

JOINT WMO TECHNICAL PROGRESS REPORT ON THE GLOBAL DATA PROCESSING AND FORECASTING SYSTEM AND NUMERICAL WEATHER PREDICTION RESEARCH ACTIVITIES FOR 2006

ALGERIA

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Web site: www.meteo.dz

1. Summary of highlights

The major changes in data processing and forecasting system during the year 2006, at the National Meteorological Forecasting Centre of Algiers are as follow:

- Moving from cycle 29t1 to cycle 29t2 with :
 - An improved climatology (orography, land/sea index, aerosols and ozone etc...)
 - Moving from 41 to 46 vertical levels
 - New microphysic scheame
 - Modification of sea surface albedo
- Implementation of ALADIN/Algérie in Meteo France operational supercomputer
- The update of the Intranet ALADIN/Algérie web site is done at 08h00.
- Use of ALADIN/Algérie outputs in operational way from September 2006
- Improvement of dust concentration forecasts in Eta model

2. Equipment in use at the Centre

- Two switching systems of messages and processing (Messir) working in hot stand-by mode, whith the following functions:
 - Exchange of data and products in TCP/IP and Ftp protocols
 - Processing of aeronautical and satellite products (RETIM 2000, SADIS and MSG)
- Around thirty five PCs under Windows and Linux are used at the meteorological forecasting centre of Algiers.

3. Data and Products from GTS in use

- Synop + ship : 8416 messages
- TEMP + TEMP/ship + Pilot : 977 messages
- Airep : 2005 messages
- Amdar : 6500 messages
- Satob : 1635 messages
- GRIB Météo France : 1738
- GRIB KWBC : 2400
- GRIB EGRR : 9726 (aeronautical assistance)
- GRIB ECMWF : 1828
- Aeronautical maps T4 (Wafs Exeter)
- T4 reçus via RETIM

4. Forecasting system

The forecasting system is based on the following models: Arpège (as Global) and the limited area models ALADIN/Algérie (12 km horizontal resolution) and Eta/Algérie (36 km horizontal resolution). Other models as: ECMWF, KWBC, UKMO, Eta/Greece and some EPS products are either consulted.

4.1 System run schedule and forecast ranges

The limited area models ALADIN/Algérie and Eta/Algérie are under use in operational way. They are launched twice a day (00 and 12 UTC). ALADIN/Algérie is running on Meteo France supercomputer, it is coupled with Arpège and the forecast range is 48 hours.

Eta/Algérie is running on a PC (Pentium IV) under Linux and is launched twice a day and the forecasts range is 72 hours. The initial and boundary conditions are downloaded from NCEP and the update of the web site is done automatically at the following address: www.meteo.dz (rubrique eta-onm).

Besides, a new version of WAM model is implemented at the NMC of Algiers and it is running on a PC under Linux using as initial conditions ALADIN's 10 m winds.

An extended version of Eta/model, up to the golf of Guinea, is launched once a day (00 UTC) at the request of ACMAD and some African countries. An update of Eta/Afrique products is done automatically at the following address: www.meteo.dz (rubrique Eta-Afrique).

4.2 Medium range forecasting system (4-10 days)

The models which are under use for medium ranges forecasts are as follow: Arpège, ECMWF and some EPS products of great centres. Other models as GFS (NCEP) are also consulted.

4.2.1 Data assimilation, objective analysis and initialization

4.2.1.1 In operation

Not available yet

4.2.1.2 Research performed in this field

Observation Data Base under development

4.2.2 Model

4.2.2.1 in operation

□ Aladin (00-48h) :

- ✓ ALADIN is the LAM version of ARPEGE- IFS
- ✓ ALADIN is a spectral model
- ✓ ALADIN is coupled with Arpège
- ✓ ALADIN/Algérie is used in pure dynamic adaptation, with 12 km horizontal resolution and a time step of 415 s.
- ✓ Vertical resolution : 46 levels

□ ETA (00, 72h) :

- ✓ Eta/Algérie is a limited area model based on eta coordinate
- ✓ Eta is a grid points model
- ✓ ETA/Algérie is launched with initial and boundary conditions downloaded from NCEP
- ✓ ETA/Algérie is used with 36 km horizontal resolution and 24 levels and a time step of 02 mn

4.2.2.2 Research performed in this field

In the frame of the ALADIN's Consortium research programme, some research will be performed during 2007, in the improvement of dust concentration forecasts, in satellite data assimilation, in the verification tools and in the adaptation of some derived fields.

4.2.3 Operationally available Numerical Weather Prediction Products

ALADIN model	
Horizontal Resolution	12 km
Integration domain	15N – 48 N ; 20 W - 20 E
Forecast range	00-48 h
Available products	<ul style="list-style-type: none"> - Large scale precipitation - Convective precipitation - Snow depth - MSLP - 10 m wind - 2 m Temperature - Low cloud cover - Medium cloud cover - High cloud cover - Maxi. temperature in cls - Mini. temperature in cls - Z+T + RH 850, 700 and 500 hPa - Z + winds 300 hPa - Z + winds 200 hPa
Frequency of the outputs: 03 hours	<p>Derived fields</p> <ul style="list-style-type: none"> - Thickness 1000/700 hPa - Thickness 1000/500 hPa - PV 315 K - PV 330 K - θ'_w 700 hPa - θ'_w 850 hPa - K index - Latent instability 1000/850, 850/700 and 700/500 hPa - CAPE - Vertical velocity 850 hPa and 700 hPa

ETA model	
Horizontal Resolution	36 km
Integration domain	18 W - 18 E ; 17 N - 47 N
Forecast range	00-72 H
Available products	<ul style="list-style-type: none"> - Z+T 1000, 850, 700, 500, 300, 200 hPa - RH 850 and 700 hPa - Vertical velocity 850 and 700 hPa - MSLP - 2m temperature, - DC (Dust Concentration), - Total cloud cover

Frequency of the outputs: every 06 hours up to 48 hours and then every 12 hours	- Visibility reduced by haze - Latent Instability 1000/850, 850/700 and 700/500 hPa - K Index -Potential Vorticity 315 K -Potential Vorticity 330 K - Humidity Convergence at the Surface - Humidity Convergence at 850 hPa - Tetae at surface - Tetae at 850 hPa - Surface specific Humidity - Total precipitation - Convective precipitation
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4.2.4 Operational techniques for application of NWP products (*MOS, PPM, KF, Expert Systems, etc..*)

4.2.4.1 In operation

MOS under development

4.2.4.2 Research performed in this field

Improvement of verification techniques adapted to limited area models and application of post processing techniques.

4.2.5 Ensemble Prediction System (EPS)

4.2.5.1 In operation

Not available

4.2.5.2 Research performed in this field

None

4.2.5.3 Operationally available EPS Products

The EPS outputs which are used are those of the Great centres as ECMWF and GFS (NCEP)

4.3 Short-range forecasting system (0-72 hrs)

4.3.1 Data assimilation, objective analysis and initialization

4.3.1.1 In operation

Not available

4.3.1.2 Research performed in this field

In the frame of ALADIN Consortium's research programme for 2007, the effort will be done on the assimilation of satellite and radar data.

4.3.2 Model

4.3.2.1 In operation

The models which are under use at the Forecasting Meteorological Centre of Algiers are:

1) Eta model

MODEL:	ETA/Algeria: Limited Area Model based on eta (η) coordinate
Basic equations	Primitive Equations
Independent variables	Latitude, Longitude, eta (η) and time

Dependent variables	Temperature, horizontal wind components, specific humidity, pressure and turbulent kinetic energy.
Numerical technique	Finite difference method
Horizontal	Janjic scheme Upstream advection used at near boundaries
Vertical	Euler backward time scheme. Centred differences in space for all quantities except humidity Upstream spatial differencing for humidity.
Time	Split-explicit time differencing
Integration domain	18° W to 18° E 17° N to 47° N
Horizontal and vertical resolution, time step	Horizontal : 36 km Vertical: 24 levels Time step: 120 s
Orography, gravity wave drag	Silhouette mountains
Horizontal diffusion	Nonlinear fourth order diffusion is applied to the historical variables T, q, u and v after each adjustment time step
Vertical diffusion	Mellor-Yamada hierarchy
Planetary boundary layer	Mellor-Yamada at level 2.5
Treatment of sea surface, earth surface and soil	Surface layer : Monin-Obukhov similarity theory Janjic scheme for parameterization of surface processes Land-Air Parameterization scheme (LAPS) from Novi Sad University
Radiation	GFDL radiation scheme
Convection (deep and shallow)	Betts and Miller scheme
Atmospheric moisture	Zhao et al for large scale precipitation Betts and Miller scheme modified by Janjic for convective precipitation
Boundaries	Downloaded from NCEP
Albedo	climatology
SST Analysis	Downloaded from NCEP

2) ALADIN model

MODEL:	ALADIN/Algérie : Aire Limitée Adaptation Dynamique développement INternational. In the frame of the ALADIN Consortium.
Basic equations	Primitive Equations system
Independent variables	Horizontal wind vector, temperature, specific humidity and surface pressure
Dependent variables	Vertical velocity and density
Numerical technique	Spectral
Horizontal	Spectral and uses bi-Fourier horizontal transforms on a bi-periodic domain
Vertical	Hybrid coordinate (s,p) from Simmons and Burridge (1981).
Time	Semi-lagrangian
Integration domain	11° W to 17° E 18° N to 47° N
Horizontal and vertical resolution, time step	Horizontal : 12 km

	Vertical : 46 levels Time step : 415 s
Orography, gravity wave drag	The orography of this model is computed from the data base GTOPT30, using a variational technique that strongly reduces the noise associated to Gibbs waves. The gravity waves drag takes into account some anisotropy, blocking and mid-tropospheric effects.
Horizontal diffusion	Implicit in spectral space and incorporating an orography dependant correction
Vertical diffusion	Scheme linked with PBL
Planetary boundary layer	ECMWF method (Louis et al. 1981) with several enhancements in the stable case.
Treatment of sea surface, earth surface and soil	An improved version of ISBA (Interaction Soil Biosphere Atmosphere) scheme is used, including an explicit parametrisation of soil freezing. Six prognostic variables are handled by ISBA. Soil characteristics (texture, depth) are point-dependent. Vegetation characteristics are point and month-dependent.
Radiation	Highly simplified scheme (inspired by Ritter and Geleyn 1992) called at every time-step in every grid-point.
Convection (deep and shallow)	Mass-flux scheme (Bougeault 1985) enhanced with : <ul style="list-style-type: none"> - The Gregory-Kershaw treatment of momentum transport by cumulus - A treatment of the moist adiabatic computation consistent with the previous point - A downdraft parametrisation - Vertically variable entrainment and detrainment rates - A parametrisation of the selective effect of entrainment leading to a warmer upper part of the single cloud ascent
Atmospheric moisture	Specific humidity is the variable: no storage of the condensate; evaporation of the falling rain; treatment of the ice-phase
Boundaries	Coupled with ARPEGE
Albedo	Climatology
SST Analysis	Coupled with ARPEGE

4.3.2.2 Research performed in this field

In the frame of ALADIN Consortium's research programme for 2007, efforts will be done in the modelisation of dust cycle and to the verification tools adapted to limited area models.

4.3.3 Operationally available NWP products

Same as 4.2.3

4.3.4 Operational techniques for application of NWP products

4.3.4.1 In operation

Stability indices and derived fields

4.3.4.2 Research performed in this field

Some stability indices which are used to the improvement of thunderstorms are under study in order to adapt it to our region.

4.3.5 Ensemble Prediction System

4.3.5.1 In operation

None

4.3.5.2 Research performed in this field

None

4.3.5.3 Operationally available EPS Products

None

4.4 Nowcasting and Very Short-range Forecasting Systems (0-6 hrs)

None

4.4.1 Nowcasting system

None

4.4.1.1 In operation

None

4.4.1.2 Research performed in this field

None

4.4.2 Models for Very Short-range Forecasting Systems

None

4.4.2.1 In operation

None

4.4.2.2 Research performed in this field

None

4.5 Specialized numerical predictions (on sea waves, sea ice, tropical cyclones, pollution transport and dispersion, solar ultraviolet (UV) radiation, air quality forecasting, smoke, sand and dust, etc.....)

The WAM model is integrated on a PC under Linux with ALADIN's 10 m winds. This model is used to the forecast of swell height and its direction.

4.5.1 Assimilation of specific data, analysis and initialization (where applicable)

4.5.1.1 In operation

None

4.5.1.2 Research performed in this field

None

4.5.2 Specific Models

4.5.2.1 In operation

Eta model with specific software to simulate the dust cycle of life

4.5.2.2 Research performed in this field

Improvement of dust concentration forecasts over Sahara

4.5.3 Specific products operationally available

Dust concentration forecasts converted to visibility.

4.6 Extended range forecasts (ERF) (10 days to 30 days) (Models, Ensemble, Methodology)

4.6.1 Models

4.6.1.1 In operation

None

4.6.1.2 Research performed in this field

None

4.6.2 Operationally available NWP model and EPS ERF products

None

4.7 Long range forecasts (LRF) (30 days up to two years)

4.7.1 In operation

None

4.7.2 Research performed in this field

None

4.7.3 Operationally available EPS LRF products

None

5. Verification of prognostic products

5.1 Annual verification summary

None

5.2 Research performed in this field

None

6. Plans for the future (next 4 years)

6.1 Development of the GDPFS

6.1.1 Major changes in the operational DPFS which are expected in the next year

The Algerian Meteorological service plans to train a Numerical Weather Prediction specialised team in the frame of ALADIN Consortium, with at least ten (10) elements at the end of 2007, in order to achieve the main objectives both in research/development and in the model maintenance.

6.1.2 Major changes in the operational DPFS which are envisaged within the next 4 years

The Algerian Meteorological service plans to build a new forecasting Centre and to buy a super computer to implement the 3Dvar ALADIN data assimilation, the ALADIN model with medium and high resolution and to perform model outputs with verification and post processing.

6.2 Planned research Activities in NWP, Nowcasting and Long-range Forecasting

After the implementation of numerical weather prediction chain, a nowcasting system based on high resolution model outputs, satellite and radar data will be performed.

6.2.1 Planned Research Activities in NWP

Some research in modelisation of dust, in EPS for LAM, in the interpretation of high resolution models, in satellite data assimilation and in observation monitoring will be performed

6.2.2 Planned Research Activities in Nowcasting

Concerning nowcasting, the efforts will be done in the build of a nowcasting system based on : high resolution model outputs, satellite and radar data.

6.2.3 Planned Research Activities in Long-range Forecasting

None

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