

Table 3.1.1: Specifications of Global Spectral Model (GSM)

System	
Model (version)	Global Spectral Model (GSM2503)
Date of implementation	December 1987 (Latest version: 18 March 2025)
Configuration	
Horizontal resolution (Grid spacing)	Spectral triangular truncation 959 with a quadratic and reduced Gaussian grid system (TQ959), roughly equivalent to $0.125 \times 0.125^\circ$ (13 km) in latitude and longitude
Vertical resolution (model top)	128 stretched sigma pressure hybrid levels (0.01 hPa)
Forecast length (initial time)	132 hours (06 and 18 UTC) and 264 hours (00 and 12 UTC)
Coupling to ocean / wave / sea ice models	–
Integration time step	300 seconds
Initial conditions	
Data assimilation	Hybrid Four-dimensional variational (4D-Var) method using the Local Ensemble Transform Kalman Filter (LETKF)
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 using the first guess estimated from the satellite observation and the model forecast Temperature: first guess Soil moisture: simplified extended Kalman filter scheme
Other details	
Land surface and soil	GSM land model based on the Simple Biosphere (SiB) scheme
Radiation	Two-stream with delta-Eddington approximation for short wave (hourly) Two-stream absorption approximation method for long wave (hourly)
Numerical techniques	Spectral (spherical harmonics) in horizontal, finite differences in vertical Two-time-level, semi-Lagrangian, semi-implicit time integration scheme Hydrostatic approximation
Planetary boundary layer	Hybrid scheme combining Mellor and Yamada level-2 turbulence closure with local eddy diffusivity model 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