

The main features of large-scale atmospheric circulation in the Northern Hemisphere for the winter 2024-2025

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Seasonal the 500 hPa geopotential height and MSLP anomalies (ERA5 reanalysis, based on a 1991-2020 mean)



H500 dam anomalies (norms 1991-2020). DJF 2024.



In the troposhere:

- In the Northern Hemisphere, positive geopotential anomalies were predominant;
- The circumpolar cyclone was weakened, and a zone of positive anomalies formed over the pole. The center of the circumpolar cyclone was located in the

east of the polar regions of Canada, which is consistent with the climatic norm;

• Throughout the season, ridges of high-altitude anticyclones extended toward the pole from the northeastern Pacific Ocean.

At sea level:

- In the Atlantic, the position of the weakened Icelandic minimum is normal. The Azores maximum is not expressed on the monthly average map;
- Circulation over the Atlantic, Europe, and the European part of Russia was uneven during the season.

MSLP hPa anomalies (norms 1991-2020). DJF 2024.

Temperature





Territory		Positive anomaly	Negative anomaly	
Europe		over most	-	
Russ	sia	over most, excluding the central regions of Chukotka and the north of Kamchatka Krai, where the temperature was normal	-	
Central	Asia	Kazakhstan, western Uzbekistan, eastern Kyrgyzstan	southeast of Turkmenistan	

T2M deg anomalies (norms 1991-2020). DJF 2024.

Seasonal temperature 2m anomalies (ERA5 reanalysis, based on a 1991-2020 mean)

Territory	Temperature, °C	Rank		Anomaly
		Current	Warmest	
		year		
Northern Hemisphere	11,3	1 (with 2024)		1,2
Arctic	-20,3	2	2018	2,6
Europe	4,9	9	2020 2020	1,3
Russia	-15,4	2	2020	3,2
European Russia	-4,1	2	2020	3,2
Northern Asia	-18,5	1		3,3

Data by the Hydrometeorological Center of Russia.

Precipitation





PREC sigma anomalies (norms 1991-2020). DJF 2024.

Precipitation anomalies (ERA5 reanalysis, based on a 1991-2020 mean)

- The observed processes of blocking and the predominance of anticyclonic circulation patterns contributed to the precipitation deficit in the eastern half of Europe, in the center and south of the European part of the Russian Federation;
- The shift of the Icelandic minimum troughs to the east and their influence on the north of the European part of Russia, the Northern Urals and the north of Siberia was reflected in the excess of precipitation in these areas;
- Low winter precipitation was observed in southern Central Asia, northern China, and parts of Mongolia due to the influence of the Siberian High.

SST in Northern Hemisphere





SST deg anomalies (norms 1991-2020). DJF 2024.



Seasonal SST anomalies (ERA5 reanalysis, based on a 1991-2020 mean)

<u>SST:</u>

- Positive anomalies SST were observed over much of the Pacific Ocean in the Northern Hemisphere. The highest positive anomalies SST were observed near the coast of Japan and in the center of temperate latitudes of the ocean (more than 3°);
- Negative SST anomalies were observed off the coasts of the United States and Mexico and in the northern East China Sea;
- Colder than normal SST in the Atlantic Ocean was in the north near the southwest coast of Greenland and north of Iceland, and in the west – near the east coast of Canada and the United States. In the rest of the ocean, anomalies were positive;
- The negative anomalies of SST developed in the central and eastern parts of equatorial Pacific;
- The winter season a cold phase of La Niña was observed (data by CPC NOAA).

Sea ice extent in the Arctic region





Ice edge and areas of rarefied (<8/10) and cohesive (≥8/10) ice in the Arctic Ocean on a) 31.12.2024; б) 28.01.25; в) 26.02.25 based on the ice analysis of the US NIC, and edge repeatability from 21-25.04 for the period 1979-2017 according to SSMR-SSM/I-SSMIS observations (NASATEAM algorithm).

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

Top 10 lowest Arctic sea ice maximum extents

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

Sea ice extent was below average all months of the season in the Barents Sea, Bering Sea, and Sea of Okhotsk

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 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. This year's maximum occurred 10 days later than the 1981 to 2010 average date of March 12.

Snow cover in Russia





Anomalies (1981-2021) of snow cover height in the Northern Hemisphere on: a) 20.12.23, б) 31.01.24, в) 20.02.24.

- Negative snow depth anomalies were observed in the European part of Russia;
- Positive anomalies in snow cover depth were observed in most of the Asian territory of Russia; they were greatest in the north of Krasnoyarsk Krai, in the Yamalo-Nenets Autonomous Okrug, in the Amur Region and the north of the Chukotka Autonomous Okrug;



Thank you very much 🙂

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