RUSSIAN HYDROMETEOROLOGICAL SERVICE (ROSHYDROMET)

OPERATIONAL FORECAST SYSTEM COSMO-RU

COSMO-RU07: domain, time of run with MPI

- Initial and boundary data:
  00, 06, 12 and 18 UTC, GME (DWD)
- Forecast: 78 h (00,12 UTC)
  48 h (06,18 UTC)
- Grid step 7 km
- Grid:
  700 * 620 * 40
- SGI Altix 4700 (1664 cores)
  (832 processors Itanium, 64-bit, 3,3 Tb memory)
- Run time for 78 h.
  19 min: 1024 cores
  33 min: 512 cores
  59 min: 256 cores

4900 km

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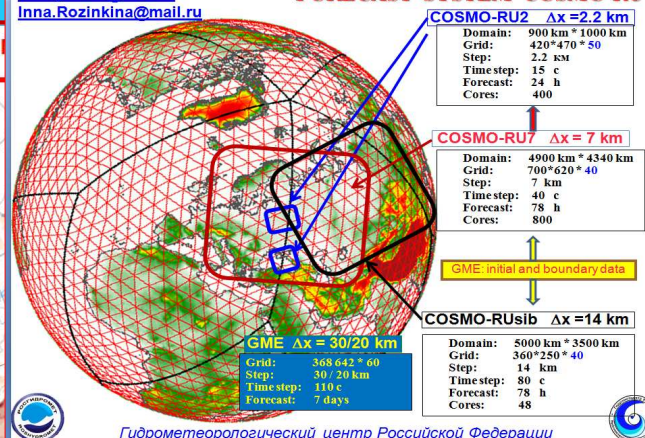
COSMO-RU02: domain, time of run with I

- Initial and boundary data:
  00,06,12 and 18 UTC, GME (DWD)
- Forecast: 24 h
- Grid step 2.2 km
- Grid:
  420 * 470 * 50 (Moscow)
  420 * 470 * 50 (Sochi)
- SGI Altix 4700 (1664 cores)
  (832 processors Itanium 2, 64-bit, 3,3 Tb memory)
- Run time for 24 h.
  27 min: 400 cores

Moscow h = 2.2 km

Sochi h = 2.2 km

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FORECAST SYSTEM COSMO-RU

COSMO-RU2 Δx =2.2 km	
Domain:	900 km * 1000 km
Grid:	420*470 * 50
Step:	2.2 км
Time step:	15 c
Forecast:	24 h
Cores:	400

COSMO-RU7 Δx = 7 km	
Domain:	4900 km * 4340 km
Grid:	700*620 * 40
Step:	7 km
Time step:	40 c
Forecast:	78 h
Cores:	800

GME: initial and boundary data

COSMO-RUsib Δx =14 km	
Domain:	5000 km * 3500 km
Grid:	360*250 * 40
Step:	14 km
Time step:	80 c
Forecast:	78 h
Cores:	48

GME Δx = 30/20 km	
Grid:	368 642 * 60
Step:	30 / 20 km
Time step:	110 c
Forecast:	7 days

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April 13, 2011 Roshydromet decided to implement the system of mesoscale weather prediction COSMO-RU in operational practice as a base for use in Hydrometeorological Centre of Russia and Roshydromet prognostic offices.
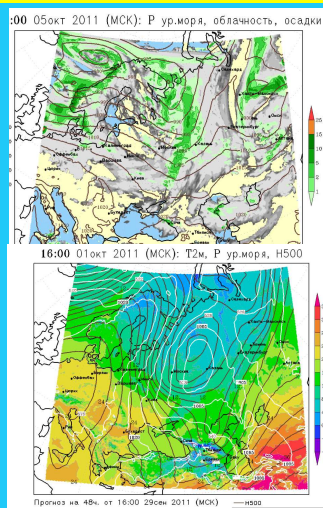
4 times per day
(for 00, 06, 12, 18 h UTC, 4h .15 min. after the observation times)
the system COSMO-RU07km:
- forms 662 weather forecast maps and 400 meteogramms
- send them to the weather forecaster centers of Roshydromet and ftp-servers;
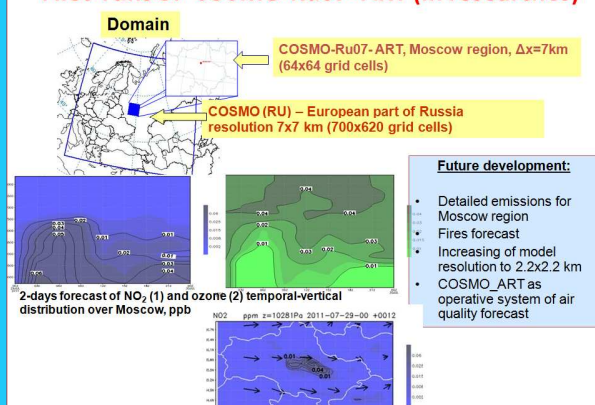- allocates the GRIB-products on a ftp-servers and in the data bases (about 20 GB).
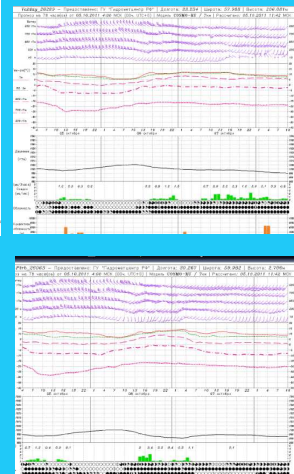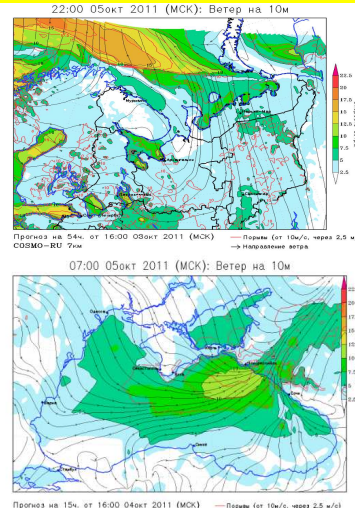
COSMO-RU-14-EPS : Start of researches

main features
- 28 members
- Different variants of model physics, numerical schemes for model dynamics and boundary conditions schemes
- **Ensemble members:** COSMO-RU model, grid: 350×310×40, Δx=Δy=14 km
- **Control experiment:** COSMO-RU model, Δx=Δy=7 km
- **Forecast length:** 78 hours
- **Computer:** SGI Altix 4700 Itanium 2, 1.66 GHz, NUMALink, 1664 PEs, Peak 11 Tflops
- **Performance:** 256 CPUs, forecast ready in 7 hours
- 1 run / day, 00 UTC

applied perturbations PERTURBATION	PARAMETER RANGE	DEFAULT VALUE	USED VALUES
DYNAMICS			
Numerical scheme		Leapfrog	Leapfrog, 2nd order Runge-Kutta, 2nd order Runge-Kutta TVD schemes
Boundary conditions scheme		Implicit	Implicit, explicit
PHYSICS			
Deep convection parameterization scheme		Tiedtke	Tiedtke, Kain-Fritsch
Length scale of sub-scale surface thermal patterns over land (pat_len)	0–10000 m	500	0, 500, 10000 (like used in COSMO-SREPS [Marsigli, 2009])
Scaling factor for the thickness of the laminar boundary layer for heat (rlam_heat)	0.1–10.0	1.0	0.1, 1.0, 10.0 (tested in COSMO-SREPS and CSPERT projects [Marsigli, 2009])

First runs of COSMO-Ru07- ART (in researches)

Domain

COSMO-Ru07- ART, Moscow region, Δx=7km (64x64 grid cells)

COSMO (RU) – European part of Russia resolution 7x7 km (700x620 grid cells)

2-days forecast of NO_2 (1) and ozone (2) temporal-vertical distribution over Moscow, ppb

Future development:
- Detailed emissions for Moscow region
- Fires forecast
- Increasing of model resolution to 2.2x2.2 km
- COSMO_ART as operative system of air quality forecast

Valday water-balance research station in Russia
(57°58'N, 33° 14'E) located in a boreal forest area.

- Seasonal variations with an annual temperature: range of 35°C
- Annual average precipitation of 730 mm (the maximum in the summer and autumn).
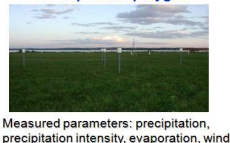- Persistent snow cover period from November until April

Observatory Valday

2011 – start of participation of Roshydromet in the SRNWP Data Exchange Programme EUMETNET.
The necessary preliminary jobs for organization of activities on Valday observatory were carried out

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VALDAY OBSERVATIONS

Precipitation polygon

Meteorological station
Measured parameters: fluxes of radiation, standard meteorological measurements, Soil frost penetration

Water balance
Measured parameters: runoff, soil frost penetration, precipitation, snow height and water content on the forest, evaporation

Measured parameters: precipitation, precipitation intensity, evaporation, wind

Gaging station

Gradient measurements
Measurements: Turbulent fluxes

Meteorological radar

Measured parameters: daily runoff on 9 stations of river Polomet' and its tributaries, maximal snow survey

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METEOROLOGICAL SUPPORT FOR OLYMPICS SOCHI-2014
on the framework WMO project FROST

COSMO Perspective Project CORSO:
Consolidation of **O**peration and **R**esearch results for the **S**ochi **O**lympic Games

CORSO main goal:
To develop and improve the complex operational high resolution short-range forecast technology for mountain areas for winter weather events on base of COSMO researches (in example of Sochi area)

CORSO Participants:
Italy, Germany, Russia, Switzerland

MAIN TASKS:
1. High resolution model development
   FDP: Operative COSMO-RU for SOCHI-2014, Δx=2.2 km incl. DA for mountain region
   RDP: Experimental version COSMO-model Δx=1 km
2. Downscaling postprocessing development
   FDP: Operational technology of local specific weather conditions for venues
   RDP: algorithms of mountain vertical interpolation, development of weather types classification
3. Ensemble high-resolution forecasting
   FDP: EPS Δx = 7 km
   RDP: EPS Δx = 2.2 km
4. Development of forecast verification for "Sochi-201

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