

**WWW TECHNICAL PROGRESS REPORT ON THE GLOBAL DATA-
PROCESSING AND FORECASTING SYSTEM (GDPFS),
AND THE ANNUAL NUMERICAL WEATHER PREDICTION (NWP)
PROGRESS REPORT FOR THE YEAR 2005**

SLOVAKIA

Slovak Hydrometeorological Institute

1. Summary of highlights

The limited area NWP system ALADIN is operated at the Slovak Hydrometeorological Institute (full operational status declared on 01/07/2004). In 2005, the model integration was prolonged up to +54h, two additional runs were introduced (06 & 18UTC), and the high-resolution dynamical adaptation of the wind field over the territory of Slovakia was employed.

2. Equipment in use at the Centre

The computer facilities include the IBM @server pSeries 690, 32 CPUs POWER 4+ 1.7GHz, 32 GB RAM Memory with IBM FAST T600 Storage Server EXP700 1.5TB. For archiving, the IBM Total Storage 3584 with 24TB Tape Library and IBM Tivoli Storage Manager is used.

Database server IBM p570

Server 1:9117 Model 570, 2x 73.4 GB 10,000 RPM Ultra320 SCSI Disk Drive Assembly, 4x 2048MB (4x512MB) DIMMs, 208-pin, 8NS DDR SDRAM, 2x Processor, 0/2 Way 1.65 GHz with DDR1 memory, OS: AIX, DB Oracle

Application server IBM x460

x460, Xeon MP, 2x3.3GHz/667MHz, 1MB/8MB L2/L3, O/Bay SAS, 2x1300W p/s, 2x xSeries 3.33GHz 667MHz 1MB L2 8MB L3 Upgrade with Xeon Processor MP, 4x 73.4 GB 10K 2.5-inch SAS HDD, 4x 2 x 2GB PC2-3200 ECC DDR2 SDRAM RDIMM Kit, OS: Win 2003 ESX

Telecommunication computer

Stratus Continuum C 439 (Fault-tolerant system on hardware level), procesor HP PA-RISC 8600, 480 MHz, 1.5 Cache, 2 GB operational memory, OS: HP-UX 11.0 with SVR4, POSIX, SVID, X11. Message Switching System - MSS II - Moving Weather

3. Data and Products from GTS in use

We receive and use following reports and products from GTS (daily numbers): SYNOP - 4431, SHIP - 817, TEMP - 552, TEMP SHIP - 10, PILOT - 28, GRIB -1712, GRID - 535, T4 - 75, BUFR - 4546.

We use RETIM200 and EUMETCAST systems for receiving data as well.

4. Data input system

Data input system is fully automated.

5. Quality control system

We have implemented a real-time multi-level quality control procedure in the surface and upper-air observing network. All data are automatically or semi-automatically checked for their range limits and internal relations at the observing stations and in the central processing units. The reports are checked for adherence to the prescribed codes. There are applied also the rough and multiple data error detection procedure (based on inter-comparisons) and the module for checking of completeness and timeliness of all reports, at the national centre. All measuring instruments are regularly recalibrated and documented. Only the national climatological observations are checked at the regional level.

6. Monitoring of the observing system

The surface observing system is monitored at the national level. The basic monitoring - like e.g. the sensor failure detection unit - works in real-time at the centre. The upper-air observing system is monitored mainly locally because it consists of one observing site only.

7. Forecasting system

7.1 System run schedule and the forecast ranges

The ALADIN/SHMU model is operationally run at SHMU 4 times per day. The operational suite is based on the in-house developed system of perl scripts and programs, and enables on-line monitoring and documentation via the web interface. Majority of the subsequent applications is embedded in this system. The schedule of the operational suite is summarized in the table below.

<i>start time (UTC)</i>	<i>lead time</i>	<i>forecast range</i>
02:19	00 UTC	+54h
09:35	06 UTC	+54h
14:19	12 UTC	+54h
21:35	18 UTC	+54h

7.2 Medium range forecasting system

There is no medium range forecast system run at SHMI, but the products of DWD, Meteo-France and NCEP available from internet, retim2000 or eumetcast are used by forecasters.

7.3 Short-range forecasting system

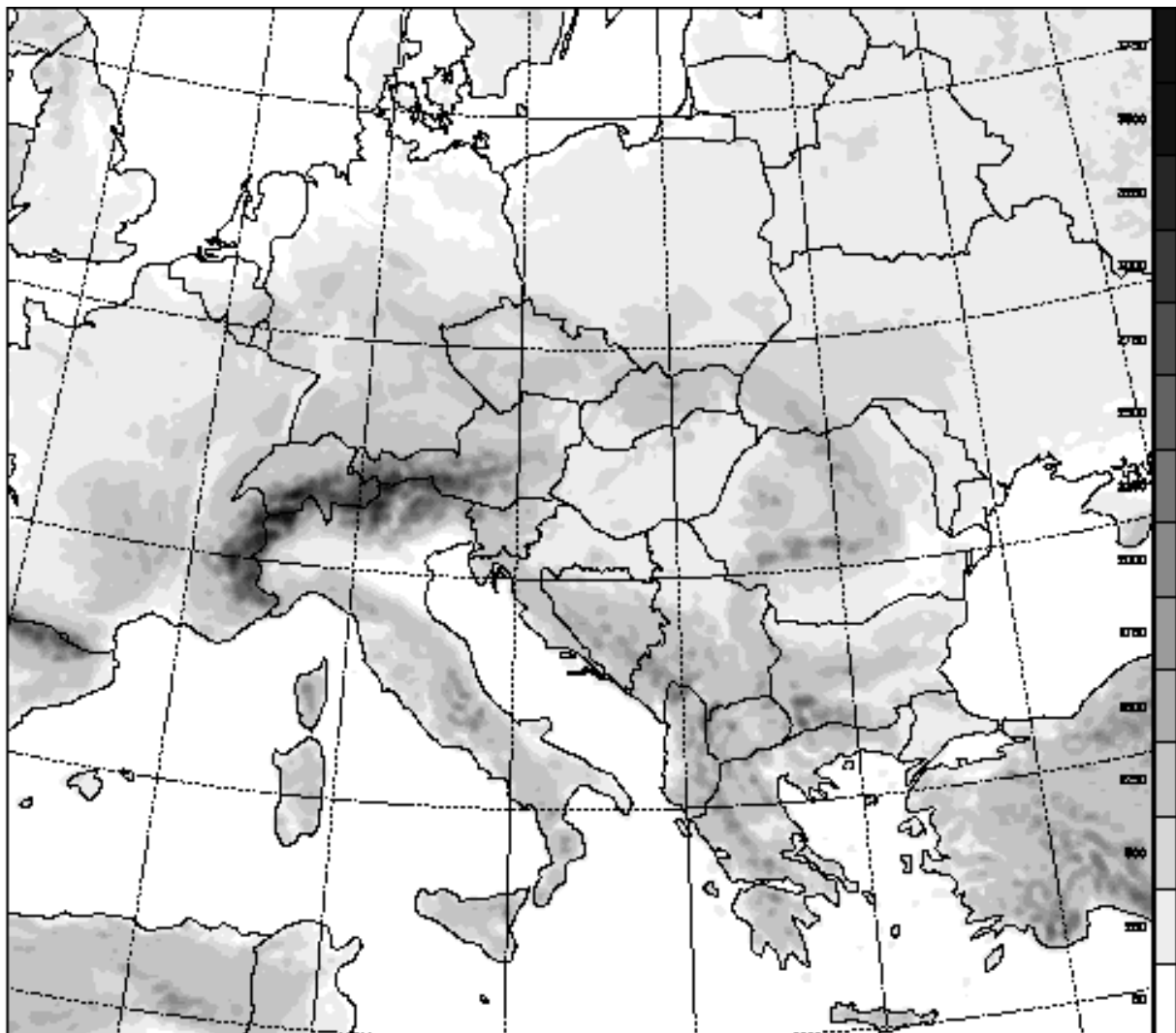
7.3.1 Data assimilation, objective analysis and initialization

ALADIN/SHMU model runs in the so-called dynamical adaptation mode, i.e. the initial conditions are obtained by interpolation of the ARPEGE global model analysis into the

target ALADIN/SHMU grid. The digital filter initialization is applied prior to model integration.

7.3.2 Model

ALADIN model is based on the global ARPEGE/IFS system (sharing the source code). Shortly, it is hydrostatic, spectrally formulated primitive equations model, with surface pressure, temperature, wind, specific humidity independent variables (non-hydrostatic version exists as well). Two time level semi-implicit semi-lagrangian scheme is used, with 400 seconds time step. ALADIN/SHMU is applied over the limited area domain of 2882x2594km, having 320x288 points (including extension zone 11 points wide) in quadratic grid, with 106x95 spectral truncations. The horizontal resolution is 9km horizontal resolution, in vertical there are 37 irregularly distributed levels. ALADIN model physics is similar to ARPEGE one. The lateral boundary conditions are obtained by the interpolations of the global model ARPEGE forecasts. The ALADIN/SHMU domain is plotted below.



7.3.3 Numerical weather prediction products

The hourly outputs from ALADIN/SHMU are direct model fields and variety of derived ones (e.g. temperature, wind, geopotential, humidity, precipitation, cloudiness, vertical velocity...) on standard pressure levels, height levels, PVU levels etc.

7.3.4 Operational techniques for application of NWP products

The NWP products are mainly directly visualized. For some products, the correction of 2m temperature on the orography height is applied. The Kalman filter is used to process the screen level parameters for specific application.

7.4 Specialized numerical predictions

Following specialized numerical predictions applications are using ALADIN/SHMU data:

- hydrological models (precipitation forecasts for river catchments)
- RODOS model (the Real-time On-line Decision Support system for off-site emergency management in Europe) operated by the Nuclear Regulatory Authority
- CALLPUFF non-steady-state meteorological and air quality modeling system can be fed with ALADIN/SHMU data
- ozone modeling
- simple interpolation tool used to derive automatic forecasts for the set of predefined points

7.5 Extended range forecasts

none

7.6 Long range forecasts

none

8. Verification of prognostic products

The outputs from ALADIN/SHMU are regularly verified against SYNOP stations (point-to-point). These results are available on intranet. Data are also dispatched to be processed in the frame of the common ALADIN verification project.

9. Plans for the future

9.1 Development of the GDPFS

The prolongation of the forecast range up to +72h is planned (once data from the ARPEGE driving model are available). The (pseudo-)assimilation cycle based on DFI blending will be tested in the ALADIN/SHMU operational suite, and later the 3DVAR data assimilation as well.

9.2 Research Activities in NWP

SHMU will further participate in the R&D work on ALADIN (and ALARO and AROME) NWP system(s). The impact of the MOS technique used for 2m temperature will be studied.

10. References

Benard P. , J. Masek and P. Smolikova, 2005: Stability of Leap-Frog Constant-Coefficients Semi-Implicit Schemes for the Fully Elastic System of Euler Equations. Case with Orography. *Mon. Wea. Rev.*, vol 133, n° 5, pp 1065-1075.

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