

Environmental monitoring training seminar



Meteorological Aspects of Nuclear Accidents and Bulgarian Emergency Response System

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Outlines

Introduction – overall structure of BERS

Operational part

Meteorological pre-processing

Trajectory calculations

Visualization and Web-presentation

Accidental part

Dispersion model EMAP - description and validation

Dispersion calculations

Visualization and Web-presentation

Participation of BERS in EU 5FP project ENSEMBLE Acknowledgements

Introduction

- In spite many safety measures are permanently taken, industrial accidents leading to release of harmful material (chemical or radioactive) are still probable. In the atmosphere, it can have consequences extending to hundreds and thousands of kilometers. In order to prevent population the decision makers need information about the possible long-range transport of pollutants.
- Computer-based Emergency Response Systems are established in many countries, simulating and predicting the distribution of the released pollution.
- Such system is developed and works operationally in the National Institute of Meteorology and Hydrology (NIMH) of Bulgaria. Its creation and development was highly stimulated by the European Tracer Experiment. NIMH took part in all activities of ETEX with the puff model LED. In the second phase of ETEX, a new model EMAP was tested performing better than LED.



Meteorological pre-processing (input to the built in PBL model)

Two sources of met-data: from UK Met.Office, Bracknell (2.5°, GRID) from DWD, Offenbach (1.5°, GRIB)

Type of meteo-data: U_{850} , V_{850} , T_{850} , T_{gl} , Prec ($\Delta t=12 h$)

Operational data base (Ts - current synoptic term)



Archive data base

Trajectory calculations

 $X(t+\Delta t) = X(t) + V(t).\Delta t$



Kozloduy, BG
 Jose cabrera, ES
 Kursk, RU
 Krsko, SL
 Paluel, FR
 Leibstadt, CH
 Ringhals, SE



- 1. Armenia, AR
- 2. Tarapur, IN
- 3. Gentilly, CA
- 4. Laguna Verde, MX
- 5. Clinton, US
- 6. San Onofre, US
- 7. Hope creek, US
- 8. Tsuruga, JP

Dispersion model EMAP (Eulerian Model for Air Pollution)

Time splitting approach.

Cartesian coordinate system in horizontal (Arakawa's C type).

Log-linear terrain-following staggered Z-coordinate system.

Processes involved:

Advection

TRAP scheme Bott's type explicit positively definite conservative limited numerical viscosity very fast

Horizontal diffusion:

the simplest **explicit** scheme **Vertical difusion**

the simplest **implicit** scheme variable steps

variable diffusion coefficient

Dry deposition: bottom boundary condition to vertical diffusion equation **Wet removal:** simple decay rate



NATIONAL INSTITUTE OF METEOROLOGY AND HYDROLOGY

Numerical Simulation of Radioactive Pollution Distribution



Ground-Level Concentration in Air (Bq/cub.m)



NATIONAL INSTITUTE OF METEOROLOGY AND HYDROLOGY

Numerical Simulation of Radioactive Pollution Distribution



Accumulated Deposition (Bq/sq.m)

SIMULATION DESCRIPTION:

Source Location (*): 51.75N 35.62E Release Rate: 0.10E+11 Bq/s Release Height: 650 Release Duration: 12.00 hrs Start of Release: 30/11/01 09:00 UTC Forecast for: 03/12/01 09:00 UTC Maximum Value: 10000 0.136E+05 1000 100 10



ENSEMBLE

METHODS TO RECONCILE DISPARATE NATIONAL FORECASTS OF MEDIUM AND LONG-RANGE ATMOSPHERIC DISPERSION

CONCEPT, SYSTEM & WEB TOOL

Steano Galmarini IES/JRC-Ispra

LONG RANGE ATMOSPHERIC TRANPORT MODELLING FOR EMERGENCY RESPONSE

Why ENSEMBLE?

- Accidental release of radioactive material from NPP or other
- Atmospheric transport and dispersion over the continent
- Necessity to know where the tracer is going to be in the next few days (60 h), its concentration levels and deposition at ground
- At national level, met services and environmental protection agencies use long range transport and dispersion models to forecast concentration and deposition

Why ENSEMBLE?

Need to estimate the degree of agreement of the various forecasts by analyzing several model results at the same time to support DM by:

- collecting several model results in real time
- display of model results on an homogeneous geographical framework
- real time comparison of single model results, group of model results



What is ENSEMBLE?

- Internet based system for emergency response in case of atmospheric dispersion of radioactive contaminants
- All remote users access and operate the system by web browser
- Rapid exchange of dispersion forecasts produced by several groups in Europe
- Real time consultation of the dispersion forecast
- Ensemble treatment



ENSEMBLE's results



RELEASE NOTIFICATION

	Ensemble - Netscape			
Notification	ENSEMBLE METHODS TO RECONCILE DISPARATE NATIONAL FORECASTS			
	MEDIUM AND LONG-RANGE ATM	MOSPHERIC DISPERSION		
• Email • Fax	European Commission - Fifth Framework Programme project FIKR-CT-2000-00038			
• Web	Exercise number: 02 Change exercise			
	Selected exercise: 02 - Status: closed System time: Wed Jun 19 18:04:45 CEST 2002 You logged in as sgalmarini [models: 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31] from IP address: 139.191.172.112			
	Home Exit Calendar People Models Change your password Contact system administration Documentation Publications Development notes Release information Meteorological conditions Upload new results Status of upload Dataset changes Analysis Personal folder			
	Release information			
	Exercise number	02		
	Lon (dd:mm)	02:20 E		
	Lat (dd:mm)	43:13 N		
	Date and time (UTC)	2001-09-28 12:00		
	Release rate (Bq/h)	1.0E15		
	Duration of release (hours)	6		
	Emission height (m agl)	300		
	Nature of release	leakage		
	Isotope released	Cs137		
	Time horizon of forecast (UTC)	2001-10-01 00:00		



UPLOADING MODEL RESULTS

File Edit View Go Communicator Help Diamanana Anno 2000 Anno 2000 Anno 2000 Anno 2000				
ENSEMBLE METHODS TO RECONCILE DISPARATE NATIO OF MEDIUM AND LONG-RANGE ATMOSPHERIC European Commission - Fifth Framework Programme project FIKR-CT-2000-00038	ONAL FORECASTS DISPERSION			
Exercise number: 05 Change exercise				
Selected exercise: 05 - Status: open System time: Thu Jun 20 10:53:53 CEST 2002 You logged in as sgalmarini [models: 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 27 28 29 30 31] from IP address: 139.191.172.112	File Upload	<u>? ×</u>		
Home Exit Calendar People Models Change your password Contact system admir Documentation Publications Development notes Release information Meteorological conditions Upload new results Status of upload Date Personal folder	My Computer My Network Places Prepository			
Upload new results Image: Compute results Valid names for upload are mo-ex-yyyymmddhhmm.zip and mo-ex-yyyymmddhhmm.ens.gz, according to the specifications set in the Technical Specification Document Image: Compute results				
Enter the name of the file to be uploaded: Ensemble-file-modelXX Browse Reset Upload	File name: Ensei Files of type: HTML Files	mble-file-modelXX		
Document: Done				





ECWMF-based forecast of 4 models

HIRLAM-based forecast of 6 models



Projection: LambertAzimuthal Created by user sgalmarini on 2002-01-11 08:39:55 UTC Projection: LambertAzimuthal Created by user sgalmarini on 2002-01-11 08:40:29 UTC



Exercise 03 - Space overlap for concentration (0 m ogl) in Bg/m³ Date and time: 2001-11-22 12:00 UTC (+24h0m after release start) Threshold level = .01

Release infor Location: 00:00 E 51:33 N Start: 2001-11-21 12:00 UTC Duration: 6 hours



HIRLAM-based forecast of 6 models



Projection: LambertAzimuthal Created by user sgalmarini on 2002-01-11 08:40:29 UTC Exercise 03 - Space overlap for concentration (0 m agl) in Bg/m^a Date and time: 2001-11-22 12:00 UTC (+24h0m after release start) Threshold level = .01



Projection: LambertAzimuthal Created by user sgalmarini on 2002-01-11 08:41:05 UTC

Release info:

Location: 00:00 E 51:33 N Start: 2001-11-21 12:00 UTC Duration: 6 hours

Model(s) [delta meteo/delta upload] Ensemble A: avg DK1 [+60h0m/+121h55m] NL1 [+60h0m/+145h19m]

NO1 [+60h0m/+95h37m] DK2 [+60h0m/+118h47m] DK3 [+60h0m/+118h48m] DK4 [+60h0m/+121h54m]

Ensemble B: avg

UK1 [+60h0m/+166h56m] DE1 [+60h0m/+119h20m] FR1 [+60h0m/+121h43m] BE1 [+60b0m/+147h31m]

Overlap (FMS)

Summary of ENSEMBLE project achievements Main characteristics of the ENSEMBLE system

- Availability of several tens of model results in real time
- Possibility to consult several model outputs (conc., t-int. conc., wet-,dry- dep., precipitation) at surface and in the vertical up to 3000 m
- Total freedom is given to the user in the consultation and analysis of the results
- Availability of several tools that allow to condense the results of several models
- Timeliness in the uploading procedures
- Timeliness in the consultation phase
- No need for installation of special software at the client side, a browser and an access to the system are sufficient for operating it
- The system has been conceived for a pre-operational application
- The approach can be applied to the dispersion of other types of harmful contaminants

Participation of Bulgarian ERS in ENSEMBLE

- Bulgarian team joined ENSEMBLE when half a project passed
- All previous runs calculated *off line*
- Participation in all other regular and additional runs (ETEX, Iraq)

The score of BERS varies between the different runs. For demonstration, among the big variety of statistics and graphs the "Concentration overlap" graphs and the FMS-statistics will be presented here, as produced by the ENSEMBLE web-site.

Two runs will be shown – the best and the worst ones

BERS results are compared with the average of 9 European models: Austria, Belgium, Denmark, France, Germany, Netherlands, Norway, Sweden and United Kingdom (model No 1 of each country).

RUN 05

animated

Exercise 05 - Space overlap for concentration (0 m agl) of Cs137 in Bq/m^a Date and time: 2002-04-16 15:00 UTC (+3h0m after release start) Threshold level = 0.01



Model(s) [delta meteo/delta upload] Ensemble A: avg

- UK1 [+60h0m/+170h55m]
- DK1 [+60h0m/+71h59m]
- SE1 [+60h0m/+71h36m]
- DE1 [+60h0m/+68h31m]
- FR1 [+60h0m/+140h46m]
- NL1 [+60h0m/+67h56m]
- N01 [+54h0m/+71h22m]
- AT1 [+36h0m/+41h46m]
- BE1 [+0h0m/+44h57m]

Ensemble B: none

BG1 [+60h0m/+2159h44m]

Overlap (FMS)

Projection: LambertAzimuthal Created by user dsyrakov on 2004-03-08 13:12:13 UTC

65

60

•



RUN 07

Exercise 07 - Space overlap for concentration (0 m agl) of Cs137 in Bq/m^a Date and time: 2002-10-04 09:00 UTC (+2h0m after release start) Threshold level = 0.01



Release from Glasgow Location: 04:14 W 55:53 N Start: 2002-10-04 07:00 UTC Duration: 4 h hours

Model(s) [delta meteo/delta upload] Ensemble A: avg

DE1 [+65h0m/+77h36m] AT1 [+65h0m/+70h39m] NL1 [+65h0m/+73h26m] DK1 [+59h0m/+73h16m] SE1 [+59h0m/+73h40m] BE1 [+59h0m/+169h16m] UK1 [+53h0m/+75h42m] FR1 [+53h0m/+78h42m] N01 [+53h0m/+78h42m]

Ensemble B: none

BG1 [+65h0m/+74h42m]

Overlap (FMS)

49%

Projection: LambertAzimuthal Created by user dsyrakov on 2004-03-08 13:49:45 UTC Exercise 07 - Space overlap for concentration (0 m agl) of Cs137 in Bq/m^a Date and time: 2002-10-04 12:00 UTC (+5h0m after release start) Threshold level = 0.01



Release from Glasgow Location: 04:14 W 55:53 N Start: 2002-10-04 07:00 UTC Duration: 4 h hours

Model(s) [delta meteo/delta upload] Ensemble A: avg

DE1 [+65h0m/+77h36m] AT1 [+65h0m/+70h39m] NL1 [+65h0m/+73h26m] DK1 [+59h0m/+73h16m] SE1 [+59h0m/+73h40m] BE1 [+59h0m/+169h16m] UK1 [+53h0m/+75h42m] FR1 [+53h0m/+78h42m] N01 [+53h0m/+78h42m]

Ensemble B: none

BG1 [+65h0m/+74h42m]

Overlap (FMS)

49%

Projection: LambertAzimuthal Created by user dsyrakov on 2004-03-08 13:51:35 UTC Exercise 07 - Space overlap for concentration (0 m agl) of Cs137 in Bq/m^a Date and time: 2002-10-04 15:00 UTC (+8h0m after release start) Threshold level = 0.01



Release from Glasgow Location: 04:14 W 55:53 N Start: 2002-10-04 07:00 UTC Duration: 4 h hours

Model(s) [delta meteo/delta upload] Ensemble A: avg

DE1 [+65h0m/+77h36m] AT1 [+65h0m/+70h39m] NL1 [+65h0m/+73h26m] DK1 [+59h0m/+73h16m] SE1 [+59h0m/+73h40m] BE1 [+59h0m/+169h16m] UK1 [+53h0m/+75h42m] FR1 [+53h0m/+78h42m] N01 [+53h0m/+78h42m]

Ensemble B: none

BG1 [+65h0m/+74h42m]

Overlap (FMS)

46%

Projection: LambertAzimuthal Created by user dsyrakov on 2004-03-08 13:52:11 UTC Exercise 07 - Space overlap for concentration (0 m agl) of Cs137 in Bq/m^a Date and time: 2002-10-04 18:00 UTC (+11hOm after release start) Threshold level = 0.01



Release from Glasgow Location: 04:14 W 55:53 N Start: 2002-10-04 07:00 UTC Duration: 4 h hours

Model(s) [delta meteo/delta upload] Ensemble A: avg

DE1 [+65h0m/+77h36m] AT1 [+65h0m/+70h39m] NL1 [+65h0m/+73h26m] DK1 [+59h0m/+73h16m] SE1 [+59h0m/+73h40m] BE1 [+59h0m/+169h16m] UK1 [+53h0m/+75h42m] FR1 [+53h0m/+78h42m] N01 [+53h0m/+78h42m]

Ensemble B: none

BG1 [+65h0m/+74h42m]

Overlap (FMS)

48%

Projection: LambertAzimuthal Created by user dsyrakov on 2004-03-08 13:52:54 UTC Exercise 07 - Space overlap for concentration (0 m agl) of Cs137 in Bq/m^a Date and time: 2002-10-04 21:00 UTC (+14hOm after release start) Threshold level = 0.01



Release from Glasgow Location: 04:14 W 55:53 N Start: 2002-10-04 07:00 UTC Duration: 4 h hours

Model(s) [delta meteo/delta upload] Ensemble A: avg

DE1 [+65h0m/+77h36m] AT1 [+65h0m/+70h39m] NL1 [+65h0m/+73h26m] DK1 [+59h0m/+73h16m] SE1 [+59h0m/+73h40m] BE1 [+59h0m/+169h16m] UK1 [+53h0m/+75h42m] FR1 [+53h0m/+78h42m] N01 [+53h0m/+78h42m]

Ensemble B: none

BG1 [+65h0m/+74h42m]

Overlap (FMS)

45%

Projection: LambertAzimuthal Created by user dsyrakov on 2004-03-08 13:53:29 UTC Exercise 07 - Space overlap for concentration (0 m agl) of Cs137 in Bq/m^a Date and time: 2002-10-05 00:00 UTC (+17h0m after release start) Threshold level = 0.01



Release from Glasgow Location: 04:14 W 55:53 N Start: 2002-10-04 07:00 UTC Duration: 4 h hours

Model(s) [delta meteo/delta upload] Ensemble A: avg

DE1 [+65h0m/+77h36m] AT1 [+65h0m/+70h39m] NL1 [+65h0m/+73h26m] DK1 [+59h0m/+73h16m] SE1 [+59h0m/+73h40m] BE1 [+59h0m/+169h16m] UK1 [+53h0m/+75h42m] FR1 [+53h0m/+78h42m] N01 [+53h0m/+78h42m]

Ensemble B: none

BG1 [+65h0m/+74h42m]

Overlap (FMS)

45%

Projection: LambertAzimuthal Created by user dsyrakov on 2004-03-08 13:54:14 UTC Exercise 07 - Space overlap for concentration (0 m agl) of Cs137 in Bq/m^a Date and time: 2002-10-05 03:00 UTC (+20h0m after release start) Threshold level = 0.01



Release from Glasgow Location: 04:14 W 55:53 N Start: 2002-10-04 07:00 UTC Duration: 4 h hours

Model(s) [delta meteo/delta upload] Ensemble A: avg

DE1 [+65h0m/+77h36m] AT1 [+65h0m/+70h39m] NL1 [+65h0m/+73h26m] DK1 [+59h0m/+73h16m] SE1 [+59h0m/+73h40m] BE1 [+59h0m/+169h16m] UK1 [+53h0m/+75h42m] FR1 [+53h0m/+78h42m] N01 [+53h0m/+78h42m]

Ensemble B: none

BG1 [+65h0m/+74h42m]

Overlap (FMS)

46%

Projection: LambertAzimuthal Created by user dsyrakov on 2004-03-08 13:54:58 UTC Exercise 07 - Space overlap for concentration (0 m agl) of Cs137 in Bq/m^a Date and time: 2002-10-05 06:00 UTC (+23hOm after release start) Threshold level = 0.01



Release from Glasgow Location: 04:14 W 55:53 N Start: 2002-10-04 07:00 UTC Duration: 4 h hours

Model(s) [delta meteo/delta upload] Ensemble A: avg

DE1 [+65h0m/+77h36m] AT1 [+65h0m/+70h39m] NL1 [+65h0m/+73h26m] DK1 [+59h0m/+73h16m] SE1 [+59h0m/+73h40m] BE1 [+59h0m/+169h16m] UK1 [+53h0m/+75h42m] FR1 [+53h0m/+78h42m] N01 [+53h0m/+78h42m]

Ensemble B: none

BG1 [+65h0m/+74h42m]

Overlap (FMS)

47%

Projection: LambertAzimuthal Created by user dsyrakov on 2004-03-08 13:55:34 UTC Exercise 07 - Space overlap for concentration (0 m agl) of Cs137 in Bq/m^a Date and time: 2002-10-05 09:00 UTC (+26h0m after release start) Threshold level = 0.01



Release from Glasgow Location: 04:14 W 55:53 N Start: 2002-10-04 07:00 UTC Duration: 4 h hours

Model(s) [delta meteo/delta upload] Ensemble A: avg

DE1 [+65h0m/+77h36m] AT1 [+65h0m/+70h39m] NL1 [+65h0m/+73h26m] DK1 [+59h0m/+73h16m] SE1 [+59h0m/+73h40m] BE1 [+59h0m/+169h16m] UK1 [+53h0m/+75h42m] FR1 [+53h0m/+78h42m] N01 [+53h0m/+78h42m]

Ensemble B: none

BG1 [+65h0m/+74h42m]

Overlap (FMS)

43%

Projection: LambertAzimuthal Created by user dsyrakov on 2004-03-08 13:56:15 UTC Exercise 07 - Space overlap for concentration (0 m agl) of Cs137 in Bq/m^a Date and time: 2002-10-05 12:00 UTC (+29h0m after release start) Threshold level = 0.01



Release from Glasgow Location: 04:14 W 55:53 N Start: 2002-10-04 07:00 UTC Duration: 4 h hours

Model(s) [delta meteo/delta upload] Ensemble A: avg

DE1 [+65h0m/+77h36m] AT1 [+65h0m/+70h39m] NL1 [+65h0m/+73h26m] DK1 [+59h0m/+73h16m] SE1 [+59h0m/+73h40m] BE1 [+59h0m/+169h16m] UK1 [+53h0m/+75h42m] FR1 [+53h0m/+78h42m] N01 [+53h0m/+78h42m]

Ensemble B: none

BG1 [+65h0m/+74h42m]

Overlap (FMS)

39%

Projection: LambertAzimuthal Created by user dsyrakov on 2004-03-08 13:57:05 UTC Exercise 07 - Space overlap for concentration (0 m agl) of Cs137 in Bq/m^a Date and time: 2002-10-05 15:00 UTC (+32h0m after release start) Threshold level = 0.01



Release from Glasgow Location: 04:14 W 55:53 N Start: 2002-10-04 07:00 UTC Duration: 4 h hours

Model(s) [delta meteo/delta upload] Ensemble A: avg

DE1 [+65h0m/+77h36m] AT1 [+65h0m/+70h39m] NL1 [+65h0m/+73h26m] DK1 [+59h0m/+73h16m] SE1 [+59h0m/+73h40m] BE1 [+59h0m/+169h16m] UK1 [+53h0m/+75h42m] FR1 [+53h0m/+78h42m] N01 [+53h0m/+78h42m]

Ensemble B: none

BG1 [+65h0m/+74h42m]

Overlap (FMS)

31%

Projection: LambertAzimuthal Created by user dsyrakov on 2004-03-08 13:57:42 UTC Exercise 07 - Space overlap for concentration (0 m agl) of Cs137 in Bq/m^a Date and time: 2002-10-05 18:00 UTC (+35h0m after release start) Threshold level = 0.01



Release from Glasgow Location: 04:14 W 55:53 N Start: 2002-10-04 07:00 UTC Duration: 4 h hours

Model(s) [delta meteo/delta upload] Ensemble A: avg

DE1 [+65h0m/+77h36m] AT1 [+65h0m/+70h39m] NL1 [+65h0m/+73h26m] DK1 [+59h0m/+73h16m] SE1 [+59h0m/+73h40m] BE1 [+59h0m/+169h16m] UK1 [+53h0m/+75h42m] FR1 [+53h0m/+78h42m] N01 [+53h0m/+78h42m]

Ensemble B: none

BG1 [+65h0m/+74h42m]

Overlap (FMS)

30%

Projection: LambertAzimuthal Created by user dsyrakov on 2004-03-08 13:58:21 UTC Exercise 07 - Space overlap for concentration (0 m agl) of Cs137 in Bq/m^a Date and time: 2002-10-05 21:00 UTC (+38h0m after release start) Threshold level = 0.01



Release from Glasgow Location: 04:14 W 55:53 N Start: 2002-10-04 07:00 UTC Duration: 4 h hours

Model(s) [delta meteo/delta upload] Ensemble A: avg

DE1 [+65h0m/+77h36m] AT1 [+65h0m/+70h39m] NL1 [+65h0m/+73h26m] DK1 [+59h0m/+73h16m] SE1 [+59h0m/+73h40m] BE1 [+59h0m/+169h16m] UK1 [+53h0m/+75h42m] FR1 [+53h0m/+78h42m] N01 [+53h0m/+78h42m]

Ensemble B: none

BG1 [+65h0m/+74h42m]

Overlap (FMS)

24%

Projection: LambertAzimuthal Created by user dsyrakov on 2004-03-08 13:59:00 UTC Exercise 07 - Space overlap for concentration (0 m agl) of Cs137 in Bq/m^a Date and time: 2002-10-06~00:00~UTC~(+41hOm~after~release~start)Threshold level = 0.01



Release from Glasgow Location: 04:14 W 55:53 N Start: 2002–10–04 07:00 UTC Duration: 4 h hours

Model(s) [delta meteo/delta upload] Ensemble A: avg

DE1 [+65h0m/+77h36m] AT1 [+65h0m/+70h39m] NL1 [+65h0m/+73h26m] DK1 [+59h0m/+73h16m] SE1 [+59h0m/+73h40m] BE1 [+59h0m/+169h16m] UK1 [+53h0m/+75h42m] FR1 [+53h0m/+78h42m] N01 [+53h0m/+78h42m]

Ensemble B: none

BG1 [+65h0m/+74h42m]

Overlap (FMS)

19%

Projection: LambertAzimuthal Created by user dsyrakov on 2004-03-08 13:59:38 UTC Exercise 07 - Space overlap for concentration (0 m agl) of Cs137 in Bq/m^a Date and time: 2002-10-06 03:00 UTC (+44hOm after release start) Threshold level = 0.01



Release from Glasgow Location: 04:14 W 55:53 N Start: 2002-10-04 07:00 UTC Duration: 4 h hours

Model(s) [delta meteo/delta upload] Ensemble A: avg

DE1 [+65h0m/+77h36m] AT1 [+65h0m/+70h39m] NL1 [+65h0m/+73h26m] DK1 [+59h0m/+73h16m] SE1 [+59h0m/+73h40m] BE1 [+59h0m/+169h16m] UK1 [+53h0m/+75h42m] FR1 [+53h0m/+78h42m] N01 [+53h0m/+78h42m]

Ensemble B: none

BG1 [+65h0m/+74h42m]

Overlap (FMS)

19%

Projection: LambertAzimuthal Created by user dsyrakov on 2004-03-08 14:05:31 UTC Exercise 07 - Space overlap for concentration (0 m agl) of Cs137 in Bq/m^a Date and time: 2002-10-06 06:00 UTC (+47hOm after release start) Threshold level = 0.01



Release from Glasgow Location: 04:14 W 55:53 N Start: 2002–10–04 07:00 UTC Duration: 4 h hours

Model(s) [delta meteo/delta upload] Ensemble A: avg

DE1 [+65h0m/+77h36m] AT1 [+65h0m/+70h39m] NL1 [+65h0m/+73h26m] DK1 [+59h0m/+73h16m] SE1 [+59h0m/+73h40m] BE1 [+59h0m/+169h16m] UK1 [+53h0m/+75h42m] FR1 [+53h0m/+78h42m] N01 [+53h0m/+78h42m]

Ensemble B: none

BG1 [+65h0m/+74h42m]

Overlap (FMS)

15%

Projection: LambertAzimuthal Created by user dsyrakov on 2004-03-08 14:06:08 UTC Exercise 07 - Space overlap for concentration (0 m agl) of Cs137 in Bq/m^a Date and time: 2002-10-06 09:00 UTC (+50h0m after release start) Threshold level = 0.01



Release from Glasgow Location: 04:14 W 55:53 N Start: 2002-10-04 07:00 UTC Duration: 4 h hours

Model(s) [delta meteo/delta upload] Ensemble A: avg

DE1 [+65h0m/+77h36m] AT1 [+65h0m/+70h39m] NL1 [+65h0m/+73h26m] DK1 [+59h0m/+73h16m] SE1 [+59h0m/+73h40m] BE1 [+59h0m/+169h16m] UK1 [+53h0m/+75h42m] FR1 [+53h0m/+78h42m] N01 [+53h0m/+78h42m]

Ensemble B: none

BG1 [+65h0m/+74h42m]

Overlap (FMS)

15%

Projection: LambertAzimuthal Created by user dsyrakov on 2004-03-08 14:06:43 UTC Exercise 07 - Space overlap for concentration (0 m agl) of Cs137 in Bq/m^a Date and time: 2002-10-06 12:00 UTC (+53h0m after release start) Threshold level = 0.01



Release from Glasgow Location: 04:14 W 55:53 N Start: 2002–10–04 07:00 UTC Duration: 4 h hours

Model(s) [delta meteo/delta upload] Ensemble A: avg

DE1 [+65h0m/+77h36m] AT1 [+65h0m/+70h39m] NL1 [+65h0m/+73h26m] DK1 [+59h0m/+73h16m] SE1 [+59h0m/+73h40m] BE1 [+59h0m/+169h16m] UK1 [+53h0m/+75h42m] FR1 [+53h0m/+78h42m] N01 [+53h0m/+78h42m]

Ensemble B: none

BG1 [+65h0m/+74h42m]

Overlap (FMS)

15%

Projection: LambertAzimuthal Created by user dsyrakov on 2004-03-08 14:07:29 UTC Exercise 07 - Space overlap for concentration (0 m agl) of Cs137 in Bq/m^a Date and time: 2002-10-06 15:00 UTC (+56h0m after release start) Threshold level = 0.01



Release from Glasgow Location: 04:14 W 55:53 N Start: 2002–10–04 07:00 UTC Duration: 4 h hours

Model(s) [delta meteo/delta upload] Ensemble A: avg

DE1 [+65h0m/+77h36m] AT1 [+65h0m/+70h39m] NL1 [+65h0m/+73h26m] DK1 [+59h0m/+73h16m] SE1 [+59h0m/+73h40m] BE1 [+59h0m/+169h16m] UK1 [+53h0m/+75h42m] FR1 [+53h0m/+78h42m] N01 [+53h0m/+78h42m]

Ensemble B: none

BG1 [+65h0m/+74h42m]

Overlap (FMS)

16%

Projection: LambertAzimuthal Created by user dsyrakov on 2004-03-08 14:08:06 UTC Exercise 07 - Space overlap for concentration (0 m agl) of Cs137 in Bq/m^a Date and time: 2002-10-06 18:00 UTC (+59h0m after release start) Threshold level = 0.01



Release from Glasgow Location: 04:14 W 55:53 N Start: 2002-10-04 07:00 UTC Duration: 4 h hours

Model(s) [delta meteo/delta upload] Ensemble A: avg

DE1 [+65h0m/+77h36m] AT1 [+65h0m/+70h39m] NL1 [+65h0m/+73h26m] DK1 [+59h0m/+73h16m] SE1 [+59h0m/+73h40m] BE1 [+59h0m/+169h16m] UK1 [+53h0m/+75h42m] FR1 [+53h0m/+78h42m] N01 [+53h0m/+78h42m]

Ensemble B: none

BG1 [+65h0m/+74h42m]

Overlap (FMS)

15%

Projection: LambertAzimuthal Created by user dsyrakov on 2004-03-08 14:08:51 UTC

Conclusion

The presented results prove that relatively good emergency response can be produced on the base of personal computers using meteorological information, distributed via GTS. This can be useful for warning-system's development in the East European Countries. The EMAP model demonstrates that rather sophisticated models can be run on small platforms producing quite reliable forecast.

Acknowledgement

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