

NCEP/EMC Operational global wave model: GFS-Wave

Summary

The NCEP/EMC global deterministic wave model is now unified with the Global Forecast System (GFS). The WAVEWATCH III wave model is one-way coupled with the atmospheric forecast model.

The wave model uses three native computational grids: 1) Arctic Polar 9km resolution from 50N to 90N, 2) Global Core 10min resolution from 15S to 52.5N and 3) Southern Ocean 15min resolution from 10.5S to 79.5S. There are 4 post-processed grids: West Coast, Eastern Pacific, Atlantic Ocean all with 0.16deg resolution and a Global grid with 0.25 deg of resolution.

The unification into GFS allows for an increase in frequency of the wind forcing from 3 hours to 30 minutes. In addition, ocean currents from the RTOFS model are included as input to the wave model. The system runs four cycles per day (00, 06, 12 and 18Z) and the wave forecast has been extended to 384 hours. The wave model produces hourly forecasts from 000 to 120 hours and every 3 hours from 120 to 384 hrs.

The Model

The forecast model is the production/GFS.v16 branch of ufs-weather-model which can be found here:

<https://github.com/ufs-community/ufs-weather-model/tree/production/GFS.v16>

This uses the WW3 branch production/GFS.v16 which can be found here:

<https://github.com/NOAA-EMC/WW3/tree/production/GFS.v16>

Grids

Name	Range	Resolution
global.0p16	-15:52.5 0:359.83	16km 1/6 deg 10 arcmin
arctic.9km	50:90, 0:360	9km
gsouth.0p25	-10.5:-79.5	25km

	0:359.75	¼ deg 15 arcmin
global.0p25 (interpolated from 3 above)	-90:90 0:359.75	25km ¼ deg 15 arcmin
alaska.0p16 (masked)	44:75 140:240	16km ⅓ deg 10 arcmin
atlocn.0p16 (masked)	0:55 260:310	16km ⅓ deg 10 arcmin
epacif.0p16 (masked)	-20:30 130:215	16km ⅓ deg 10 arcmin
wcoast.0p16 (masked)	25:50 210:250	16km ⅓ deg 10 arcmin

Note about the grids

In GFS-Wave, only three grids are computational grids: global.0p16, arctic.9km, and gsouth.0p25. The regional 0p16 grids are subsets of the three computational grids and are provided for continuity.

Model Data

FTPFRD

<ftp://ftpprd.ncep.noaa.gov/pub/data/nccf/com/gfs/prod/gfs.YYYYMMDD/CC/wave/gridded> for all grib2 files.

[/station](#) for gfswave.tCCz.spec_tar.gz, gfswave.tCCz.bull_tar, gfswave.tCCz.cbull_tar, gfswave.tCCz.ibp_tar, gfswave.tCCz.ibpbull_tar, and gfswave.tCCz.ibpcbull_tar files.

[/station/bulls.tCCz/gfswave.stationID.bull](#) for individual station files.

Where YYYY = year, MM = month, and DD = day. CC = 00, 06, 12, 18 is the cycle run.

NOMADS

<https://nomads.ncep.noaa.gov>

GRiB2 File Naming Convention

gfswave.tCCz.alaska.0p16.fNNN.grib2
gfswave.tCCz.atlocn.0p16.fNNN.grib2
gfswave.tCCz.epacif.0p16.fNNN.grib2
gfswave.tCCz.wcoast.0p16.fNNN.grib2
gfswave.tCCz.global.0p25.fNNN.grib2
gfswave.tCCz.global.0p16.fNNN.grib2
gfswave.tCCz.gsouth.0p25.fNNN.grib2
gfswave.tCCz.arctic.9km.fNNN.grib2

Where CC = 00, 06, 12, 18 is the cycle run, and NNN is the forecast hour.
The model produces hourly forecasts from 000 to 120 hours, and every 3 hours from 120 to 384 hours.

GRiB2 Output Parameters

Significant Height of Combined Wind Waves and Swell (HTSGW)
Direction of Combined Wind Waves and Swell (DIRPW)
Mean Period of Combined Wind Waves and Swell (PERPW)
Significant Height of Wind Waves (WVHGT)
Mean Period of Wind Waves (WVPER)
Direction of Wind Waves (WVDIR)
Significant wave height of first swell partition (SWELL: 1 in sequence)
Mean wave period of first swell partition (SWPER: 1 in sequence)
Mean wave direction of first swell partition (SWDIR: 1 in sequence)
Significant wave height of second swell partition (SWELL: 2 in sequence)
Mean wave period of second swell partition (SWPER: 2 in sequence)
Mean wave direction of second swell partition (SWDIR: 2 in sequence)
Significant wave height of third swell partition (SWELL: 3 in sequence)
Mean wave period of third swell partition (SWPER: 3 in sequence)
Mean wave direction of third swell partition (SWDIR: 3 in sequence)
Wind Speed (WIND)
Wind Direction (WDIR)
U-component of wind (UGRD)
V-component of wind (VGRD)

Wave Field Graphics

Operationally generated graphics of the wave fields are available from:

<https://mag.ncep.noaa.gov/model-guidance-model-area.php#>

Select **GFS-Wave**

Select a Model Area from the list (only available areas will be active)

Select a cycle (left side) and wave parameter (center section)

Select Loop All (right side) to see the animation similar to the old wave site. All of the frames can be individually viewed from that page as well.

Note: The Model Analysis and Guidance (MAG) is managed by NCEP Central Operations, not the Environmental Modeling Center. For more information, see the MAG Users Guide:

<https://mag.ncep.noaa.gov/help/ModelGuidanceProds.php>

Further information on GFSv16

https://www.emc.ncep.noaa.gov/emc/pages/numerical_forecast_systems/gfs.php

<https://www.emc.ncep.noaa.gov/users/meg/gfsv16>