Our ref.:   WDS/DPFS/GDPFS-NWP/2013   GENEVA, 19 March 2013

Annexes: 2 (available in English only)

Subject: Annual Joint WMO Technical Progress Report on the Global Data-processing and Forecasting System (GDPFS) and related Research Activities on Numerical Weather Prediction (NWP) for 2012

Action required: To submit your contribution for the Annual WMO Technical Progress Report on the Global Data-processing and Forecasting System (GDPFS) combined with the report on Research on Numerical Weather Prediction (NWP) by **30 May 2013**

Dear Sir/Madam,

The Annual WMO Technical Progress Report on the Global Data-processing and Forecasting System (GDPFS), combined with the report on Research on Numerical Weather Prediction (NWP), serves as one way of updating Members on the rapidly evolving and emerging facilities, research and services being implemented at GDPFS Centres as requirements and technology advance. It provides to operational experts and researchers information on the status in GDPFS Centres related to the: (1) implementation of operational equipment and related facilities, including analysis-forecast systems and their specialized NWP for specific applications; and (2) their research and development efforts in the area of understanding of physical processes, numerical models and techniques for operational forecasting. Additionally, this comprehensive review plays an important function in ensuring WMO's support at global, regional and national levels, through the successful implementation and operation of the GDPFS.

To: Permanent Representatives (or Directors of Meteorological or Hydrometeorological Services) of Members of WMO (PR-6694)
        Director, ECMWF
        Director, ACMAD

cc: Presidents and vice-presidents of the Commissions for   )
        Atmospheric Sciences and for Basic Systems   )
        Members of CAS Management Group   )
        Members of CAS Joint Scientific Committee of OPAG-WWRP   ) (for information)
        OPAG-WWRP Working Groups   )
        Members, CBS Management Group and CBS/OPAG on DPFS   )
        Points of Contact, RSMCs for Environmental Emergency   )
        Response and/or Backtracking   )

In this context, I am pleased to inform you that the 2011 reports submitted by Members (list of countries that have provided a report for 2011 or a previous year is indicated in Annex I) have been collected and compiled, along with those of previous years, on the WMO Website at http://www.wmo.int/pages/prog/www/DPFS/ProgressReports/2012/2011_GDPFS-NWP.html. Members are now invited to prepare and submit to the WMO Secretariat their contributions to the Annual WMO Technical Progress Report on the GDPFS combined with NWP Research Activities for the year 2012.

For facilitating the provision of information related to the operationally implemented GDPFS activities by your GDPFS Centre and/or Consortia as well as the related NWP research activities, including from nowcasting to extended- and long-range forecasting, and specialized numerical weather predictions (e.g. for 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.), a template has been prepared (electronic form available on the WMO ftp server at ftp://ftp.wmo.int/Documents/PublicWeb/www/gdpfs/GDPFS-NWP_Annualreports2012/TEMPLATE_2012.doc; the Table of Contents and guidance are provided in Annex II). I would like to take this opportunity to thank you for your continuous support and contribution to this Report over many years, and strongly encourage those countries that have not contributed or have not updated reports, to do so for the benefit of all WMO Members.

I should be grateful if you could kindly arrange for the completion of the form and for submitting your national contributions, and those that are partnership in GDPFS Consortia, **in electronic form only**, to the WMO Secretariat at your earliest convenience, but preferably **not later than 30 May 2013** by e-mail (dpfsmail@wmo.int) or on a CD (preferably in Word 2003 or other compatible formats), attention to: Ms Pascale Gomez.

Yours faithfully,

(J. Lengoasa)
for the Secretary-General

2011 GDPFS / NWP REPORTS

ECMWF (2011)
Algeria (2009)
Argentina (2010)
Armenia (2011)
Australia (2010)
Austria (2010)
Belarus (2011)
Belgium (2008)
Bolivia (2010)
Bosnia and Herzegovina (2008)
Botswana (2010)
Brazil (2010)
Bulgaria (2006)
Canada (2011) (EN) (FR)
Chile (2008)
China (2010)
Côte d'Ivoire (2004)
Croatia (2011)
Cyprus (2011)
Czech Republic (2010)
Denmark (2010)
Ecuador (2008)
Egypt (2008)
Estonia (2008)
Fiji (2010)
Finland (2011)
France (2011)
Georgia (2004)
Germany (2011)
Greece (2011)
Hong Kong, China (2011)
Hungary (2011)
India (2011)
Indonesia (2009)

Iran, Islamic Republic of (2006)

Ireland (2010)
Israel (2009)
Italy (2011)

Japan (2011)

Kazakhstan (2011)

Kenya (2011)
Kyrgyzstan (2004)
Latvia (2011)
Lithuania (2009)
Madagascar (2008)
Malaysia (2011)
Montenegro (2008)
Morocco (2006)
Mozambique (2010)
Netherlands (2010)
New Zealand (2011)
Oman (2011)
Pakistan (2010)
Panama (2005)
Peru (2007)
Poland (2011)
Portugal (2011)
Qatar (2011)
Republic of Korea (2009)
Romania (2009)
Russian Federation - English (2011)
Russian Federation - Russian (2011)
Saudi Arabia (2008)
Serbia (2008)
Singapore (2010)
Slovakia (2011)
Spain (2010)
Sri Lanka (2010)
Sweden (2011)
Switzerland (2011)
Thailand (2011)
The former Yugoslav Republic of Macedonia (2010)
Tunisia (2003)
Turkey (2009)
United Kingdom of Great Britain and Northern Ireland (2011)
United Republic of Tanzania (2009)
United States of America (2007)
Uruguay (2008)

Uzbekistan (2011)

WORLD METEOROLOGICAL ORGANIZATION
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ANNUAL JOINT WMO TECHNICAL PROGRESS REPORT ON THE GLOBAL DATA-PROCESSING AND FORECASTING SYSTEM (GDPFS) INCLUDING NUMERICAL WEATHER PREDICTION (NWP) RESEARCH ACTIVITIES FOR 2012

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

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    4.3.5.3 Operationally available EPS products

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    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)

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    4.5.1.2 Research performed in this field

4.5.2 Specific models (as appropriate related to 4.5)

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    4.5.2.2 Research performed in this field

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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)
- Analyzed 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 run 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 the Internet and on the 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.

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