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SEASONAL OUTLOOK FOR SUMMER 2022 OVER ASIAN PART OF RUSSIA AND CENTRAL ASIA

The 18th Forum on Regional Climate Monitoring-Assessment-Prediction for Asia (FOCRAII)

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Content

The main features of atmospheric circulation in winter 2021-22.

Seasonal forecast for summer 2022.

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

Summary

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Winter 2021-22

Atmospheric circulation

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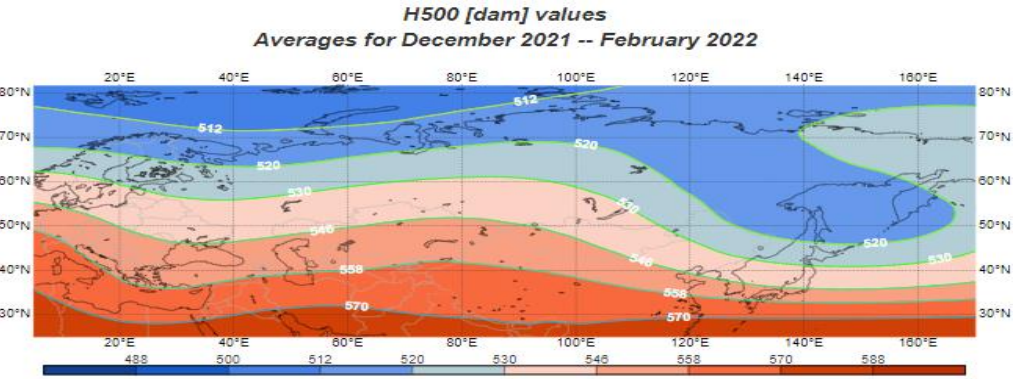
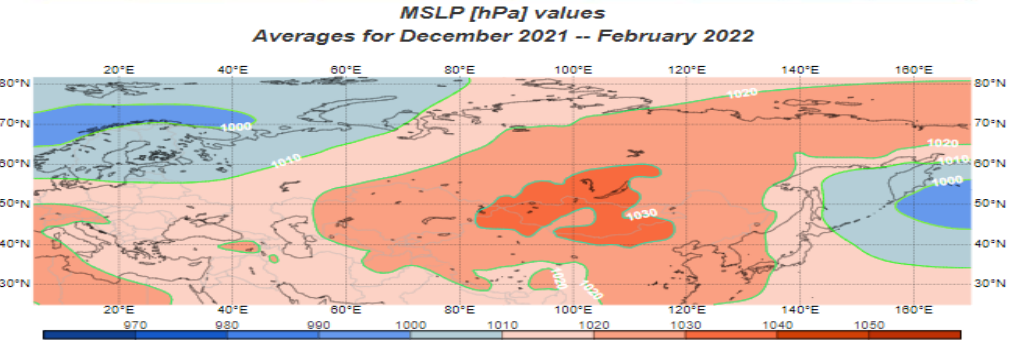
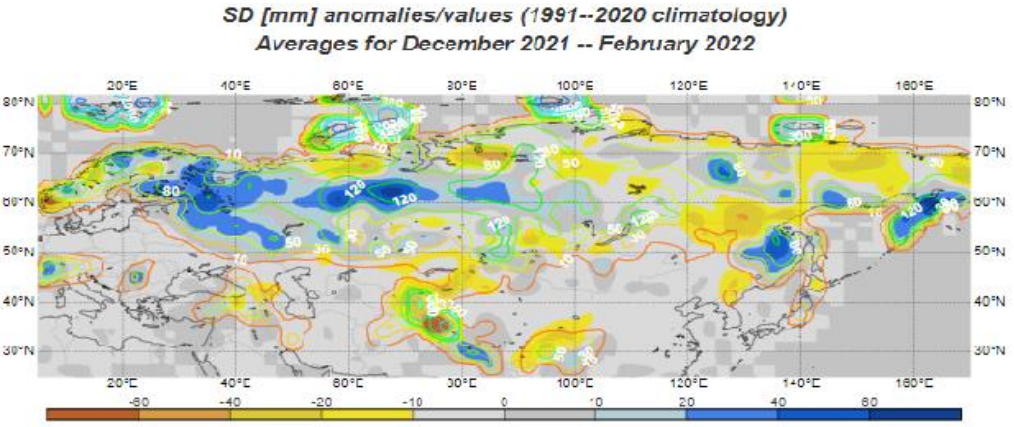
Seasonal the 500 hPa geopotential height and MSLP values, anomalies of water eqiuvalent of snow depth (ERA5 reanalysis, based on the 1991-2020 mean)







In the middle troposphere:

- The winter season is characterized by powerful tropospheric ridges over the polar region;
- Positive AO and NAO were observed during the winter;
- The circumpolar vortex was deformed, but the position was close to the climate.

At sea level:

- The Siberian maximum was located to close it's climatic position. The intensity of SH varied from month to month;
- In the North Pacific Ocean, both centers of atmospheric action were replaced from their normal position.

Snow water equivalent (snow depth SD):

Due to the positive values of the SH index (0.16, -0.35 and 1.1, respectively, in December, January and February), there was a deficit of snow cover in most of North Asia. And the snow depth above normal was only in the central regions of the West Siberia and in the south of the Far East (including Kamchatka).

Atmospheric circulation

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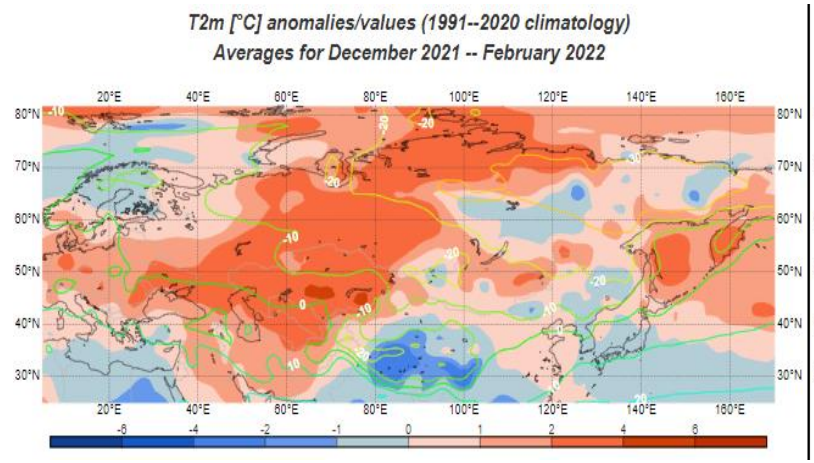
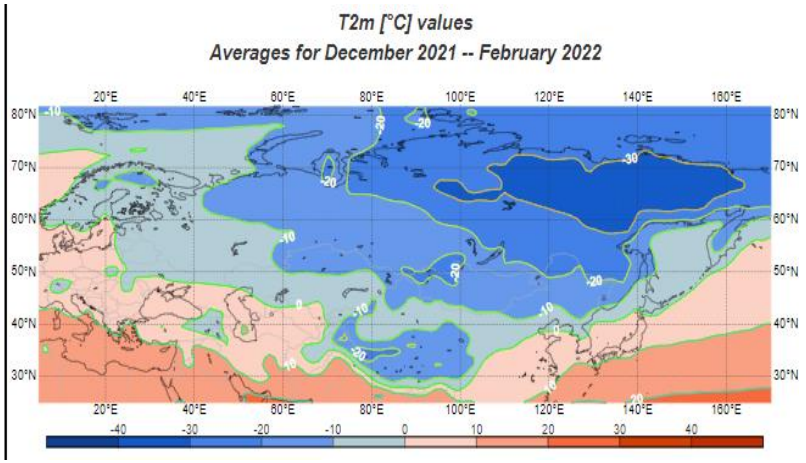
Seasonal temperature 2m anomalies and precipitation anomalies (ERA5 reanalysis, based on the 1991-2020 mean)



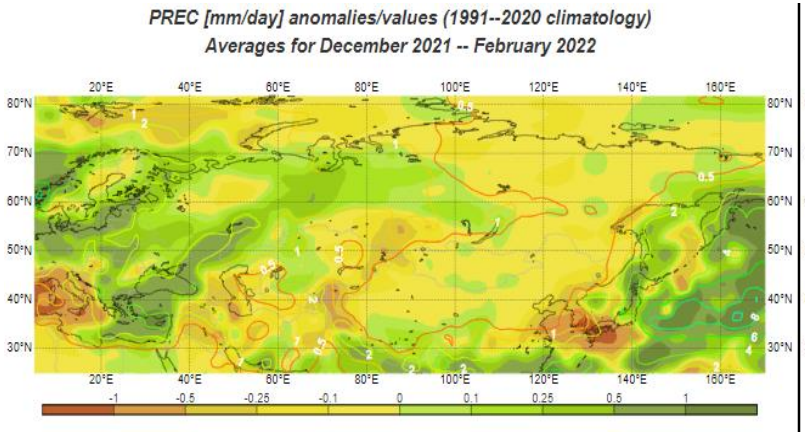


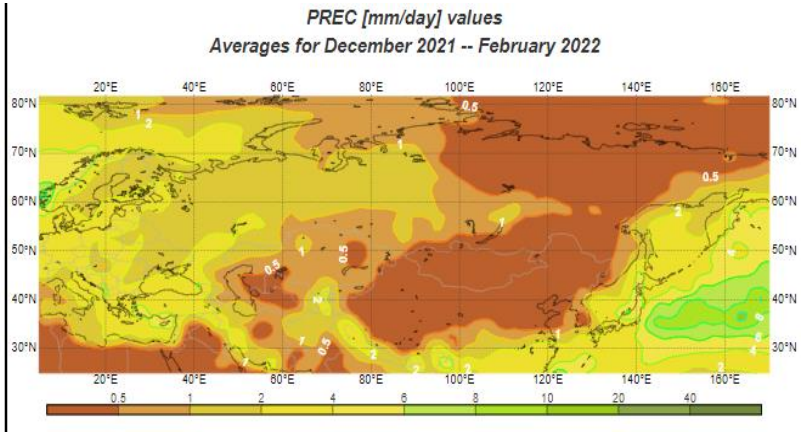
Temperature:

- An area of negative anomalies were observed in the south and northeast of Yakutia and the south of Far East;
- In the West Siberia, the northwest of Yakutia, Kamchatka, Chukotka and in Central Asia, positive anomalies up to +6°C.

Precipitation:

- An excess of precipitation was observed in near Baikal region, the north half of Far East including Kamchatka;
- There was a deficit of precipitation in the east part of Central Asia.





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Seasonal forecast for summer 2022

El Nino / Southern Oscillation. SST.

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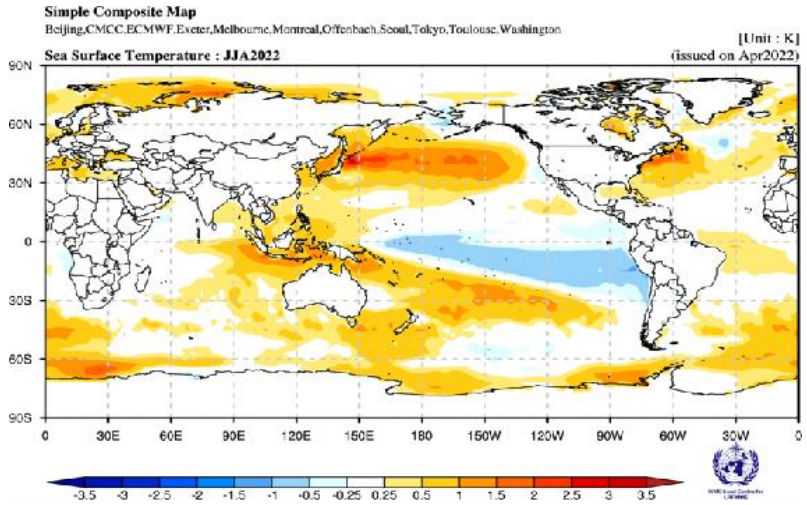

The SST anomalies forecast. Producer: LC MMELRF-WMO Lead Centre for MME LRF, *https://www.wmolc.org/*

In the Indian Ocean: 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 of the Northern Hemisphere, related to the negative phase PDO.

Most of the models predict equal chances for La Nina and neutral conditions for the summer 2022 (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 2022 season are: 49%, 49% and 2%. http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/

The impact of La Nina over North Eurasia. According to the Tokyo climate centre, the temperature below normal is seen in the south of Siberia, dry conditions are observed in most of Central Asia[1]. According to IRI data, there is a deficit of precipitation in the south of Central Asia (in Uzbekistan, Turkmenistan and Tajikistan)[2].

[3]The effect of ENSO on dry–wet changes varies with the PDO phase. Due to the effects of the cold PDO phase, La Nina-induced wet areas become wetter and the dry areas become drier and smaller.

[4] From a study by Dr. Mokhov et al., 2020, The number of typhoons in the NWPO that moved to extratropical latitudes in years beginning in the neutral phase is higher than in years beginning in El Niño and La Niña phases, with an impact on the Far East region of Russia.

1. https://ds.data.jma.go.jp/tcc/tcc/products/climate/ENSO/lanina.html#DJF
2. https://iri.columbia.edu/our-expertise/climate/enso
3. Combined effects of the Pacific Decadal Oscillation and El Nino-Southern Oscillation on Global Land Dry–Wet Changes. ***Shanshan Wang, Jianping Huang, Yongli He & Yuping Guan. 2014.***
4. Tropical cyclones and their transformation into extratropical: estimates of half-century trends. I. I. Mokhov, M. E. Makarova, A. G. Poroshenko, 2020.

Arctic sea ice extent.

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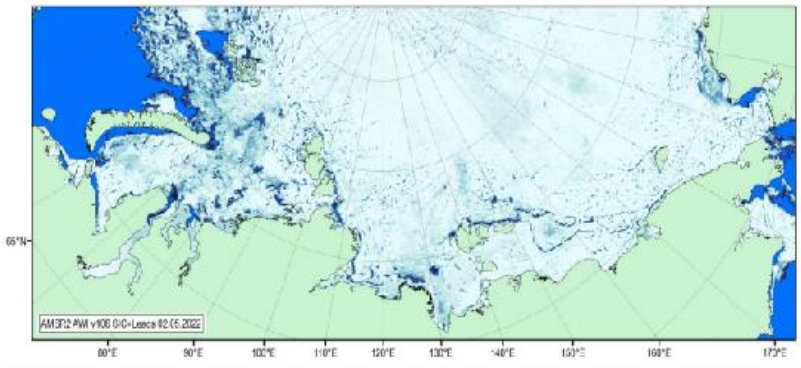
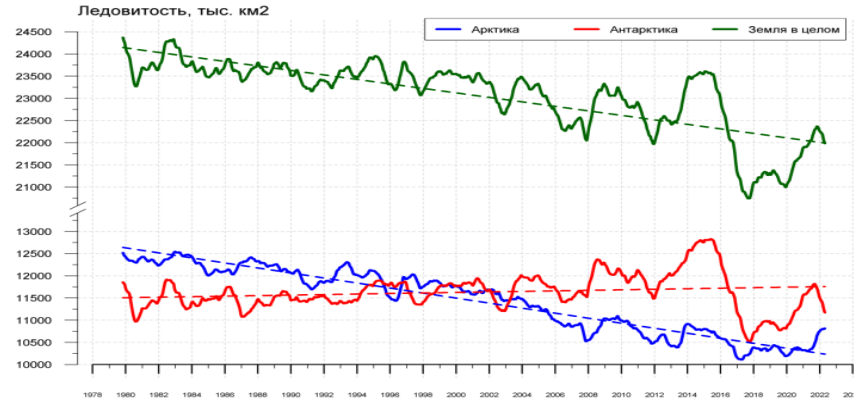
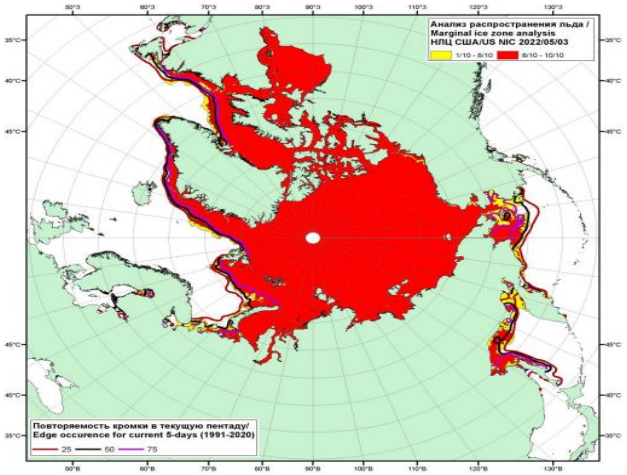


Assessment of ice concentration and location of polynyas according to AMSR2 satellite data for 05/02/2022.



The 365 days daily window-smoothed values of the ice cover for the Arctic, Antarctic and the Earth from 26/10/1978 to 24/04/2022 based on SSMR-SSM / I-SSMIS. Arctic and Antarctic Research Institute (AARI), Russia



The position of the ice edge and areas of rarefied (<8/10) and cohesive (≥8/10) ice of the Arctic Ocean on 03.05.22 based on the ice analysis of the NSIDC and edge repeatability from 01-05.05.22 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/*

The picture on the left side shows assessment of ice concentration and location of polynyas according to AMSR2 satellite data for 5th of May 2022. The Barents sea is free from ice cover and the Kara sea is covered with polynyas which is corellated with the observed positive temperature anomaly in the north of Siberia during the last winter season.

The graph on the right side points out the changes of ice cover (km^2) from 1978 to 2022. In the winter 2021-22, the values were close to minimal records.

The possible impact on the summer season JJA 2022: most likely significant positive temperature anomalies over Siberia and Far East (north part), *the storm tracks moving southward from Arctic zone.

Observed anomalous atmospheric patterns in summers of unusual Arctic sea ice melt.* ***Erlend M. Knudsen, Yvan J. Orsolini, Tore Furevik, and Kevin I. Hodges, 2015*

GENERAL CIRCULATION: 500 hPa height and MSLP

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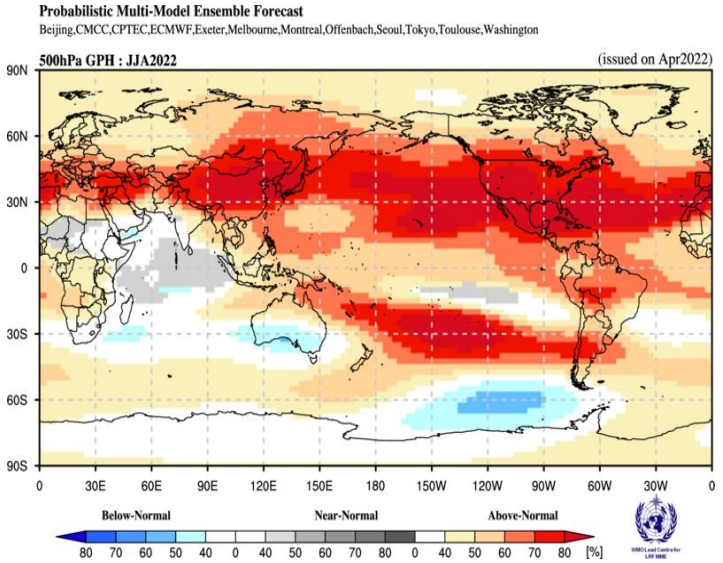
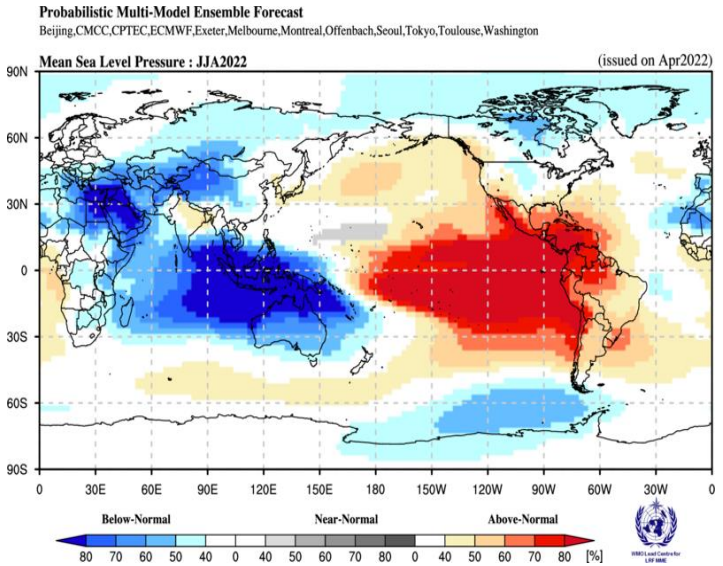
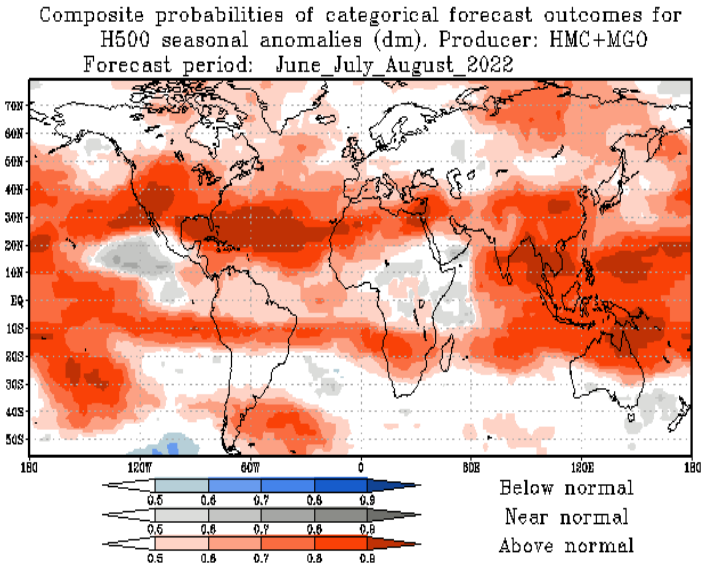
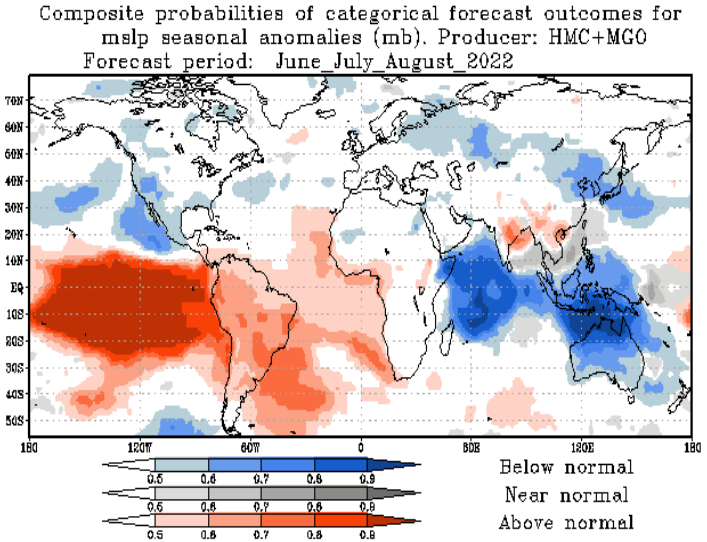




The 500-hPa geopotential height and MSLP probabilistic forecast. Producer: LC MMELRF-WMO Lead Centre for MME LRF, https://www.wmolc.org/





Composite probabilities of categorical forecast outcomes for H500 and MSLP seasonal anomalies. Producer: HMC (SL-AV)+MGO. *http://neacc.meteoinfo.ru*

During the summer 2022:

H500 above normal is forecasted over the most Asian part of Russia. The highest probabilities are in the south of Siberia and of Far East.

MSLP below normal is expected to in the south of Siberia and in Central Asia.

Teleconnection indices

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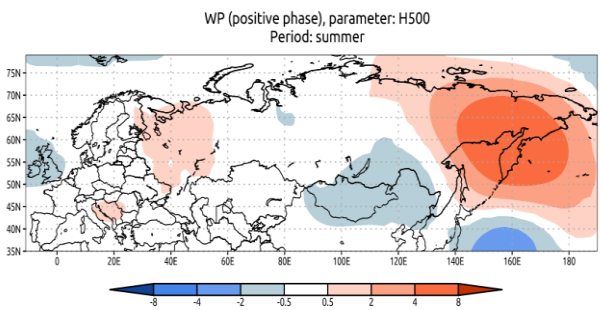
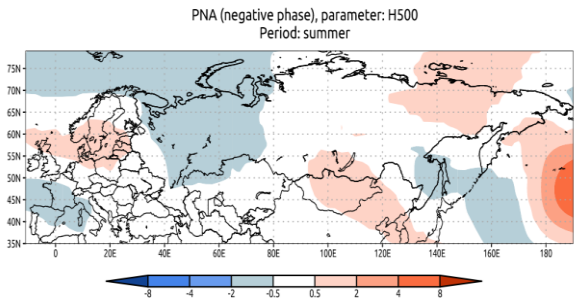
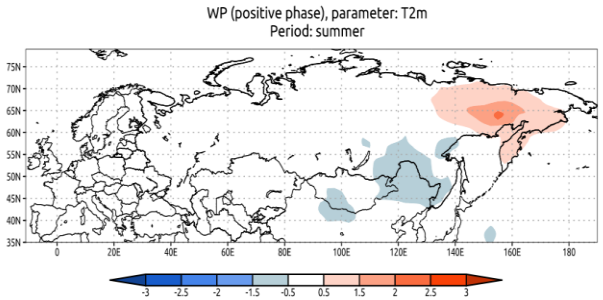
West Pacific oscillation

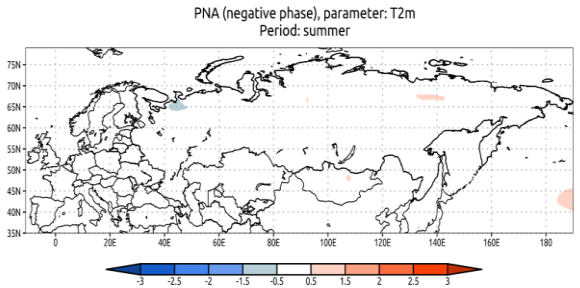


Pacific North-American oscillation

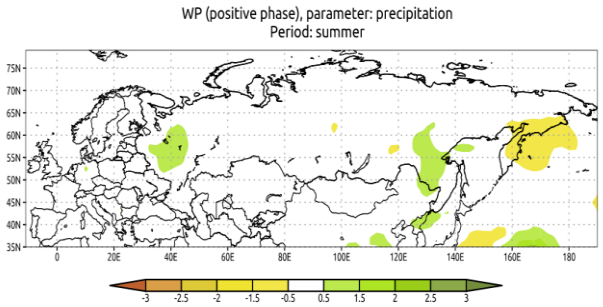


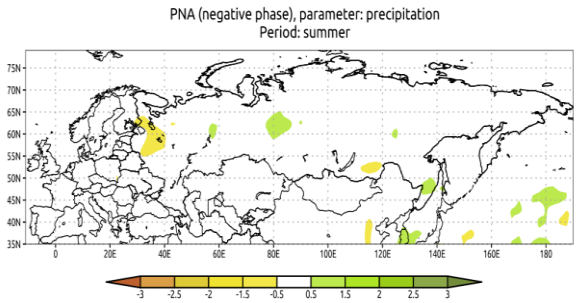
Geopotential





Temperature





Precipitation

In the case of a negative phase of the **PNA** index and a positive phase of the **WP** oscillation (second half of summer), the blocking processes are most likely over north Pacific ocean, the Subtropical maximum and Aleutian low are likely to be replaced from their's climatic positions. The positive (negative) temperature anomalies are seen in the north (south) of Far East and excessive moisture is in the south of Far East.

Temperature and Precipitation forecast

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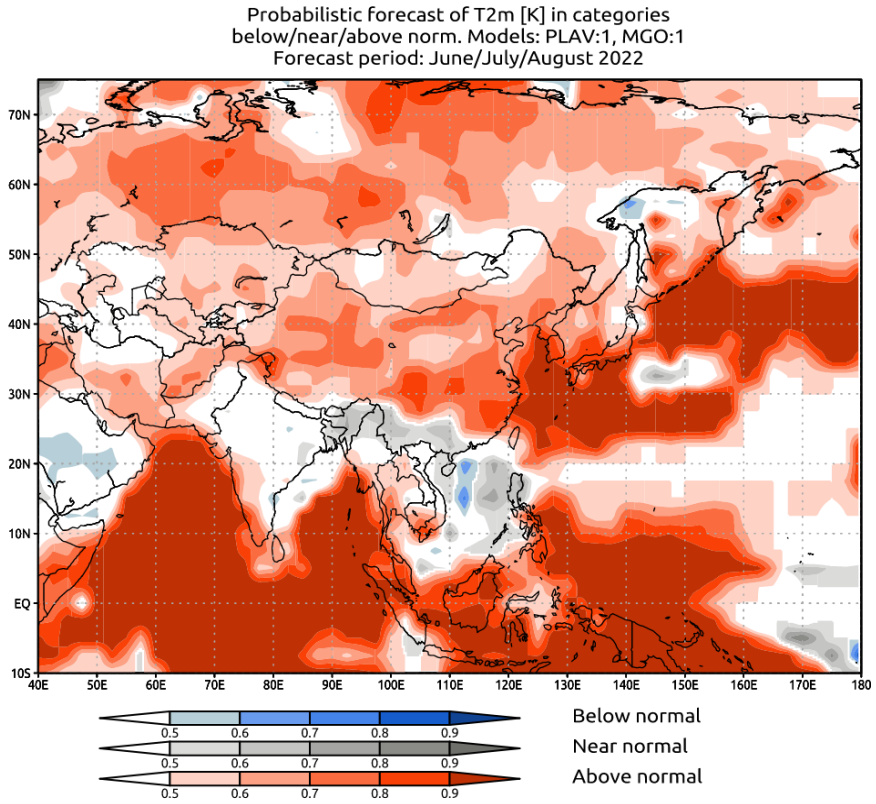

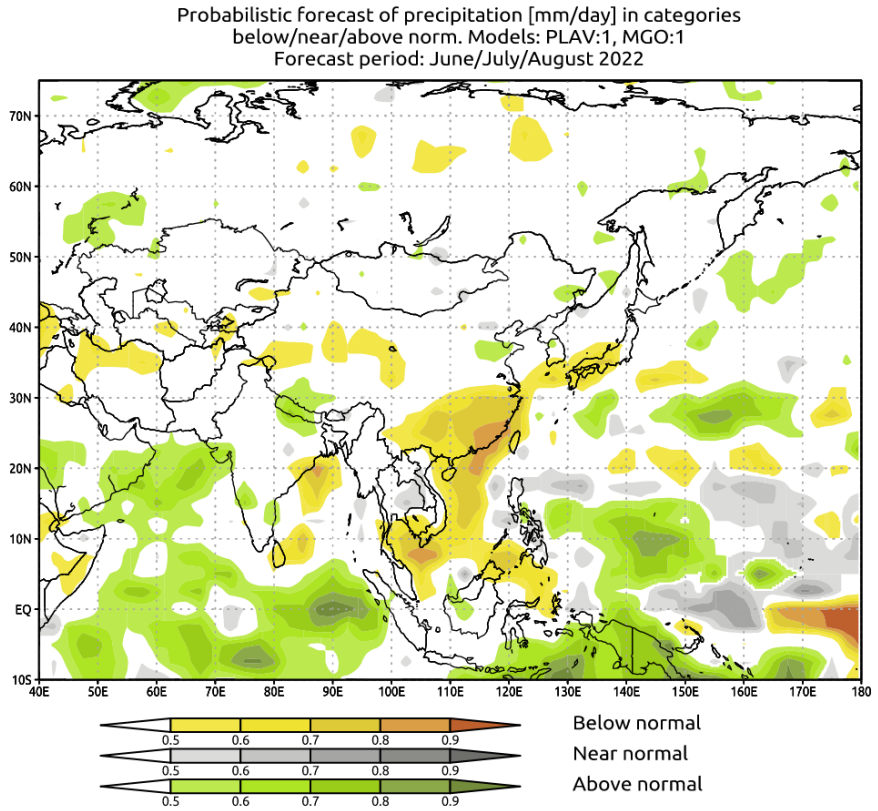

According to the forecast, the positive temperature anomalies are expected to in the West Siberia, and the south of Far East, the probabilities are 50-70%.

Precipitation deficit is forecasted in the south part of Central Asia. An excessive moisture is seen in the south of Far East.

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

Summary

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There are main features for the upcoming summer 2022 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 2022 season are: 49%, 49% and 2%.
- 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 Subtropical high and the Aleutian low. The significant temperature and precipitation anomalies are possible in the East of Asia as a result.
- According to the forecasts of indices, the blocking processes are most likely to affect the Asian territory of Russia during the summer season 2022.
- 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 Siberia, and in the southeast of Central Asia.
- As for precipitation forecasts, the significant signal is marked in the south of Far East, where above normal precipitation is expected, and also a dry conditions is forecasted in the south of Siberia and in Central Asia.

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Thank you for your attention! ☺

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