

SEASONAL OUTLOOK FOR SUMMER 2021 OVER ASIAN PART OF RUSSIA AND CENTRAL ASIA

The 17th Forum on Regional Climate Monitoring-Assessment-Prediction for Asia (FOCRAII)

7 May 2021

Authors: E.Kaverina, K.Sumerova, I.Kulikova, E.Kruglova, V.Tischenko, V.Khan

Speaker: Ekaterina Kaverina

http://neacc.meteoinfo.ru

Content

The main features of atmospheric circulation in winter 2020-21.

Seasonal forecast for summer 2021.

- El Nino/Southern Oscillation. Sea surface temperature (SST).
- Sea ice extent in the Arctic region.
- Snow cover over Russian Federation.
- General circulation.
- Teleconnection indices.
- Temperature and precipitation.

Summary



North EurAsia Climate Centre

Winter 2020-21

Atmospheric circulation

North EurAsia Climate Centre

Seasonal the 500 hPa geopotential height, MSLP, temperature 2m anomalies and precipitation anomalies (ERA5 reanalysis, based on the 1981-2010 mean)



H500 dam anomalies (norms 1981-2010). ERA5. Winter 2020.



T2M deg anomalies (norms 1981-2010). ERA5. Winter 2020.



MSLP hPa anomalies (norms 1981-2010). ERA5. Winter 2020.

ERA5 reanalysis for precipitation [mm/day] anomalies

Period: December 2020 – February 2021

In the troposphere:

- The winter season is characterized by powerful tropospheric ridges over the polar region;
- Highly negative AO was observed during the winter;
- The circumpolar vortex was deformed and displaced from its normal position.

At sea level:

- The Siberian maximum was degraded and it's center was shifted to the southeast of it's climatic position;
- Above the polar region anticyclones were constantly located during the season;
- In the North Pacific Ocean, both centers of atmospheric action were active.

Temperature:

- An extensive area of negative anomalies were observed in most of Russian (down to -6°C in the north of the Urals and West Siberia);
- In the Russian sector of the Arctic, anomalies up to +7°C.

Precipitation:

- An excess of precipitation was observed in the south of Siberia;
- There was a deficit of precipitation in the northwest of the Krasnoyarsk Territory, in the south of Central Asia.

Arctic sea ice extent and Snow cover

North EurAsia Climate Centre



The position of the ice edge and areas of rarefied (<8/10) and cohesive (\geq 8/10) ice of the Arctic Ocean on 02.03.21 based on the ice analysis of the NSIDC and edge repeatability from 26-30.04 for the period 1991-2020 according to observations SSMR-SSM/I-SSMIS (NASATEAM algorithm). Arctic and Antarctic Research Institute (AARI), Russia. *http://www.aari.ru/*



Daily analysis of snow cover anomalies, cm (based on a 1961-1990 mean). Produced by Main Computer Center of Federal Service for Hydrometeorology and Environmental Monitoring (MCC of Roshydromet), Russia

- In all winter months, a gradual increase of the ice edge to mean long-term boundaries was observed.
- Last winter became quite snowy for the territory of Asian part of Russia (anomalies up to +55..+60cm);
- The most noticeable positive anomalies during winter were observed in the north and south of Siberia and in the Primorye krai;
- The significant deviations towards the negative anomalies of snow cover height was seen in the Khabarovsk krai, Magadan region, in the central part of Yakutia and in the south of Kamchatka peninsula.

North EurAsia Climate Centre

Seasonal forecast for summer 2021

LC MMELRF-WMO Lead Centre for MME LRF

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



CPC CONSOL - NASA GMAC DYN AVG STAT AVG NCEP CESV2 **IRI/CPC** LDEO MetERANCE GEDI SPEAR KMA SNU **UKMO** CMC CANSI BCC CSM11m IOCAS ICM COLA CCSM SINTEX-F AUS-ACCESS ECMW atistical Models OF CPC MRKOV - CPC CA - CSU CLIPP - IAP-NN - BCC RZDM - UCLA-TCD - FSU REGR FORECAST NTU CODA ASC SON

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

Most of the models predict neutral conditions for the summer 2021 (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 2021 season are: 20%, 68% and 12%.

In the Indian Ocean: According to the forecasts of the most centers the positive SST anomalies are found in the equatorial latitudes in the east part of Indian ocean and near the western coast of Australia.

In the Pacific Ocean: The slightly negative anomalies are forecasted in the eastern equatorial latitudes. The significant positive SST anomalies are expected in the midlatitudes in the Northern Hemisphere.

Arctic sea ice extent and Snow cover.

North EurAsia Climate Centre



Daily analysis of snow cover height anomalies (cm) on 30/04/2021 in Russian Federation (based on mean 1961-1990). Produced by Main Computer Center of Federal Service for Hydrometeorology and Environmental Monitoring (MCC of Roshydromet), Russia. *http://www.aari.ru/*



The 365 days daily window-smoothed values of the ice cover for the Arctic, Antarctic and the Earth from 26/10/1978 to 02/05/2021 based on SSMR-SSM / I-SSMIS. Arctic and Antarctic Research Institute (AARI), Russia

- The graph on the right side points out the changes of ice cover (km²) from 1978 to 2021. In the winter 2020-21 the values were close to normal and even a bit higher than normal.
- The picture on the left side shows the anomaly of snow cover in Russia on April 30. The positive anomaly is observed in Siberia, the most significant anomalies is seen in the east part of Eastern Siberia (up to 69-86 cm). Furthermore, less snow than normal in the Kamchatka peninsula and the south of Far East.

GENERAL CIRCULATION: 500 hPa height

North EurAsia Climate Centre



According to the forecasts of HMC+MGO, during the summer 2021 the 500 hPa geopotential height above normal is forecasted in the south of Siberia and of Far East, the probabilities are 60-80%.

According to the multi-model forecast, with a probability of 50-70%, a gradation above normal is predicted in most of North Eurasian territory. The positive anomaly is expected with a probability of 70-80% in the south of East Siberia and the south of Far East.

The forecast is issued in April 2021

Mean sea level pressure (MSLP)

North EurAsia Climate Centre



There are some uncertainties in the MSLP forecast from HMC+MGO over most of Asia. During the summer 2021, the signal of the positive anomalies is forecasted over Khabarovsk krai (south of Far East), MSLP close to normal is seen in the Baikal area and the south of Central Asia, with the probabilities 50-70%.

According to the multi-model forecast, pressure below normal with a probability of 50-70% is predicted in the south of Siberia and in Central Asia.

Teleconnection indices

 Table. Indices oscillation forecasts.

Data from Hydrometeorological centre of Russia (SL-AV).

	JUNE-AUGUST 2021			
INDEX	JUNE	JULY	AUGUST	JUNE-AUGUST
EA	0,44	-0,03	-0,87	-0,21
WA	-0,13	0,43	-0,8	-0,14
EU	0,21	-0,06	-0,85	-0,3
WP	0,36	-0,13	-0,85	-0,29
PNA	-0,19	0,39	0,03	0,08
NAO	-0,32	-0,72	0,76	-0,12
POL	0,09	-0,61	0,75	0,22
AOS	-0,13	-0,13	-0,1	-0,12

North EurAsia Climate Centre

 East Atlantic (EA), 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 forecasts of **POL** index, the season is expected to be heterogeneous. In the first (second) half of summer, the weakening (strengthening) of the circumpolar vortex is possible. In the second (first) half of summer negative (positive) temperature anomalies are most likely in the north (south) of Siberia and excessive moisture (precipitation deficit) is likely in the north (south) of Far East region;

- The WP index, like the POL oscillation, indicates the prevalence of negative (positive) temperature anomalies and excessive moisture (precipitation deficit) in the north (south) of Siberia and in Far East in the first (second) half of summer;
- In the case of a negative phase of the EU index (second half of summer), the cyclones are most likely in West Siberia, anticyclone weakens and shifts to the west. The negative phase of EU is associated with the negative temperature anomalies in West Siberia, in the west of Central Asia, in Mongolia and north-west China.

Teleconnection indices

555

Eurasian oscillation



West Pacific oscillation

WP (negative phase), parameter: H500 Period: August

Polar oscillation







Geopotential



Temperature







Precipitation

Temperature forecast

North EurAsia **Climate Centre**

1601



Producer: LC MMELRF-WMO Lead Centre for MME LRF, https://www.wmolc.org/

Composite probabilities of categorical forecast outcomes for T2m seasonal anomalies. Producer: HMC (SL-AV)+MGO. http://neacc.meteoinfo.ru

According to the multimodel forecast of MGO and HMC, the positive temperature anomalies are expected over West Siberia, the south of East Siberia and of Far East, in the south of Chukotka, the probabilities are 60-80%.

According to the multi-model forecast, the temperature anomalies above normal are expected over most of Northern Eurasia. The most likely (over 70%) a gradation above normal is predicted in the south of East Siberia and of Far East, and in the east of Central Asia.

The forecast is issued in April 2021

Precipitation forecast

North EurAsia Climate Centre



From HMC+MGO forecasts. There are many uncertainties in the forecasts of precipitation. A weak signal associated with excessive moisture can be traced in the northeast of Far East, and deficit precipitation is forecasted in the some places of the south of Far East region.

According to the multi-model forecast, excessive precipitation is predicted in the northeast of Yakutia, in Chukotka, Kamchatka peninsula, and Primorye krai, the probabilities around 50%. Precipitation deficit is expected in the east part of Central Asia, with probabilities 40-60%.

Verification of HMC and MGO models

North EurAsia **Climate Centre**

0.8

0.6

0.4

0.2

0

-0.2

-0.4

-0.6

Anomaly correlation coefficient (ACC)



t2m. ACC. јја (хиндкасты Гидрометцентр)



t2m. ACC. јја (хиндкасты ГГО)

Distribution of anomaly correlation coefficients (ACC) for the seasonal (summer, JJA) 2m temperature over the North Eurasian territories, the hindcasts for the period 1985-2010 on the left side the SL-AV model (the model of Hydrometeorological centre of Russia (HMC) and on the right the MGO model (the model of Main Geophysical Observatory (MGO)). Forecast lead-time is one month. http://neacc.meteoinfo.ru

The results of PIAV and MGO hindcasts (1985 -2010) verification are satisfactory (AC> 0.5-0.6) over most of Northern Asia. The use of a multi-model approach allows us to compensate the limitations of individual models, primarily in the regions where forecasts are not successful.

Summary

There are main features for the upcoming summer 2021 from NEACC, that based on the forecasts of NEACC and WMO LC.

- 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 2021 season are: 20%, 68% and 12%.
- Most of the centers predict significant positive SST anomalies in the North Pacific Ocean connected with the negative phase of PDO. It can drive the variations of the geographical position and intensity of the Pacific maximum and the Aleutian minimum. The significant temperature and precipitation anomalies are possible in the East of Asia as a result.
- According to the forecasts of indices, the summer season 2021 is expected to be heterogeneous.
- The summer season is expected to be warmer than normal over most of Asian part of Russia and Central Asia. The positive temperature anomalies are most likely in the south of East Siberia, and in the south of Far East.
- There are a lot of uncertainties in the precipitation forecasts. The weak signal is marked only in the south (north) of Far East, where below (above) normal precipitation is expected.

North EurAsia Climate Centre

Thank you for your attention! \odot

Ekaterina Kaverina ringanieva@gmail.com

http://neacc.meteoinfo.ru