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

JMA operates four numerical wave models: the Global Wave Model (GWM), the Coastal Wave Model (CWM), the Wave Ensemble System (WENS), and the Shallow-water Wave Model (SWM). The GWM, CWM and WENS are based on MRI-III, which was developed at JMA's Meteorological Research Institute (MRI), and a major update was made to the current version in May 2007. The WENS has been operational since June 2016. The specifications of the models are given in the Table.

Model name	Global Wave Model (GWM)	Coastal Wave Model (CWM)	Wave Ensemble System (WENS)
Model type	Spectral model (third-generation wave model)		
Date of implementation	May 2007	May 2007	March 2020
Grid form	Equal latitude longitude grid on spherical coordinates		
Grid interval	$0.5^{\circ} \times 0.5^{\circ}$	$0.05^{\circ} \times 0.05^{\circ}$	$0.5^{\circ} \times 0.5^{\circ}$
	(55 km)	(5 km)	(55 km)
Calculation area	Global 75°N – 75°S	Coastal Sea of Japan 50°N – 20°N, 120°E – 150°E	Global 75°N – 75°S
Grids	720×301	601×601	720×301
Spectral	900 (25 frequencies and 36 directions)		
components	Frequency: 0.0375 – 0.3 Hz; logarithmically divided		
	direction: 10° intervals		
Forecast cycle	4 times a day (every 6 hours)		Twice a day (every 12 hours)
Forecast length (12 UTC) (00/06/18 UTC)	264 hours 132 hours	132 hours 132 hours	264 hours
Forecast time interval	Every 3 hours	Every 3 hours	Every 6 hours
Time step	Advection term: 10 minutes Source term: 30 minutes	Advection term: 1 minute Source term: 3 minutes	Advection term: 10 minutes Source term: 30 minutes
Assimilation	Wave height analyzed using the Objective Wave Analysis System Initial conditions modified using analysis wave height		
Surface forcing	Global Spectral Model (GSM) (20 km grid) Winds inside typhoons modified using ideal gradient wind values (- 72 hours)		GlobalEnsemblePredictionSystem(GEPS)27 members
Lateral boundary	Sea ice: analysis area regarded as land	Sea ice: analysis area regarded as land GWM prediction used for boundary spectra	Sea ice: analysis area regarded as land
Shallow-water effects	Refraction and bottom friction		
Product	Significant wave height, wave period and mean wave direction Wave components (windsea and two swells) also calculated		

The wave model was majorly updated in May 2007, and minor update was in July 2008. In major updates to the Global Wave Model (GWM) and the Coastal Wave Model (CWM), shallow-water effects and modification of wind input were implemented in May 2017. In major updates to the Wave Ensemble System (WENS), the grid resolution was enhanced from 1.25° to 0.5° (from 140 to 55 km) and shallow-water effects were incorporated in March 2020.

An assimilation scheme developed by JMA for wave models was incorporated into the GWM and the CWM in October 2012. The WENS also uses assimilated initial condition.

JMA began calculating wave components (windsea and swell) for the GWM and CWM on July 20 2016.

The forecast time of GWM is currently up to 5.5 days at 00, 06 and 18 UTC initial runs and 11 days at 12 UTC.

The wave predicted data of GWM is provided via GTS and WIS. The product is 6 hourly up to 3.5 days (00, 06, 12 and 18 UTC) and 12 hourly up to 8 days (12 UTC).

Reference:

Kohno, N., D. Miura, and K. Yoshita, 2012: The Development of JMA Wave Data Assimilation System. Proceeding of 12th International Workshop on Wave Hindcasting and Forecasting & 3rd Coastal Hazard Symposium, H2.

 $(http://www.waveworkshop.org/12thWaves/papers/full_paper_Kohno_et_al.pdf)$