

Updated concept and recommended list of core-data products of RSMCs for NWP

Ken Mylne

UK Met Office

Chair, Expert Team on Operational Weather Forecasting System,
SC-ESMP (ET-OWFS)

Chair Task Team on High Resolution NWP (TT-HRNWP)



WMO OMM

World Meteorological Organization

Organisation météorologique mondiale

Proposing updates to Core Data

- Core Data “shall” be provided by the RSMCs/WMCs under terms of “free and unrestricted” use
- Proposal therefore has to be a balance between what users would like to have and what RSMCs/WMCs might be prepared to commit to
- There is also the possibility to propose some additional “Recommended” optional data which centres might choose to offer (perhaps under more restrictive license terms)

Global Deterministic 1

- Biggest request increased horizontal resolution, followed by more frequent output timesteps.
- Resolution: Currently 1.5 degrees (approx. 167km). Most popular requests for 0.25 or 0.5 degrees (28 or 55km) but a few requests for higher. Higher resolutions involve much greater cost and bandwidth requirements. 0.5 degrees approx. 9X higher costs and 0.25 approx. 36X higher!
- **Recommendation:** Core (mandatory) 0.5 degree *with higher resolutions as optional voluntary offerings (optional both for WMC to offer and for user to select).*
- Time-steps (currently every 6h up to 3d and every 12h thereafter): most ask for every 3h but a few require only every 6h at lead-times of more than 3 days.
- Frequency (currently twice per day): many requests for 4 updates per day.
- Range (currently up to 6d): Majority up to 7 or 10d.
- **Recommendation:** Core (mandatory) Twice a day every 3h to 3 days plus every 6h to 6 or 7d; *more optional but for longer range beyond 6d recommend use of ensemble.*



Global Deterministic 2

- Many requests for additional variables, some of them at many levels (probably for LBCs).
- **Recommendation:** Limit additional core products to a very few for severe weather prediction eg Tmax, Tmin, Wind gusts, 2m dew point OR relative humidity. *Many more could be optional for WMCs to provide.*
- Products: several requests including Storm tracks and tropical storm tracks – not clear if former includes extra-tropical.
- **Recommendation:** Core to include Tropical Storm Tracks including latitude/longitude, location, maximum sustained wind speed, MSLP.

Proposed Global Deterministic

Below shows changes

Parameter	Level (hPa)	Resolution	Forecast range	Time steps	Frequency
Geopotential height	850/500/250	1.50.5° x 1.50.5°	Up to 3 days/ Beyond 3 days up to 6 days [0.7 days]	Every 6.3 hours/ Every 12.6 hours	Twice a day (0000 and 1200 UTC)/ Once a day
Temperature	850/500/250				
Wind zonal velocity (u) and meridional velocity (v)	925/850/700/500/250				
Relative humidity	850/700				
Divergence, vorticity	925/700/250				
MSLP	Surface				
2m temperature	Surface				
2-m minimum and maximum temperatures in the last 6 hours					
2-m dewpoint temperature					
10m u, 10m v, 10-m wind gust in the last 6 hours					
Total precipitation					
CAPE					

Parameter	Level (hPa)	Resolution	Forecast range	Time steps	Frequency
Geopotential height	850/500/250	0.5° x 0.5°	Up to 3 days/ Beyond 3 days up to 6 days [Every 3 hours/ Every 6 hours	Twice a day
Temperature	850/500/250				
Wind zonal velocity (u) and meridional velocity (v)	925/850/700/500/250				
Relative humidity	850/700				
Divergence, vorticity	925/700/250				
MSLP	Surface				
2m temperature	Surface				
2-m minimum and maximum temperatures in the last 6 hours					
2-m dewpoint temperature					
10m u, 10m v, 10-m wind gust in the last 6 hours					
Total precipitation					
CAPE					
Total cloud cover					

Also: Tropical storm tracks (latitude/longitude locations, maximum sustained wind speed, MSLP).

New Recommended Deterministic (optional for RSMC/WMC)

- Chart products as map layers and/or images
 - If possible plotted at full model resolution
 - Including TC tracks
- Higher resolution gridded data, additional variables or output times etc
- High resolution data sufficient to support LBCs and Initial Conditions for Regional models

Global Ensemble 1

- Biggest request increased horizontal resolution, followed by more frequent output timesteps and issue Frequency.
- Resolution: Currently 1.5 degrees (approx. 167km). Most popular requests for 0.5 degrees (55km) but a few requests for higher. Higher resolutions involve much greater cost and bandwidth requirements as global deterministic.
- **Recommendation:** Core (mandatory) 0.5 degree *with higher resolutions as optional voluntary offerings (optional both for WMC to offer and for user to select)*.
- Time-steps (currently every 12h up to 10d: most ask for every 6h but a few request more frequent.
- Frequency (currently once per day): many requests for 2 updates per day.
- Range (currently up to 6d): Up to 14d.
- **Recommendation:** Core (mandatory) Twice a day every 6h to 14d (or available range).

Global Ensemble 2

- Requests for additional variables on multiple levels but not clear what; percentiles for precipitation; 6h precipitation thresholds for probs. Various ensemble mean/spread fields and surface weather variables. Eg 2m temp anomalies (difficult to get reliable reference with reforecasts)
- **Recommendation:** Additional core products: 6h precipitation exceeding set of thresholds 1, 5, 10, 25, 50 mm; percentiles for 2m temperature and 6h/24h precipitation: eg. 10th/25th/50th/75th/90th. *Many more could be optional for WMCs to provide.*
- Products: tropical storm tracks.
- **Recommendation:** Core to include Tropical storm tracks (latitude/longitude locations, maximum sustained wind speed, MSLP from EPS members).

Proposed Global Ensemble

Below shows changes

Parameter	Level (hPa)	Thresholds	Resolution (lat/lon grid)	Forecast range	Time steps	Frequency
Probability of precipitation	Surface	1, 5, 10, 25, 50 and 100 mm/24 hours, 1, 5, 10, 25 and 50 /6 hours	1x50,5° x 1-50,5°	10-14 days (or the maximum range if less)	Every 120 hours	Once a day, Twice a day
Percentiles for 2-m temperature and 6h/24h precipitation	Surface	10th, 25th, 50th, 75th, 90th				
Probability of 10m sustained wind and gusts	Surface	10, 15 and 25 m s ⁻¹				
Probability of temperature anomalies	850	±1, ±1.5, ±2 standard deviations with respect to a reanalysis climatology specified by the Producing Centre				
Ensemble mean + spread (standard deviation) of geopotential height	500					
Ensemble mean + spread (standard deviation) of MSLP	Surface					
Ensemble mean + spread (standard deviation) of wind speed	850/250					

Parameter	Level (hPa)	Thresholds	Resolution (lat/lon grid)	Forecast range	Time steps	Frequency
Probability of precipitation	Surface	1, 5, 10, 25, 50 and 100 mm/24 hours, 1, 5, 10, 25 and 50 /6 hours	0.5° x 0.5°	14 days (or the maximum range if less)	Every 6 hours	Twice a day
Percentiles for 2-m temperature and 6h/24h precipitation	Surface	10th, 25th, 50th, 75th, 90th				
Probability of 10m sustained wind and gusts	Surface	10, 15 and 25 m s ⁻¹				
Probability of temperature anomalies	850	±1, ±1.5, ±2 standard deviations with respect to a reanalysis climatology specified by the Producing Centre				
Ensemble mean + spread (standard deviation) of geopotential height	500					
Ensemble mean + spread (standard deviation) of MSLP	Surface					
Ensemble mean + spread (standard deviation) of wind speed	850/250					

Also: Tropical storm tracks (latitude/longitude locations, maximum sustained wind speed, MSLP from EPS members).

New Recommended (optional for RSMC/WMC)

- Chart products as map layers and/or images
 - If possible plotted at full model resolution
 - Post-processed ensemble products
 - Including ensemble TC tracks
- Location_specific time series of temperature, precipitation, wind speed, depicting the most likely solution and an estimation of uncertainty (“EPSgrams”);
 - the definition, method of calculation and the locations should be documented;
- Higher resolution gridded data, additional variables, thresholds or output times etc
- High resolution data sufficient to support LBCs and Initial Conditions for Regional ensembles



Requirements for LBCs (incl EPS)

- Possibility of new type of RSMC designation for the provision of LBCs
 - Deterministic or Ensemble
- Uptake – would any centres sign up to provide this?

Thank you



WMO OMM

World Meteorological Organization
Organisation météorologique mondiale