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LAM ACTIVITIES IN ROMANIA

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The actual Romanian national numerical prediction system is based on the following models: Aladin, HRM, LM, MM5.

1. ALADIN model

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Operational suite

➢ **Computing platform:**

▪ **SUN E4500 server (8-CPU 400GHz, 8*1 GB RAM) for direct integrations and in line post-processing**

▪ **ALPHA DEC 500 workstation (1CPU, 704 MB RAM) for different processing of model output**

➢ **Domains (quadratic grid , Lambert projection)**

▪ **ALADIN-Romania: 41 vertical levels, 144x144 grid points (Δx=10 km)**

▪ **ALDIN-Selam: 46 vertical levels, 120x90 grid points (Δx=24 km)**

➢ **Characteristics :**

▪ **Model version: Cy28t3**

▪ **Dynamical adaptation mode**

▪ **DFI initialization**

▪ **2TL Semilagrangian scheme with time step of 450s for 10km and 900s for 24 km**

▪ **Physics –changes in respect to previous version of the model:**

- radiation scheme (Ritter and Geleyn,1992): more exact computation of the exchange with the surface; maximum overlap for adjacent radiative clouds and climatological profile for ozone

- ISBA soil and vegetation scheme: prognostic albedo for snow

-Gravity wave drag: a more consistent definition of wave and form drag components, a lift acting (orthogonal) on the geostrophic wind, usage of mean orography instead of envelope orography

- Xu-Randall cloudiness formulation

➢ **4 runs per day :**

▪ **new climatic files and new variables in the coupling files;**

▪ **Arpege LBC; 6hours coupling frequency**

▪ **forecast range: 78h for 00 UTC run, 66h for 12 UTC run, 48h for 06 and 18 UTC run**

➢ **Post-processing**

▪ **in line FPOS on geographical regular grid, every 3 hours (pressure & near surface standard levels output in grib format, routed towards the visualization systems in Bucharest and to the Regional Meteorological Centers)**

▪ **of line FPOS on model grid, every 3 hours**

▪ **additional post processing: stability indexes, pseudo-temp, different isotherms height**

➢ **Graphical products: meteograms, pseudo – satellite images, cloudiness, 1.5 PV surface height, minimum and maximum temperature, equivalent potential temperature, MSL pressure, accumulated precipitation over 12h and 24 h, height of specific isotherms, stability indexes, etc, available on the intranet ALADIN web page.**

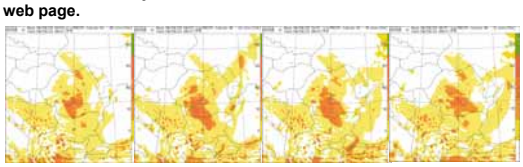

Fig1. ***Updated information is available due to the 4 runs: the 24h accumulated precipitations forecasted by 00, 06, 12 and 18 UTC runs (top) and the observed 24h accumulated precipitation valid at 22 September 2006 06 UTC (bottom).***

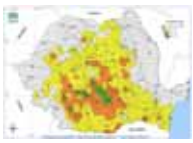

Fig2. *observation-24 h cumulated precipitation*

➢ ***Statistical adaptation***
➢ ***Verification*** **: local and common verification project**
➢ ***Input for Downstream applications*****: wave models (WAM and VAGROM),sea circulation models, hydrological models**

Research-development

Mainly in the frame of the ALADIN and LIFE projects

▪ **Data assimilation: J_b formulation**
▪ **Physical parameterization (3MT approach)**
▪ **Scale analysis and tunning of spectral coupling for fine scale process representation**
▪ **Case studies (severe weather events)**
▪ **Study of the urban boundary layer using an extended database; application for Bucharest region**

2. High resolution Regional Model

I.V.PESCARU, R.DUMITRACHE, L.VELEA,C.BARBU

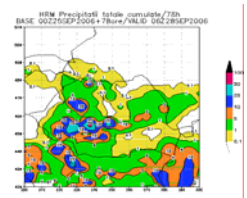

Fig3. ***HRM domain, 78 cumulated precipitation forecast***

•Workstation version updated (updated accordingly with DWD version)
•Full operational implementation
•Initial and boundary conditions from GME-DWD
•Rotated geographical grid 0.25 deg., 20 vertical levels
•78 hours forecast range, twice per day

4. MM5 model

I. IBANESCU

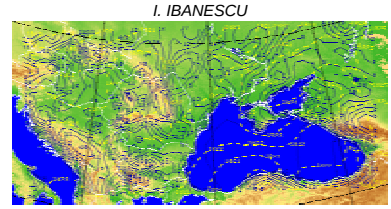

Fig4. ***MM5 : MSL pressure and 2m temperature forecast***

Operational suite in Romania

Characteristics**:**
➢ **non-hydrostatic mm5v3.4 version**
➢ **the horizontal grid: Arakawa-Lamb B-staggering of the velocity variables with respect to the scalars**
➢ **semi-implicit scheme**
➢ **initial and boundary condition from global model GFS (Global Forecast System, 1.25º resolution) and the sea-surface temperature from NCEP)**
➢ **coupling: relaxation technique (Davies, 1976)**
➢ **model domain: 80 x 167 points (Δx = 15 km, stereographic projection), 25 vertical σ levels**
➢ **physics**

▪ **Grell cumulus parameterization**
▪ **simple ice (Dudhia) microphysics**
▪ **no radiation effects on atmosphere: surface radiation active**
▪ **horizontal diffusion of perturbation from the base-state temperature**
▪ **Burk Thompson PBL; Surface force/restore (Blackadar) scheme**

➢ **4 runs per day, up to 24 hours**
➢ **Output: pressure & near surface standard levels output in grib format routed towards the visualization systems in Bucharest and to the Regional Meteorological Centers)**

Research-development

Data assimilation of SYNOP and TEMP data using FDDA scheme based on nudging,
Main objective: asses the the assimilation schme impact on the quality of the regional forecast.
Experiments : variation of the free parameters of the schme

Fig.5 *Temperature, σ level=0,988, without FDDA schme (left) and with FDDA (right)*

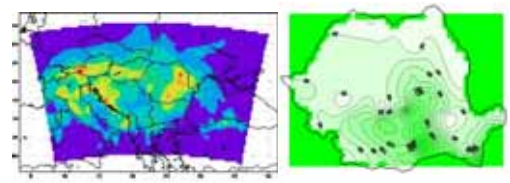

Fig. 9 *10 days ensamble simulation (left) versus observations for cumulated precipitations (right).*

3. Local Model - LM

I.V.PESCARU, R.DUMITRACHE, L.VELEA,C.BARBU

LM Integration characteristics

➢**limited area atmospheric prediction model, based on**
➢**the nonhydrostatic, full compressible hydro**
➢**thermodynamical equation in advection form.**
➢**Horizontal resolution: 14km**
➢**Vertical resolution: 35 levels**
➢**Time step: 80s**
➢**IC & LBC: GME 00, every 3h**
➢**Grid-scale pp: 2-ice category scheme, prognostic**
➢**Convection scheme: Tiedtke**
➢**Data Assimilation: No**
➢**Time of integration: 54 h**

Physical parameterizations:

•Clouds and precipitation
-Grid-scale clouds
-Convection
-Cloud cover
•Radiation
•Turbulent fluxes
•Soil processes

Fig 8. *observation -24 hcumulated precipitation*

Operational products

➢**2m temperature**
➢**sea level pressure**
➢**10 m wind speed**
➢**wind direction**
➢**total precipitation**
➢**geopotential 850, 700, 500 hpa**
➢**cloudiness**
➢**convective precipitation**
➢**grid scale precipitation**

Operational domain

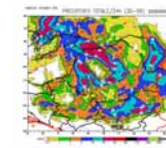

Fig.6 *24 h cumulated precipitation*

Future domain

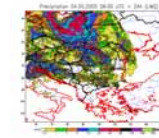

Fig. *724 hour cumulated precipitation*

Future activities

Local developments

•Installing of LM code on the new HPC machine
•The new domain will have 301x301 grid points and 40 vertical levels (7 km resolution)
•Design of an operational suite for 4 runs/day (00, 06,12 and 18 UTC)
•First tests with LMK for a domain covering Romanian territory
•Data assimilation for synop and AMDAR data
•Improvement of the data visualisation
•Operational verification versus observational data

Development in the frame of COSMO Consortium

•Further participations on SIR ***"Sequential Importance Resampling filter"*** - priority project
•Further participations on QPF ***"Tackle deficiencies in precipitation forecasts"*** - priority project
•Participations on CV ***"Conditional Verification, Extended Common Verification Suite"*** - priority project
•Participations on SPRT ***"Support Activities"*** - priority project
•Participations to other priority projects, if it is required

5. Regional climate modelling

Since 2005, September, ensemble regional simulations for 10 days (daily) and 1 month (weekly) forecast, using REGCM3 (Giorgi, 1993), coupled with the ECMWF, with 10 members ensemble perturbations in initial and lateral boundary conditions.
- **For10 days: Δx=10km, 23 σ - levels.**
- **For 1 month: Δx=50 km , 15 σ levels**
- **Integration Platform: Altix 350 - 2 ITANIUM processors**
- **Physical parameterizations: Kiehl (1996) scheme, BATS (Dickinson, 1993) surface exchange parameterization with a complex soil hydrology, Holtslag (1990) non-local boundary layer treatment, Grell convection scheme with Arakawa-Schubert closure, Pall (2001) large-scale precipitation, an interactive Hostetler 1D lake model and Zhong ocean scheme.**