GRIB

Additional parameters for waves products

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Summary and Purpose of Document

This document proposes new entries to GRIB Code tables 4.2 Product discipline 10 –*Oceanographic products*, parameter category 0: *waves* to encode new parameters for the new freak waves prediction system.

ACTION PROPOSED

The Team is requested to approve the content of this proposal for inclusion within the next update to the WMO Manual on Codes.

DISCUSSION

ECMWF is updating its freak waves prediction system and based on recent development, a new set of parameters is needed to fully describe the impact of the sea state on the likelihood of freak waves (Janssen 2018: https://www.ecmwf.int/en/elibrary/18063-shallow-water-version-freak-wave-warning-system)

Our model currently separates the total swell into a maximum of 3 swell partitions that are characterised with an equivalent wave height, mean direction and mean period as recently added to code table 4.2, discipline 10, category 0. ECMWF welcomes the recent additions and would like to extend it by adding wave frequency width and wave directional width of each partition. This is required to fully describe the distributions of the waves that make up each partition. The proposed entries 56-58 in the next section represent the partitioning of the wave directional width (already defined unpartitioned in the code table, see entries 31-33). The proposed entries 59-61 represent the partitioning of the wave frequency width of total swell, which does not exist in the table yet. We propose to add entries 62-64 designed to be consistent with entries 31-33. Entries 56-64 in the following section do not have units (like entries 31-33).

We are also requesting additional parameters that reflect the impact of waves on the oceans. The surface momentum flux (stress) in vector form that is transferred from the atmosphere to the oceans is modulated by the waves and it is not simply the momentum flux lost by the atmosphere, the so-called surface stress parameters. Another impact of waves on the upper ocean is the flux of turbulent kinetic energy that is generated when waves break. The three new parameters are needed to properly reflect the coupled nature of our forecasting system.

PROPOSAL

ADD the following entries in Code table 4.2, Product discipline 10 –Oceanographic products, parameter category 0: waves

Code	Name	Units	Description
56	Wave directional width of first swell partition	-	Relative spread of the distribution in direction of the waves belonging to swell partition 1
57	Wave directional width of second swell partition	-	Relative spread of the distribution in direction of the waves belonging to swell partition 2
58	Wave directional width of third swell partition	-	Relative spread of the distribution in direction of the waves belonging to swell partition 3
59	Wave frequency width of first swell partition	-	Relative spread of the distribution in frequency of the waves belonging to swell partition 1
60	Wave frequency width of second swell partition	-	Relative spread of the distribution in frequency of the waves belonging to swell partition 2
61	Wave frequency width of third swell partition	-	Relative spread of the distribution in frequency of the waves belonging to swell partition 3
62	Wave frequency width	-	Relative spread of the distribution in frequency of all waves in the spectrum
63	Frequency width of wind waves	-	Relative spread of the distribution in frequency of all waves classified as wind waves
64	Frequency width of total swell	-	Relative spread of the distribution in frequency of all waves classified as swell

65	Wave induced mean sea level correction	m	Non-linear wave-wave interaction induced mean sea level change
66	Spectral width index	numeric	This index based on 2d spectra widths, both in direction and in frequency is needed to determine the probability of the presence of freak waves
67	Number of events in freak waves statistics	numeric	To determine the freak wave statistics, an estimate of the number of waves they represent is needed
68	U-component of surface momentum flux into ocean	N m-2	U-component of the momentum flux that drives the ocean circulation
66	V-component of surface momentum flux into ocean	N m-2	V-component of the momentum flux that drives the ocean circulation
70	Wave turbulent energy flux into ocean	W m-2	Flux of turbulent kinetic energy to the upper oceans generated by wave breaking.
71-191	Reserved		