

GOW2: A GLOBAL WAVE DATASET FOR COASTAL APPLICATIONS

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Configuration

- Model WW3 (v2.22, ST: Tolman&Chalikov96)
- Global grid with 1.5° x1°
- Bathymetry: ETOPO
- Forcings: 6-h wind fields and Ice of NCEP/NCAR RI.

Main characteristics:

- Historical Reconstruction: 1948-present (~70 years)
- Correction of the wave data with satellite





***** GOW1 dataset



RMSE (m) of altimetry (SAT) and the reanalysis significant wave height data: (a) before (SAT, NC-GOW) and (b) after the calibration process (SAT, GOW).



Background



Main characteristics:

- A homogenous wave hindcast covering the whole European coasts and seas
 - High skill to reproduce historical extreme wave events.







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Background



Perez J, Menendez M, Camus P, Mendez FJ, Losada IJ (2015). Statistical multi-model climate projections of surface ocean waves in Europe. Ocean Modelling, 96, 161–170. doi: 10.1016/j.ocemod.2015.06.001

GOW2 Setup

- Model: WavewatchIII (v4.18)
- Formulations for simulating physical processes
- ST parameterization: TEST451 (Ardhuin et al. 2010)
- Continuous sea-ice concentrations treatment from 0.25 (no effect) to 0.75 (total blocking).
- SHOWEX movable-bed bottom friction (Ardhuin et al. 2003)
- Obstructions. Wave energy flux attenuation across discrete grid cell boundaries (Tolman, 2003)
- Coastline reflection (0.05)
- Non-linear wave-wave interactions: DIA (Hasselmann et al. 1985)
- Shallow water depth breaking and shallow water limiter for maximum energy
- A third-order Ultimate Quickest propagation scheme with the correction for the garden sprinkler effect proposed by Tolman (2002)

• Forcings and boundaries



Wind- wave growth parameter (betamax): 1.26 - Bathymetry: ETOPO. Coastline: GSHHG

- CFSR and CFSv2 wind fields and ice coverage

4 domains (2 way nesting)

GOW2 Setup



Shelf domain is designed to include all grid-points at depths below 200 m and the surrounding area within 1.5 deg.



GOW2 dataset

Outputs (1979-present)

15 sea state parameters (hourly) for all the ocean grid-points.

3-hourly wave spectra (at more than 40000 locations along the world coastlines with a spacing of 0.25°).

hs (m)

tm (s)

tp (s)

 $\theta_{waves}^{(\circ)}$

[32 frequencies and 24 directions]





***** Validation against buoys

GOW2 performance







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GOW2 performance



167 buoy records (with at least 3 recorded years) Source: CEFAS, INCOIS, Irish Weather Buoy Network, NOAA, NBDC and REDEXT.



Validation against observations (in-situ & remote)





Satellite data: Intercalibrated multimission altimeter data (1992-2015)



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GOW2 performance



Satellite data: Intercalibrated multimission altimeter data (1992-2015)



***** Validation focusing on Tropical Cyclones

GOW2 performance





Validation focusing on Tropical Cyclones

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GOW2 performance



Wave Climatologies

 Mean monthly wave energy (of the most energetic month)



kW/m

Wave Climatologies

50 year significant wave height return value

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Wave Spectrum analysis

- Preliminary analysis
- Moments are estimated from the raw spectra-> Hs and Tp
- JONSWAP theoretical spectrum is evaluated:
 - ■How good is gamma=3.3?
 - ■What is the best gamma?
 - ■How good fit the JONSWAP theoretical spectrum?
 - (% overlapping area)

Wave Spectrum analysis

Wave Spectrum analysis

agreement JONSWAP (γ=3.3)

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Thank you for your attention!