WMC Tokyo (JMA)

JMA's Global Determistic NWP and Ensemble NWP

Det: TL959 (0.1875 deg. 20 km), 128 levels, 132 h (06, 18UTC), 264 h (00, 12 UTC) forecast time

Ens: TQ479 (0.2g deg. 27km), 128 levels, 51 members, 5.5 days (06, 18 UTC), 11 days (00, 12 UTC), 18 days (12UTC) forecast time

- **Data access:**
  - **Gridded Data** via JMA Open Data Server https://www.wis-jma.go.jp/cms/index.html
    Data specification:
    Det: 1.25 deg., Global Area, Forecast hours 0-132 every 6 h, 144-264 every 12 h (00, 12 UTC),
       00, 06, 12, 18 UTC initial times
    Ens: 1.25 deg., Global Area, Forecast hours 0-264 every 12 h, 00, 12 UTC initial times
  - **Graphical products:** forecast maps, meteograms, geostationary meteorological satellite and ocean wave forecasts available at https://www.wis-jma.go.jp/swfdp/index.html
- **Further information:**
  - https://www.jma.go.jp/jma/en/Activities/nwp.html
  - https://www.jma.go.jp/jma/jma-eng/jma-center/nwp/nwp-top.htm

WMC Beijing: Provision of high-resolution NWP grid data

- WMC Beijing is running its Global Forecast System (named CMA-GFS) 4 times a day with 4DVAR, and providing the GRIB2 data to the Members through the GISC-Beijing.
  - The data is sufficient to nest a limited-area NWP.

- Available Output of CMA-GFS
  - Spatial resolution: **horizontal: 0.25deg; vertical: 87 layers up to 0.1hPa(~60km)**
  - Variables: Geopotential height, Temperature, Wind, Pressure, Humidity, Precipitation, and many more
  - Forecast range: 120/240h
  - Step: every 3h from 0h to 120h, every 6h from 120h to 240h
  - Issuance frequency: 4 times/day, 00/12UTC to 240h; 06/18UTC to 120h
  - Domain: Global
  - Latency about 4.5h~5.5h
  - Data volume about 68G/day
  - Special services for the WMO Members through CMACAST
  - Licensing conditions: **free/open data**
- References
  - Links to a website on which the data are provided : http://data.wis.cma.cn/DCPC_WMC_BJ/open/
  - Documents on the service: (http://image.nmc.cn/userfiles/ueditor/userid/files/cms/article/2021/11/1636966605580.pdf)

WMC ECMWF: Provision of high-resolution NWP grid data

- ECMWF runs global deterministic (9km) and ensemble (18km resolution) forecasts four times a day

- From January 2022 ECMWF made a wide range of this forecast data openly available (free of charge) at high resolution of 0.4 deg
  - Forecasts from 00/12 UTC: Output 3-hourly to 6 days, then 6-hourly to 10 days (deterministic) and 15 days (ensemble)
  - Forecasts from 06/18 UTC: Output 3-hourly to 3 days (deterministic), 6 days (ensemble)
  - Pressure Levels (hPa): 1000, 925, 850, 700, 500, 300, 250, 200, 50
  - Surface fields including 10m winds, 2m temperature, precipitation, ocean waves
  - The set of data exceeds the requirements defined in the GDPFS Manual 485
  - Full list of forecast variables provided on the ECMWF web site https://www.ecmwf.int/en/forecasts/datasets/open-data
  - A large selection of forecast charts is also openly available on the ECMWF web site https://www.ecmwf.int/en/forecasts/charts

- Full resolution data (e.g. to nest a limited-area NWP) is available to WMO members for official use at handling charge only
  - https://www.ecmwf.int/en/forecasts/accessing-forecasts/licences-available

- ECMWF to start a pilot project to provide full resolution (0.1 degrees) forecast fields free of charge to NMHS of WMO Members prioritized by SOFF in 2022
  - This will enable them to initialize LAMs (including WRF, ICON, HARMONIE); data to be provided for sub-regions (planned to be via ftp pull)
- Plans
  - from 2023 to include CAMS meteorological fields on model-levels (137 levels) at 0.4 deg via Atmospheric Data Store
  - From 2023 ECMWF seasonal forecast (1 deg resolution) with no delay via Climate Data Store
- References
  - ECMWF website https://www.ecmwf.int/
  - Documentation: User Guide to ECMWF forecasts; Training courses and eLearning

WMC Exeter: Provision of high-resolution NWP grid data

Global Deterministic model at 10km to 7 days; Ensemble at 20km to 10 days

- Plan to unify to 12km ensemble to 14 days (no separate deterministic)

Global Deterministic data provided on GTS

- higher resolution (1.0 degrees) – accessible via GDPFS Portal
- a few variables currently missing – working to rectify

Working towards provision of data via WIS2 technology

- Support for a moderate increase in core data specification (e.g. 0.5 degree resolution)
  - Including core ensemble data
- Higher resolution data incl. ensemble available under open data license – download costs

Support for SWFP and VCP

- Tropical Africa model (4km) shared via web and satellite distribution
  - operational, long-term commitment supported by VCP
- SWFP training support
- ensemble charts and site forecasts for several SWFP regions

Met Office leads the UM Partnership which offers:

- access to the Unified Model for regional modelling
- full support including boundary conditions
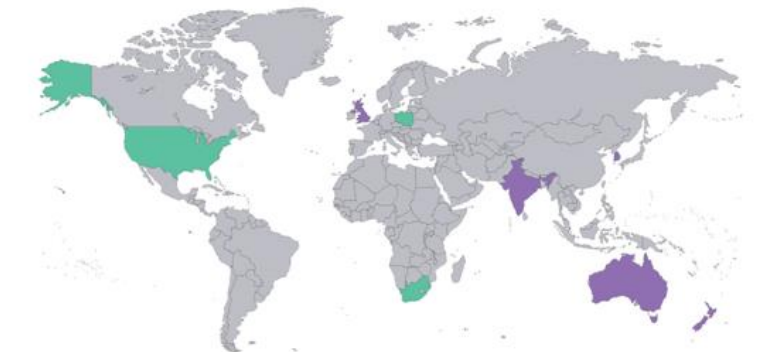- Annual fee – core partners also commit research contribution

Support some countries through WCSSP projects funded by UK government

More information on NWP on Met Office website

Tropical Africa Model
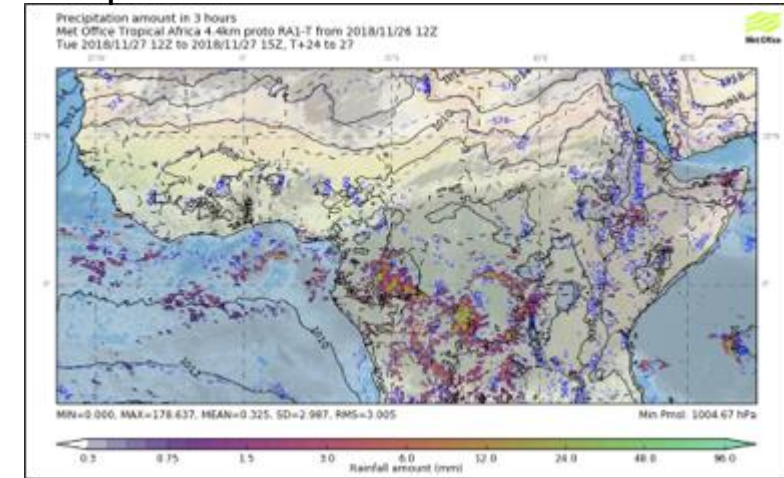
The Unified Model Partnership

CORE PARTNERS   ASSOCIATE PARTNERS

Met Office

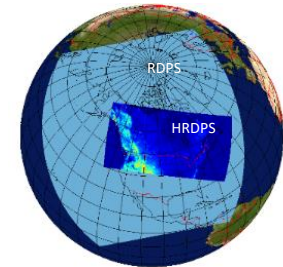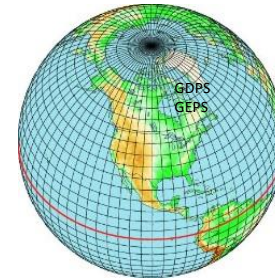# WMC Melbourne: Provision of high-resolution NWP grid data

- Produce own Global NWP as well as own regional models.
  - Provide most data to WMO for deterministic, minimal for ensemble models.
- Specification of high-resolution NWP data:
  - Most parameters considered compliant (deterministic better than ensemble). All data can be made available, is dependent on resources.
  - Resolution, Forecast range, Time steps, Frequency all more finer than required.
  - No special services provided.
  - Free/open data is available, special services would need to be individually considered.
- References
  - [ACCESS NWP Data Information](#)
  - [Operations Bulletin](#)

Meteorological Service of Canada

Provision of NWP grid data

- Access to many NWP models including:
    - [Regional Deterministic](#) 10km, 33 pressure levels,   84h forecast, 4 runs/day
    - [Global Deterministic](#)   15km, 33 pressure levels, 240h forecast, 2 runs/day
    - [Global Ensemble](#)   50km, 10 pressure levels, 384h forecast, 2 runs/day
    - [Regional Ensemble](#)   10km, 10 pressure levels,   72h forecast, 4 runs/day

- Available via MSC open data portal [open-data/msc-data](#).

- Data available trough interoperable web services and software API, or as raw gridded files.
- See documentation for list of levels and variables: [open-data/msc-data](#).
- Free, but need to attribute data to the originator: [See the licence](#).

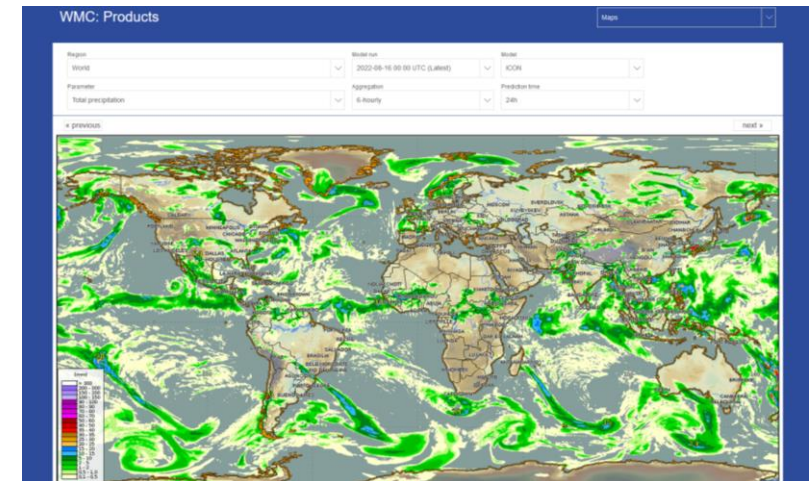# WMC Moscow: Provision of high-resolution NWP grid data

- Currently, no high-res data is provided. It is planned to provide them. Global fields will not be sufficient to run nested LAM. Separate regional data with more variables, finer time step and vertical levels allowing LAM run will be available upon request from NMHSs.

- Specification: Horizontal resolution 0.5 degree lat-lon; 27 vertical isobaric levels; 00 and 12 UTC runs; forecast range: 120 hr for 00UTC, 240hr for 12UTC run. Global fields; 3-hour step up to 78 hrs, then 6-hour step up to 120 hrs, then 12hrs. List of variables: H, T, U, V, RH, MSLP, T2M, RH2M, U10M, V10M, Prec, SWE, Psurf, Tsurf.

- Additional variables for running LAM: more vertical levels; 4 hydrometeors, soil T and W; step of 1 hour up to 78 hrs.

- Free access for both global/regional fields; regional fields will be password protected and available upon request for WMO member NMHSs.

- Data will be available at ftp.meteorf.ru and a document will be prepared.

WMC Offenbach

Global ICON Deterministic and Ensemble NWP

➡ **Det:** 13 km horizontal resolution, 90 levels, 180 h forecast time

➡ **Ens:** 40 km horizontal resolution, 40 members, 180 h forecast time

➡ Provision of ICON EPS verification measures to the Lead Centre on Verification of Ensemble Prediction Systems at JMA

➡ **Data access:**

▪ Grib Data via DWD Open Data Server (for last 24 hrs)
http://opendata.dwd.de/weather/nwp/icon/grib/

▪ Visualization as Maps and Meteograms
on https://dwd.de/wmc

More information: https://www.dwd.de/EN/ourservices/wmc/wmc

Also available at open data: Regional Det and Ens for Europe with higher resolution and update frequency

WMC Toulouse: Provision of high-resolution NWP grid data

- Access to different NWP models products :

    - Global operational numerical weather prediction model - ARPEGE - Resolution 0.5° on the globe and 0.1° over Europe

    - High resolution and limited area operational numerical weather prediction model - AROME - Resolution 0.025° or 0.01° over Western Europe

    - Global statistical products based on surface fields from the global French numerical ensemble weather prediction model - PEARP - Resolution 0.5 degree

- Open data but not sufficient to initialize a high-resolution model

- Reference : http://dcpcpnp-int-p.meteo.fr/openwis-user-portal/srv/en/main.home

WMC Washington (NCEP): Provision of high-resolution NWP grid data

Modeling System	Cadence/ Forecast Length	Products/Resolution of NWP data
GFS (Global weather and waves, deterministic, 13 km);	4 cycles, 16 days	0.25^0, 0.5^0 and 1^0 data, 743 variables (surface and upper air); Available in GRIB2 via ftp; Available in GRIB2 via https; Available in GRIB2 via AWS
GEFS (Global weather and waves, 31-member ensembles, 25 km)	4 cycles, 16 days except 35 days at 00z	0.25^0, 0.5^0 and 1^0 data, 505 variables, raw and bias corrected (surface and upper air); Available in GRIB2 via FTP; Available in GRIB2 via HTTPS; Available in GRIB2 via AWS
GEFS-Aerosol (Global, deterministic, 25 km)	4 cycles, 5 days	0.25^0, 0.5^0 and 1^0 data, 31 variables (aerosols and chemistry); Available in GRIB2 via FTP; Available in GRIB2 via HTTPS
NAEFS (Global weather and waves, multi-model ensemble – GEFS+CMC+Navy, 25km)	4 cycles, 16 days	0.5^0, 51 variables, raw and bias corrected (surface and upper air); Available in GRIB2 via ftp; Available in GRIB2 via https. Additional downscaled products at 3 km
CFS (Global, deterministic, ~100 km)	4 cycles, 45d-9months	0.5^0, various atmosphere, ocean and ice products (raw and bias corrected); Available in GRIB2 via FTP; Available in GRIB2 via HTTPS
Hurricane (Regional, on-demand, hurricane model for all global TCs)	4 cycles a day, 126 hrs, through the life cycle	0.125^0, 0.015^0 and 0.25^0 data, 700 variables, (surface and upper air), TC track and intensity (atcf); Available in GRIB2 via ftp; Available in GRIB2 via https
WAM-IPE (Whole Atmosphere, Space)	4 cycles a day, 48 hrs	Available in netCDF via FTP; Available in netCDF via HTTPS

- All data freely available through FTP, HTTPS, and selected data on AWS (with longer retention time) in real-time, including unrestricted global observations in BUFR format for analysis and data assimilation. Longer archives are available through NCEI with additional filtering capabilities.
- Widely used worldwide for downscaling, initializing limited-area models (IC/BC), and various forecast applications
- GFS full resolution (C768L127) native model data available through AWS for running FV3 based NWP models
- Output from several high-resolution limited area deterministic models (NAM, RAP, HRRR) and ensemble models (SREF, HREF) are also available for North American Domain and other selected domains including Alaska, Hawaii, Guam and Puerto Rico
- Complete inventory of all NCEP operational models and their data availability is listed here.

Provision of Long-Range Forecast Multi-model Ensemble data

- KMA was officially designated for the Global Producing Center (GPC) at CBS-Ext.06 (2006) and for **Lead Centre for Long-range forecast Multi-Model Ensemble (LC-LRFMME)** at CBS-14 (2009).
  - https://wmolc.org/ (access statistics 18,771 in 2021)
- Data type : Images and GRIB1&2, netcdf (but it need to login to download each GPC's model raw data)
- Plans
  - Enable to free access to download the data without login (It need 14 GPCs consent)

Provision of high-resolution global NWP grid data

- Global area
  - From 1st July, KMA started to send NWP forecast data based on *KIM to TIGGE (global)
    - KIM: KMA's new operational model KIM (Korea Integrated Model) has been in operational since 2020
  - Global deterministic(~12km, ~12days) and ensemble(26 members, ~32km, ~12days)
  - Original horizontal resolution for deterministic, re-grided to 50 km for ensemble model
  - Data specification
    - Model description : https://confluence.ecmwf.int/display/TIGGE/Models
  - Before 1st July, KMA data in TIGGE archive is based on UM
- Regional area
  - *Hong-Kong(global deterministic, ensemble), Mongolia, Vietnam and Sri Lanka