World Meteorological Organisation

WDS/DPFS/GDPFS-NWP_2017

ANNUAL JOINT WMO TECHNICAL PROGRESS REPORT ON THE GLOBAL DATA PROCESSING AND FORECASTING SYSTEM (GDPFS) AND NUMERICAL WEATHER PREDICTION (NWP) RESEARCH ACTIVITIES FOR 2017

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1. Summary of highlights

The major changes in data processing and forecasting system during the year 2017, at the National Meteorological Forecasting Centre of Algiers are as follow:

- Realization of a new benchmark based on the cycle 43t2 for the acquisition of a new computer.
- Implementation of 3Dvar data assimilation for ALADIN, 3DVAR+CANARI surface analysis for AROME , this process is not operational yet.
- Implementation of several configurations based on a new versions of the following models: AROME-1.3km, ALARO-ALGERIE 6km, ALADIN_SURFEX based on a 40t1 cycle.
- Implementation of ALADIN-Climat model in seasonal forecast mode.

2. Equipment in use at the centre

- Two commutation systems of messages and processing (Messir) working on hot stand-by mode, dedicated to exchange of data and products in TCP/IP and ftp modes
- Aeronautical products (BUFR+Grib2+opmet) with SADIS Secure via FTP.
- NWP operational models are running on the HPC-IBM computer with a pick power of 10 Tf. (26 nodes with 16 processors each).
- More than thirty working stations dedicated to the forecasters.

3. Data and Products from GTS in use

Average number of messages, received by day:

AIREP	ACARS	AMDAR	BATHY	BUOY	PILOT	SHIP	SYNOP	TEMP	TEMP SHIP
6000	X	6000	6000	5000	X	5000	10000	800	20

Others data

- Grib GFS global model from nomads.ncep.noaa.gov by ftp
- Coupling files (Grib Arpège) for ALADIN model from Meteo-France by ftp

4. Forecasting system

The operational forecasting system at the national meteorological centre of Algiers is based on the following models: ARPEGE and ECMWF as a global models and ALADIN-Algeria, ALADIN-DUST and AROME-Algeria as LAMs with an horizontal resolution of 08 km, 14 km and 03 km, respectively.

ARPEGE (Action de Recherche Petite Echelle Grande Echelle) is run in Toulouse for short range predictions (1-4 days). We receive the outputs of this model 4 times a day (00 UTC, 06UTC, 12 UTC and 18 UTC).

ALADIN (Aire Limitée Adaptation Dynamique Développement International) is a limited area version of Arpege (Termonia and al. 2018).

AROME (Application de la Recherche à l'Opérationnel à Mesoéchelle) combines a non-hydrostatic kernel and framework developed with the Aladin NWP consortium with physical parametrizations and surface representation developed by the French atmospheric research community within the Meso-NH project.

ALADIN_DUST: is the version of ALADIN used to simulate the atmospheric dust cycle.

WAVE WATCH III: is a third generation wave model developed at NOAA/NCEP in the spirit of the WAM wave model. This model is used in operational at Météo Algérie with 8 Km of horizontal resolution.

We also use the outputs of models available on the internet such as: GFS, UKMO, Eta/Greece and some EPS fields and Epsgrams and the Extreme Forecast Index (EFI) from ECMWF are also under use.

4.1 System run schedule and forecast ranges

The Limited Area Models ALADIN-Algeria, ALADIN-DUST and AROME-Algeria are used in operational way. These models are launched twice a day (00h00 and 12h00 UTC basis).
ALADIN-Algeria and ALADIN-DUST are coupled with the global model Arpège, and they are integrated until 72 hours. AROME-Algeria is coupled with ALADIN-Algeria and it is integrated until 48 hours.

For wave forecasting, the model WAVEWATCH III is used in operational way. The model is launched twice a day (00h00 and 12h00 UTC). This model is forced by ALADIN winds and is integrated until 72h.

A daily update of the different models is done on the intranet web site.

All times are UTC in the table below.

UTC valid times	0000	1200
ALADIN-ALGERIE range end of ALADIN	72 0500	72 1700
ALADIN-DUST ALGERIE range end of ALADIN-DUST	72 0510	72 1710
AROME-ALGERIE range end of AROME	48 0540	48 1740
WWIII range end of WWIII	72 0800	72 2000

4.2 Medium range forecasting system (4-10 days)

Locally no medium range forecasts are produced. The models which are used to elaborate the medium range reports are: ECMWF and GFS (NCEP).

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

The short-range forecasting system run at the National Centre for Meteorological Forecasts comprises three main systems: ARPEGE, ALADIN and AROME.
ARPEGE is run at Toulouse.

4.3.1 Data assimilation, objective analysis and initialization

4.3.1.1 In operation

Actually, the forecasting operating system works without the data assimilation.
The data assimilation system is actually in the pre-operational phase for ALADIN and AROME.
The ALADIN assimilation runs using the analysed first guess every 6 hour with SYNOP , ASCAT winds and AMDAR data.
The AROME assimilation runs using the coupled upper-air analysis performed with 3Dvar and surface analysis obtained from CANARI-OI main for deep soil temperature and water content from observations of 2m temperature and humidity.

4.3.1.2 Research performed in this field

Testing of a 6 hours data assimilation cycle using 3DVAR minimisation for the ALADIN model at full model resolution, with a first guess error covariances matrix provided by the NMC (National Meterological Centre) method. The analysis background is used as initial state and ARPEGE as coupling model . The observations window is set to 3 hours.
A 3DVAR data assimilation setup is running in test mode for AROME with 3hours window observations. The background error covariances is calculated using the AEARP method (The Assimilation d'Ensemble ARPEGE). The ALADIN forecasts are used as coupling terms for AROME forecast production. The surface data analysis is performed with CANARI configuration using synop observation type. Analysed fields are 2 meters temperature and humidity. The both surface analysis and 3Dvar minimisation are not yet coupled.

Assimilated data

Local SYNOP data and from the other countries in ALADIN domain, ASCAT winds from MetOpA and MetOpB , AMDAR and ACARS.

Assimilation cycle:

ALADIN and AROME use 6 hours assimilation cycle.

Analysis method:

3DVAR minimisation and CANARI surface analysis.

Analysed variables:

Horizontal wind, temperature and specific humidity on model levels, plus surface pressure.

4.3.2 Model

4.3.2.1 In operation

The models which are under operational use at the National Forecasting Meteorological Centre of Algiers are the ALADIN-Algeria model and the AROME-Algeria model. Their configurations are presented hereafter.

- 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, cloud water and ice, precipitating water and ice, turbulent kinetic energy.
Dependent variables	Vertical velocity and density
Numerical technique	Horizontal Two-time-level semi-lagrangian spectral semi-implicit time-stepping and horizontal discretization scheme Vertical: vertical finite element discretization
Integration domain	11° W to 17° E 18° N to 47° N
Horizontal and vertical resolution,	Horizontal : 8 km Vertical : 70 levels Number of point to the total of the field :350 x 350 x 70
Time step	Time step : 514.268 s
Orography and 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 for temperature
Vertical diffusion	Scheme linked with PBL
Planetary boundary layer	The PBL vertical diffusion is implemented as a CBR prognostic turbulent kinetic energy scheme that models the effect of subgrid eddies, plus a shallow convection scheme (KFB/EDKF) that simulates the mixing effect of subgrid non-precipitating convection.
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	Version of the 6-band Fouquart-Morcrette radiation scheme in the visible wavelengths, the 16-band RRTM scheme in the infrared.
Convection (deep and shallow)	Mass-flux scheme (Bougeault 1985) enhanced with : - 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

- AROME model

Model	AROME-Algérie In the frame of the ALADIN Consortium.
Basic equations	Compressible non-hydrostatic primitive equations system
Independent variables	Horizontal wind vector, temperature, specific humidity and surface pressure, cloud water and ice, precipitating water and ice, turbulent kinetic energy, graupel, vertical velocity and hydrostatic pressure departure.
Dependent variables	Vertical velocity and density
Numerical technique	Two-time-level semi-lagrangian spectral semi-implicit time-stepping and horizontal discretization scheme Vertical: Vertical finite differences. Time: Semi-Lagrangian
Integration domain	31.27 ° N - 37.40 °N 02.50 ° W - 08.40 ° E
Horizontal and vertical resolution,	Horizontal : 3 km Vertical : 41 levels Number of point to the total of the field :400 x 400 x 41
Time step	Time step : 60.0 s
Orography induces 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 for temperature. AROME includes an additional gridpoint numerical diffusion, SLHD, which is associated with the semi-lagrangian advection scheme only for the condensed water variables.
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	AROME uses the SURFEX scheme which comprises four prognostic surface tiles (for soil/vegetation, sea/sea ice, lakes, towns), a snow scheme, a surface layer interpolator (Canopy), and the Ecoclimap physiographic database. SURFEX manages several dozens of prognostic variables.
Radiation	Version of the 6-band Fouquart-Morcrette radiation scheme in the visible wavelengths, the 16-band RRTM scheme in the infrared.
Convection (deep and shallow)	Mass-flux scheme (Bougeault 1985) enhanced with : - 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 ALADIN/Algeria model

4.3.2.2 Research performed in this field

The WRF model has been implemented as a backup solution for the operational models ALADIN and AROME. Two versions of the model exist: a serial implementation on a personal workstation (PC version), and a parallel implementation (HPC version). It is currently in its validation stage.

We have also implemented ALARO-ALGERIE and ALADIN_SURFEX models with 6 km and 8 km of horizontal resolution, respectively. These two models are in test phase.

4.3.3 Operationally available NWP products

- ALADIN-Algeria

Spatial Domain	18N – 47 N ; 11W - 17E : with a resolution of 08 km
Time Domain	00-72h : with a 3-hourly output
Available products	Surface Fields - Temperature at 2m above ground - Gust Wind at 10m above ground - Total precipitation - Snow height

	- Daily maximum/ minimum Temperature Altitude Fields at the levels : 850hPa, 700hPa, 500hPa, 300hPa, 200hPa - Temperature - Wind - Geopotential Height - Relative humidity Derived Fields - Thickness of the 1000/700 hPa and 1000/500 hPa layers - PV at 315 K and 330 K - θ'w at the levels 700 hPa and 850 hPa - K index - Latent instability 1000/850 hPa, 850/700 hPa, 700/500 hPa - CAPE - Vertical velocity 850 hPa , 700 hPa Clouds - Cloud Cover : Low, Middle, and High Layer

- ALADIN-DUST Model

Spatial Domain	31 27 N – 37 40 N - 02 50 W - 08 40 E : with a resolution of 14 km
Time domain	00-72 h : with a 3-hourly output
Available products	- Visibility - Optical thickness - Surface flux - Dust concentration at the levels 700hPa, 850hPa, 1000hPa

AROME-Algeria

Spatial Domain	31.27 N – 37.40 N - 02.50 W – 08.40 E : with a resolution of 03 km
Time domain	00-48 h : with a 1-hourly output
Available products	Surface Fields - Temperature at 2m above ground - Gust Wind at 10m above ground - Total precipitation - Snow height - Daily maximum/minimum Temperature Altitude Fields at the levels : 1000hPa, 850hPa, 700hPa, 500hPa - Temperature - Vertical velocity - TKE - Relative humidity - Cloud water - Cloud fraction - Rain - Snow

	- Ice Crystal - Graupel Clouds - Cloud Cover : low, Middle, and High Layer - Convective Cloud Cover - Total Cloud cover Derived Fields - CAPE - Vertical velocity 850 hPa , 700 hPa

4.3.4 Operational techniques for application of NWP products

4.3.4.1 in operation

Local forecasts of meteorological parameters are produced daily by taking the closest point to the grid point.

4.3.4.2 Research performed in this field

Works are being done to use statistical adaptation and interpolation methods to improve local forecasts.

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)

4.4.1 Nowcasting system

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

4.4.2.1 In operation

None.

4.4.2.2 Research performed in this field

None.

4.5 Specialized numerical predictions

For marine forecasts, we used Wavewatch III (version 4.20) model. This model is implemented on HPC computer. The Wavewatch III model is forced using the ALADIN model winds.

For dust forecasting the Aladin-Dust model is used. It is coupled with the Arpege model from Meteo-France

4.5.1 Assimilation of specific data, analysis and initialization

4.5.1.1 In operation

The wave model Wavewatch III is run from a cold state initialized by wind fields.

The dust model ALADIN_DUST is initialized by its own prediction from the previous run. No data assimilation or analyses are performed for ALADIN_DUST.

4.5.1.2 Research performed in this field

4.5.2 Specific Models

4.5.1.1 In operation

Marine forecasts

- WWIII model

MODEL:	Wavewatch III, version 4.18
Basic equations	Random phase spectral action density balance equation for wavenumber-direction spectra
Numerical technique	Finite differences
Integration domain	Occidental basin of the mediteranean sea, between the Strait of Gibraltar and the Strait of Sicily
Spatial Discretization	Regular latitude-longitude grid of increment 0.08° with a range: 8° W - 34° E 35° N – 44°N
Spectral Discretization	Logarithmic frequency grid of 30 frequencies, with a lowest frequency of 0.04 Hz, and an increment factor of 1.1.
Number of directions	30 directions
Main time step	120 s
Bathymetry	Bathymetric data from the ETOPO1 database.

Forcing	Wind input from ALADIN-Algeria (8km)
Propagation	Third order QUICKEST scheme, with the ULTIMATE TVD (PR3 and UQ switches).
Treatment of wind input and whitecapping	Input source term of Ardhuin (ST4 switch)
Treatment of the quadruplets non-linear interaction	Discrete interaction approximation, DIA. (NL1 switch).
Treatment of bottom friction	Empirical, SHOWEX parameterization (BT4 Switch).
Treatment of depth-induced breaking	Approach of Battjes and Janssen (DB1 switch).
Treatment of triad non-linear interaction	Source term deactivated (TR0 Switch)
Treatment of bottom scattering	Source term deactivated (BS0 Switch).
Treatment of reflection	Based on field measurement by Elgar and al. (REF1 Switch).

4.5.2.2 Research performed in this field

For wave forecasting, an HPC version of the model WwavewatchIII and a nested SWAN model, using wind data from ALADIN-Algeria and AROME-Algeria are being implemented for near shore applications. Furthermore, we are planning to realise a coupled Atmospheric/Oceanic/Wave forecasting system based on the new capabilities offered by the WW3 model.

Specific products operationally available

- WWIII Model

Spatial Domain	Occidental basin of the Mediterranean sea
Time Domain	00-72 h : with a 3-hourly output
Available products	- Significant wave height - Mean wave direction - Wind speed and direction

4.5.4 Operational techniques for application of specialized numerical prediction products (MOS, PPM, KF, Expert Systems, etc.) (as appropriate related to 4,5)

4.5.4.1 In operation.

None.

4.5.4.2 Research performed in this field.

None.

4.5.5 Probabilistic predictions (where applicable)

4.5.5.1 In operation.

None.

4.5.5.2 Research performed in this field.

None.

4.5.5.3 Operationally available probabilistic prediction products.

None.

4.6 Extended range forecasts (ERF) (10 days to 30 days)

4.6.1 Models

4.6.1 In operation.

None.

4.6.1.2 Research performed in this field.

None.

4.6.2 Operationally available EPS products.

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

4.7.1 In operation.

For the seasonal forecast, we use the outputs products of the Climate Forecast System (NCEP) model with 40 km of horizontal resolution.

4.7.2 Research performed in this field.

A new system of seasonal forecast based on ALADIN-CLIMAT is implemented and it is under test. ALADIN_CLIMAT run on Algeria-HPC supercomputer with 12.5 km horizontal resolution and 91 levels. This model is forced by ARPEGE-CLIMAT.

4.7.3 Operationally available products.

CFS Model

- Temperature anomaly (T2m)
- Precipitation anomaly
- Seasonal mean temperatures

ALADIN-CLIMAT model

- Temperature anomaly (T2m)
- Precipitation anomaly
- Seasonal mean temperatures
- Monthly mean temperatures

5. Verification of prognostic products

5.1 Annual verification summary

1.1. Short-range forecasting system

The routine control of the operational models is made by comparison of the 24h forecasts with corresponding analyzed data. Monthly statistical indicator (RMS, BIAS and MAE) are computed for the following variables:

- Geopotential height at : 1000 hPa, 850 hPa, 700 hPa, 500 hPa
- Temperature at : 1000 hPa, 850 hPa, 700 hPa, 500 hPa
- Wind components at : 1000 hPa, 850 hPa, 700 hPa, 500 hPa
- Pressure at mean sea level
- Temperature at 2m above ground

Wind components at 10m above ground

- Number of point to the total of the field :400 x 400 x 41

Thereafter we present the most meaningful verification results.

Verification table of ALADIN-Algeria for the year 2017 :

24-hour forecast, statistics verification

		Jan	Fév	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
T2m	RMSE BIAIS MAE	0,97 -0,03 0,71	1,05 0,18 0,76	1,05 0,27 0,77	1,12 0,42 0,43	1,24 0,43 0,90	1,40 0,52 1,03	1,18 0,54 0,88	1,34 0,60 0,99	1,10 0,47 0,82	1,03 0,35 0,77	0,91 0,10 0,66	1,26 -0,08 0,72
MSLP	RMSE BIAIS MAE	89,40 -47,81 73,87	92,22 - 52,33 72,55	80,38 -41,86 64,60	72,40 - 47,35 58,75	66,08 -34,72 51,40	69,43 -37,08 53,80	63,41 -37,66 50,10	68,90 -35,46 52,50	70,72 -45,21 57,00	82,95 -55,08 68,30	70,74 -39,44 56,10	82,79 -48,94 67,20
Humidité	RMSE BIAIS MAE	0,07 -0,01 0,05	0,07 -0,01 0,05	0,08 -0,009 0,05	0,08 - 0,009 -0,05	0,08 -0,01 0,05	0,10 -0,009 0,068	0,08 -0,006 0,005	0,10 -0,01 0,06	0,07 -0,01 0,05	0,07 -0,006 0,051	0,07 -0,009 0,05	0,07 -0,01 0,05
Vent	RMSE BIAIS MAE	1,73 1,08 1,32	1,85 1,20 1,43	1,85 1,25 1,45	1,82 1,23 1,42	1,91 1,29 1,50	1,86 1,22 1,45	1,92 1,32 1,51	1,86 1,24 1,46	1,79 1,17 1,39	1,75 1,12 1,35	1,59 0,99 1,22	1,88 1,26 1,47
Température à 850 hpa	RMSE BIAIS MAE	0,85 -0,20 0,65	0,82 -0,01 0,62	0,76 0,58 -0,05	0,72 0,01 0,53	0,80 0,098 0,61	0,86 0,22 0,65	0,76 0,10 0,56	0,82 0,13 0,59	0,74 0,08 0,55	0,83 -0,11 0,63	0,75 -0,20 0,57	0,82 -0,13 0,62
Humidité à 850 hpa	RMSE BIAIS MAE	0,13 -0,01 0,08	0,15 -0,02 0,09	0,13 -0,01 0,08	0,13 -0,01 0,08	0,15 -0,03 0,10	0,15 -0,04 0,10	0,14 -0,029 0,09	0,14 -0,03 0,09	0,13 -0,02 0,09	0,10 -0,01 0,06	0,12 -0,02 0,08	0,12 -0,008 0,08
Géopotentiel à 850 hpa	RMSE BIAIS MAE	70,30 -47,86 60,67	69,59 - 42,93 57,46	58,12 -35 47,95	51,68 - 36,62 43,20	42,80 -22,45 34,00	42,35 -20,29 34,00	40,88 -23,95 33,10	42,78 -20,10 34,40	47,89 -32,21 39,90	65,72 -47,54 56,00	55,78 -39,72 46,90	67,91 -50,47 57,90
Température à 500 hpa	RMSE BIAIS MAE	0,71 0,05 0,55	0,67 0,08 0,51	0,65 0,18 0,49	0,57 0,16 0,43	0,64 0,26 0,50	0,65 0,26 0,50	0,62 0,21 0,48	0,65 0,25 0,50	0,64 0,16 0,50	0,63 0,16 0,49	0,58 0,11 0,44	0,62 -0,001 0,47
Humidité à 500 hpa	RMSE BIAIS MAE	0,13 -0,01 0,08	0,15 -0,02 0,10	0,13 -0,01 0,08	0,13 - 0,014 0,08	0,15 -0,03 0,10	0,15 -0,03 0,10	0,14 -0,03 0,09	0,14 -0,03 0,08	0,13 -0,03 0,09	0,1 -0,01 0,06	0,12 -0,02 0,08	0,12 -0,008 0,08
Géopotentiel à 500 hpa	RMSE BIAIS MAE	95,88 -49,43 81,62	78,53 - 31,41 61,69	62,59 -17,03 48,00	51,19 - 15,45 40,70	47,02 11,31 36,50	47,86 15,34 37,10	40,41 3,51 31,80	41,53 3,34 31,60	41,85 -10,73 33,70	75,28 -39,56 61,70	64,15 -39,64 53,70	79,72 -49,91 67,60

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 four year.
Receive only the data useful to the forecast in our system of information

6.1.2 Major changes in the operational DPFS which are envisaged within the next four year.
Join the RMDCN European network

6.2 Planned Research activities in NWP, Nowcasting, Long-range Forcasting and Specialized Numerical Predictions

6.2.1 Planned Research Activities in NWP

- Setting up the data assimilation chain in an operational way
- Used AMDAR and GPS data in the data assimilation system.
- Upgrade of the version of ALADIN cycle (cy43t2)

6.2.2 Planned Research Activities in Nowcasting

6.2.3 Planned Research Activities in Long-range Forcasting

- Implementation of a seasonal forecasting system based on ALADIN_CLIMAT in an operational way

6.2.4 Planned Research Activities in Specialized Numerical Predictions

- Implementation of a coastal forecasting system based on WWIII.

7 Consortium

The ONM is a member of the ALADIN consortium, which develops the ALADIN, ALARO, and AROME models.

7.1 System and/or model

7.1.1 In operation

The ALADIN, AROME, and ALADIN-DUST (See sections 4.3 and 4.5).

7.1.2 Research performed in this field

Use of new observations types in data assimilation.

7.2 System run schedule and forecast ranges

7.3 List of countries participating in the consortium

Algeria, Austria, Belgium, Bulgaria, Croatia, Czech Republic, France, Hungary, Marocco, Poland, Portugal, Romania, Slovakia, Sloavenia, Tunisia, Turkey.

7.4 Data assimilation, objective analysis and initialization

7.4.1 In operation

4Dvar and the 3Dvar not for all the countries of the consortium..

7.4.2 Research performed in this field

Inject new observations in the assimilation.

7.5 Operationally available NWP products

Outputs of ARPEGE, ALADIN, AROME, ALARO and ALADIN Dust

7.6 Verification of prognostic products

By the statistical indicators RMSE, BIAS, MAE and the satellite images.

7.7 Plans for the future next four years

7.7.1 Majors changes in operations

Make the kits for the data assimilation in order to generalize this part operational in.

7.7.2 Planned research activities

- AROME core physics efforts;
- Process and parameterization codes for radiation;
- Model output diagnostics;
- High-resolution observations optimize structure functions generation for assimilation of high resolution data;
- Initialization techniques;

Observing system observation experiment.

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