LRF and training activities at NEACC

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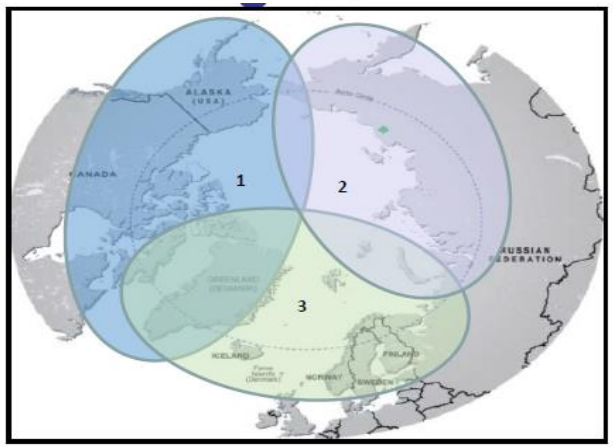

About us

World Meteorological Organization (WMO) Regional Climate Centres (RCCs) are centres of excellence that operationally generate regi
climate products including climate monitoring and prediction in support of regional and national climate activities and thereby strengthe
capacity of WMO members in a given region to deliver better climate services to national users. While all WMO RCCs are required t
certain mandatory functions, the RCC concept includes flexibility to accommodate specific regional needs, capabilities and limitati
concept also provides options to implement a single multi-functional entity or a distributed-function RCC-Network collaboratively
a number of interested hosts. Under the RCC concept service deliver
is designed to assist with their mandate.

Mandatory and recommended functions of WMO RCCs and the
and other related information are also described at http://www.w

Mandatory Functions

- operational activities for long range forecasts (LRF);
- operational activities for climate monitoring;
- operational data services to support LRF and climate monit
- training in the use of operational RCC products and service

Highly Recommended Functions

- climate prediction and climate projection;
- non-operational data services;
- coordination functions;
- training and capacity development; and
- research and development.

Northern Eurasia node has been composing as an multifunctional climate center for RAII Arctic region. Main contributor to LRF service provision are Hydrometcenter of Russia and Main Geophysical Observatory (main institutions of NEACC). Web site of North Eurasia node is under development

https://www.arctic-rcc.org/eurasian-node

TCC_ProducingGui....pdf | TCC_Introduction....pdf | TCC_SeasonalFore....pdf | aari_20181231-2....docx | aari_20190128-2....docx

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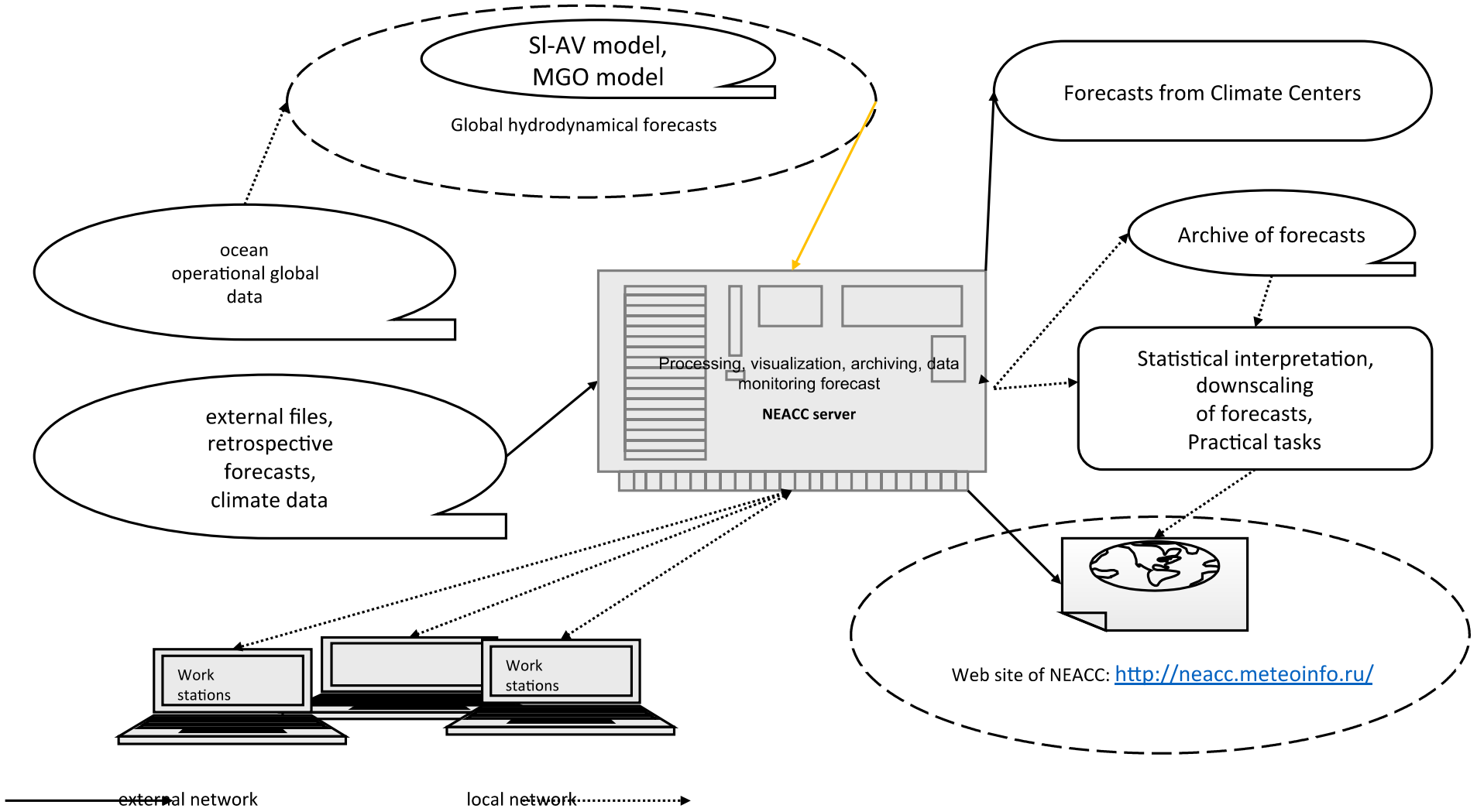
ENG 13:46

Operational LRF activities at NEACC in support of North Eurasian Node of ArcRCC-N

LRF technology at NEACC



Updating of computational facilities at Roshydromet

New supercomputer complex (2018) has been facilitating operational LRF work at GPC-Moscow and NEACC
- increased storage of forecast and monitoring information
- increase of resolution of dynamical model forecasts
- optimization of LRF technology

Center	Peak Performance TFlops (10^{12} Flops)	System	Cores	RAM TB/ GB per core	Manufacturer	Storage
GPC-Moscow	1200	Cray XC40-LC	33696/ 36	120/3,55	Cray (USA)	2,8 PB Cray Sonexion 3000 + 360 TB EMC
	13	Bull S6 130	384/38 4	4/10	Bull SAS (France)	

The list of LRF products available at NEACC to support Northern Eurasian node

Climate forecast information

- **Forecasts at subseasonal – seasonal scale on the basis of SL-AV and MGO models (maps, surveys, numerical data)**
- **Circulation Indices**
- **Intraseasonal forecasts (at weekly time scale)**
- **Outlooks of seasonal forecasts**
- **Consensus winter and summer forecasts from NEACOF sessions**

Forecasts verification

- **Skill scores of operational forecasts**
- **Skill scores of retrospective forecasts**

http://seakc.meteoinfo.ru/ Рус

http://neacc.meteoinfo.ru/ Eng

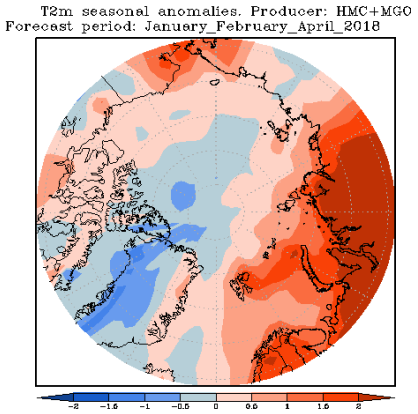
North EurAsia Climate Centre

http://neacc.meteoinfo.ru/ - English version of NEACC website
http://seakc.meteoinfo.ru/ - Russian version of NEACC website

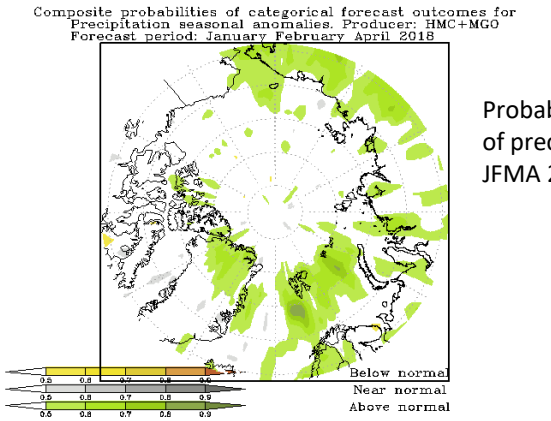
NEACC since 2015 has started to deliver climate forecast products over Arctic region in operational regime

LRF products for Arctic region provided by NEACC

Monthly to seasonal multimodel forecasts (SL-AV + MGO models) of basic meteorological parameters with monthly update



Deterministic forecast of air temperature for JFMA 2018



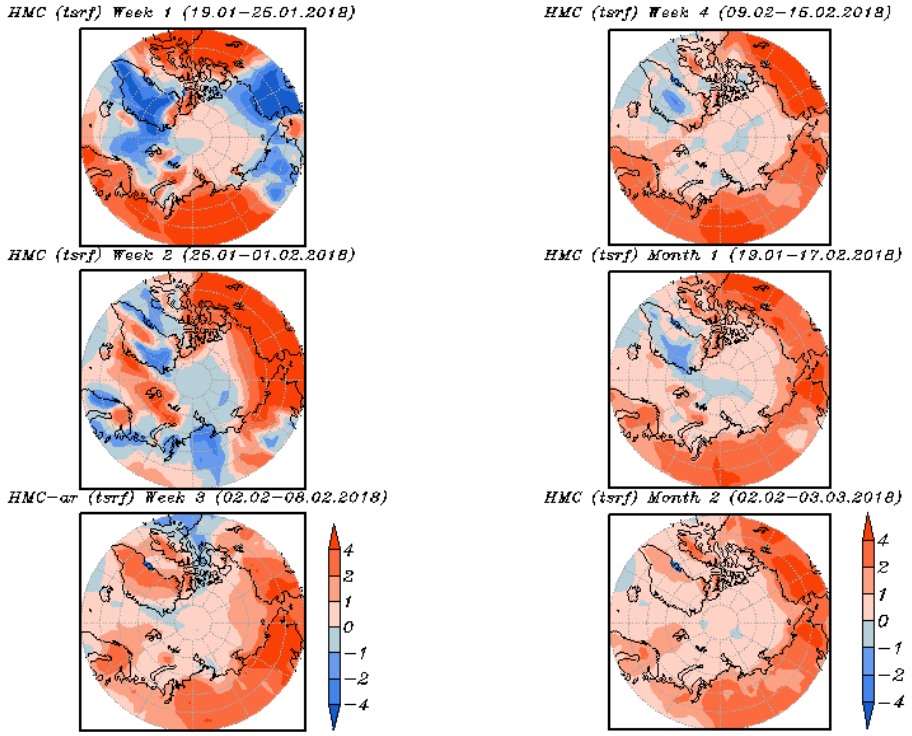
Probabilistic forecast of precipitation for JFMA 2018

Forecasts of climate indices (including Arctic Oscillation Index, Polar Oscillation Index) with monthly update

index	JANUARY, FEBRUARY, MART, APRIL 2018					
	1 month	2 month	3 month	4 month	1 сезон	2 season
EA	-1,14	0,93	0	-0,51	-0,22	0,36
WA	-1,54	-1,04	-1,3	-1,61	-1,88	-1,79
EU	-0,65	-1,52	-0,39	-1,47	-1,25	-1,57
WP	-1,13	-1,98	-0,59	0,5	-1,57	-1,01
PNA	-0,23	-1,96	-0,93	-0,32	-1,09	-1,43
NAO	1,01	0,99	0,18	1,53	1,17	1,3
POL	0,09	0,26	-0,45	-0,34	-0,01	-0,16
AOS	0,79	0,99	0,36	0,35	0,71	0,57

EA - East Atlantic Oscillation
WA - West Atlantic Oscillation
EU - Eurasia Pattern
WP - West Pacific Oscillation
PNA - Pacific – North American Pattern
NAO - North Atlantic Oscillation
POL - Polar Oscillation
AOS - Arctic Oscillation

Subseasonal forecasts of basic meteorological parameters over Arctic region with weekly update



- Climate Watch Advisory
- Climate monitoring
- Express monitoring
- Monitoring of climate extremes
- Satellite monitoring of sea ice and snow cover dynamics

Monitoring

Climate Watch Advisory

11.02.2019:Temperature will be below normal in the southern regions of the Siberian Federal District.

01.02.2019:Temperature will be below normal in the Siberian Federal District.

25.01.2019: Temperature will be below normal in Murmansk region and the Siberian Federal District.

04.12.2018: Temperature will be below normal in the central and southern regions of the Siberian Federal District.

Precipitation will be above normal in Far East regions.

Precipitation will be below normal in the central regions of Russia and the northwestern regions of

Temperature will be significantly above normal over the most of the Northwestern federal district of Russia.

Prolongation of abnormally cold temperature for the northern regions of European Russia, the Urals and

Prolongation of abnormally cold temperature for European Russia.

Prolongation of abnormally cold temperature for European Russia.

Prolongation of abnormally cold temperature for the northern and eastern regions of the European Russia.

Temperature will be significantly below normal for the most part of the European territory of Russia, the , Belarus and Ukraine.

Prolongation of the cold spell in the southern regions of Far East.

A cold spell in the southern regions of Far East.

pg ... Показа

NORTH EURASIA CLIMATE CENTRE

CLIMATE WATCH ADVISORY

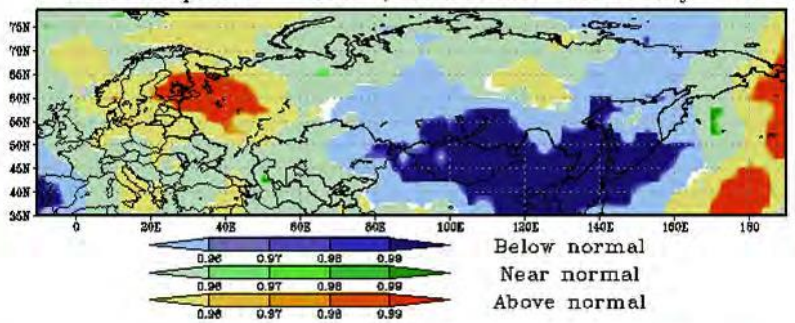
WMO RA VI
WMO RA II
RCC-Network

TEMPERATURE WILL BE SIGNIFICANTLY BELOW NORMAL

The forecast (from 08.02.2019) for the next week (till 14.02.19) shows anomalously cold weather for southern regions of the Siberian federal district, the republic of Buryatia, the north-western regions of Kazakhstan and Mongolia. The most significant anomalies are predicted to 12-14°C below normal.

WEEKLY DETERMINISTIC FORECASTS OF TEMPERATURE ANOMALIES
(HYDROMETEOROLOGICAL CENTRE OF RUSSIA (SL-AV) and MGO MODEL)

Composite probabilities of categorical forecast outcomes for
T2m anomalies. Producer: HMC+MGO
Forecast period – WEEK 1, initial data: 07february 2019



Abnormal cold weather
At a period (from October to March) when the mean daily temperature anomalies are less than 7 °C during the 5 or more days.

Abnormal hot weather
At a period (from April to September) when the mean daily temperature anomalies are more than 7 °C during the 5 or more days.

The dangerous phenomena are the phenomena of weather which intensity, duration and time of occurrence represent threat of a security of people, as well as they can cause significant damage to branches of economy. The list of the typical dangerous phenomena which are used and specified by the local territorial hydrometeorological services of Russia Federation is located on the web site of the Hydrometeorological centre of Russia: http://meteoinfo.ru/hazards-definitions

http://neacc.meteoinfo.ru

Skill scores of monthly-seasonal forecasts

Operational forecasts

Forecast verifications

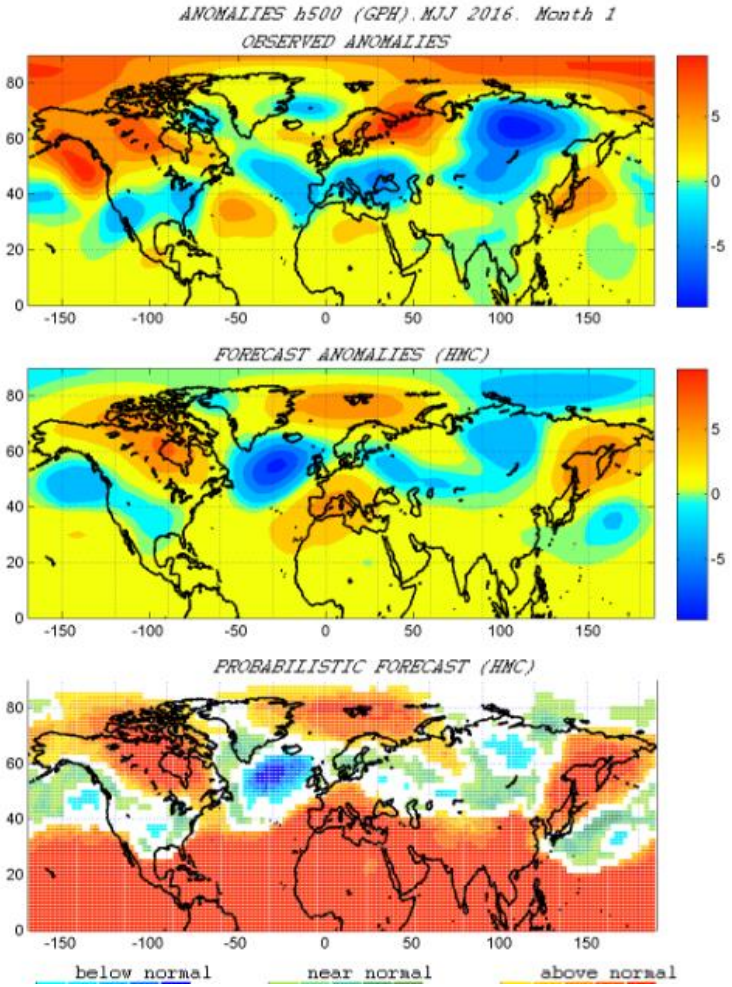
Skill scores of seasonal forecast

Date: 2016-05-01 | Region: GLOBUS | Parameter: H500 | Upload

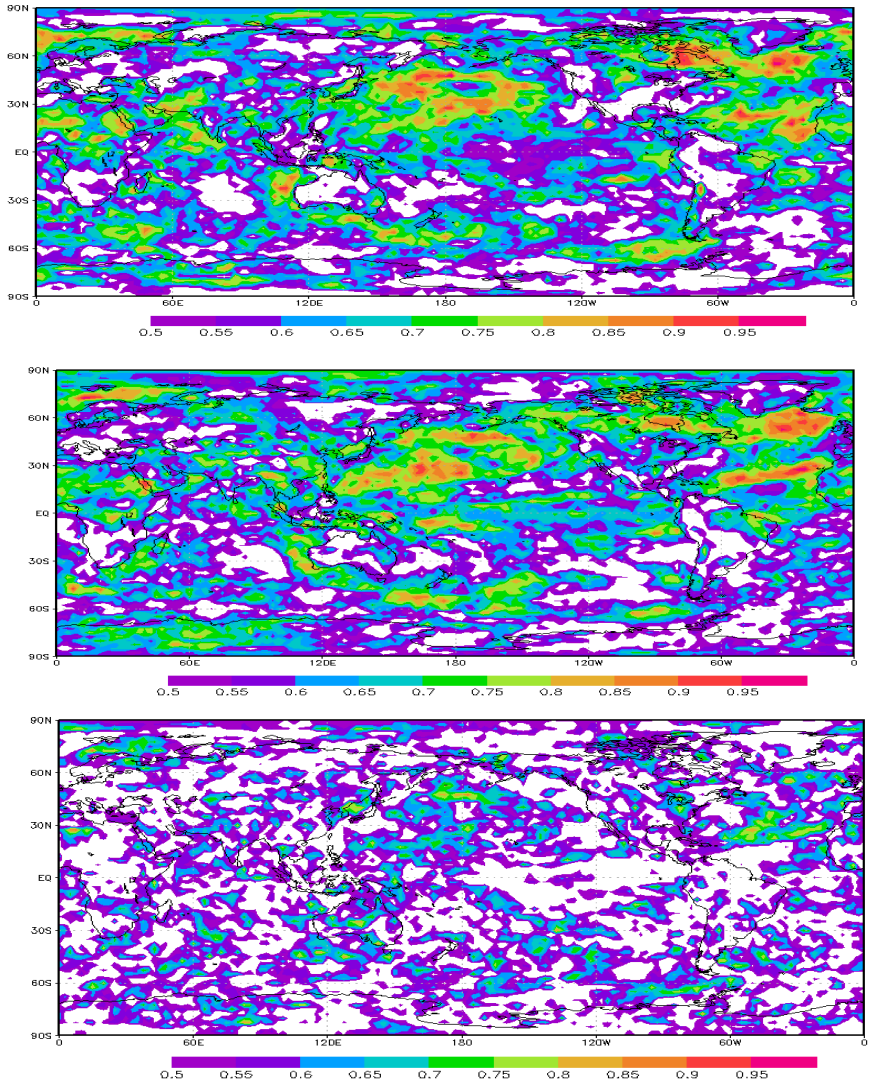
Parameter: H500
Region: GLOBUS (90S - 90N; 0 - 360)
Date: 2016-05-01

Model	Verifications						Maps
	ROC_A	ROC_N	ROC_B	RO	ACC	RMSE	
May 2016							
PLAV	0.8	0.7	0.79	0.63	0.63	32.5	Open
MGO	0.88	0.72	0.84	0.65	0.73	29.25	Open
PLAV+MGO	0.88	0.74	0.85	0.66	0.72	29.19	Open
June 2016							
PLAV	0.77	0.64	0.86	0.74	0.53	38.33	Open
MGO	0.78	0.65	0.83	0.65	0.68	35.47	Open
PLAV+MGO	0.79	0.67	0.88	0.74	0.66	35.81	Open
July 2016							
PLAV	0.69	0.63	0.76	0.63	0.46	28.61	Open
MGO	0.67	0.61	0.71	0.55	0.28	31.94	Open
PLAV+MGO	0.69	0.64	0.77	0.64	0.41	29.22	Open
Season							
PLAV	0.83	0.75	0.89	0.84	0.8	17.52	Open
MGO	0.84	0.74	0.83	0.71	0.71	20.6	Open
PLAV+MGO	0.87	0.77	0.88	0.8	0.8	18.04	Open

Skill scores:



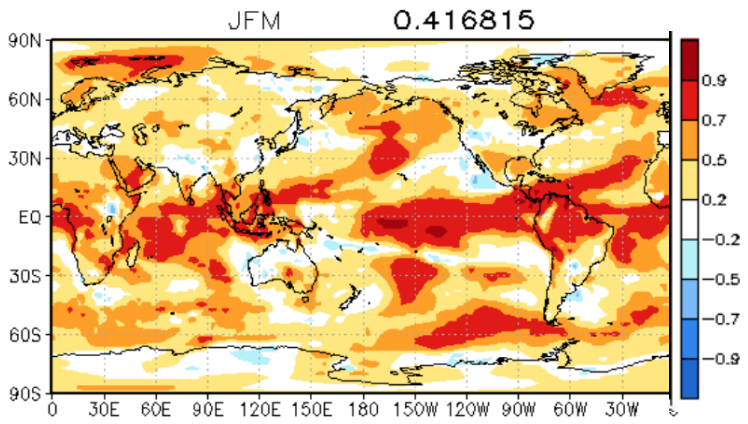
Hindcasts

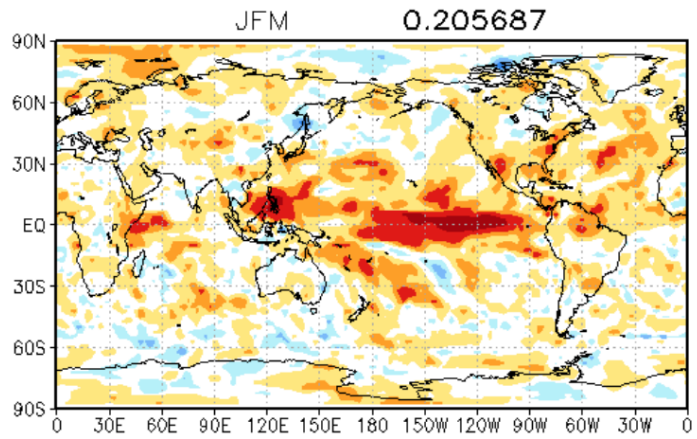


Research aimed at LRF improvement at NEACC

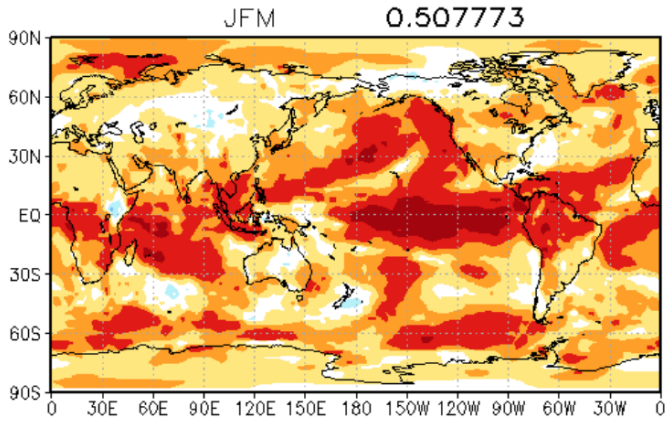
Skill scores (ACC) of some GPCs models

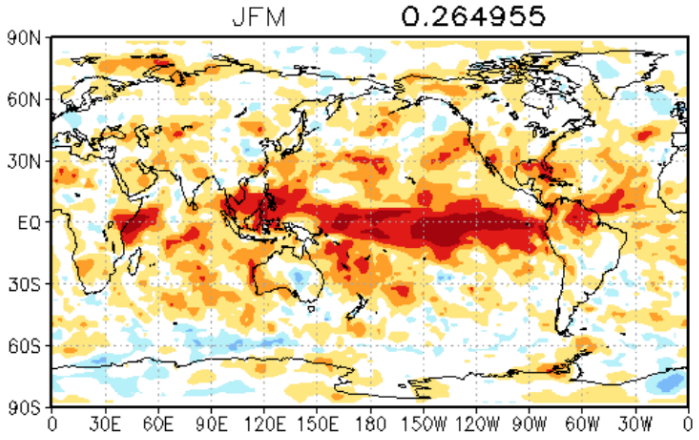
Washington



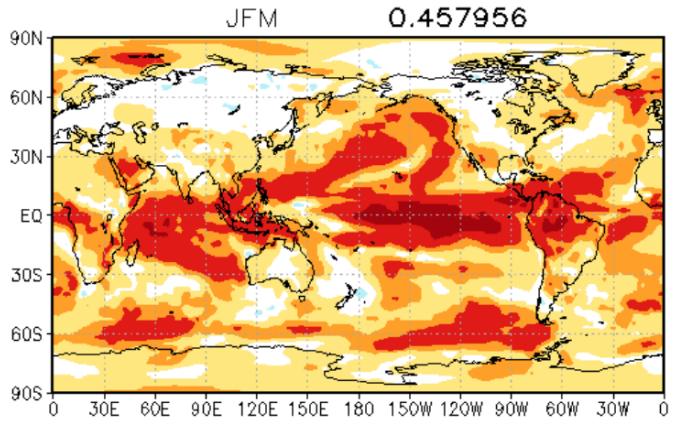


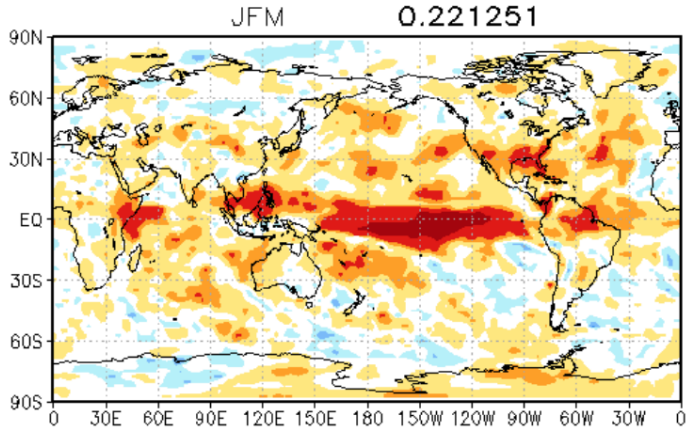
Exeter





Tokyo





t2m

Precip

MOS scheme for deterministic seasonal forecasts used at NEACC to increase forecast quality

Hindcasts of T2m, H500, PRSML from SI-AV

NCEP/DOE data

Operational forecasts of T2m, H500, PRSML from SI-AV

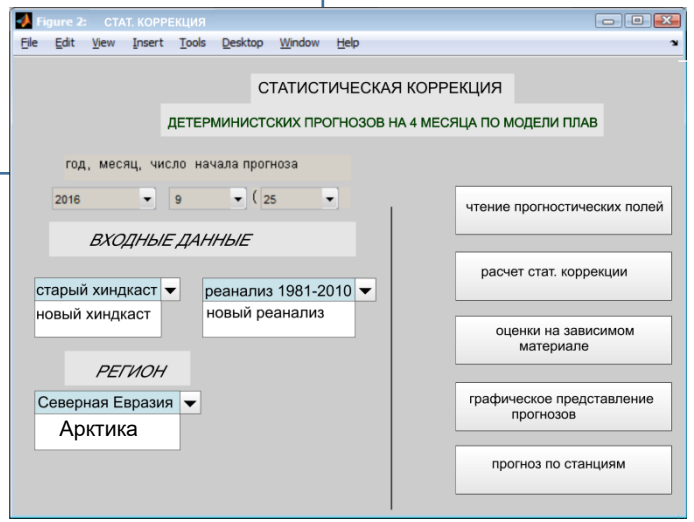
Observational station data

Optimal statistical linear relationships between hindcast and reanalysis data

Statistical correction of operational forecasts based on linear relationships between hindcast and reanalysis data

Visualization of forecast fields

Calculation of skill scores

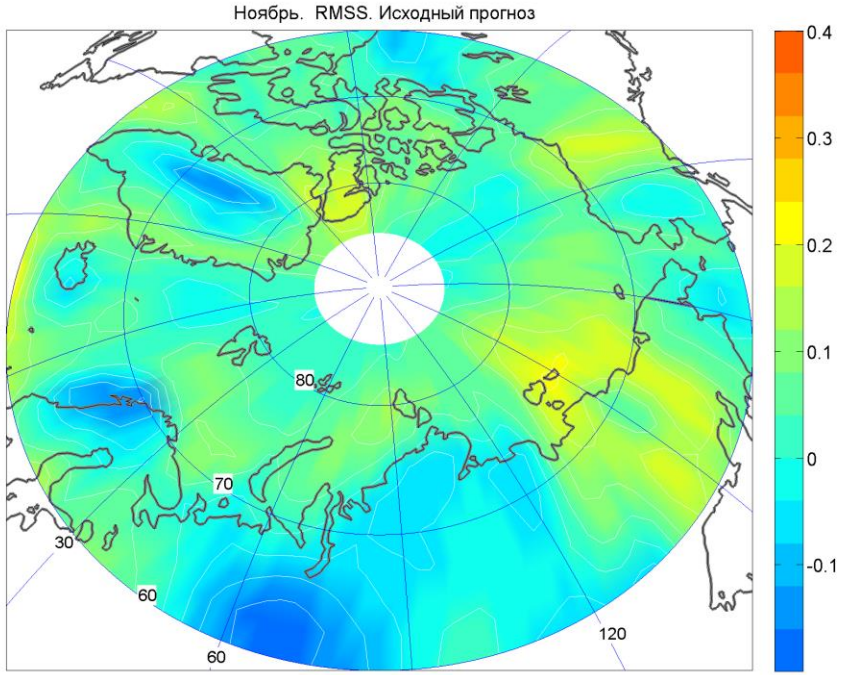


Interface program for statistical correction of model outputs

How much does MOS approach improve seasonal hindcasts from Sl-AV model in Arctic region?

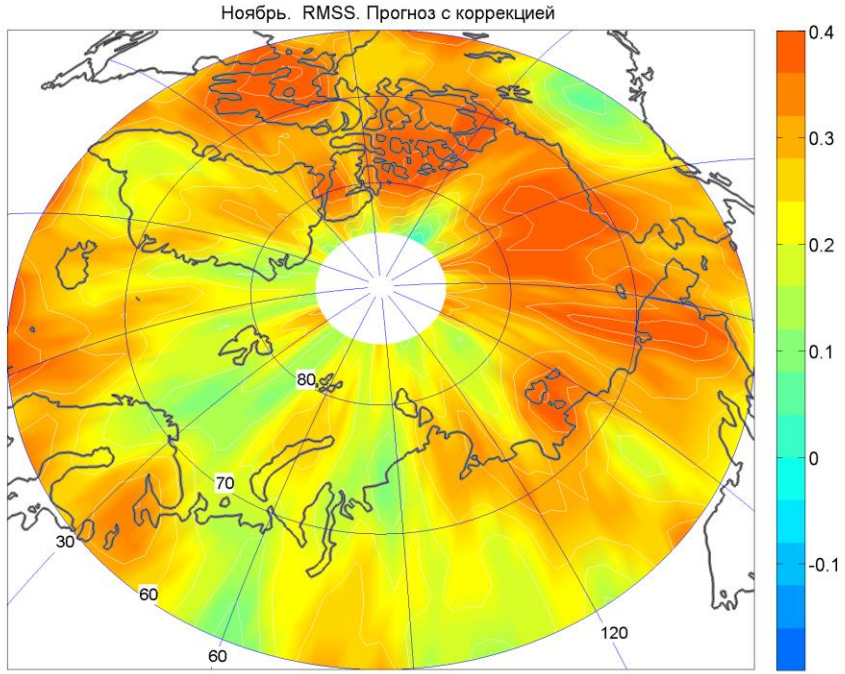
$$RMSS = 1 - (1 - MSSS)^{1/2}$$

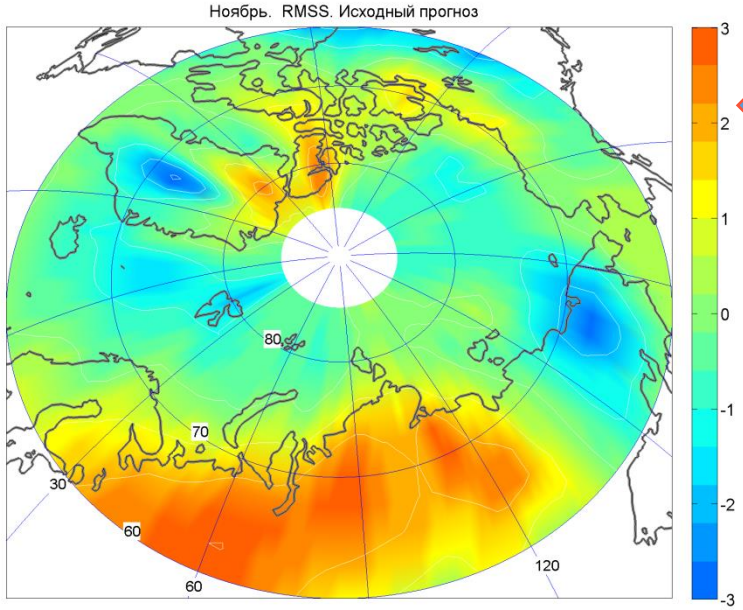
RMSS of SL-AV model forecast of T2m anomaly



Hindcast data were used for period from 1982 to 2010

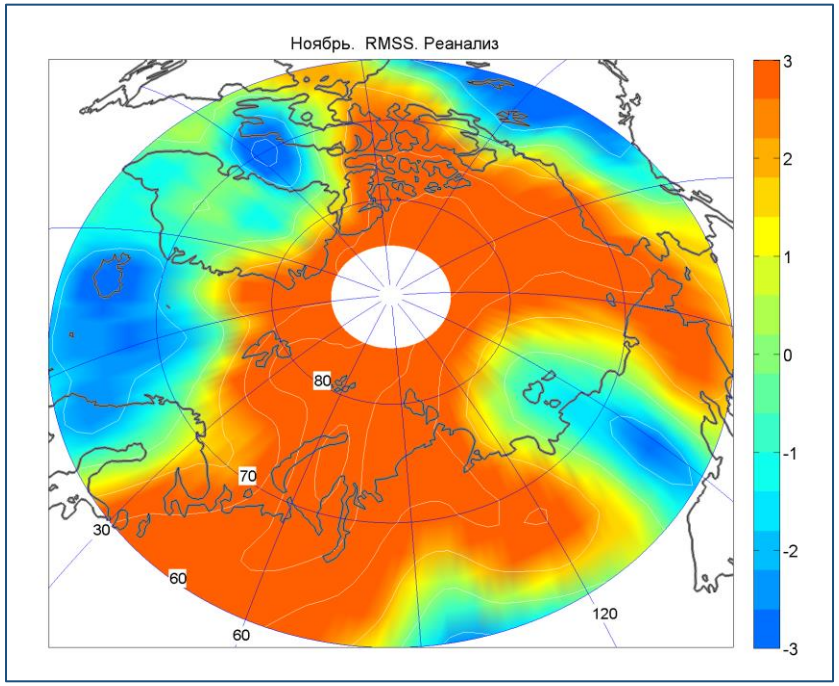
RMSS of corrected SL-AV model forecasts of T2m anomaly

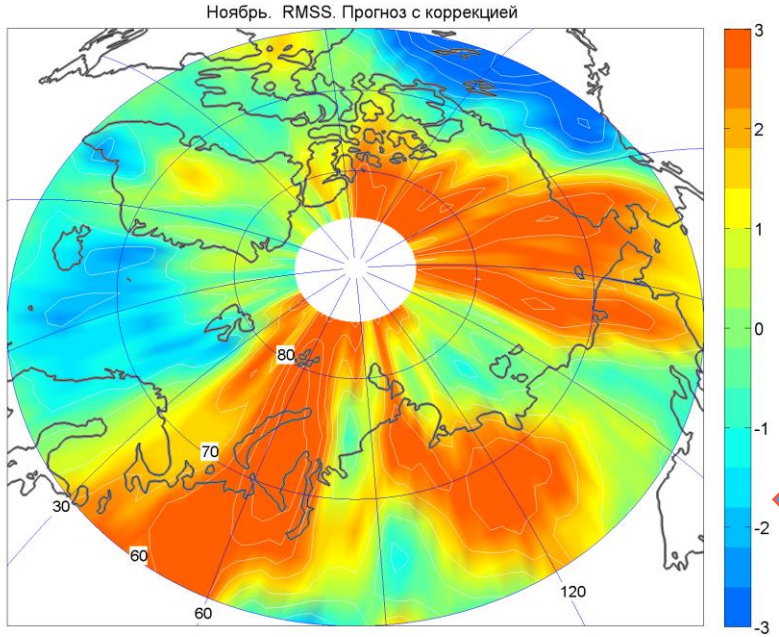




T2m anomaly forecast from SI-AV

T2m anomaly from NCEP/NCAR data



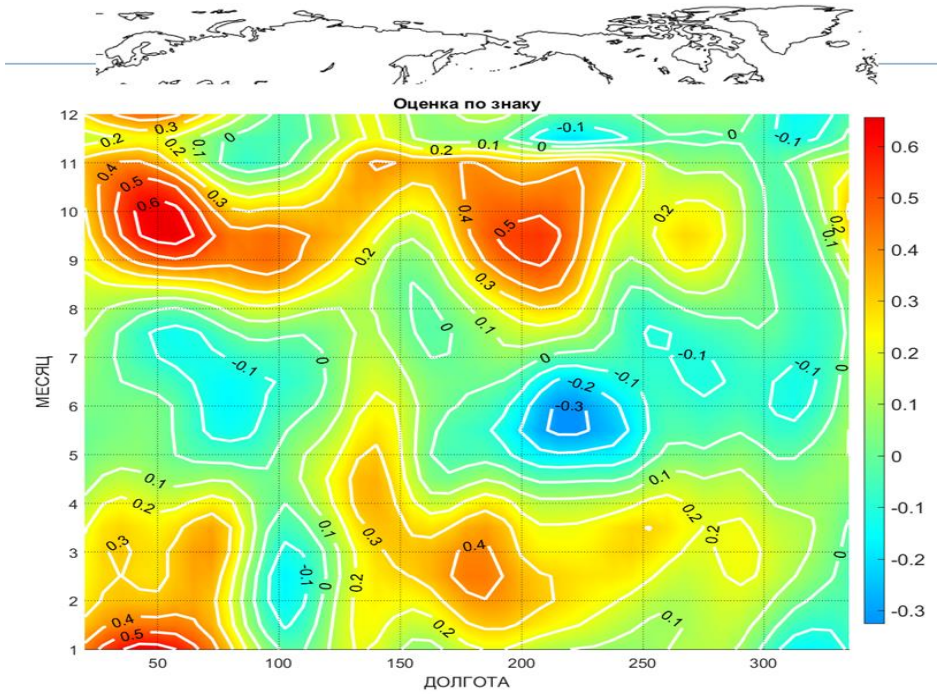


MOS corrected T2m anomaly forecast

Added value of using MOS approach for operational seasonal forecasts

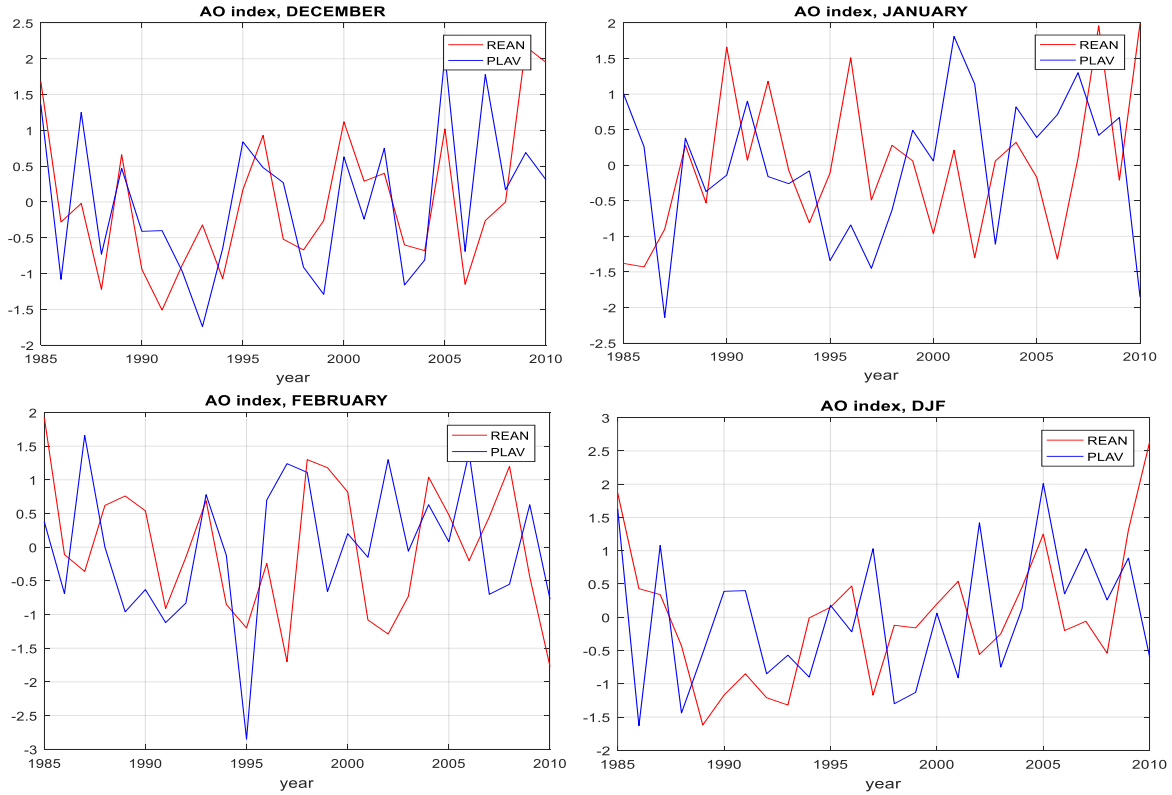
Operational Sl-AV forecasts were used for period from 2015 through 2018

Lead time	ACC	r	RMSSS	Kss
1 mon	0.09	0.11	-0.08	0.11
2 mon	0.16	0.06	0.08	0.06
3 mon	0.11	0.07	0.03	0.06
4 mon	0.09	0.12	0.01	0.09
Season	0.09	0.10	0.13	0.09



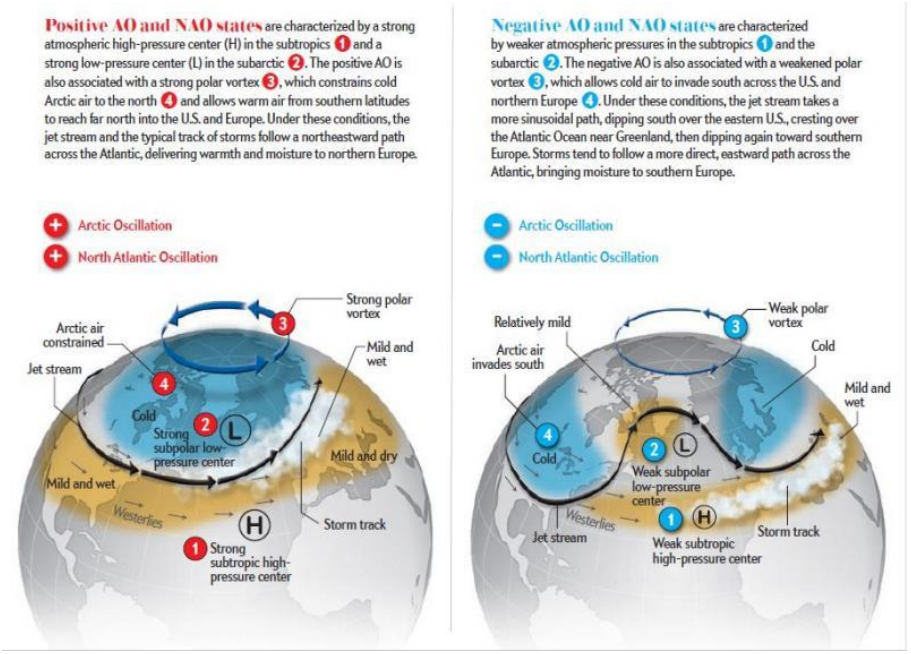
The largest improvements are revealed for transition seasons – autumn and spring.

Simulation of Arctic Oscillation variability by Sl-AV model

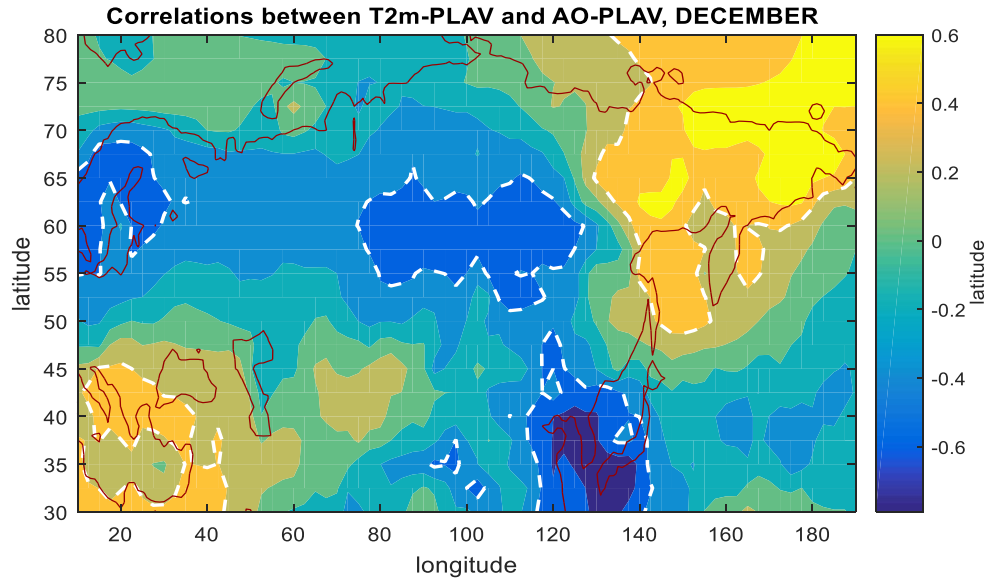


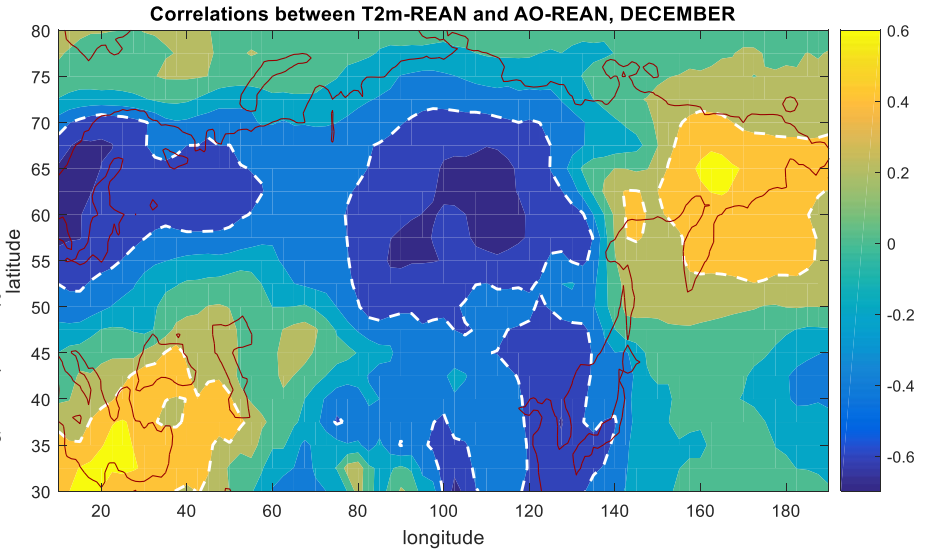
	December	January	February	DJF
AO	0.60	-0.21	0.10	0.2

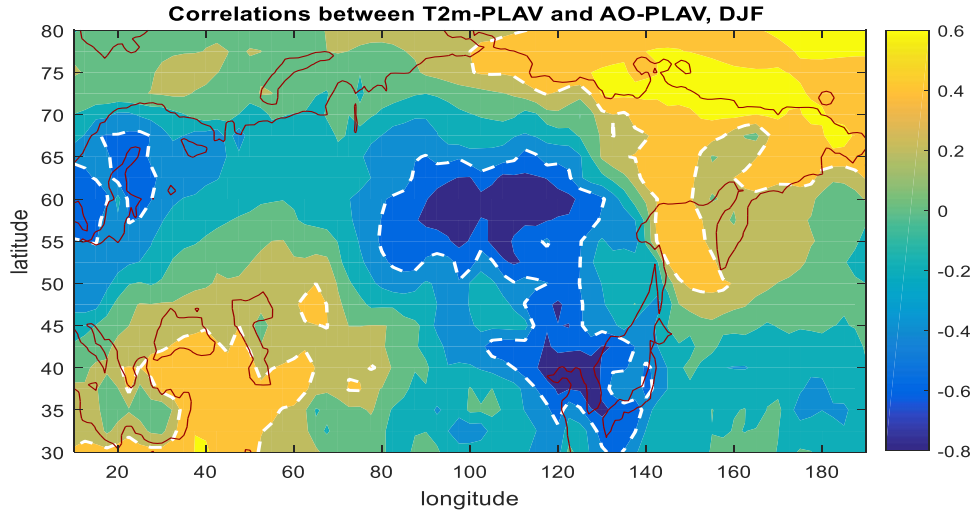
Arctic oscillation index reflects main features of large-scale circulation pattern in Arctic region and high latitudes of Northern Hemisphere.

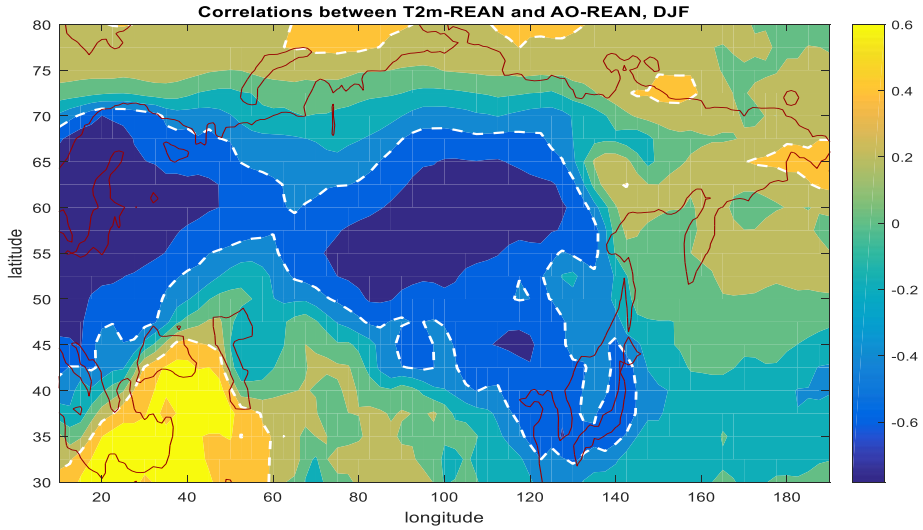


Influence of AO on air temperature regime during boreal winter in northern Eurasia from NCEP/NCAR and SI-AV data

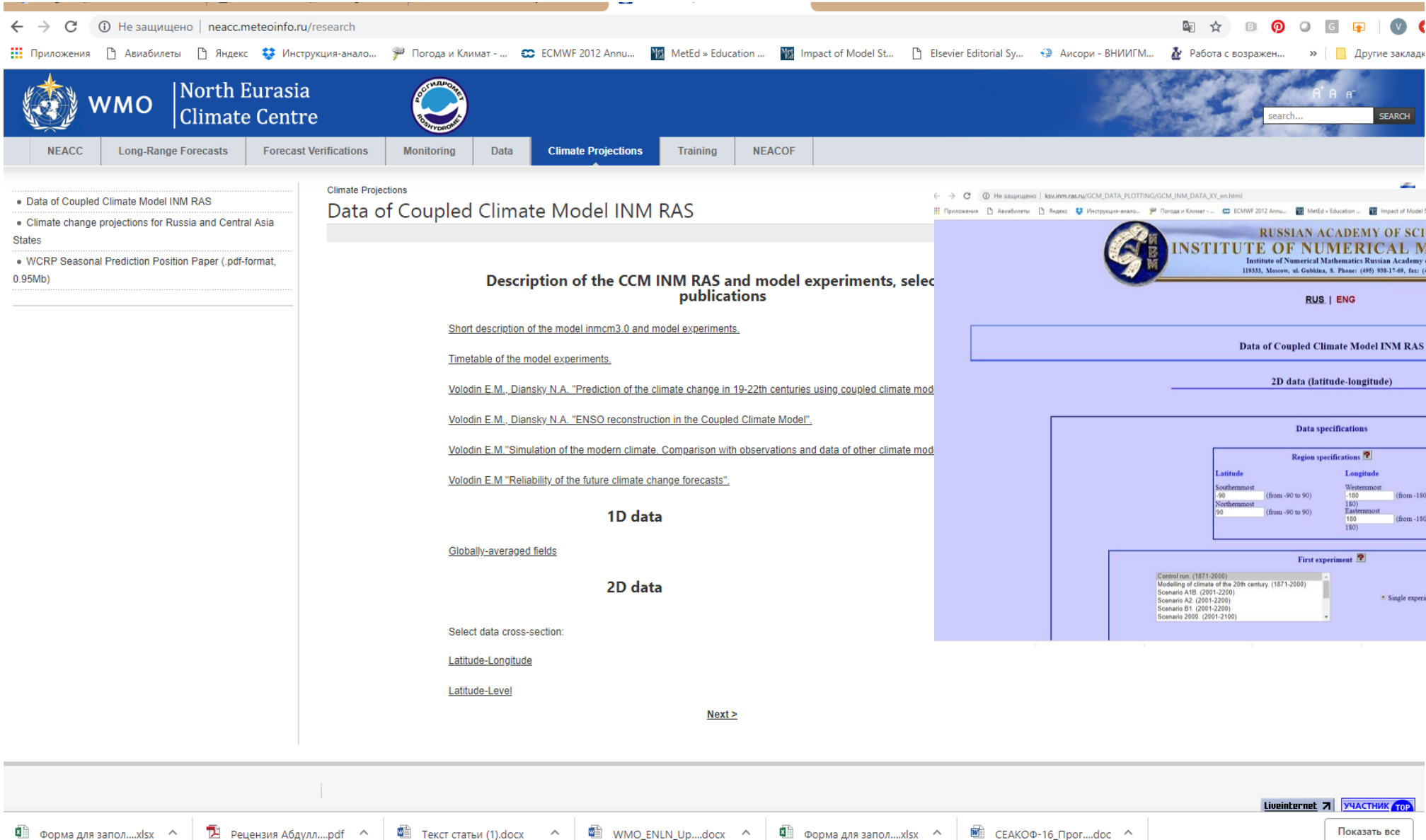








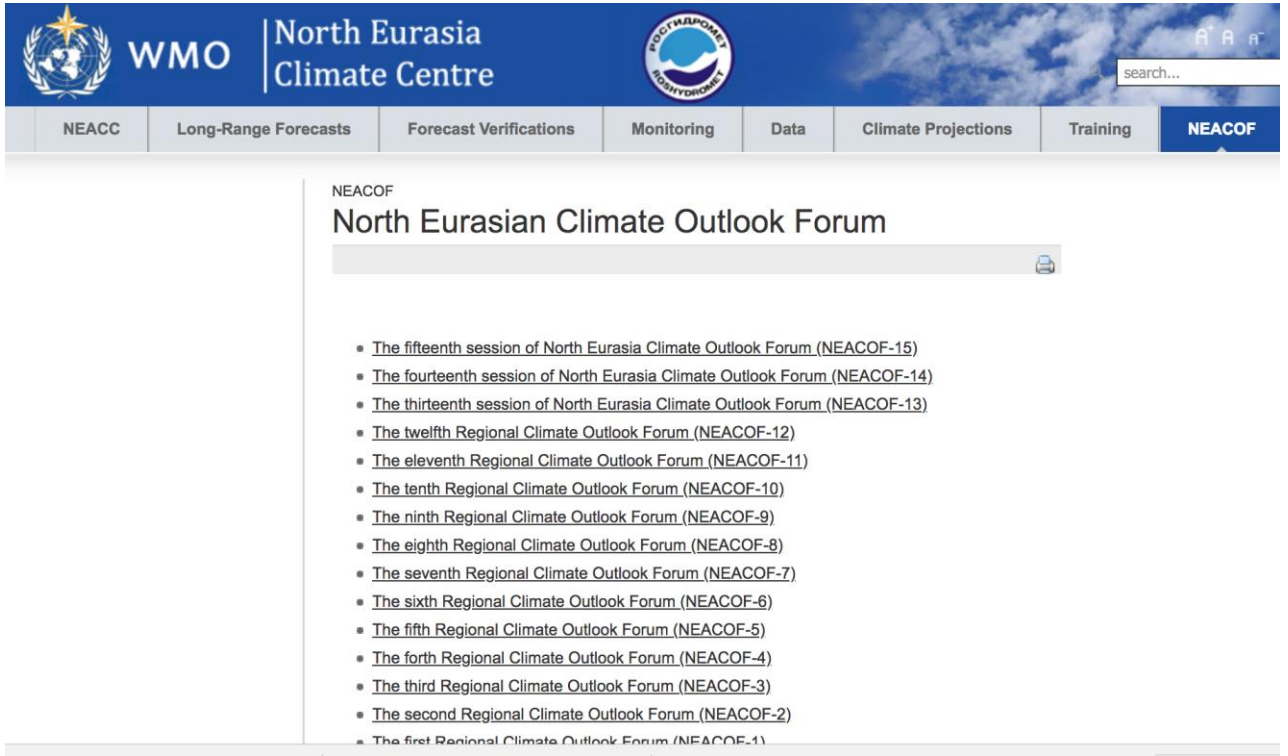
Availability of climate projections information and data through NEACC website



Training activities in LRF area

Mandatory Functions of NEACC on Training in the use of RCC products

- Training courses on LRF topics (irregular);
- Consultation of NHMSs for clarifications of seasonal forecasts in area of interest (upon request);
- NEACOF sessions include training component (at regular time scale)



CST and NEACC Resources

CST)Climate Services Toolkit) is a suite of guidance, procedures and instructions, data, software tools, training resources, and examples for enabling climate services at global, regional, and national levels

The CST main target audience is National Meteorological and Hydrological Services and associated RCCs with end user beneficiaries represent by five GFCS priority sectors.

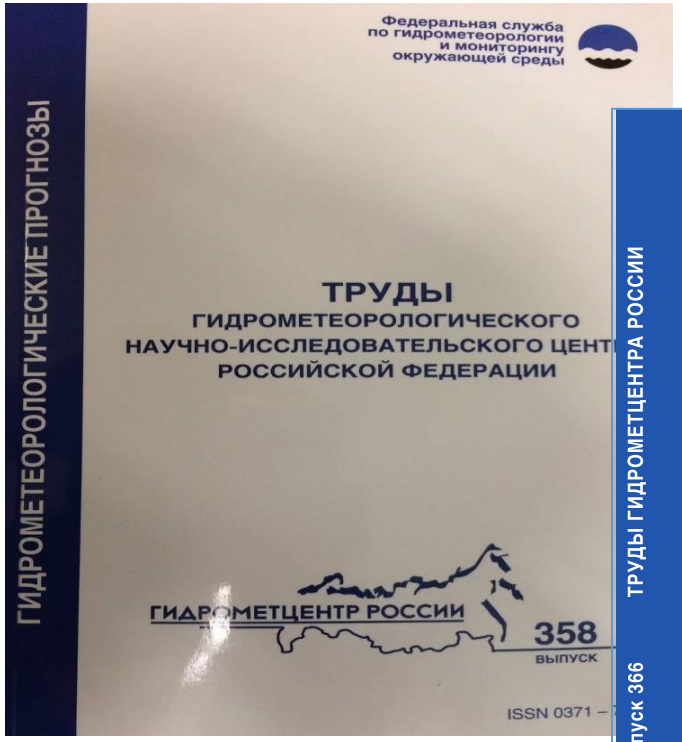
- In collaboration with NEACC, CST will make regional recommendations for climate service tools

Training module of NEACOF-15 included CST overview

November 7, 2018 г.	
Training module: Introduction to some applications and software packages in support of climate services Chair: V.Mirvis Co-chair: D. Baidulloeva	
10.00-10.30	Evaluation of snow cover to predict the seasonal water content of rivers in Central Asia using the MODSNOW-Tool. Demonstration of basic functions. A. Gafurov, consultant of the CAMP4ASB project
10.30-11.00	Climate Services Toolkit developed by the WMO (Climate Services Toolkit CST). Demonstration of basic functions. V.Khan on behalf of TT CST WMO
11.00-11.30	Program complex "Long-term forecaster" Demonstration of basic functions. V.Yu. Tsepelev (North-Western UGMS, RSHU)

Feedbacks from participants of NEACOF-15 were collected for improvement of CST functionality

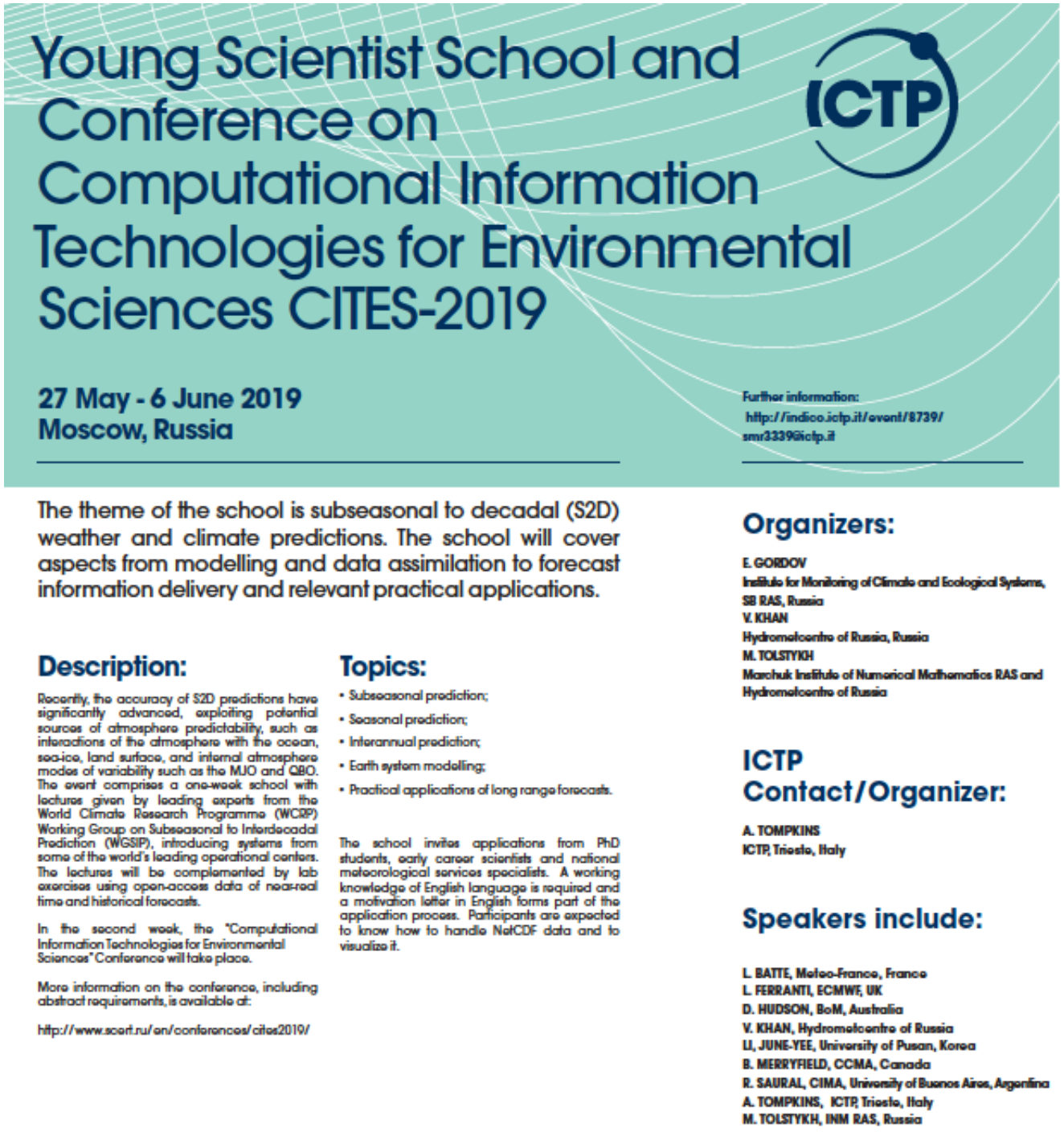
Materials of NEACOF session (research papers and technical notes) have been published in special issues of scientific-technical journal “Hydrometeorological Forecasting and Research ” (former “Trudy Gidrometcentra Rossii”)



2016

2017

The special volume with outcomes of NEACOF-15 held in November 2018 will be published in March 2019.



Young Scientist School and Conference on Computational Information Technologies for Environmental Sciences CITES-2019

ICTP

27 May - 6 June 2019
Moscow, Russia

Further information:
http://indico.ictp.it/event/8739/
smr3339@ictp.it

The theme of the school is subseasonal to decadal (S2D) weather and climate predictions. The school will cover aspects from modelling and data assimilation to forecast information delivery and relevant practical applications.

Description:

Recently, the accuracy of S2D predictions have significantly advanced, exploiting potential sources of atmosphere predictability, such as interactions of the atmosphere with the ocean, sea-ice, land surface, and internal atmosphere modes of variability such as the MJO and QBO. The event comprises a one-week school with lectures given by leading experts from the World Climate Research Programme (WCRP) Working Group on Subseasonal to Interdecadal Prediction (WGSIP), introducing systems from some of the world's leading operational centers. The lectures will be complemented by lab exercises using open-access data of near-real time and historical forecasts.

In the second week, the "Computational Information Technologies for Environmental Sciences" Conference will take place.

More information on the conference, including abstract requirements, is available at:

http://www.scert.ru/en/conferences/cites2019/

Topics:

- Subseasonal prediction;
- Seasonal prediction;
- Interannual prediction;
- Earth system modelling;
- Practical applications of long range forecasts.

The school invites applications from PhD students, early career scientists and national meteorological services specialists. A working knowledge of English language is required and a motivation letter in English forms part of the application process. Participants are expected to know how to handle NetCDF data and to visualize it.

Organizers:

E. GORDOV
Institute for Monitoring of Climate and Ecological Systems, SB RAS, Russia
V. KHAN
Hydrometcentre of Russia, Russia
M. TOLSTYKH
Marchuk Institute of Numerical Mathematics RAS and Hydrometcentre of Russia

ICTP Contact/Organizer:

A. TOMPKINS
ICTP, Trieste, Italy

Speakers include:

L. BATTE, Meteo-France, France
L. FERRANTI, ECMWF, UK
D. HUDSON, BoM, Australia
V. KHAN, Hydrometcentre of Russia
LI, JUNE-YEE, University of Pusan, Korea
B. MERRYFIELD, CCMA, Canada
R. SAURAL, CIMA, University of Buenos Aires, Argentina
A. TOMPKINS, ICTP, Trieste, Italy
M. TOLSTYKH, INM RAS, Russia

Upcoming training events

- Main topic of the upcoming young scientist school is subseasonal to interannual prediction
- Young specialists from NHMSs of CIS were preferentially selected for participation (Armenia, Moldova, Kazakhstan, Kirgizstan, Tajikistan, Ukraine, Uzbekistan,)
- The lectures will be given by WGSIP, ICTP, and IPET-RCA experts.
- Effective collaboration of scientific and operational community
- Followed the young scientist school the16 the session of NEACOF will be combined with CITIES-2019 and conducted as an parallel session during the Conference

http://indico.ictp.it/event/8739/ (school)

http://www.scert.ru/en/conferences/cites2019/
(conference and 16th session of NEACOF)

Welcome to participate in the CITIES-19 and NEACOF-16!

Way Forward

- ✧ Keep making efforts on provision of new LRF products
- ✧ Develop tool for production and verification of objective consensus forecasts
- ✧ Continue LRF area research within Russian and international projects
- ✧ Expand training activities in collaboration with academic and research communities
- ✧ Facilitate use of CST for NHMSs within area of responsibility

Thank you for your attention!