anomalies are expected over most of Europe, with a 90% probability.
- According to the most models precipitation below normal is forecasted in the central and southern parts of Europe (probability 50-60%). According to the forecasts of the HMC and MGO, precipitation below normal is seen in southern Germany, Switzerland, northern Italy, and the southern Balkan Peninsula. Precipitation above normal is seen in the British Isles, the Scandinavian Peninsula and north-eastern Europe. EA index signal confirms moisture deficit in Southern Europe. According to the INM model, normal precipitation amounts are expected in Central and Southeastern Europe.

**The information in the bulletin is advisory in nature and should be applied to specific regions, taking into account the predictability of atmospheric processes, regional climatic features and the quality of modern hydrodynamic models.



Thank you !

