



Nuestra ref.: WDS/DPFS/GDPFS-NWP/2015

GINEBRA, 18 de mayo de 2016

Anexos: 2 (disponibles solamente en inglés)

Asunto: Informe anual de la OMM de 2015 sobre los progresos técnicos del Sistema Mundial de Proceso de Datos y de Predicción (SMPDP) y las actividades de investigación conexas en materia de predicción numérica del tiempo

Finalidad: Presentar su contribución al Informe anual de la OMM de 2015 sobre los progresos técnicos del Sistema Mundial de Proceso de Datos y de Predicción (SMPDP) y las actividades de investigación conexas en materia de predicción numérica del tiempo, a más tardar el **31 de julio de 2016**

Estimado señor/Estimada señora:

El Informe anual de la OMM sobre los progresos técnicos del Sistema Mundial de Proceso de Datos y de Predicción (SMPDP) junto con el informe sobre las actividades de investigación conexas en materia de predicción numérica del tiempo, en adelante "el Informe", permite mantener informados a los Miembros sobre las instalaciones, la investigación y las aplicaciones nuevas y de rápida evolución que se están poniendo en marcha en los centros SMPDP, como necesidades y adelantos tecnológicos. En el Informe se proporciona a los expertos operacionales y a los investigadores información sobre la situación en los centros SMPDP relativa a: 1) la instalación y actualización del equipo operacional y las instalaciones conexas, en particular el análisis y la predicción meteorológicos y los sistemas de predicción

- A los Representantes Permanentes (o Directores de los Servicios Meteorológicos o Hidrometeorológicos) de los Miembros de la OMM (PR-6904)
Director del Centro europeo de predicción meteorológica a medio plazo (CEPMMP)
Director del Centro Africano de Aplicaciones Meteorológicas para el Desarrollo (ACMAD)

copias: Presidentes y vicepresidentes de la Comisión de Ciencias)
Atmosféricas (CCA) y la Comisión de Sistemas Básicos (CSB))
Miembros del Grupo de gestión de la CCA)
Miembros del Comité Científico Mixto del Grupo abierto de área de)
programa (GAAP) sobre el Programa Mundial de Investigación)
Meteorológica de la CCA) (para información)
Grupos de trabajo del GAAP sobre el Programa Mundial de)
Investigación Meteorológica)
Miembros del Grupo de gestión de la CSB y del GAAP sobre)
Sistema de proceso de datos y de predicción (SPDP) de la CSB)
Puntos de contacto de los Centros Meteorológicos Regionales)
Especializados (CMRE) para la respuesta en casos de)
emergencia ambiental)
Respuesta y/o procedimiento de búsqueda retrospectivo)

numérica del tiempo, así como sus sistemas especializados de aplicaciones específicas, y 2) su labor de investigación y desarrollo por lo que respecta a la comprensión de los procesos meteorológicos y avances constantes en materia de modelos numéricos y técnicas de apoyo a la predicción operativa. Además, un examen completo sobre la base de todos los informes recibidos cumple una importante función para garantizar la comprensión de la OMM acerca del estado del funcionamiento del Sistema Mundial de Proceso de Datos y de Predicción, así como la atención permanente que se le concede, a escala mundial, regional y nacional.

En este contexto, me complace informarle de que los informes de 2013 presentados por los Miembros se han reunido y compilado junto con los de años anteriores (véase el anexo I) en el sitio web de la OMM en el enlace siguiente:

<http://www.wmo.int/pages/prog/www/DPFS/ProgressReports/2014/GDPFS-NWP-2014.html>

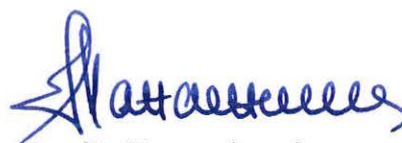
Se invita a los Miembros a que preparen y presenten a la Secretaría de la OMM sus contribuciones al Informe para el año 2014. A fin de facilitar el suministro de información pertinente sobre las actividades a su centro SMPDP y/o su colaboración en un consorcio, desde la predicción inmediata a la predicción ampliada y a largo plazo, así como aplicaciones especializadas de predicción numérica del tiempo (PNT) y del proceso posterior (por ejemplo, de olas oceánicas, mareas de tempestad, hielo marino, transporte y deterioro natural de la contaminación marina, ciclones tropicales, transporte y dispersión de la contaminación atmosférica, radiación solar ultravioleta, pronósticos de la calidad del aire, humo, arena y polvo, etc.), se ha preparado una plantilla siguiendo el índice del Informe (véase el anexo II), que puede consultarse en el sitio web de la OMM en el enlace siguiente:

<http://www.wmo.int/pages/prog/www/DPS/gdps.html>

Mucho le agradecería que tomase las disposiciones necesarias para realizar su contribución al Informe de 2015, **únicamente en formato electrónico**, y hacerla llegar con la mayor brevedad posible, pero preferiblemente **no más tarde del 31 de julio de 2016**, a la Secretaría de la OMM por correo electrónico (dpfsmail@wmo.int), preferentemente en MS Word u otros formatos compatibles, a la atención de la señora Pascale Gómez.

Quisiera agradecer su apoyo constante y contribución al presente Informe e instar encarecidamente a aquellos Miembros que aún no hayan aportado contribuciones o que durante varios años no hayan actualizado sus informes respectivos, a que lo hagan, para beneficio de todos los Miembros de la Organización.

Le saluda atentamente.



(E. Manaenkova)
por el Secretario General

**Annual WMO Technical Progress Reports on the
GDPFS and related Research Activities on NWP
(for 2014, or latest report year)**

ECMWF (2014)	Kyrgyzstan (2004)
Algeria (2013)	Latvia (2013)
Argentina (2013)	Lithuania (2012)
Armenia (2011)	Madagascar (2008)
Australia (2010)	Malaysia (2011)
Austria (2010)	Montenegro (2008)
Belarus (2012)	Morocco (2006)
Belgium (2008)	Mozambique (2010)
Bolivia (2010)	Netherlands (2010)
Bosnia and Herzegovina (2008)	New Zealand (2014)
Botswana (2010)	Oman (2011)
Brazil (2010)	Pakistan (2012)
Bulgaria (2006)	Panama (2005)
Canada (2014)	Peru (2007)
Chile (2008)	Poland (2012)
China (2014)	Portugal (2011)
Côte d'Ivoire (2004)	Qatar (2012)
Croatia (2014)	Republic of Korea (2013)
Cyprus (2014)	Romania (2014)
Czech Republic (2013)	Russian Federation - English (2014)

ANNEX I, p. 2

Denmark (2010)	Russian Federation - Russian (2014)
Ecuador (2008)	Saudi Arabia (2008)
Egypt (2014)	Serbia (2013)
Estonia (2008)	Singapore (2012)
Fiji (2010)	Slovakia (2012)
Finland (2014)	Slovenia (2012)
France (2013)	Spain (2014)
Georgia (2004)	Sri Lanka (2010)
Germany (2014)	Sweden (2014)
Greece (2013)	Switzerland (2014)
Hong Kong, China (2014)	Tanzania (2014)
Hungary (2014)	Thailand (2014)
India (2011)	The former Yugoslav Republic of Macedonia (2010)
Indonesia (2009)	Tunisia (2003)
Iran, Islamic Republic of (2006)	Turkey (2009)
Ireland (2014)	United Kingdom of Great Britain and Northern Ireland (2014)
Israel (2012)	United Republic of Tanzania (2009)
Italy (2014)	United States of America (2013)
Japan (2014)	Uruguay (2008)
Kazakhstan (2014)	Uzbekistan (2013)
Kenya (2013)	

**ANNUAL JOINT WMO TECHNICAL PROGRESS REPORT ON THE GLOBAL DATA-
PROCESSING AND FORECASTING SYSTEM (GDPFS) INCLUDING NUMERICAL
WEATHER PREDICTION (NWP) RESEARCH ACTIVITIES FOR 2015**

TABLE OF CONTENTS

Introduction

[National Contributions and/or Consortia]

1. Summary of highlights

2. Equipment in use at the Centre

3. Data and Products from GTS in use

4. Forecasting system

4.1 System run schedule and forecast ranges

4.2 Medium range forecasting system (4-10 days)

4.2.1 Data assimilation, objective analysis and initialization

4.2.1.1 In operation

4.2.1.2 Research performed in this field

4.2.2 Model

4.2.2.1 In operation

4.2.2.2 Research performed in this field

4.2.3 Operationally available Numerical Weather Prediction (NWP) Products

4.2.4 Operational techniques for application of NWP products (MOS, PPM, KF, Expert Systems, etc.)

4.2.4.1 In operation

4.2.4.2 Research performed in this field

4.2.5 Ensemble Prediction System (EPS) (Number of members, initial state, perturbation method, model(s) and number of models used, number of levels, main physics used, perturbation of physics, post-processing: calculation of indices, clustering)

4.2.5.1 In operation

4.2.5.2 Research performed in this field

4.2.5.3 Operationally available EPS Products

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

4.3.1 Data assimilation, objective analysis and initialization

4.3.2.1 In operation

4.3.2.2 Research performed in this field

4.3.2 Model

4.3.2.1 In operation

4.3.2.2 Research performed in this field

4.3.3 Operationally available NWP products

4.3.4 Operational techniques for application of NWP products (MOS, PPM, KF, Expert Systems, etc.)

4.3.4.1 In operation

4.3.4.2 Research performed in this field

4.3.5 Ensemble Prediction System (Number of members, initial state, perturbation method, model(s) and number of models used, perturbation of physics, post-processing: calculation of indices, clustering)

4.3.5.1 In operation

4.3.5.2 Research performed in this field

4.3.5.3 Operationally available EPS products

4.4 Nowcasting and Very Short-range Forecasting Systems (0-12 hrs)

4.4.1 Nowcasting system

4.4.1.1 In operation

4.4.1.2 Research performed in this field

Note: please also complete the CBS/PWS questionnaire on Nowcasting Systems and Services, 2014)

4.4.2 Models for Very Short-range Forecasting Systems

4.4.2.1 In operation

4.4.2.2 Research performed in this field

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

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

4.5.1.1 In operation

4.5.1.2 Research performed in this field

4.5.2 Specific models (as appropriate related to 4.5)

4.5.2.1 In operation

4.5.2.2 Research performed in this field

4.5.3 Specific products operationally available

4.5.4 Operational techniques for application of specialized numerical prediction products (MOS, PPM, KF, Expert Systems, etc.) (as appropriate related to 4.5)

4.2.4.1 In operation

4.2.4.2 Research performed in this field

4.5.5 Probabilistic predictions (where applicable)

4.5.5.1 In operation

4.5.5.2 Research performed in this field

4.5.5.3 Operationally available probabilistic prediction products

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

4.6.1 In operation

4.6.2 Research performed in this field

4.6.3 Operationally available EPS products

4.7 Long range forecasts (30 days up to two years) (Models, Ensemble, Methodology)

4.7.1 In operation

4.7.2 Research performed in this field

4.7.3 Operationally available products

5. Verification of prognostic products

5.1 Annual verification summary

5.2 Research performed in this field

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

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

6.2 Planned Research Activities in NWP, Nowcasting, Long-range Forecasting and Specialized Numerical Predictions

6.2.1 Planned Research Activities in NWP

6.2.2 Planned Research Activities in Nowcasting

6.2.3 Planned Research Activities in Long-range Forecasting

6.2.4 Planned Research Activities in Specialized Numerical Predictions

7. Consortium (*if appropriate*)

7.1 System and/or Model

7.1.1 In operation

7.1.2 Research performed in this field

7.2 System run schedule and forecast ranges

7.3 List of countries participating in the Consortium

7.4 Data assimilation, objective analysis and initialization

7.4.1 In operation

7.4.2 Research performed in this field

7.5 Operationally available Numerical Weather Prediction (NWP) Products

7.6 Verification of prognostic products

7.7 Plans for the future (next 4 years)

7.7.1 Major changes in operations

7.7.2 Planned Research Activities

8. References

EXPLANATORY NOTES

to the suggested contents of Annual Joint WMO Technical Progress Report on the Global Data-Processing and Forecasting System (GDPFS) and Numerical Weather Prediction (NWP) Research Activities

The WMO progress report will be jointly compiled annually by the WDS and AREP Departments of the WMO Secretariat on the basis of contributions from WMO Members and/or GDPFS centres.

The publication will begin with an introduction prepared by the WMO Secretariat explaining the major purposes of the publication with the appropriate references.

Each individual contribution should contain appropriate parts of the following items.

- 1. Summary of highlights.** This should reflect the major changes in the data-processing and forecasting system during the last year.
- 2. Equipment in use at the centre.** This paragraph should contain information on the major data-processing units, especially in the large centres. Here and in the following paragraphs the information for the first national contribution to the Progress Report should be given in a complete form to avoid too many references. In the next contribution, the information can be restricted to the indication of major changes during the year being reported on.
- 3. Data and products from GTS in use.** It is suggested that only the bulletin headings with the basic information (SYNOP, SHIP, TEMP, SATEM etc.) and the types of products (GRID, GRIB, facsimile charts etc.) received through the GTS or other means and used at the centre will be indicated in this paragraph. The daily statistics for each type of bulletin and the product should be included, if such statistics are available. For example, SYNOP-500, TEM-600, GRID-20.
- 4. Forecasting system.** There are several aspects of this system since some centres run several models which have different approaches to the data assimilation, use different numerical techniques and so on. Consequently, this paragraph is divided into several sub paragraphs.
 - 4.1 System run schedule.** It is suggested that the general structure of a prognostic system should be described in the paragraph with an indication of models in operational use, including those for specialized applications, the run schedule and the forecast ranges.
 - 4.2-4.6** These sub-paragraphs are a series of similarly structured texts describing different operational sub-systems of a numerical weather forecasting system: Medium-range forecasting (section 4.2); Short-range forecasting (section 4.3); Nowcasting and very-short-range forecasting (section 4.4), Specialized numerical predictions for various sector specific applications, including sea waves, storm surge, sea ice, marine pollution transport and weathering, tropical cyclones, air pollution transport and dispersion, solar ultraviolet (UV) radiation, air quality forecasting, smoke, sand and dust, etc. (section 4.5), extended-range forecasting (section 4.6) and long-range forecasting (section 4.7). Each sub-paragraph contains the same components starting with data assimilation and objective analysis, description of the model, of operational techniques for application of NWP products, and a section on Ensemble Prediction Systems if used for that range. List of products available for WMO members should be indicated. All sub-paragraphs should include information regarding any performed research activities in the related field.

The list of suggested items in each sub-paragraph is given for 4.2 (it is assumed that for 4.3-4.7 they will be similar).

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

4.2.1 Data assimilation objective analysis and initialization

4.2.1.1 In operation

- . Assimilated data,
- . Assimilation cycles, including cut-off time,
- . Method of analysis (e.g. 3 D-VAR, 4D-VAR)
- . Analysed variables
- . First guess
- . Coverage
- . Horizontal resolution
- . Vertical resolution (levels)
- . Initialization (non linear normal mode, diabatic, etc.)

4.2.1.2 *Research performed in this field*

4.2.2 *Model*

(If no model is operationally runs for this time range, indicate, if any, the other GDPFS centre and its model from which you use products.)

4.2.2.1 *In operation*

- . Basic equations
- . Independent variables
- . Dependent variables
- . Numerical technique (in horizontal, vertical and in time), hydrostatic or non-hydrostatic
- . Integration domain (in horizontal and vertical)
- . Horizontal and vertical resolution
- . Time step
- . Orography, gravity wave drag, bathymetry (ocean models)
- . Horizontal diffusion
- . Vertical diffusion
- . Planetary boundary layer
- . Treatment of sea surface earth surface and soil
- . Radiation
- . Convection (deep and shallow)
- . Atmospheric moisture
- . Boundaries
- . Type of ocean model (deep and shallow waters)
- . Source of input (e.g. wind etc.) data (ocean models).

4.2.2.2 *Research performed in this field*

4.2.3 *Operationally available Numerical weather prediction products.* This item should contain a brief description of variables which are outputs from the model integration and the list of products available for WMO Members on Internet and on GTS. *(If no model is operationally runs for this time range, indicate the list of products, if any, you use from another GDPFS centre.)*

4.2.4 *Operational techniques for application of NWP products.* This item should include only a brief description of automated (formalized) procedures in use for interpretation of NWP output (MOS, PPM, Kalman filter, Expert System, etc.) for example, "the MOS from ECMWF NWP is used to derive extreme temperatures and daily precipitation".

4.2.4.1 *In operation*

4.2.4.2 *Research performed in this field*

4.2.5 *Ensemble Prediction System (Number of members, initial state perturbation method, number and different models used, perturbation of physics, post-processing: calculation of indices, clustering).* This item should be a brief but clearer description of the techniques used for the ensemble prediction system, including the main post-processing techniques applied.

4.2.5.1 *In operation*

4.2.5.2 *Research performed in this field*

4.2.5.3 *Operationally available EPS products.* This item should contain a brief description of variables which are outputs from the EPS integration and the list of products available for WMO Members on Internet and on GTS.

5. Verification of prognostic products. Centres producing standard scores are requested to produce an annual summary for insertion in the WMO Progress Report on the GDPFS. The recommended content of this summary is given below:

VERIFICATION SUMMARY FOR INCLUSION IN THE ANNUAL WMO PROGRESS REPORT ON THE GDPFS

RSMC error	Z 500	NH, SH: against analysis 4 extra tropical standard area: against observations
RMS vector wind error	W 250	Same areas
RMS vector wind error	W 250	Tropics: against analysis
RMS vector wind error	W 850	Tropical standard area: against observations

Forecast range: 1, 3 and 5 days

All values to be the average of the monthly values over the year.

For ensemble system, provide annual and seasonal averages of the Brier Skill Score at 24, 72, 120, 168 and 240 hours for Z500 and T850.

6. Plans for the future (*next 4 years*)

6.1 Development of GDPFS.

6.1.1 Indicate major changes in the data processing and forecasting system which are expected in the next year.

6.1.2 Indicate major changes in the data processing and forecasting system which are envisaged within the next 4 years.

6.2 Planned Research activities in NWP, Nowcasting, Long-range Forecasting and Specialized Numerical Predictions. Indicate your planned research and development efforts in the area of understanding of physical processes, models, EPS and other techniques for the next 4 years.

6.2.1 Planned Research Activities in NWP

6.2.2 Planned Research Activities in Nowcasting

6.2.3 Planned Research Activities in Long-range Forecasting

6.2.4 Planned Research Activities in Specialized Numerical Predictions

7. Consortium (*if appropriate*)

There are a number of GDPFS Centres participating in Consortia. Those Centres participating in and/or responsible for a Consortium should indicate it in this item. Details on the system and/or model developed and/or operated by a Consortium, including approaches to the data assimilation, use of different numerical techniques and so on, should be reported in sub-paragraphs 7.1-7.7, using a similar approach as described in item 4.

7.1 *System and/or Model*

7.1.1 *In operation*

7.1.2 *Research performed in this field*

7.2 *System run schedule and forecast ranges*

7.3 *List of countries participating in the Consortium*

7.4 *Data assimilation, objective analysis and initialization*

7.4.1 *In operation*

7.4.2 *Research performed in this field*

7.5 *Operationally available Numerical Weather Prediction (NWP) Products*

7.6 *Verification of prognostic products*

7.7 *Plans for the future (next 4 years)*

7.7.1 *Major changes in operations*

7.7.2 *Planned Research Activities*

8. References: Give references to the sources where more detailed descriptions of different components of the data-processing and forecasting system can be found, including websites addresses.
