



WEATHER CLIMATE WATER
TEMPS CLIMAT EAU

Capabilities of the Hydrometcenter of Russia (Moscow) for designation as RSMC for limited-area deterministic weather prediction



CBS-16, November 2016

WMO OMM

World Meteorological Organization
Organisation météorologique mondiale



Basic requirements



Centres conducting limited area deterministic numerical weather prediction shall:

- (a) Produce limited area analyses of the three-dimensional structure of the atmosphere;
- (b) Produce limited area forecast fields of basic and derived atmospheric parameters;
- (c) Make available on the WIS a range of these products. The list of mandatory and highly recommended limited area deterministic NWP products to be made available, including metadata, is given in Appendix 2.2.3;
- (d) Produce verification statistics according to the standard defined in Appendix 2.2.21, adapted for the region covered by the model, at an appropriate resolution, and make available consistent up-to-date graphical displays of the verification results on a website;
- (e) Make available on a website up-to-date information on the characteristics of its limited area numerical weather prediction system. The minimum information to be provided is given in Appendix 2.2.4.



- In 2009 Roshydromet joined the COSMO consortium (COnsortium for Small-scale Modeling).
- The mandatory list of limited area deterministic NWP products is covered by the COSMO-Ru system of the Hydrometcentre of Russia

Parameter	Level	Output Resolution	Forecast range	Time steps	Frequency
Geopotential height	925/850/700/500/250	0.5° x 0.5°	Up to 3d	Every 6h	4-times per day
Temperature	925/850/700/500/250				
u,v	925/850/700/500/250				
Relative humidity	925/850/700/500				
Divergence, vorticity	925/850/700/500/250				
MSL pressure	Surface				
2m Temp 10m u, 10m v Total precipitation	Surface				
Medium cloud cover					



COSMO-Ru deterministic NWP system at the Hydrometcenter of Russia (Moscow)



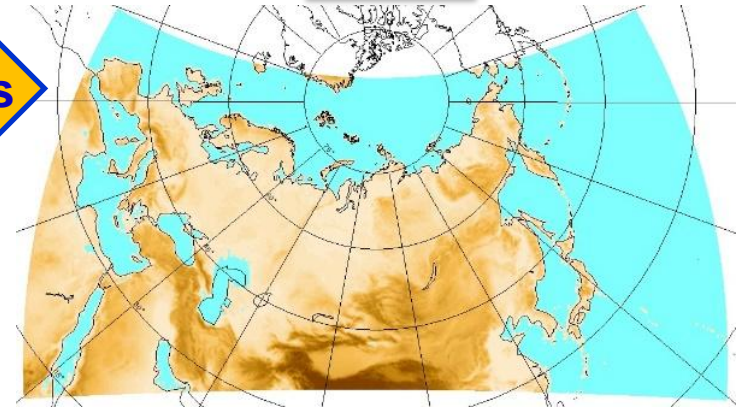
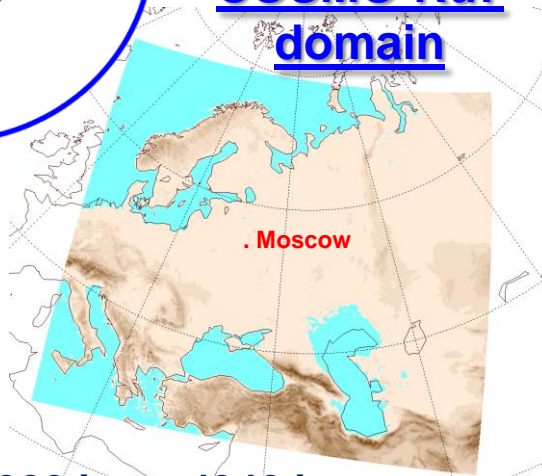
Global driving systems: ICON, domestic global model, GFS

COSMO-Ru13 domain



Initial and boundary conditions

COSMO-Ru7 domain



Domain: 13200 km x 6100 km
Grid spacing: 13.2 km (6.6 km in 2017)
Time step: 120 s
Forecast range: 99 h

Domain: 4900 km x 4340 km
Grid spacing: 7 km (2.2 km in 2017)
Time step: 66 s
Forecast range: 78 h

+ *Three nested domains with grid spacing 2.2km*
Domain: 900 km x 1000 km
Time step: 20 s
Forecast range: 42 h

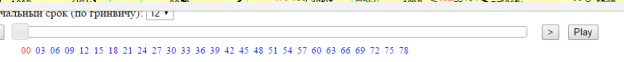
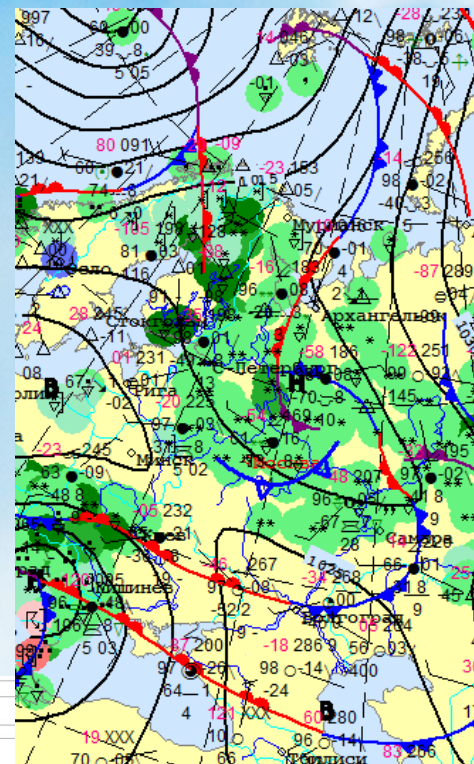
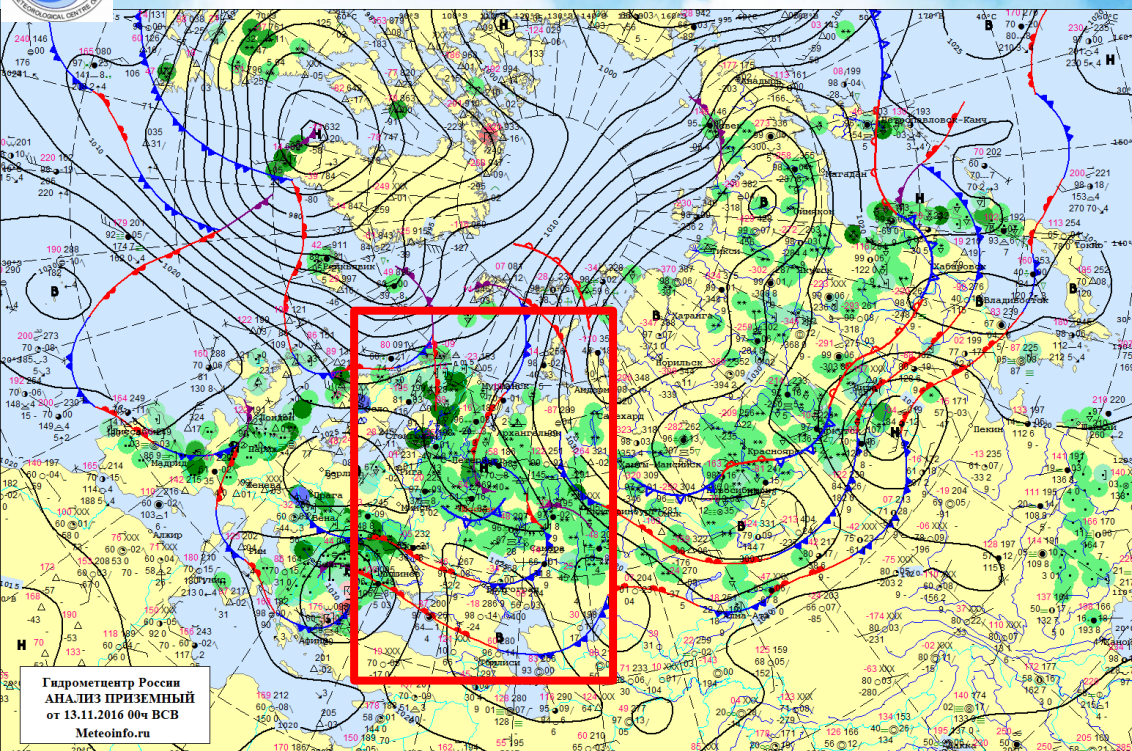
+ *One nested domain with grid spacing 1.1km*
Domain: 210 km x 210 km
Time step: 6 s
Forecast range: 36 h



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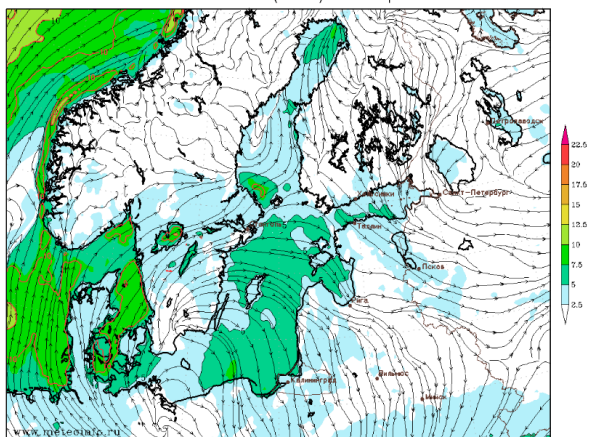


Graphical products: analysis and forecast charts

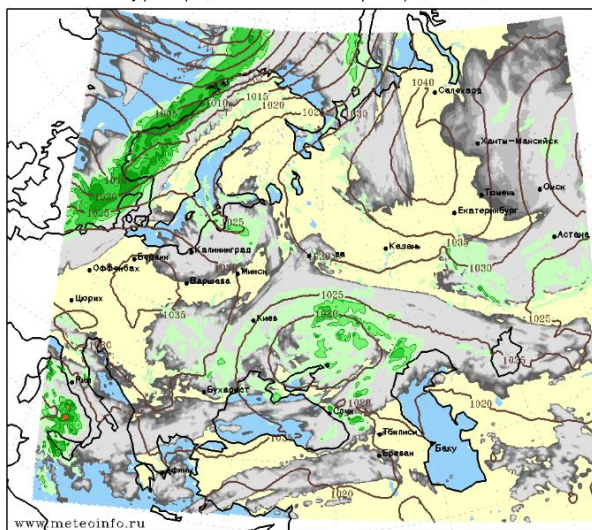


15:00 14ноя 2016 (МСК):
Р ур. моря, облачность ср. яр., Осадки

15:00 13ноя 2016 (МСК): Ветер на 10м



Прогноз на 0ч. от 15:00 13ноя 2016 (МСК) COSMO-Ru 7км
— Период ветра (от 10м/с, через 2.6 м/с)
→ Направление ветра



www.meteoinfo.ru

Available via Internet
(<http://meteoinfo.ru/forecasts/COSMO-Ru>) and specialized GIS-tools

Dissimination of COSMO-Ru7 products

Charts from 00, 16, 12, 18 UTC, time steps 3h up to 78/48h - available via <http://meteoinfo.ru/forecasts/cosmo-maps> or FTP:

- Individual mandatory parameters;
- Combined charts (Po + Medium clouds + 3h/6h/12h Precipitation totals, Po + H500 + T2m, T850+T2m, V10 (vectors) + gust10m, H300/500/700 + stream lines on H300/500/700, Streamlines on 750/800/925 + Relative humidity (R) on 750, V10 streamlines + gust10m, KI, SI, SLI, TT, CAPE, Top of convective cloudiness + |V| on 500hPa, Bottom of convective cloudiness + |V| on 850, Fresh snow depth etc.)

B. Meteograms for locations in European Russia, Belorussia, Armenia, Uzbekistan, Kazakhstan (Po, T2m, Td, T850, T700, T500, cloud top, medium and upper cloudiness, V10m, V500m, V850, V700, V500, Prec (rain/snow), fresh snow depth) - available via <http://meteoinfo.ru/forecasts> and FTP

C. Vertical profiles for a set of locations – via FTP: T, Td, Wind



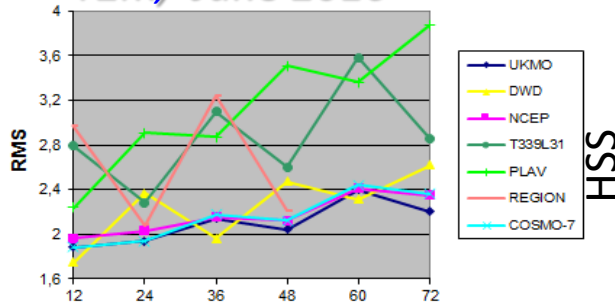
D. Digital products (Grib1/2) on 7x7 km grid - via FTP

Verification tools in use:

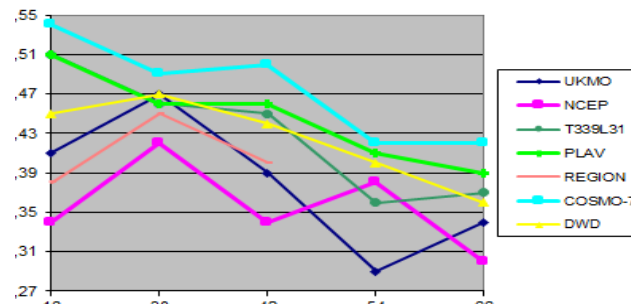
- Domestic verification software for inter-comparison with other NWP systems and development of the own NWP suite;
- COSMO verification package VERSUS2.

Verification results are available at <http://method.meteorf.ru/>

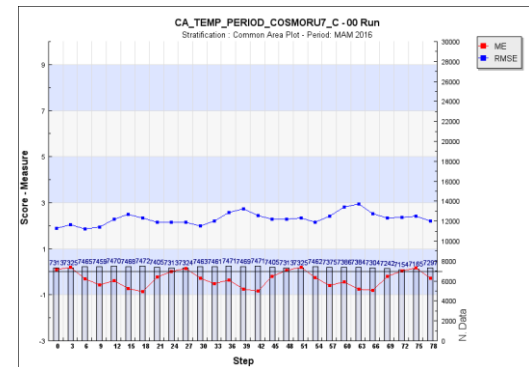
T2m, June 2016



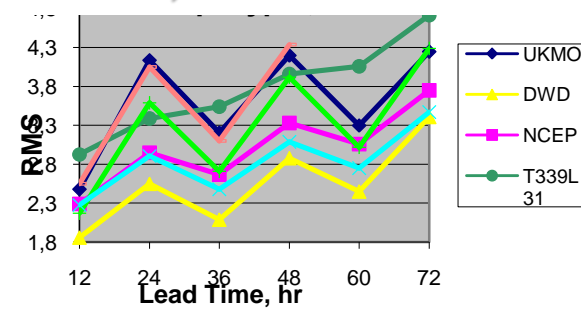
12h precipitation, June 2016



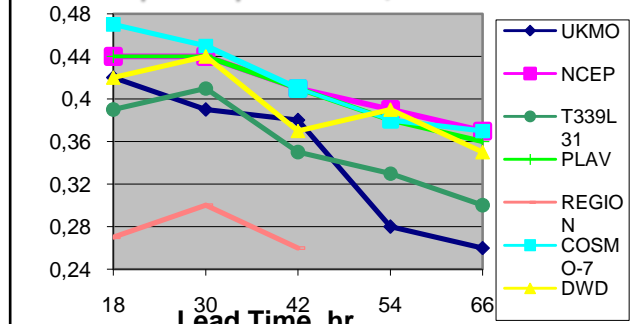
T2m, MAM 2016



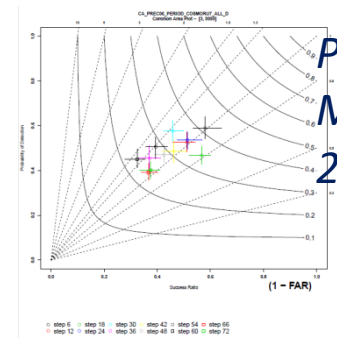
T2m, Jan 2016



12h precipitation, Jan 2016



Prec, MAM 2016





Characteristics of the limited area deterministic NWP system COSMO-Ru7



1. System

System name	COSMO-Ru7
Date of implementation	2009

2. Configuration

Domain	4900 x 4340 km
Horizontal resolution of the model, with indication of grid spacing	7x7 km (<u>2.2x2.2 km in 2017</u>)
Number of model levels	40
Top of model	20 hPa
Forecast length and forecast step interval	48/78 hours; 1/3 hours
Runs per day (Times in UTC)	00, 06, 12, 18
Integration time step	66 s
Additional comments	

3. Initial conditions

Data assimilation method	Nudging; OI for T2m
Additional comments	First guess from ICON system. QC is a part of DA procedure. Archival of obs. data. Rolling archive of model forecasts.

4. Surface Boundary Conditions

Sea-surface temperature? If yes, briefly describe method(s)	DAS product from ICON
Land surface analysis? If yes, briefly describe method(s)	Snow water equivalent: OI analysis with processing of



Characteristics of the limited area deterministic NWP system COSMO-Ru13



1. System

System name	COSMO-Ru13-ENA
Date of implementation	2013

2. Configuration

Domain	13200 x 6100 km
Horizontal resolution of the model, with indication of grid spacing	13.2x13,2 km (<u>6.6x6.6 km in 2017</u>)
Number of model levels	40
Top of model	20 hPa
Forecast length and forecast step interval	99 hours; 3 hours
Runs per day (Times in UTC)	00, 06, 12, 18
Integration time step	120 s
Additional comments	

3. Initial conditions

Data assimilation method	Nudging; OI for T2m
Additional comments	First guess from ICON system. QC is a part of DA procedure. Archival of obs. data. Rolling archive of model forecasts.

4. Surface Boundary Conditions

Sea-surface temperature? If yes, briefly describe method	DAS product from ICON
Land surface analysis? If yes, briefly describe method(s)	Snow water equivalent: OI analysis with processing of GYNOR data



Characteristics of the limited area deterministic NWP system COSMO-Ru7 and COSMO-Ru13



5. Lateral Boundary Conditions	
Model providing lateral boundary conditions	ICON (DWD) or WMC-Moscow global model
Lateral boundary conditions update frequency	3 h
6. Other details of model	
What kind of soil scheme is in use?	TERRA, 7-layer upper soil layer with plants and snow layers
How are radiations parametrized?	Ritter and Geleyn
What kind of Large scale dynamics is in use (e.g. gridpoint semi-Lagrangian)? Hydrostatic or Nonhydrostatic?	Gridpoint (3rd order Runge-Kutta, two time-level scheme and 5th order horizontal advection Nonhydrostatic
Boundary layer parametrization?	Davies-Type based on prognostic TKE
Convection parametrization?	Moist convection: Tiedke / Kain-Fritsch & CAPE-type closure Shallow convection: reduced Tiedke
What Cloud/Microphysics scheme is in use?	Bulk microphysics parameterization incl water vapour, cloud water, cloud ice, rain and snow with 3D transport for the precipitating phases
Other relevant details?	
7. Further Information	
Operational contact point	<u>Gdaly Rivin (gdaly.rivin@mecom.ru)</u>
URLs for system documentation	<u>http://cosmo-model.org/content/model/documentation</u>; <u>http://meteoinfo.ru</u>
URL for list of products	<u>http://meteoinfo.ru/cosmo-maps</u>

Training

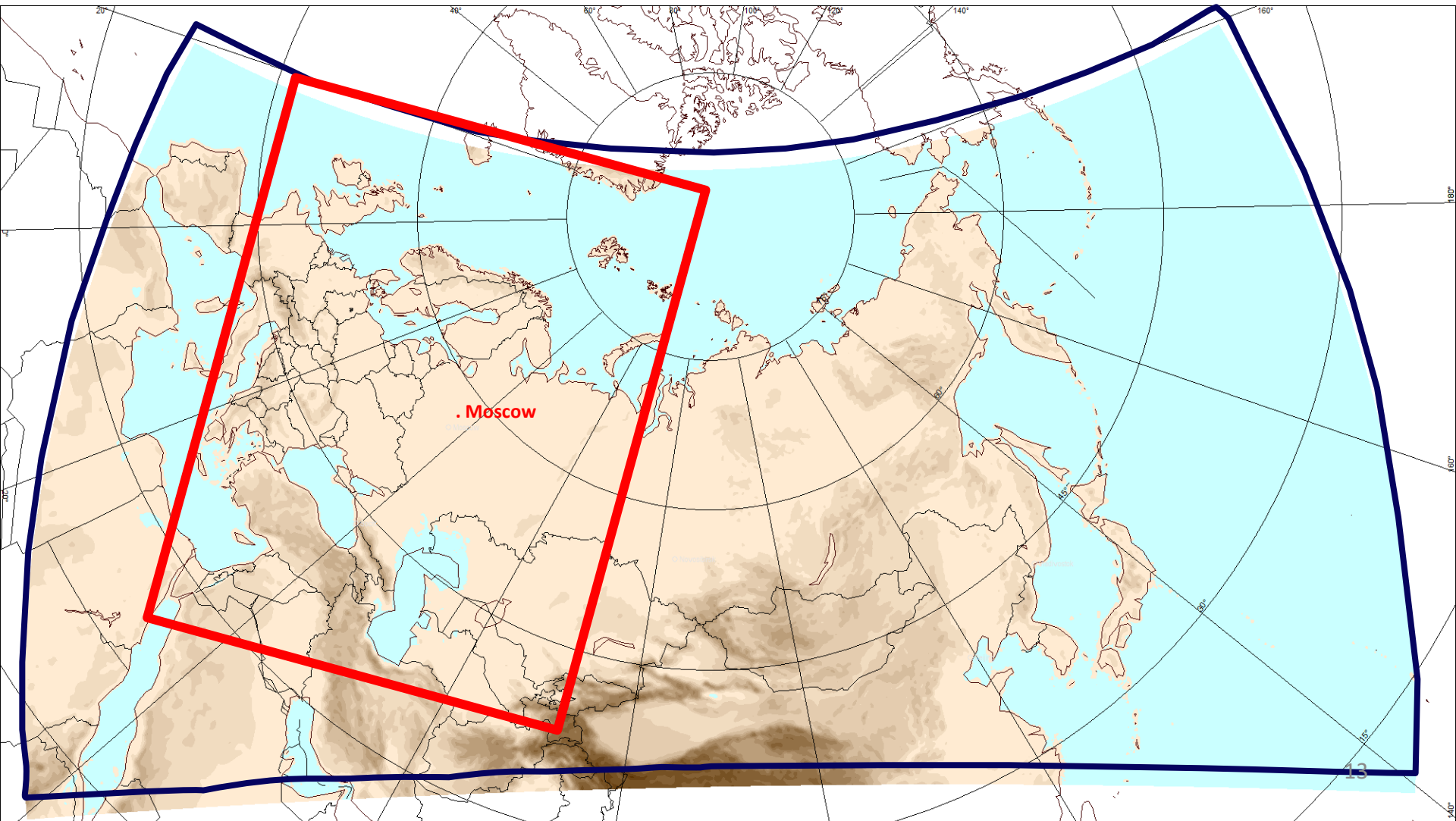
- Specialists of the Center deliver lectures for learners of the WMO Regional Meteorological Training Center in Moscow and for students of the Moscow State University;
- Online training material is published at <http://method.meteorf.ru>;
- International workshops and conferences are held on the basis of the center.

HPC facilities

- Tender for contract for technical modernization of computer facilities of Roshydromet was held in summer-autumn 2016. Contract is expected to be signed by the end of 2016.
- New computer with peak performance 1.2 Pflops is to be available for global and limited area NWP ~in mid 2017.

Plans for 2017 (after upgrade of the supercomputer)

- COSMO-Ru6 – grid spacing 6.6 km
- **COSMO-Ru2 European domain - grid spacing 2.2 km**



Thank you
Merci
Спасибо



WMO OMM

World Meteorological Organization

Organisation météorologique mondiale

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