

# Oceanographic Services at the Met Office

Observing and forecasting the ocean in real-time

# Operational Oceanographic Forecasts

The Met Office routinely runs a number of ocean models to provide forecasts for a wide range of clients.

These include:

- FOAM (Forecast Ocean Atmosphere Model)
- Shelf-Seas Model
- Wave Model

# Ocean Wave Model Development

*Martin Holt, Jim Gunson, Damian Holmes*

## Applications of wave model forecasts:

- Offshore operations, low wave height but long period
- Ship routeing
- Archive – for design and safety criteria (15 years available)
- Hindcasts, for case studies

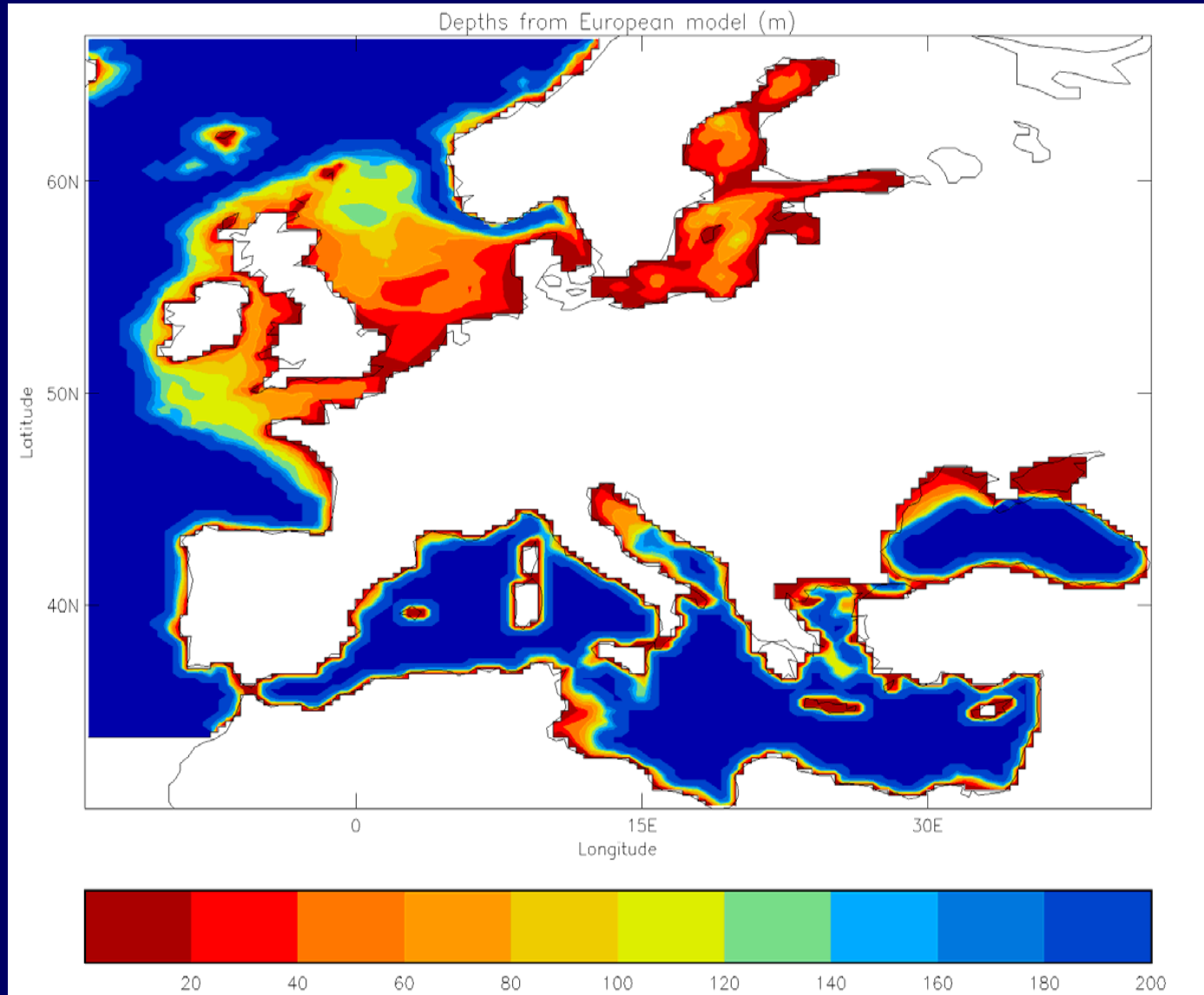
# Met Office Wave Modelling

- 'second-generation' spectral wave model
- Winds from NWP (Global or Mesoscale)
- Predicts the wave energy spectrum with wavelengths from 975 m to 15 m, wave periods from 25 s to 3 s)
- Three models:
  - Global:  $5/6^\circ$  lon x  $5/9^\circ$  lat. (60km grid at mid-latitudes)
  - European:  $0.4^\circ$  lon x  $0.25^\circ$  (35 km)
  - UK waters:  $1/6^\circ$  (12km), with wave-current interactions
- Run twice daily (00, 12 UT) out to t+120
- Data available at 4:30, 16:30 UT

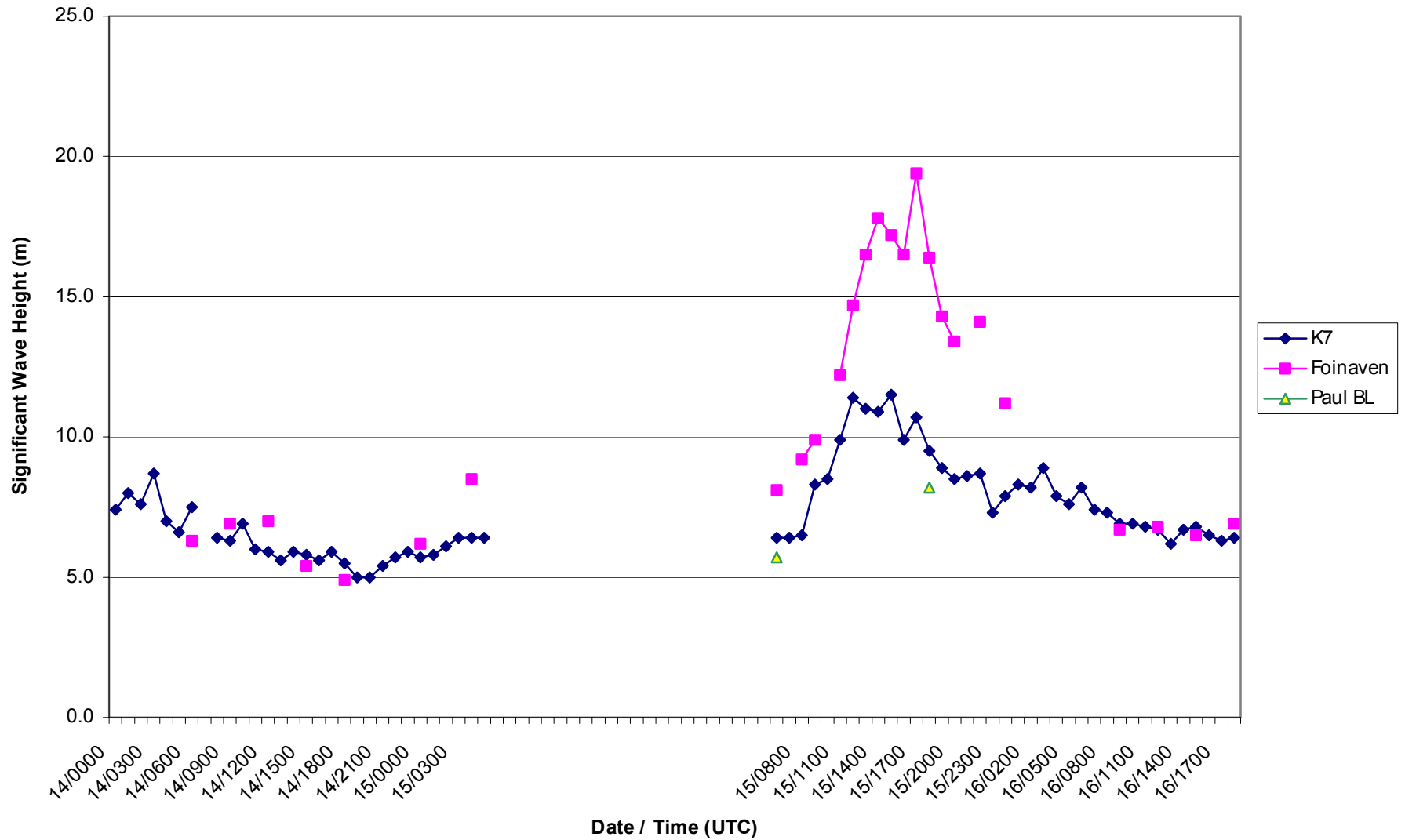
# Data available

- Integrated parameters:  $H_s$ ,  $T_p$ , etc. for windsea and swell
- 1D spectra: wave energy at each frequency bin
- 2D spectra: wave energy at each frequency and direction. Available only at gridpoints requested by customers.

# European wave model depths

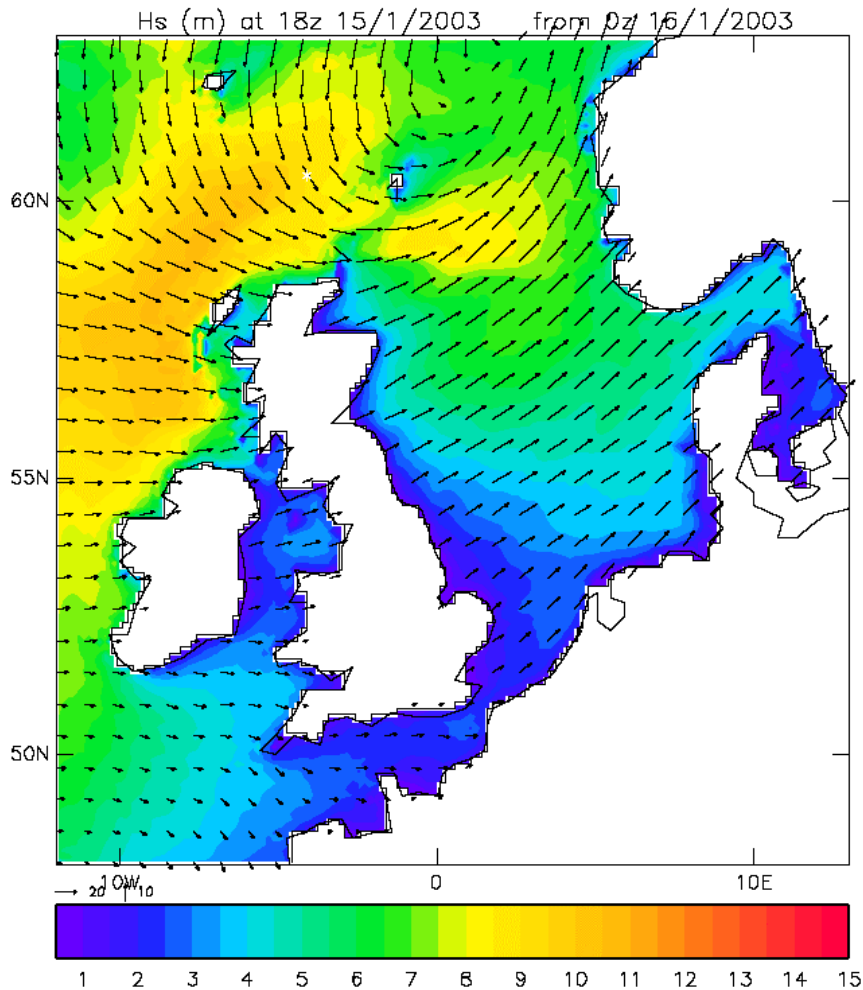


# Wave Height Comparison, Measured Data, 15 Jan 2003

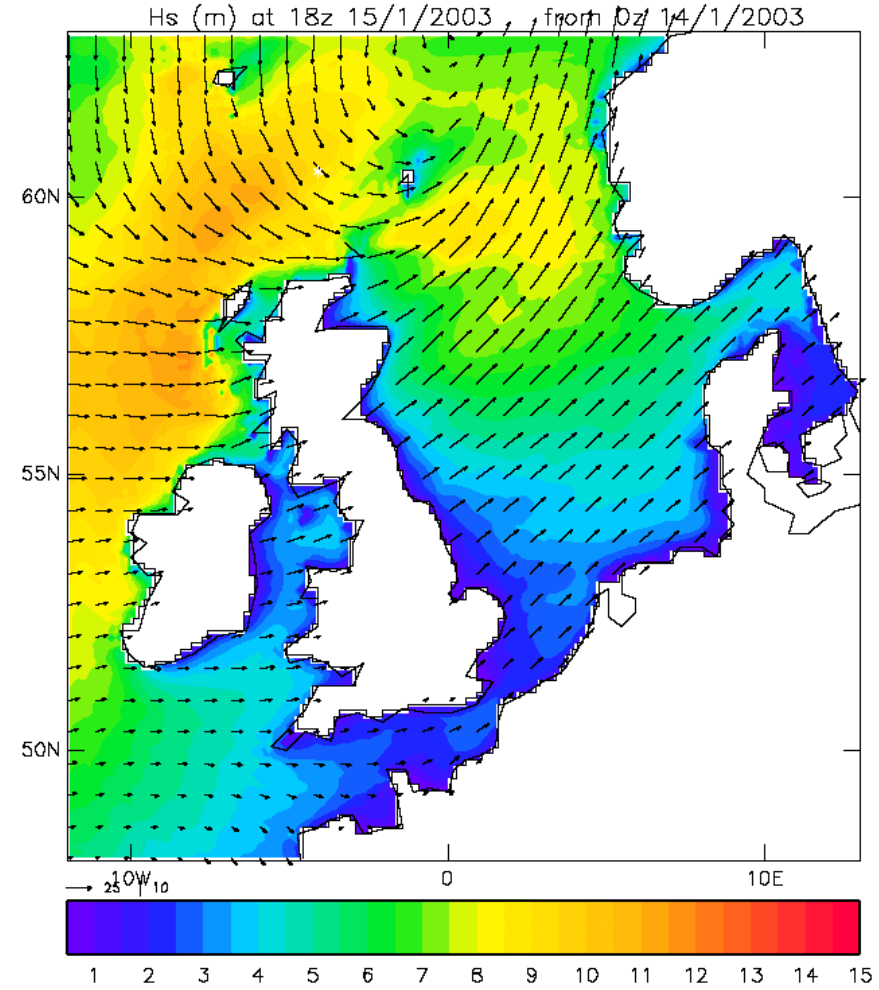


# Hs at 18:00 15 Jan 2003

Hindcast, T-6



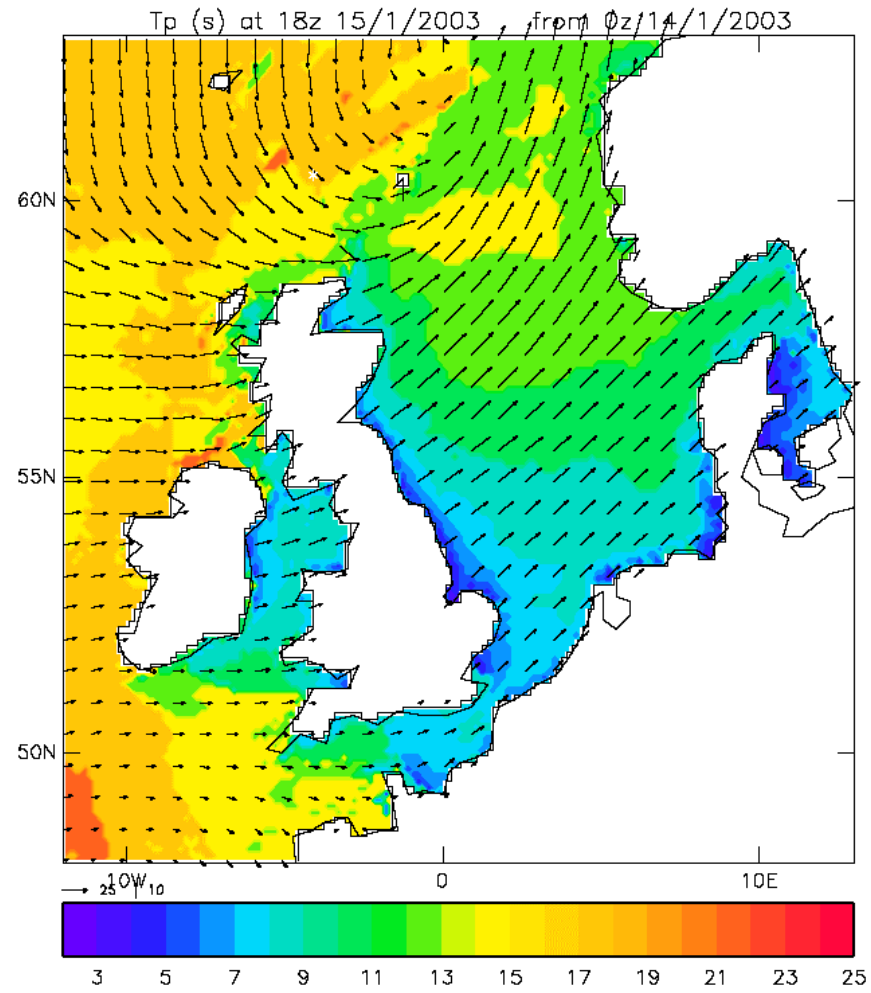
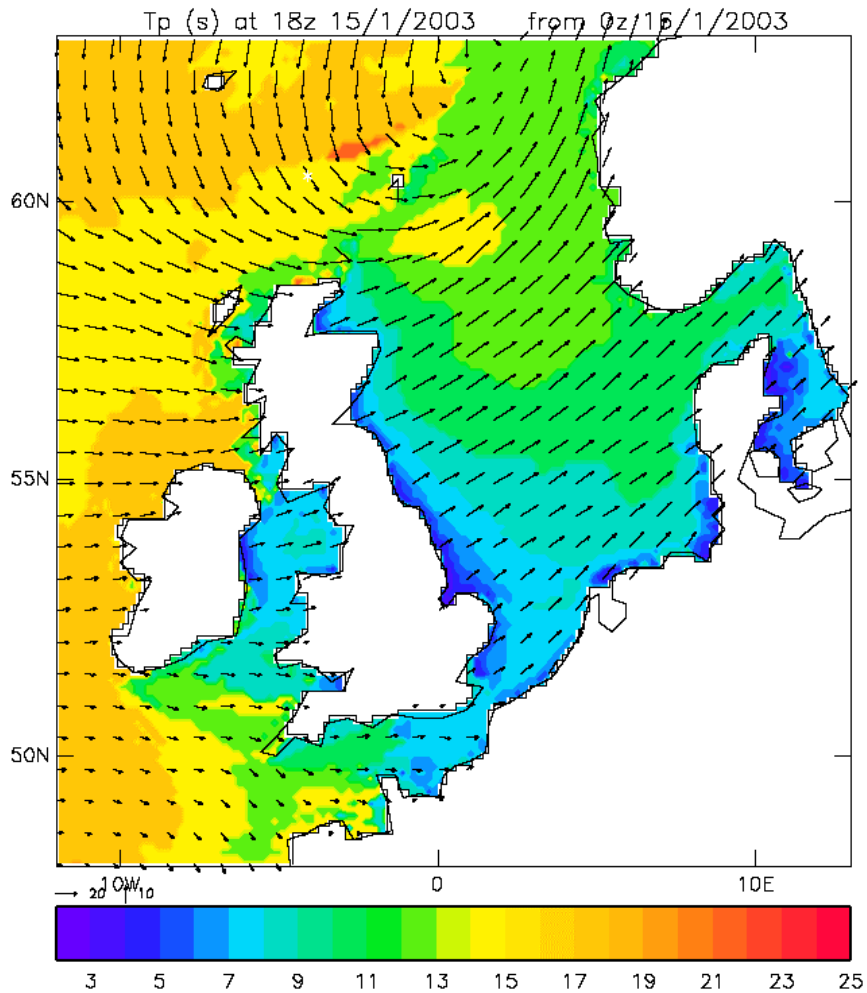
Forecast, T+42



# *Tp at 18:00 15 Jan 2003*

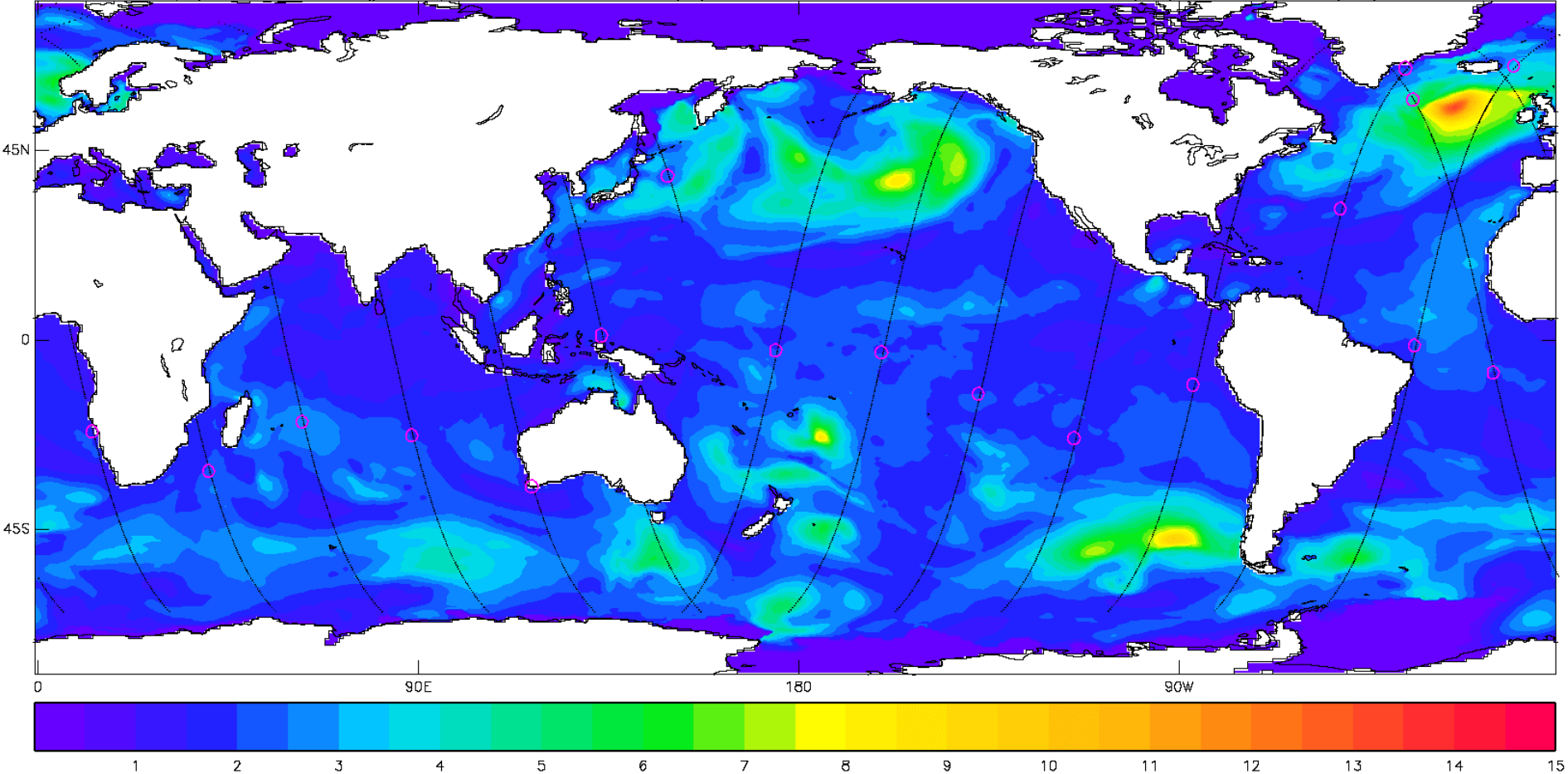
Hindcast, T-6

Forecast, T+42



# Satellite Observations

Hs (m), contours from global operational t+0: VT 18z 14/1/2003 and ERS-2 altimeter tracks, from 2003/01/14:1200 to 2003/01/14:2300



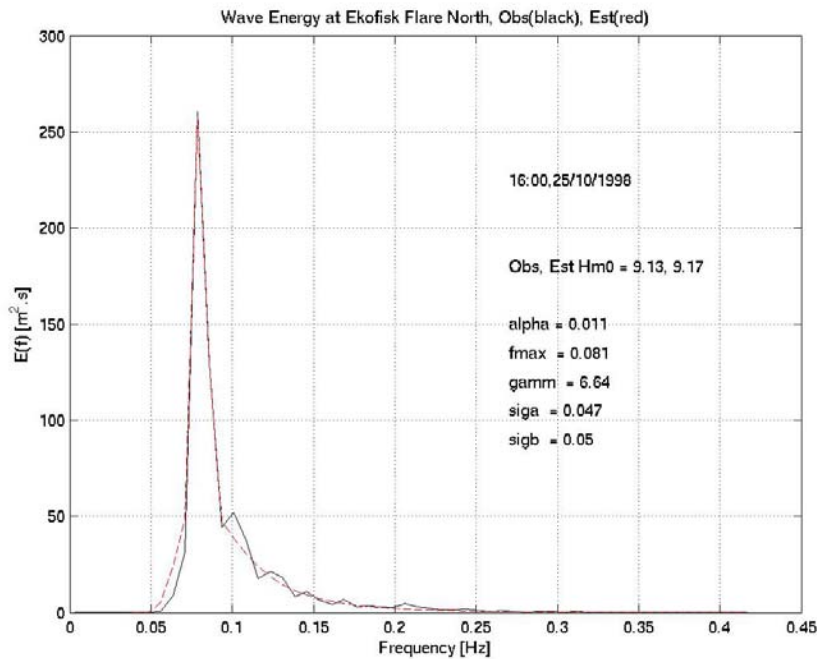
- ERS-2 & Envisat
- Hs, wind speed (altimeter)
- 2D wave energy spectrum (SAR)

# Rogue waves

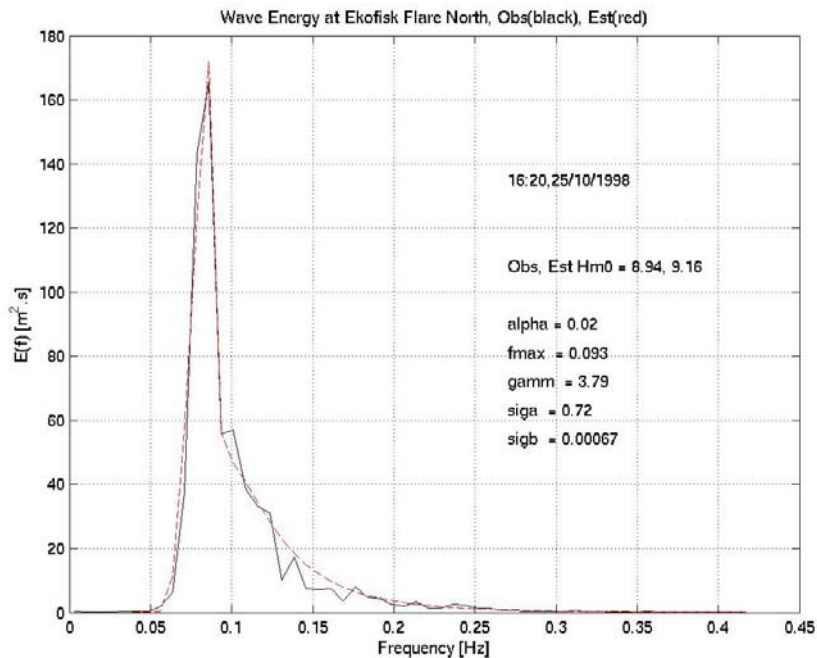
## *Benjamin-Feir instability*



at 16:00,  $\gamma = 6.6$



at 16:20,  $\gamma = 3.8$



# *Future Directions*

## **Rogue waves**

- Investigate correlation between spectral shape and occurrence of 'extreme' waves
- Develop diagnostic measures of likelihood of occurrence of rogues waves: spectral bandwidth, directionality

## **Satellite observations**

- Assess how satellite radar observations can improve wave model results
- Storm generation of swell
- Improved forecasts through data assimilation