

# Wave Modelling at ECMWF



## The Wave Modelling and Data Assimilation Teams

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### Strong Winds

In strong winds, waves become steep - up to their limit and drag forces reduce (Bidlot & Janssen, 2023).

### CY50R1

Significant wave height (m)

10

0

### Currents

Oceanic currents interact with ocean waves through the conservation of wave action density causing refraction.

### Grid

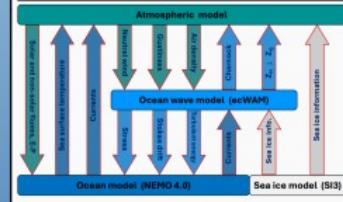
The wave model operates on the same reduced Gaussian grid as the atmospheric model (~ 9km resolution).

### Sea Ice

As waves pass through sea ice, dissipation occurs and results in attenuation of the wave amplitude.

### Coupling

The wave model is 2-way coupled to the atmosphere and the ocean. It also receives information about the ice field.



1992

Operational implementations of WAM

1992 to 2025

Inclusion of sea ice fraction

1995  
Daily archiving of operational analysis spectra

2003

Freak wave parameters included in products

2013

Shallow water dissipation and nonlinear interactions

1998  
Operational 2-way coupling

2005  
Revised wave breaking dissipation term

2019

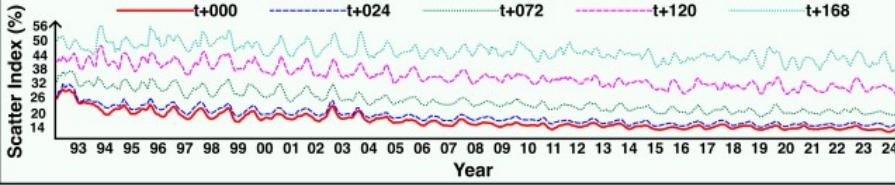
Ardhuin et al. (2010) physics for input, whitecap dissipation, and swell attenuation

### Future Work

Assimilation of synthetic aperture radar

### ECMWF Wave Model User Survey

Your response is valuable to activities at ECMWF



Two-way wave-ice interaction