

Specifications (as of 31 December 2020) – an excerpt from the Joint WMO Technical Progress
Report on the Global Data Processing and Forecasting System and Numerical Weather Prediction
Research Activities for 2020

Global EPS specifications for the first 11 days of forecasts

1. Ensemble system	
Ensemble (version)	Global EPS (GEPS)
Date of implementation	19 January 2017
2. EPS configuration	
Model (version)	Global Spectral Model (GSM2003)
Horizontal resolution/grid spacing	Spectral triangular 479 (TL479), reduced Gaussian grid system, roughly equivalent to $0.375 \times 0.375^\circ$ (40 km) in latitude and longitude
Vertical resolution (model top)	100 stretched sigma pressure hybrid levels (0.01 hPa)
Forecast length (initial time)	11 days (00, 12 UTC) 132 hours (06, 18 UTC)
Members	1 unperturbed control forecast and 26 perturbed ensemble members
Coupling to ocean/wave/sea ice models	None
Integration time step	720 seconds
Additional comments	None
3. Initial conditions and perturbations	
Initial perturbation strategy	Singular vectors (SVs) and LETKF
Optimization time in forecast for SV	Among three targeted SV areas: 48 hours for Northern Hemisphere ($30^\circ - 90^\circ\text{N}$) 24 hours for Tropics ($30^\circ\text{S} - 30^\circ\text{N}$) 48 hours for Southern Hemisphere ($90^\circ - 30^\circ\text{S}$)
Horizontal resolution of perturbations	SVs: Spectral triangular 63 (TL63), reduced Gaussian grid system, roughly equivalent to $2.8125 \times 2.8125^\circ$ (270 km) in latitude and longitude Perturbations from LETKF: See the specifications of the LETKF in Global Analysis*
Initial perturbation area	Global
Data assimilation method for control analysis	Four-dimensional variational (4D-Var) for Global Analysis (GA) Control analysis based on interpolation of high-resolution GA (TL959)
Initial conditions for perturbed members	Addition of perturbations to control analysis (SV-based components in +/- pairs)
Additional comments	LETKF-based perturbations are produced using a total of 26 six-hour forecasts starting from the previous LETKF cycle.
4. Model uncertainty perturbations	
Model physics perturbations	Stochastic perturbation of physics tendency
Model dynamics perturbations	None
Additional comments	<ul style="list-style-type: none"> • Identical model versions for all ensemble members • Above model uncertainty perturbations not applied to control forecasting
5. Surface boundary perturbations	

Sea surface temperature perturbations	Perturbations representing climatological distribution of analysis and forecast error of prescribed SST sampled from past realizations of analysis increment and forecast error of SST in the same season
Soil moisture perturbations	None
Surface wind stress/roughness perturbations	None
Other surface perturbations	None
Additional comments	The above surface perturbations are not applied to the control forecast.
6. Other model details	
Surface boundary conditions	
Treatment of sea surface	Climatological sea surface temperature with daily analysis anomaly Climatological sea ice concentration with daily analysis anomaly
Land surface analysis	Snow depth: two-dimensional optimal interpolation scheme Temperature: first guess Soil moisture: climatology
Model dynamics and physics	
Land surface and soil	Simple Biosphere (SiB) model
Radiation	Two-stream with delta-Eddington approximation for shortwave (hourly) Two-stream absorption approximation method for longwave (hourly)
Numerical techniques	Spectral (spherical harmonic basis functions) in horizontal, finite differences in vertical Two-time-level, semi-Lagrangian, semi-implicit time integration scheme Hydrostatic approximation
Planetary boundary layer	Mellor and Yamada level-2 turbulence closure scheme Similarity theory in bulk formulae for surface layer
Convection	Prognostic Arakawa-Schubert cumulus parameterization
Cloud	PDF-based cloud parameterization
Subgrid orography	Low-level blocked-flow drag, gravity wave drag and turbulent orographic form drag schemes
Non-orographic gravity wave drag	Spectral gravity wave forcing scheme
7. Products	
Method of calculation (if not unique)	None
Other specifications as necessary	None
8. Further information	
Operational contact	globalnwp@met.kishou.go.jp
System documentation URL	https://www.jma.go.jp/jma/jma-eng/jma-center/nwp/nwp-top.htm

* See Joint WMO Technical Progress Report on the Global Data Processing and Forecasting System and Numerical Weather Prediction Research Activities for 2020.

Global EPS specifications for forecasts longer than 11 days

Atmospheric model	GSM2003
Integration domain	Global
Horizontal resolution	Spectral triangular 479 (TL479), reduced Gaussian grid system, roughly equivalent to $0.375 \times 0.375^\circ$ (40 km) in latitude and longitude for forecasts up to 18 days Spectral triangular 319 (TL319), reduced Gaussian grid system, roughly equivalent to $0.5625 \times 0.5625^\circ$ (55 km) in latitude and longitude for forecasts longer than 18 days
Vertical levels (model top)	100 stretched sigma pressure hybrid levels (0.01 hPa)
Forecast time	18 days for initial times every day 34 days for initial times on Tuesday and Wednesday
Ensemble size	50 members (13 at 00 and 12 UTC over the previous two days)