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SEASONAL OUTLOOK FOR WINTER 2020-21 OVER ASIAN PART OF RUSSIA

Eighth Session of the East Asia winter Climate Outlook Forum (EASCOF)

5 November 2020

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http://neacc.meteoinfo.ru

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Content

The main features of atmospheric circulation in summer 2020.

Seasonal forecast.

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

Summary

NEACC background

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For RA-VI Region NEACC functions as one of Long-Range Forecast nodes of the RA-VI Regional Climate Network.

For RA-II Region NEACC functions as a Multifunctional Regional Climate Center.

NEACC is a contributor to FOCRA, PRESANORD, ARABCOF, PARCOF, MEDCOF, SEECOF

NHMSs of CIS

+

Consortium of the Roshydromet organizations:

1. Hydrometeorological Research Centre of the Russian Federation
2. Institute of Global Climate and Ecology
3. Russian Research Institute for Hydrometeorological Information – World Data Centre
4. A.I. Voeikov Main Geophysical Observatory
5. Droughts Monitoring Centre, Russian Research Institute of Agricultural Meteorology
6. Main Computer Centre (Russian Federation)
7. Aviamettelecom (Russian Federation)

The North Eurasia Climate Centre (NEACC) coordinated by the Roshydromet under the auspices of the Commonwealth of Independent States (CIS).

NEACC was formally designated as a WMO RCC NEACC by WMO Executive Council in May 2013 after completing demonstration phase

Hydrodynamic models within NEACC

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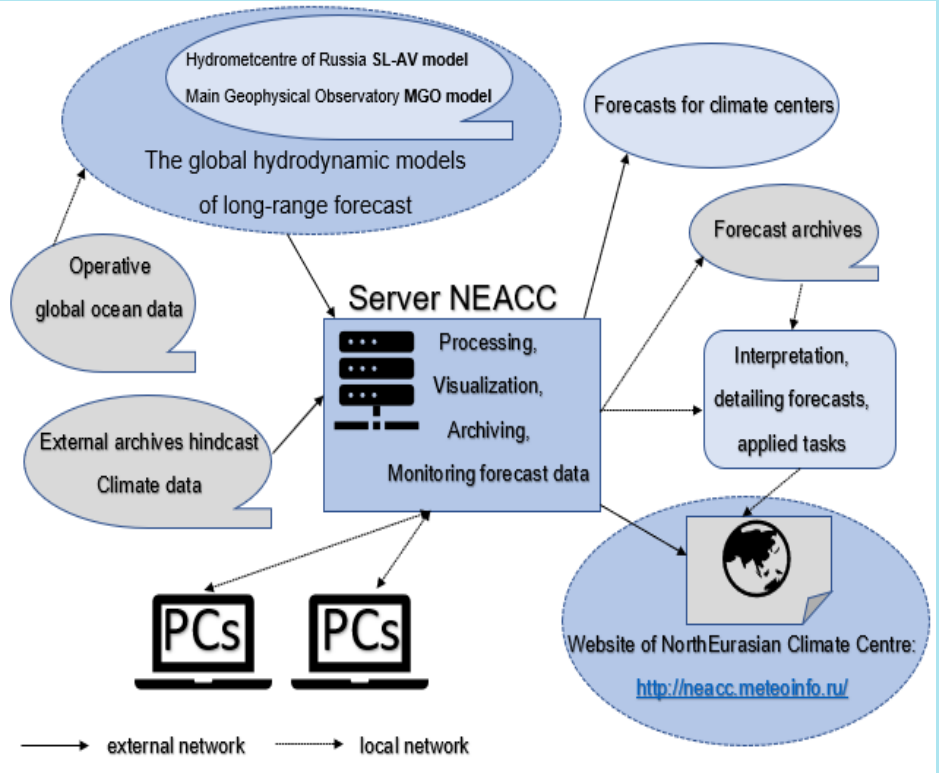
- **Seasonal version of SL-AV model at Hydrometcentre of Russia**

The 28-level semi-Lagrangian finite-difference atmospheric prognostic global model developed at the Hydrometcenter of Russia and the Institute of Numerical Mathematics of the Russian Academy of Sciences SLAV-2008 (grid 0.72°x0.9°) is used operationally. The forecasting results are delivered as the GRADS maps (basic fields for different areas) and distributed via GTS [GRIB code (full set of meteorological parameters on the grid 2.5ºx2.5º)] at www.meteoinfo.ru. Currently, experiments are being conducted on the connection to the model of the ocean atmosphere model. The participation is in the project S2S (seasonal to subseasonal).

- **Global Spectral Atmospheric General Circulation Model from MGO**

The global spectral atmospheric general circulation model (T63L25) and an ensemble approach developed in the Voeikov Main Geophysical Observatory (MGO). The horizontal resolution of the model is 1.9°x1.9°, 25 levels. Ensemble size for the forecast is 10. The forecast ensemble is configured by the original and perturbed analysis fields of the HMC of Russia. SSTs are taken from the inertial forecasts.



- **The AGCM SL-AV and MGO**

The maps of temperature and precipitation forecasts from Individual Atmospheric General Circulation Models of HMC of Russia and MGO are placed at the website of NEACC. The multi-model seasonal forecasts are presented too.

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Summer 2020

Atmospheric circulation

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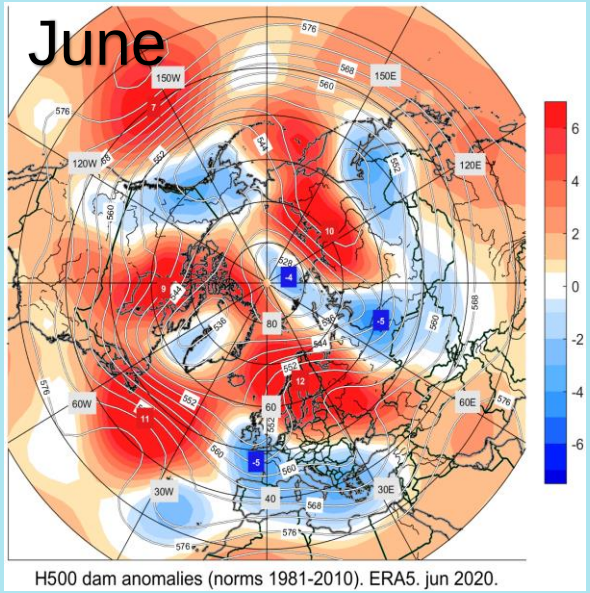
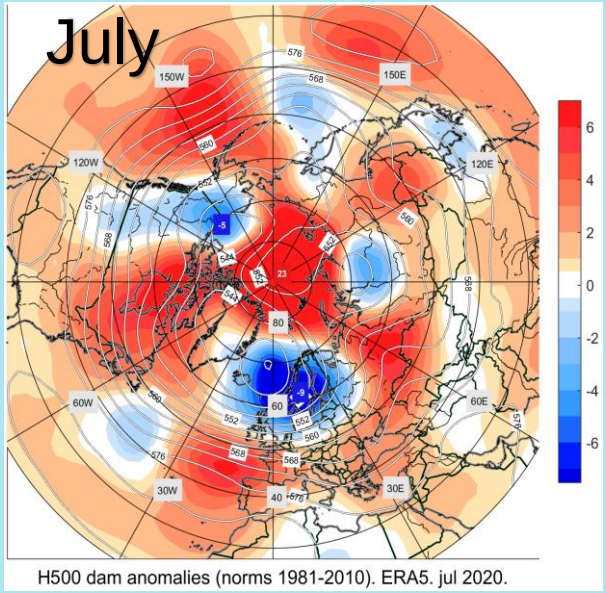
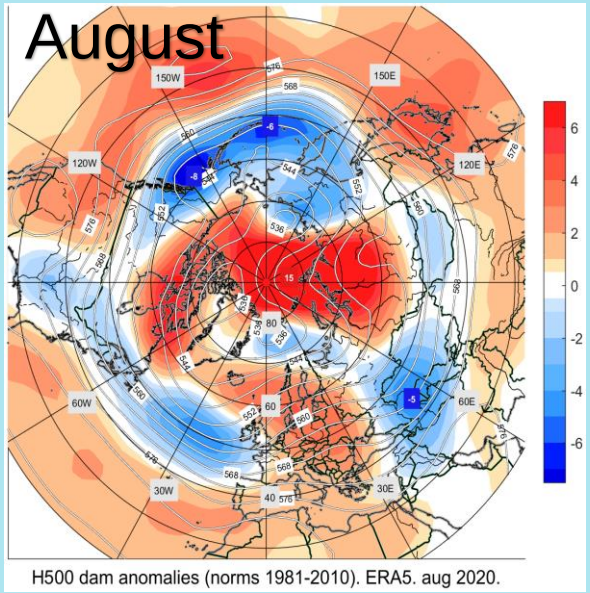
Monthly and Seasonal the 500 gPa geopotential height anomalies (based on a 1981-2010 mean)



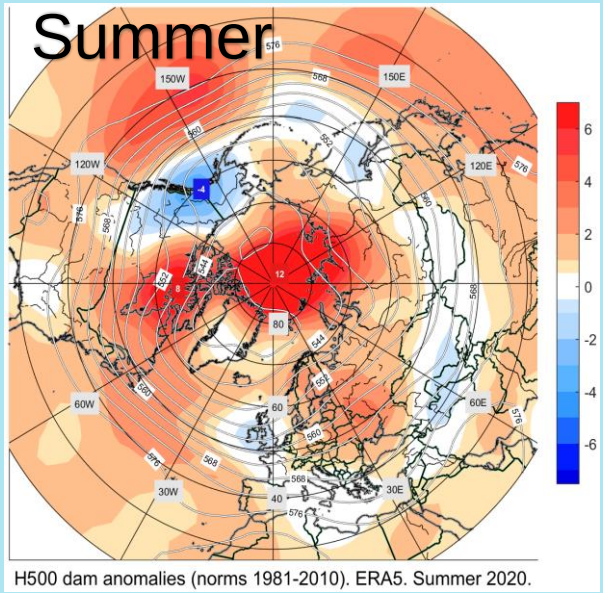
H500 dam anomalies (norms 1981-2010). ERA5. jun 2020.



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



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



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

- The summer season is characterized by unusually intense ridges and anticyclones, especially over Siberia;
- In July and August, powerful ridges of tropospheric anticyclones spread their influence on the polar regions, in some periods of the summer season, independent anticyclones even existed there, which led to disruption of zonal circulation in high latitudes;
- The circumpolar vortex was weakened, deformed and displaced from the polar region to the North Atlantic during the summer season;
- The troughs associated with the cyclone occupied their climatic positions and were weakened, only the Pacific trough was remained deep in its eastern part.

Atmospheric circulation

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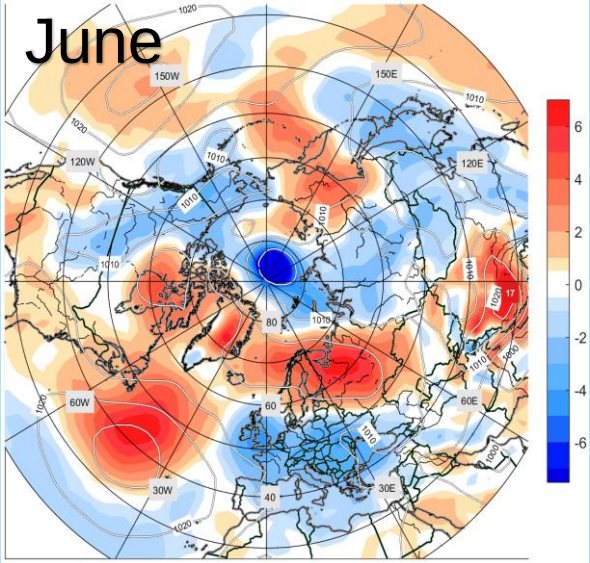
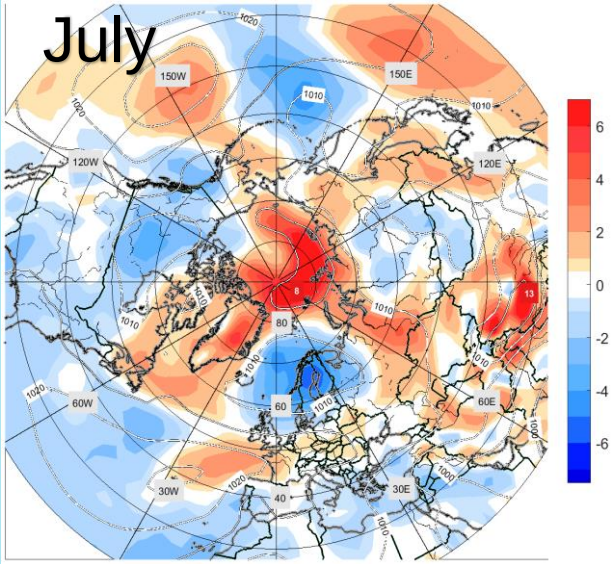
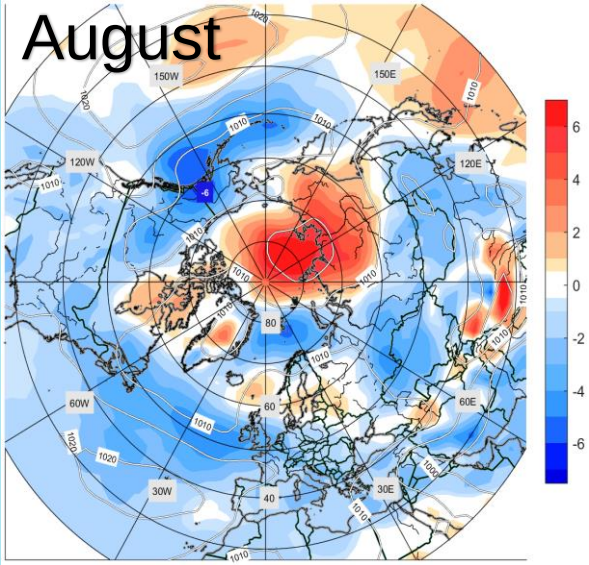
Monthly and Seasonal MSLP anomalies (based on a 1981-2010 mean)



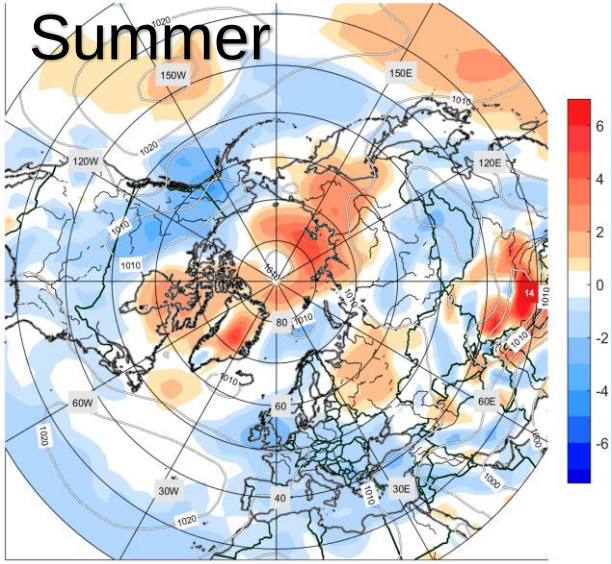
MSLP hPa anomalies (norms 1981-2010). jun 2020.



MSLP hPa anomalies (norms 1981-2010). jul 2020.



MSLP hPa anomalies (norms 1981-2010). aug 2020.



MSLP hPa anomalies (norms 1981-2010). JJA 2020.

- Intense stable anticyclones over the polar region, the influence of which extended to Siberia;
- Western Siberia. In June and August, cyclonic weather prevailed. In July, it was influenced by high pressure blocks formed by the interaction of Scandinavian and Central Asian anticyclones with the ridges of polar anticyclones;
- Eastern Siberia. Almost the entire season was influenced by intense ridges of polar anticyclones, and active anticyclones from Central Asia;
- The Asian depression was intense, located in the north of China and east of Mongolia. Active southern cyclones from Central Asia shifted across the territory of Mongolia, moving further to the south of the Far East and China;
- The North Pacific Subtropical High was more intense than usual;
- The Aleutian minimum was not identified on the map, cyclonic activity was shifted to eastward (to the west of Canada).

Temperature

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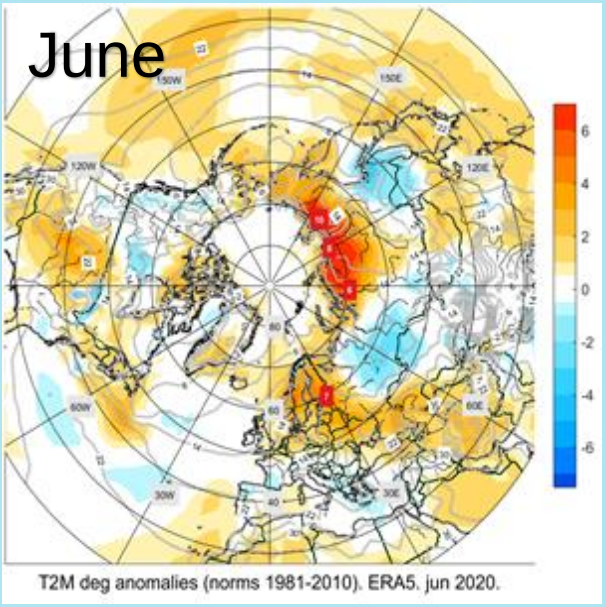
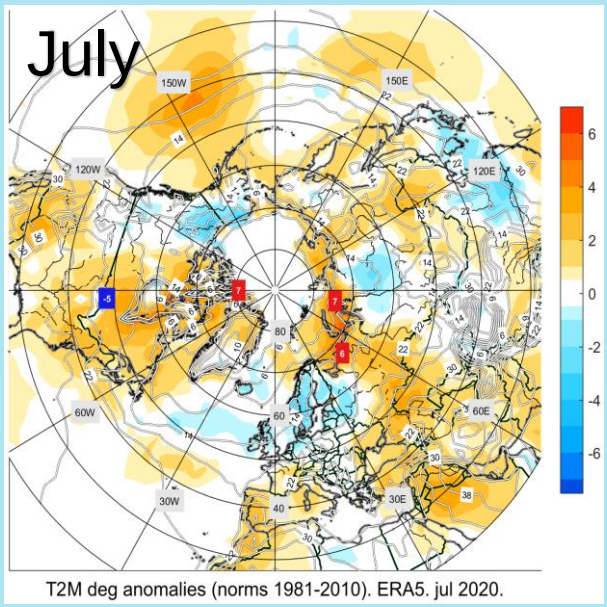
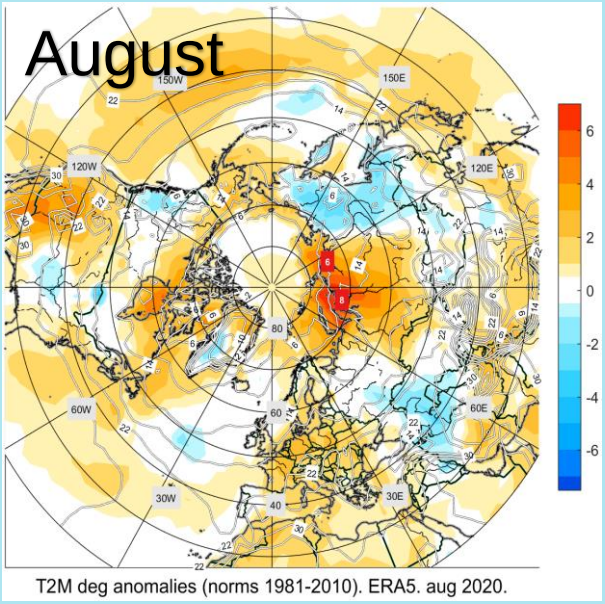
Monthly and Seasonal temperature 2m anomalies (based on a 1981-2010 mean)



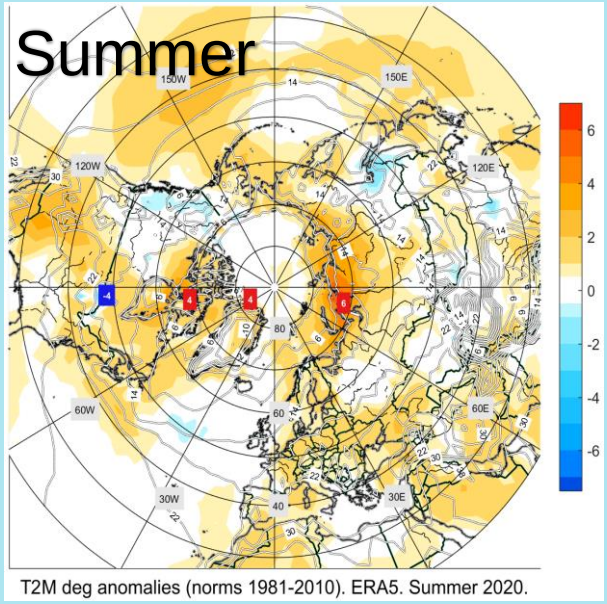
T2M deg anomalies (norms 1981-2010). ERA5. jun 2020.



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



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



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

- The most positive anomalies were observed in the Russian sector of the Arctic (on the coast of the Kara Sea + 3,5° - first rank);
- On the 20th of June, the maximum temperature in Verkhoyansk city (Yakutia) was updated and exceeded up to +38°C (the previous record 31,4°C in 1993);
- According to AARI, the summer season 2020 in the Arctic region ranked second warmest since 1979, the temperature anomaly is +1,7°C;
- The temperature was below normal In the south of Far East of Russia, due to the collapse of cold air masses in the rear of the cyclones, as well as the cold penetrated the eastern periphery of powerful polar anticyclones, in addition, active cyclones passed in August, providing heavy rains in the region.

Precipitation

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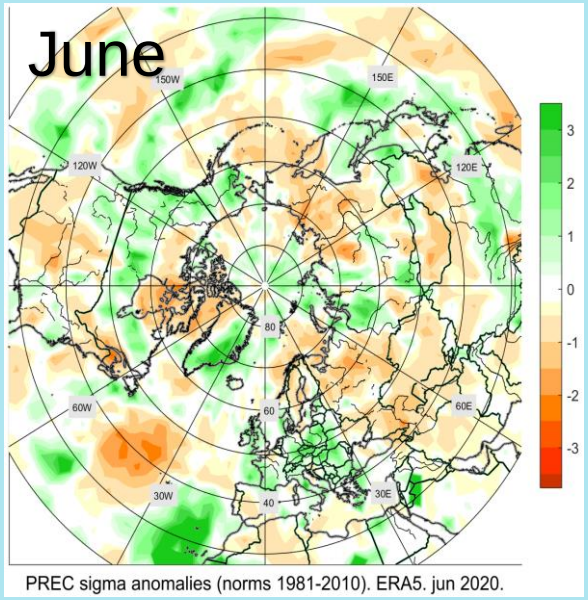
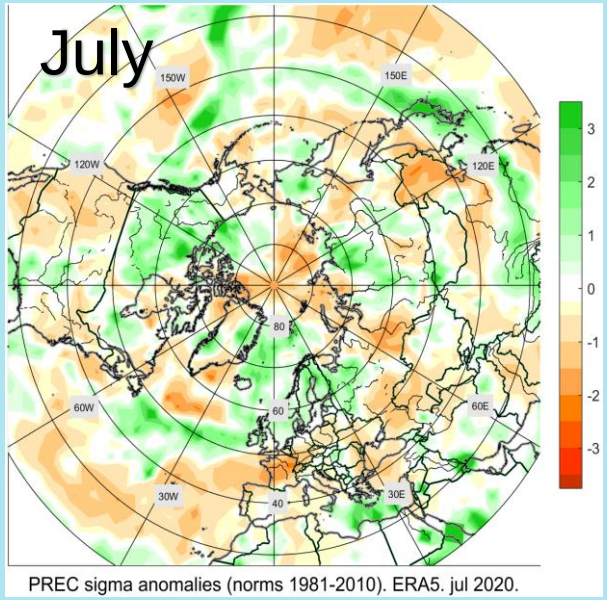
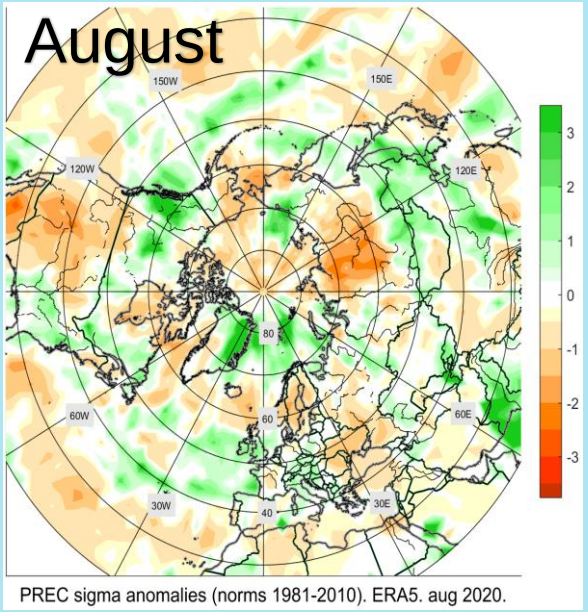
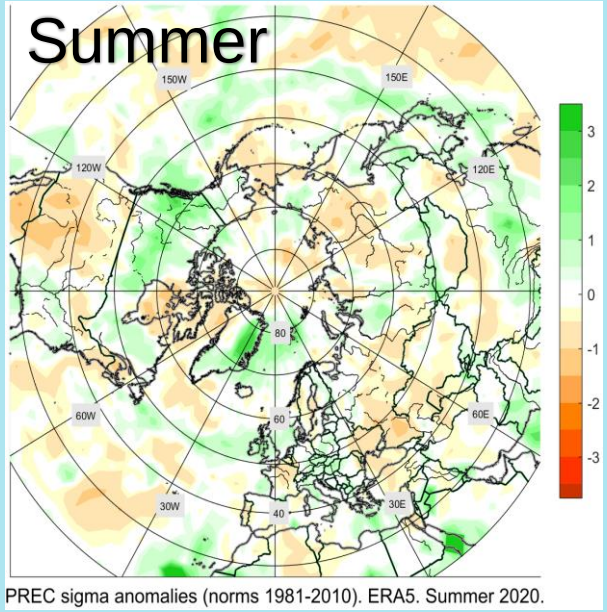
Monthly and Seasonal precipitation anomalies (based on a 1981-2010 mean).









- In the Urals and Kazakhstan, precipitation was around normal and below;
- A lot of precipitation fell in the south of Siberia, in the north and east of Mongolia, in the southern part of Far East, especially in Primorye krai (post-tropical cyclone “Bavi” came out in late August);
- Deficit of precipitation was observed in most of Eastern Siberia;
- Precipitation was around normal and below in Kamchatka and in the east of Chukotka.

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Seasonal forecast for winter 2020-21

El Nino / Southern Oscillation (SOI). SST.

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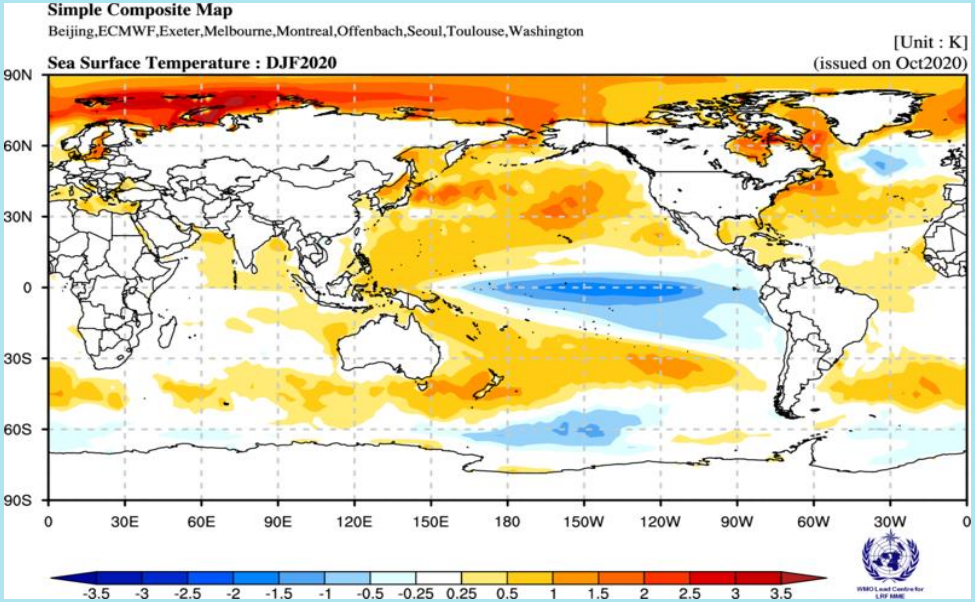
LC MMELRF-WMO Lead Centre for MME LRF

Composite map of SST

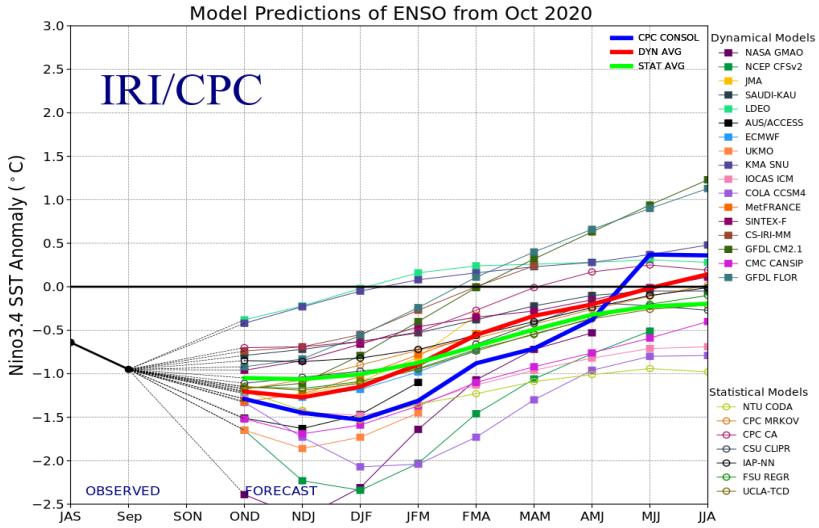
December-February 2020-21



https://www.wmolc.org/

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 **La Nina for the winter 2020-21** (December-February). 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 DJF 2020-21 season are: 90%, 10% and 0%.

In the Indian Ocean: According to the forecasts of 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 negative anomalies are forecasted in the equatorial latitudes, except for the west part of the ocean. The significant positive SST anomalies are expected in the tropics, midlatitudes and high latitudes in the Northern Hemisphere.

El Nino / Southern Oscillation (SOI).

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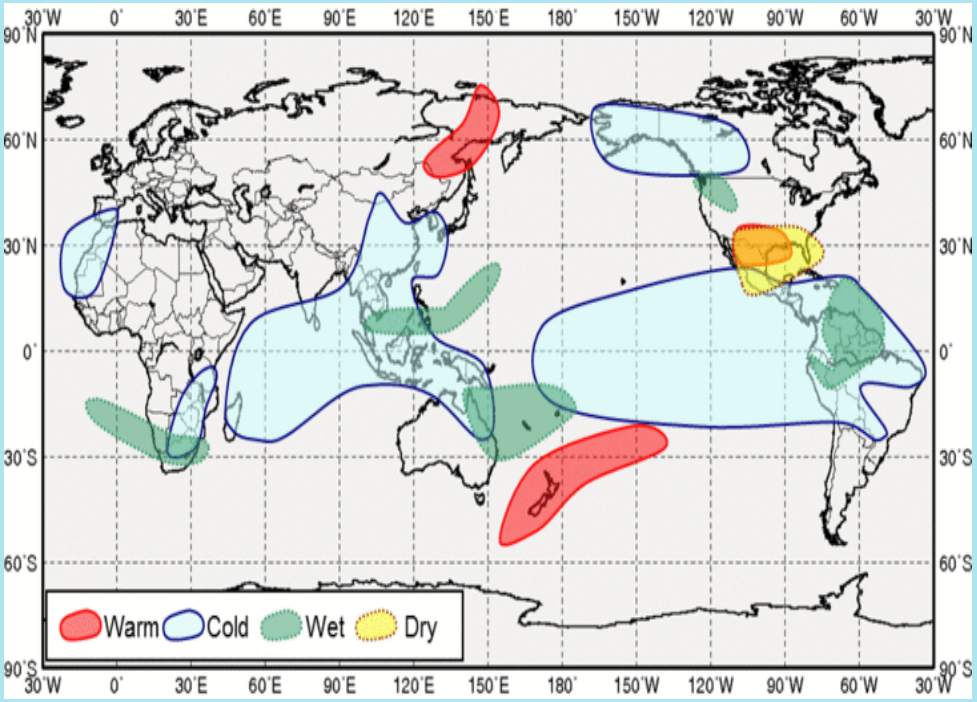
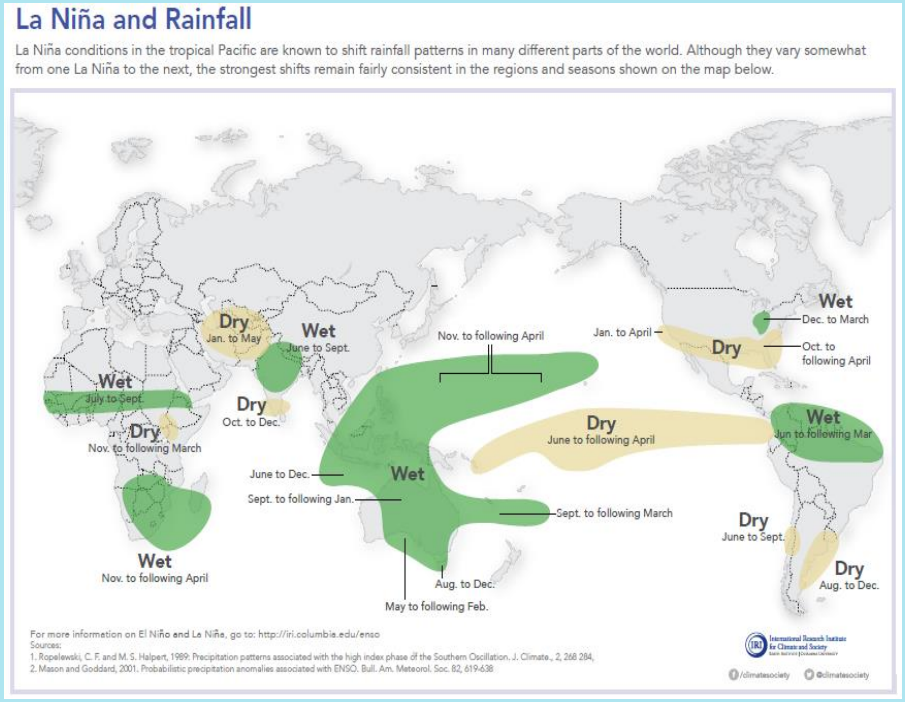
The schematic charts of typical anomaly patterns of surface temperature and precipitation for boreal winter in past La Niña events.

Data from Tokyo Climate Center on the left side. https://ds.data.jma.go.jp/tcc/tcc/products/climate/ENSO/lanina.html#DJF

Data from International Research Institute for Climate and Society on the right side. https://iri.columbia.edu/our-expertise/climate/enso/





According to Tokyo climate center (the map on left side), the impact of La Nina for winter (December-February) in Asian part of Russia is the temperature above normal in Far East except the northeastern part (Chukotka).

There is now significant signal of La Nina in Asian part of Russia, according to International Research Institute for Climate and Society (the map on the right side).

Arctic sea ice extent.
Arctic and Antarctic Research Institute (AARI), Russia

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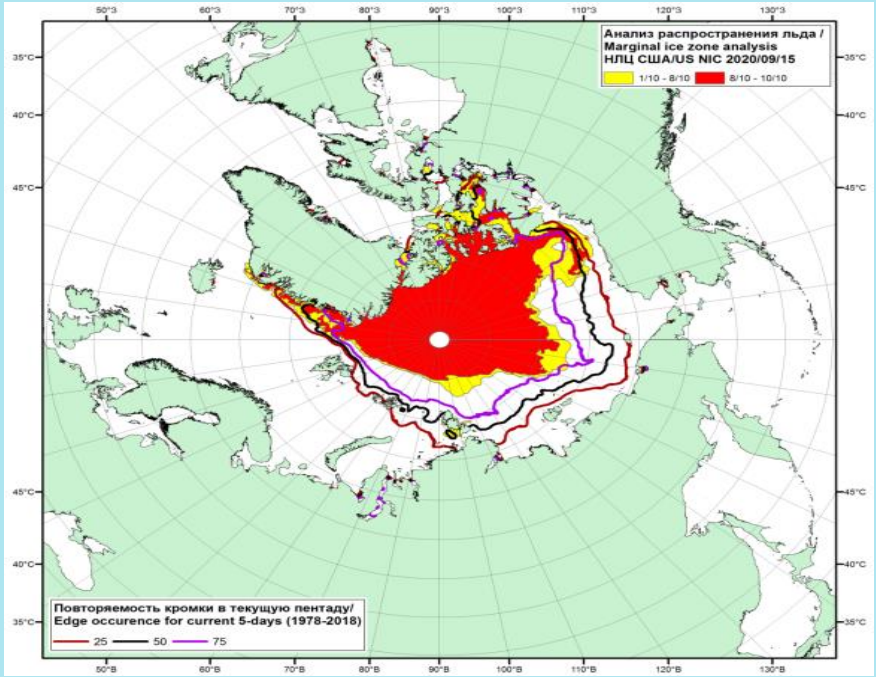
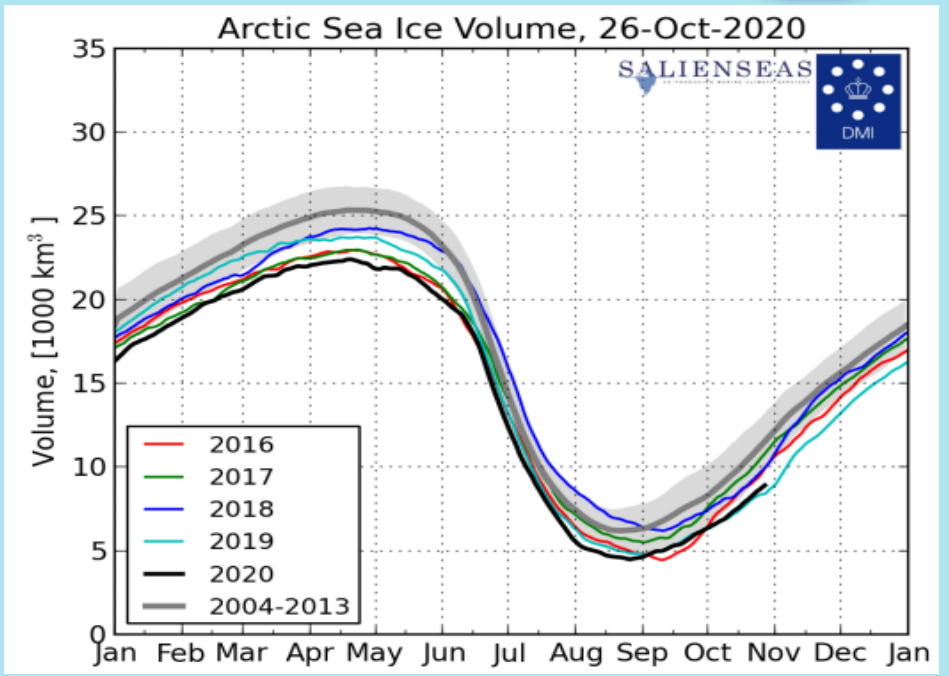


The position of the ice edge and areas of rarefied (<8/10) and cohesive (≥8/10) ice of the Arctic Ocean on 15.09.20 based on the ice analysis of the NSIDC and edge repeatability from 11-15.09 for the period 1979-2017 according to observations SSMR-SSM/I-SSMIS (NASATEAM algorithm).



Daily estimates of the seasonal variation of the sea ice volume in the Arctic Ocean from 01.01.2004 to 26.10.2020.
Data from DMI North Atlantic - Arctic Ocean model HYCOM-CICE - http://ocean.dmi.dk/models/hycom.uk.php

According to the AARI, following features highlighted in the Arctic sea ice extent:

•An unusually rapid decline in the extent of Arctic sea ice was observed in July and August 2020.
•Arctic sea ice, a key indicator of climate change, reaches its minimum annual extent in September 2020, that became the second lowest since 1979.
•Record high temperature and SST in the Arctic, especially in the Russian sector, in the summer of 2020 became one of the reasons for the decrease in the volume of sea ice in the Arctic Ocean, it became the second lowest, with 2012 and 2016 tied for lowest, compared to the period 2004-2013.

Arctic sea ice extent.
Arctic and Antarctic Research Institute (AARI), Russia

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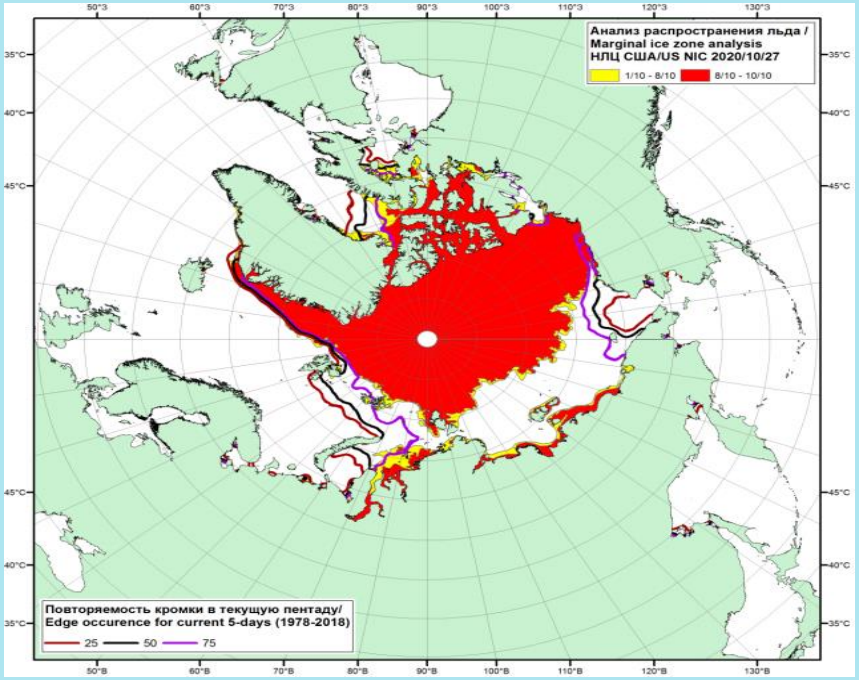
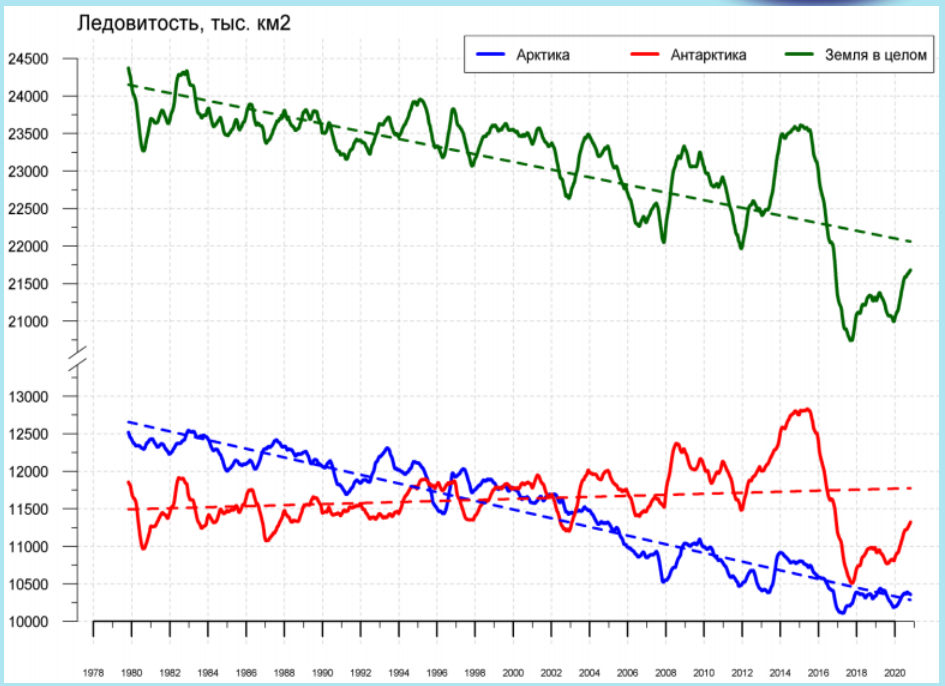


The position of the ice edge and areas of rarefied (<8/10) and cohesive (≥8/10) ice of the Arctic Ocean on 27.10.20 based on the ice analysis of the NSIDC and edge repeatability from 26-31.10 for the period 1979-2017 according to observations SSMR-SSM/I-SSMIS (NASATEAM algorithm).



The 365 days daily window-smoothed values of the ice cover for the Arctic, Antarctic and the Earth from 10/26/1978 to 25/10/2020 based on SSMR-SSM / I-SSMIS

According to the AARI, following features highlighted in the Arctic sea ice extent:

•The picture on the left side shows the position of sea ice edge in the Arctic region on October 27. Deviations occurred in the Russian sector of Arctic, the edge is far away from normal position.

•The graph on the right side shows a decline of ice cover which is close to minimal record, for 1978 to 2020 per year.

http://www.aari.ru/

GENERAL CIRCULATION: 500 hPa height

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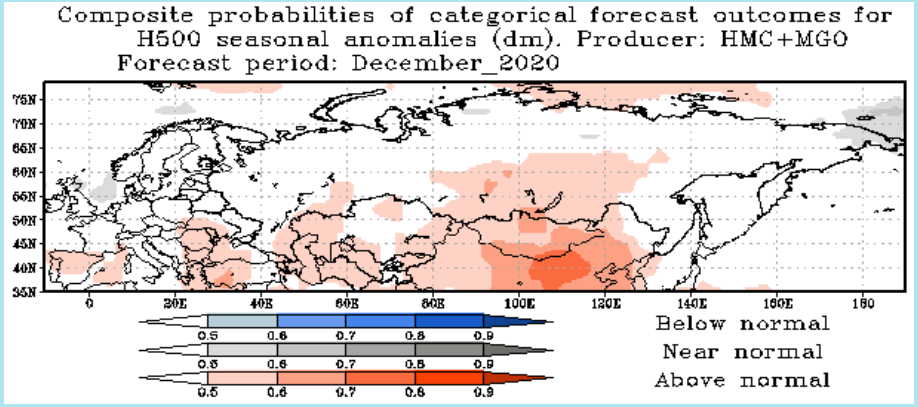
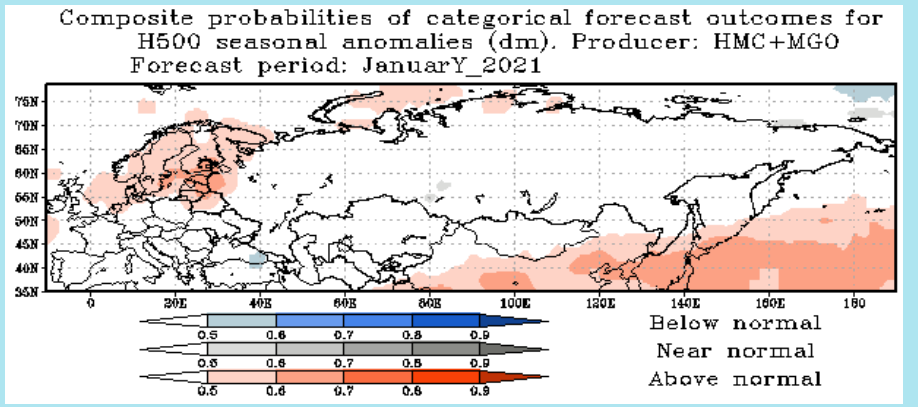
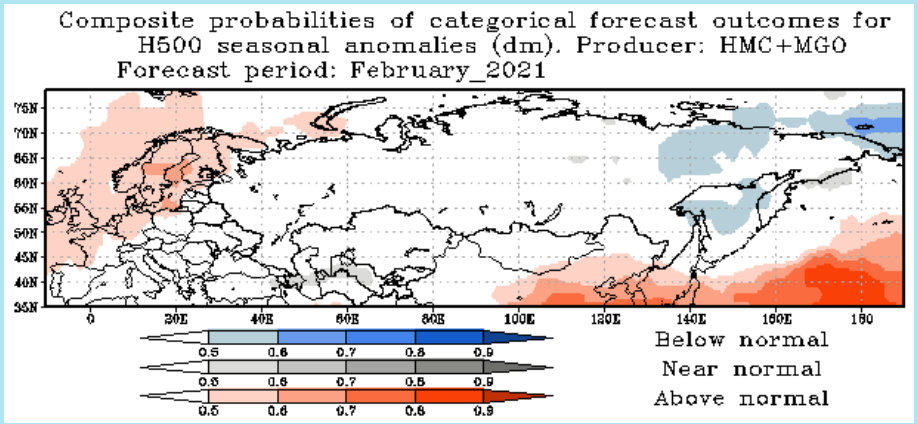
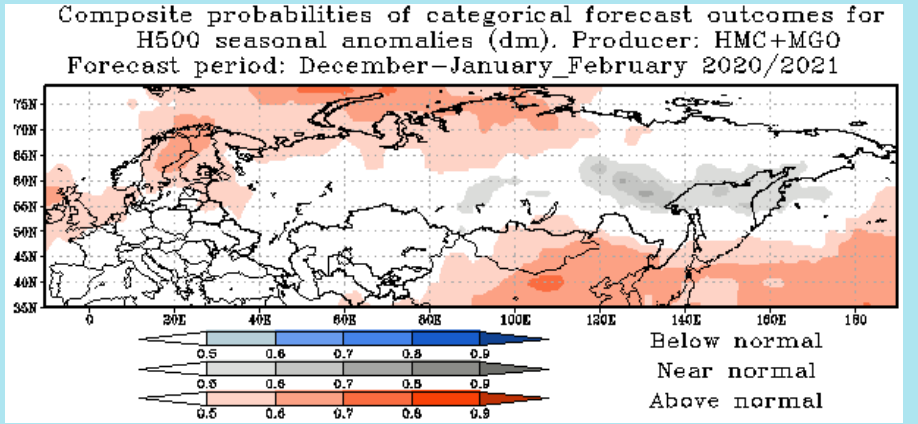
Composite probabilities of categorical forecast outcomes for H500 seasonal anomalies. Producer: HMC (SL-AV)+MGO









According to the forecasts of HMC+MGO, during winter 2020-21 the 500 hPa geopotential height above normal is forecasted in the north of **Western** Siberia, the probabilities are 60-70%, and near normal is expected in the central part of Eastern Siberia and of Far East, and in Kamchatka. In December, the positive anomalies are seen in the south part of Western and Eastern Siberia and near normal is in the east of Chukotka, with probabilities are 60-70%. In February, the weak signal of below normal the 500 hPa geopotential height over northeast part of Eastern Siberia.

Mean sea level pressure (MSLP)

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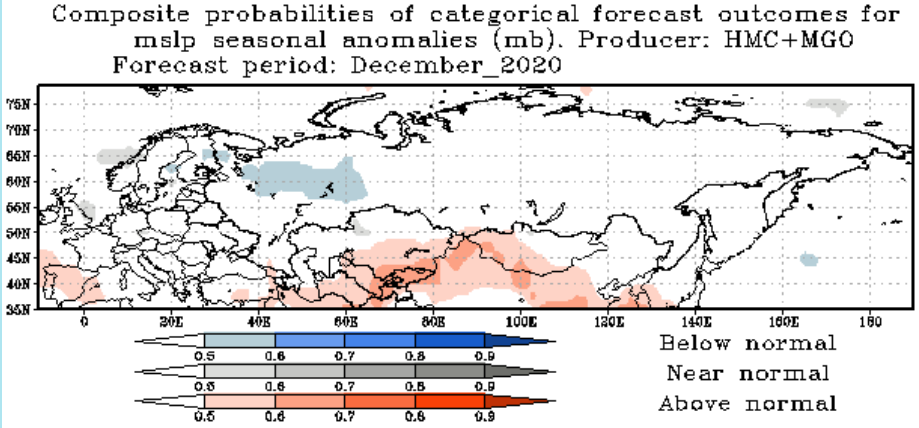
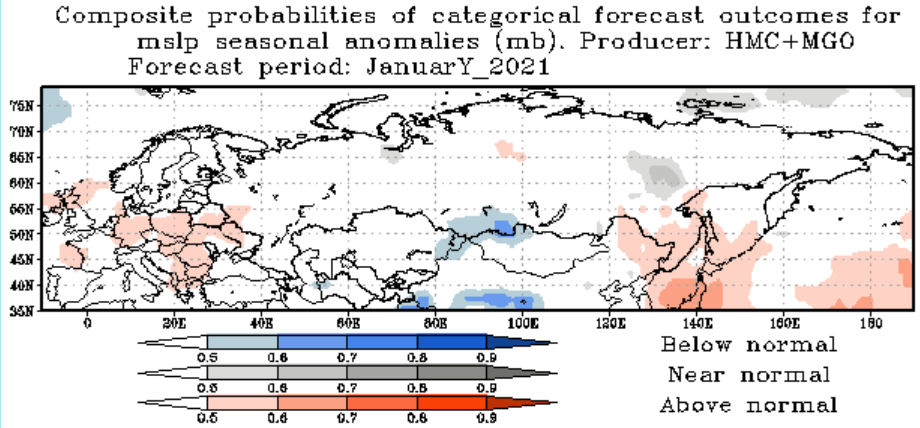
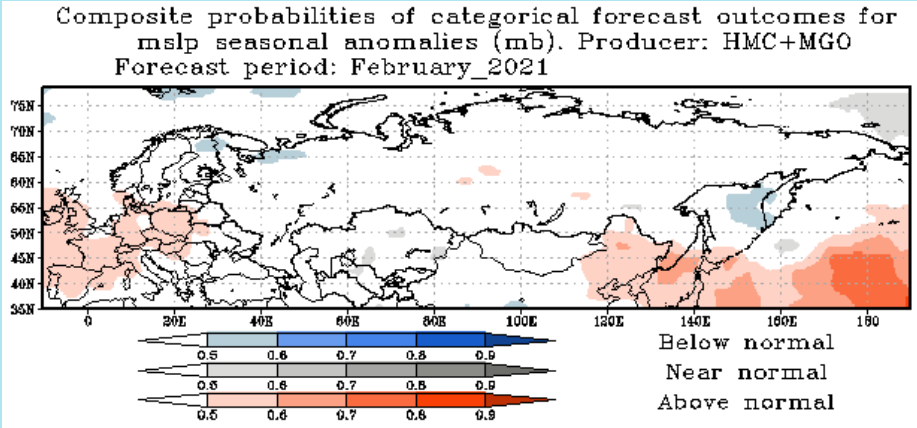
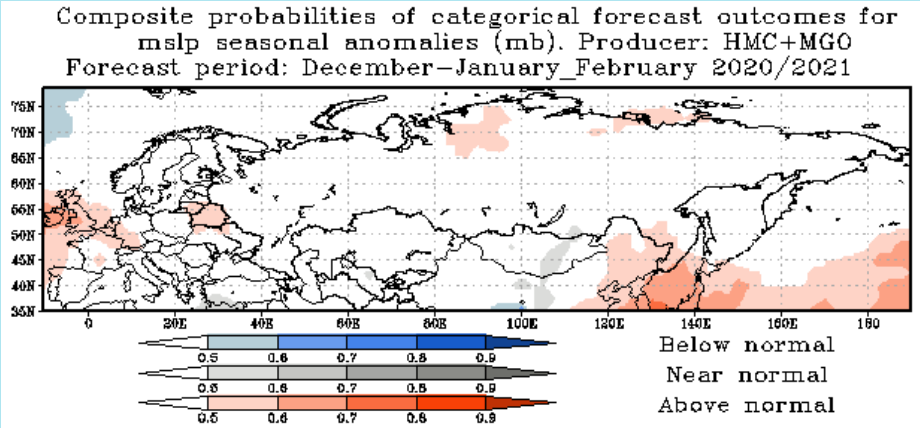
Composite probabilities of categorical forecast outcomes for MSLP seasonal anomalies. Producer: HMC (SL-AV)+MGO









There are some uncertainties in the MSLP forecast from HMC+MGO. The weak signal of positive anomalies is forecasted over Primorye krai (south of Far East) during winter and MSLP below normal is seen in the south of Western Siberia in January, with probabilities 60-70%.

Teleconnection indices

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Table.2. Indices oscillation forecasts.
Data from Hydrometeorological centre of Russia (SL-AV).

INDEX	DECEMBER-FEBRUARY 2020-21			
	DECEMBER	JANUARY	FEBRUARY	DECEMBER-FEBRUARY
EA	-0,25	-0,62	0,39	-0,12
WA	-1,71	-0,17	0,24	-0,62
EU	0,34	-0,09	0,27	0,37
WP	0,56	0	-0,69	-0,07
PNA	-0,13	-0,44	-0,59	-0,47
NAO	0,59	0,44	0,26	0,48
POL	-0,07	-0,61	-0,12	-0,37
AOS	-0,06	-0,01	-0,14	-0,07

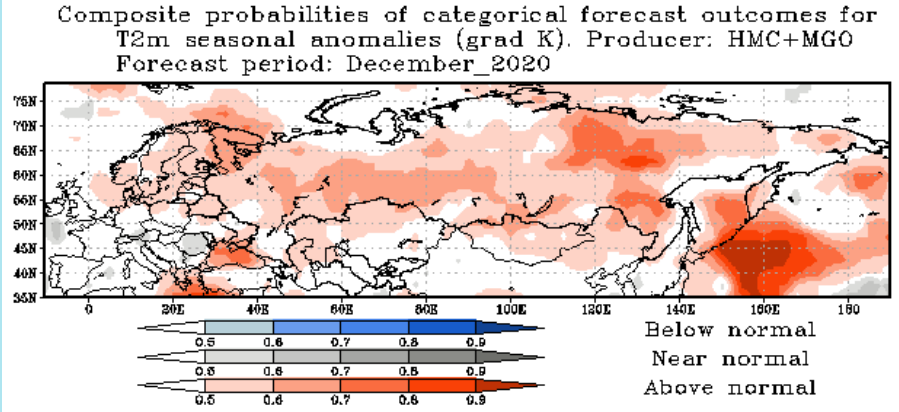
- East Atlantic **(EA),** West Atlantic **(WA),** Eurasian **(EU),** West Pacific **(WP),** Pacific-North American **(PNA)** oscillations (Wallace J. M., Gutzler D.S. Teleconnections in the geopotential height field during the Northern Hemisphere winter. – Mon. Wea. Rev., 1981, vol. 109, pp. 784-812).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

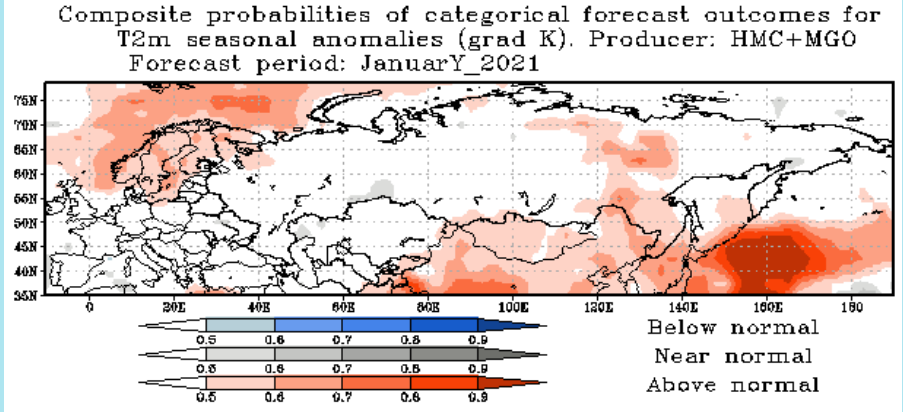
- AO is expected insignificant during winter season 2020-21;
- Due to the expected WP mode, there is possibility for unstable weather conditions during winter. In the case of a positive (negative) phase of **WP**, the temperature above normal (below normal) is noted in the northeast of Far East, including Kamchatka peninsula.
- The negative phase of **POL**, that is characterized by a weakening of the circumpolar vortex, is expected in January. So in the negative phase of **POL**, the positive temperature anomalies are expected at polar latitudes and the negative anomalies are in the south of Eastern Siberia, Yakutia and northeastern China.
- The strong signal is forecasted for **PNA** oscillation, which is in the negative phase for January, February and winter. PNA negative phase tends to be associated with Pacific cold episodes (La Nina). The impact of PNA is only seen in temperature field over Chukotka during winter seasons. In the case of negative phase PNA, that accompanies by weakening of Aleutian minimum and North Pacific Subtropical high, the positive temperature anomaly is noted in Chukotka.

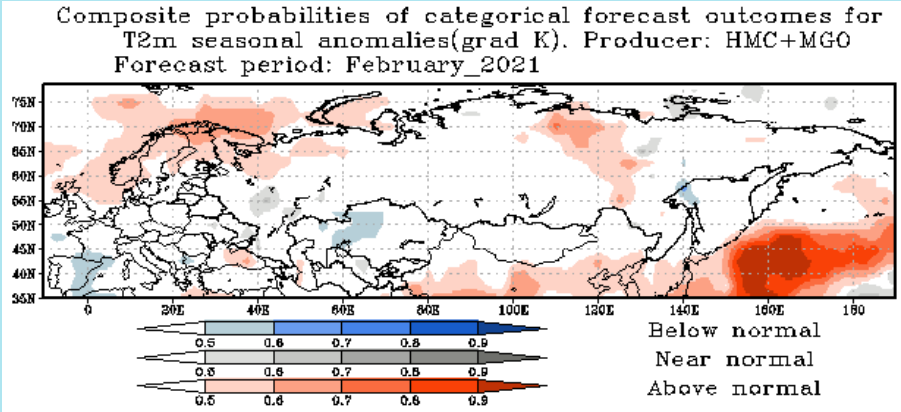
Temperature forecast

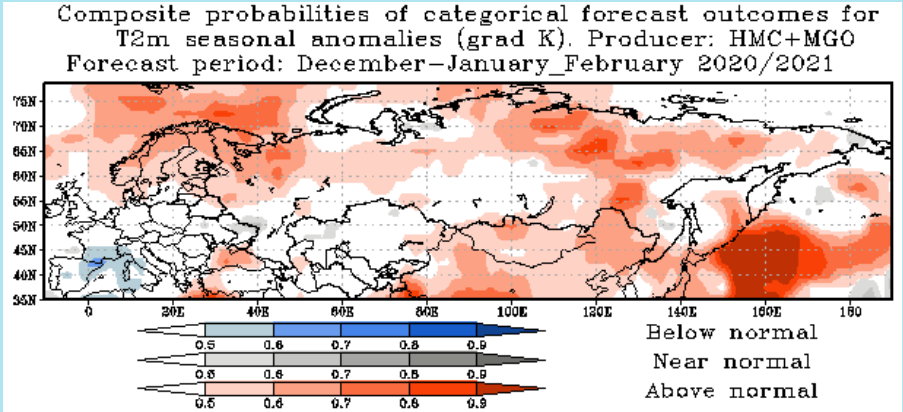
North EurAsia Climate Centre

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









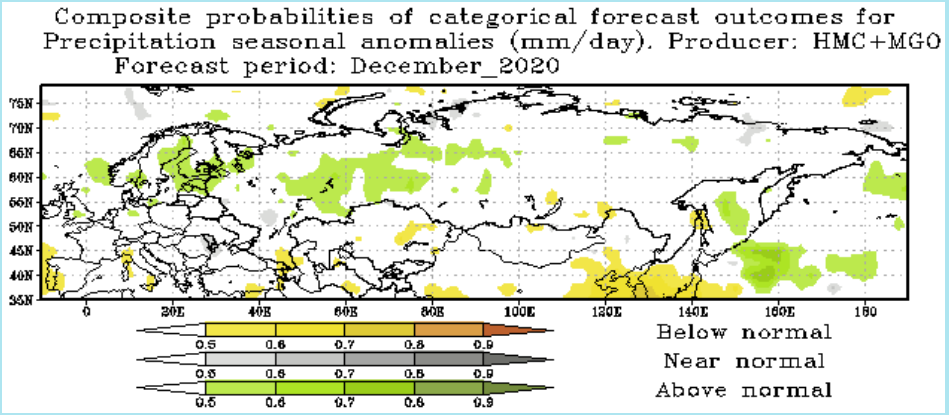
- According to the forecasts of the MGO and the HMC, the positive temperature anomalies are expected over most of Asian part of Russia, with probabilities 60-90%. The high probabilities 80-90% for temperature above normal are forecasted in the north of Siberia and Far East during winter, though with lower probability in January and February.

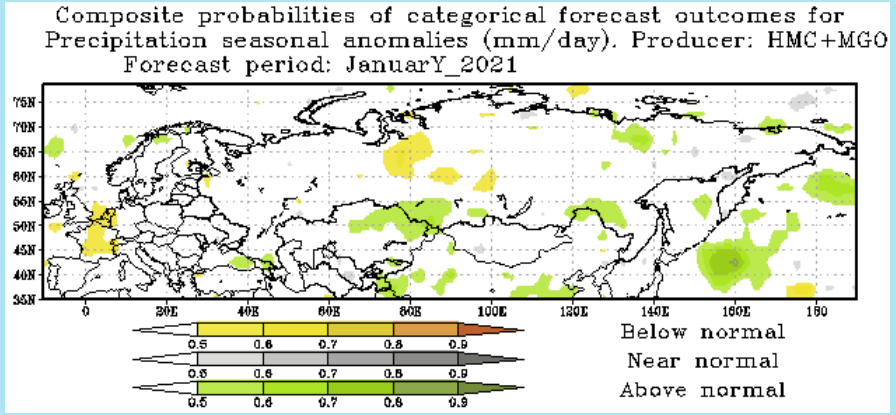
The forecast is issued in October 2020

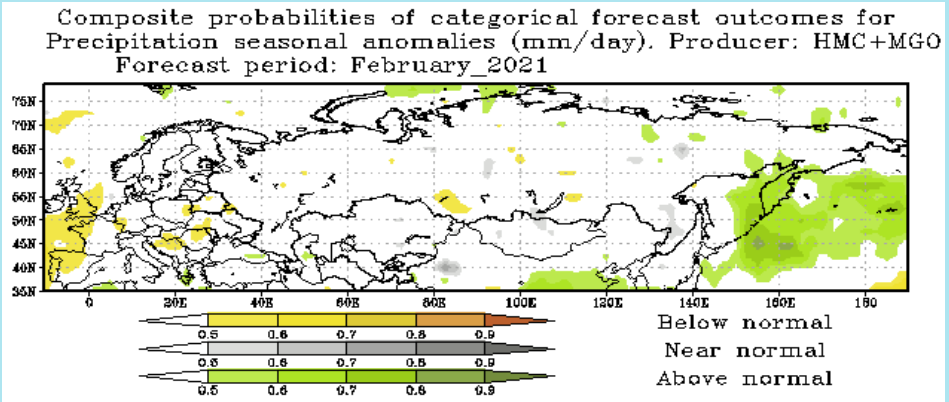
Precipitation forecast

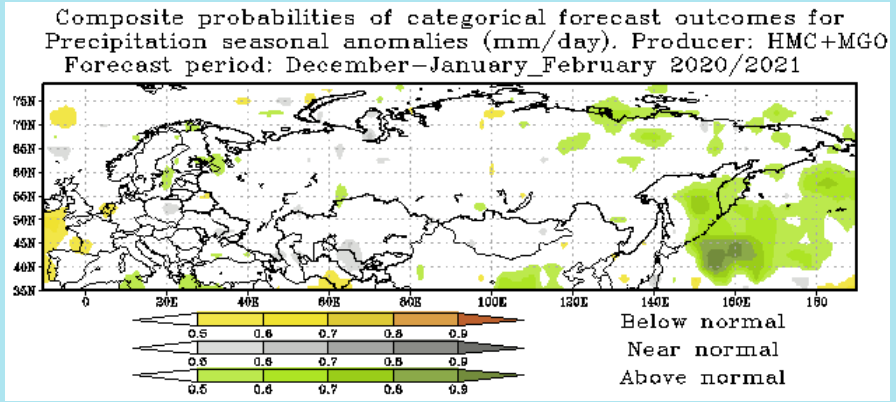
North EurAsia Climate Centre

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









- From HMC+MGO forecasts. As for precipitation there are many uncertainties in the forecasts. A weak signal associated with excessive moisture can be traced in the northeast of the region, including Kamchatka.

Meteorological services

North EurAsia Climate Centre

The **APEC** Climate Center **-** APCC (Busan, Korea)
http://www.apcc21.net/eng/service/fore/lmon/japcc030101_lst.jsp

The **EUROSIP** forecasting system is the operational monthly production of 7-month 41-member forecasts by ECMWF, Met Office, Météo-France and NCEP
http://www.ecmwf.int/products/forecasts/d/charts

The International Research Institute (**IRI**) for Climate and Society (USA) -
http://iri.columbia.edu

LC MMELRF (WMO Lead Centre for MME LRF) - **http://www.wmolc.org**

In addition we use the information of ECMWF, CPC (CFS), Météo-France, Met Office, Tokyo Climate Centre (TCC), Beijing Climate Centre (BCC).

Summary

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- Most of models predict La Nina for the winter 2020-21 (December-February). 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 DJF 2020-21 season are: 90%, 10% and 0%.
- Arctic sea ice, a key indicator of climate change, is close to its minimum extent in the Arctic region since summer 2020. The possible impact of this is weakening of circumpolar vortex, atmospheric instability and the prevalence of cyclonic weather patterns in the polar latitudes of Asian part of Russia during winter 2020-21.
- Significant positive SST anomalies are forecasted in the North Pacific Ocean. In this case, significant changes in the position and intensity of Subtropical High and the Aleutian Low are possible and, therefore, the appearance of significant deviations from the climate in temperature and precipitation in the territory of the Far East.
- The negative phase of PNA oscillation, associated with the La Nina impact, during winter 2020-21 is expected. The negative phase of PNA oscillation is associated with a weakening of the Pacific pair of the centers of atmospheric circulation.
- The intensity of the Siberian high is predicted to be close to normal or slightly below normal and it is expected to be displaced from its normal position.
- The winter season is expected warmer than normal over the most of Asian part of Russia. The temperature will be close to normal or slightly below normal in the south of Western and Eastern Siberia.
- There are a lot of contradictions and uncertainties in the precipitation forecasts. Exceeding precipitation is most likely in the north of Siberia and Far East. The weak signal, associated with the precipitation deficit or precipitation closed to normal, is in the south of Siberia.

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Thank you for your attention! ☺