TECHNICAL PROGRESS REPORT
ON THE GLOBAL DATA PROCESSING SYSTEM 2005

Meteorological and Hydrological Service

CROATIA

1. Summary of highlights

The numerical weather prediction system ALADIN/HR, which is operational at the Meteorological and Hydrological Service (DHMZ) in Croatia, originates from the international ALADIN-LACE project. The ALADIN limited area model is running on the SGI Origin 3400. From November 2005, there have been several operational changes in model physics and the forecast period is extended up to 54 h.

2. Equipments in use at the centre

SGI Origin 3400 , 16 CPU 400 MHz, 12Gb RAM

3. Data and products from GTS in use

SYNOP: 00/03/06/09/12/15/18/21 UTC
TEMP: 00/12 UTC
PILOT
SHIP

4. Data input system

Automated.

5. Quality control system

Non-controlled national observations as output on GTS.

6. Monitoring of the observing system

Surface and upper-air observations are monitored on the national level.

7. Forecasting system

ALADIN limited area model (ALADIN/HR) is operationally launched twice a day providing 48 hour forecasts (from 1st November 54 hours). High resolution isentropic diagnostic (HRID) package is used for providing short range forecasts.

7.1. System run schedule and forecast ranges

Model: ALADIN, twice a day (00 and 12 UTC runs), 54 hour forecast.

7.2. Medium range forecasting system (4-10 days)

None.

7.3. Short-range forecasting system (0-72 hours)

7.3.1 Data assimilation, objective analysis and initialization

Initial and boundary conditions retrieved from Météo-France global model ARPEGE, no assimilation, DFI.

7.3.2 Model

Hydrostatic, Fourier spectral, quadratic truncation, model prognostic variables: horizontal wind components, temperature, specific humidity, surface pressure, 8 km horizontal resolution, 327.273 seconds time-step, mean orography and 37 η vertical levels, Davies coupling, Semi-Lagrangian horizontal diffusion (SLHD), the physical parameterization package includes vertical diffusion parameterization (Louis et al., 1982) with shallow convection (Geleyn, 1987); gravity wave drag, convective and stratiform processes are treated separately by a Kessler-type large-scale precipitation scheme and a modified Kuo-type deep convection scheme. Radiation is parameterized according to Geleyn and Hollingsworth (1979) and Ritter and Geleyn (1992). The transport of moisture and heat vertically in the soil are parameterized by ISBA in two layers (Giard and Bazile, 2000).

7.3.3 Numerical weather prediction products

Output variables (3 hourly outputs):

- 3D: u, v, omega (Pa/s), geopotentiel, vorticity, divergence, absolute and potential vorticity, temperature, potential and equipotential temperature and relative moisture on pressure levels (1000, 975, 950, 925, 900, 850, 800, 700, 600, 500, 300, 250 hPa)
- 2D: u, v 10m above ground, temperature and relative humidity 2m above ground, low,medium, high and convective cloudiness, stratiform and convective rain and snow, mean sea level pressure, wind gusts u and v components, CAPE, moisture convergence and PBL height.
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7.4. Specialized forecasts

Special dynamical adaptation to 2 km resolution on 6 domains covering different parts of Croatia

7.4.1. Data assimilation, objective analysis and initialization

Initial and boundary conditions from 8 km resolution ALADIN

7.4.2. Model

Same as above, 2 km resolution, 60 seconds time-step, Davies coupling, the physical parameterization package includes vertical diffusion parameterization (Louis et al., 1982) with shallow convection (Geleyn, 1987); gravity wave drag, radiation and moist processes are omitted in this application

7.4.3. Numerical weather prediction products

Output variables (same for all domains, 3 hourly outputs):

- 2D: u, v 10m above ground, wind gusts u and v components.

7.5. Extended range forecasts (10 days to 30 days)

Monthly weather forecasts are produced using dynamical-statistical adaptations which include analog technique on the basis of ECWMF medium range forecasts and monthly forecasts.

7.6. Long-range forecasts (30 days up to two years)

Seasonal outlooks are produced according ECMWF seasonal forecasts.

8. Verification of prognostic products

ECMWF, ALADIN/LACE and ALADIN/HR products are verified and compared operationally computing simple statistical measures (ME, MAE, RMSE, SS) and some others (RPSS, KSS, HSS), using 11 SYNOP observations inside Croatia. Verification is perfomed along the EWGLAM standards.
Forecast range: 2 days for ALADINs and 10 days for ECMWF.
Parameters: temperature, precipitation, wind.

9. Plans for the future

9.1. Research Activities in NWP

Impact studies for hydrostatic & non-hydrostatic 8 km for: SLHD; different parameterisation of radiation; different cloudiness scheme; different orography representation (mean or envelope) model. NH dynamics and different orography representations on high resolution forecast.
Testing of the clustering of the ECMWF EPS members for different clustering parameters, domains, clustering times.
Downscaling of the ECMWF EPS members with ALADIN @12km, 37 levels.
Impact of the different initial and boundary condition for MAP IOPs 5&15.
Modification of the Luc Gerard convective scheme.
Development of micro-physics in AROME & ALARO models.
Computation and comparison of the background error statistics for 3D-Var (ensemble, NMC and LH method).
Sensitivity studies on the initiation, movement and deepening of the deep Mediterranean cyclones producing high impact weather in the region.