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INSITU_GLO_WAV_DISCRETE_MY_013_045

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CHANGE RECORD

When the quality of the products changes, the QuID is updated and the SQO is updated. A line is added to this table and the version of the SQO document is the same than that of the REFERENCE QUID. The third column specifies which sections or sub-sections have been updated.

Issue	Date	§	Description of Change	Authors	Validated By
1.0	27/05/2020	All	Creation of the document	Marta de Alfonso, Fernando Manzano, Alejandro Gallardo	Validated by PQ leader
4.0	04/09/2020	All	Update for Dec 2020 release and inclusion of wave spectra	Marta de Alfonso, Fernando Manzano, Alejandro Gallardo	Jerome Gourrion
4.1	21/02/2022	All	Update of version number to coincide with the corresponding QuID	Marta de Alfonso	Stéphane Tarot
5.0	06/06/2022		New product naming, new Production Unit and new template	Marta de Alfonso, Fernando Manzano, Alex Gallardo	Stéphane Tarot
5.1	02/08/2023		New dataset with hourly data	Marta de Alfonso, Fernando Manzano, Alex Gallardo	Stéphane Tarot
5.2	24/05/2024	all	Metrics update	Marta de Alfonso, Fernando Manzano, Alex Gallardo	Stéphane Tarot

Contents

Executive summary

The INSITU_GLO_WAV_DISCRETE_MY_013_45 product is based on in situ observations.

The data validation is carried out by automatic quality control tests both in real time and delayed mode (Copernicus In Situ TAC, Real Time Quality Control for WAVES, https://doi.org/10.13155/46607). Moreover, data is visualized by experts to detect spikes and anomalous behaviour of the sensors and additionally, comparison with other sources is performed to detect possible wrong data.

It is important to note that this product is providing data from stations moored by national or local institutions, and they are responsible of the data transmission and the equipment maintenance.

The temporal coverage has been divided in five different periods from 1970 up to now (2023). The metric includes the mean number of platforms in every region and the standard deviation. The spatial coverage is presented through maps with the distribution of platforms with colours showing the number of years of data.

In the temporal coverage it is clear the increasing trend in the number of platforms collected along the full period, especially since the 2000 decade mainly due to the incorporation of European historical datasets and the wave networks of US and Canada.

Regarding the spatial coverage, most of the stations providing scalar waves are concentrated in the Northern Hemisphere. In the European Seas there are differences between the regions with high coverage in all of them except in the Southern Black Sea, the Arctic and the Southern and Eastern Mediterranean. For directional waves, the coverage decreases mainly in West Pacific, North Sea and the Canadian coast. For wave spectra the coverage started with the Spanish, French, US and Canadian mooring networks and has been complemented with the merge of the spectral information from drifters and saildrones in open waters around the global ocean.

For additional information regarding the in-depth validation of this product, the calculation of the assessment metrics presented in this product and other detailed information in quality and remarkable events please refer to the reference quid document CMEMS-INS-QUID-013-045 (https://doi.org/10.13155/58696).

Important notice:
The contents of this document are an assessment based on the best set of observations available for evaluation at the time the operational system was validated. The validation methodology was defined and agreed within Copernicus Marine Service, inheriting the long experience of MyOcean and MERSEA series of projects (Hernandez et al., 2018) The results presented in this report and derived estimated accuracy numbers (EAN) are representative of average error levels over large areas of the ocean. These numbers might be used as a mean error in one given point of the area, but in order to refine error estimates locally, the reader is invited to use complementary information from reference QUIDs (error maps for instance, when available).

1. Scalar waves

The dataset coverage of scalar waves has been increasing along the last fifty years. Table 1.1 shows the evolution of the mean and standard deviation of the number of platforms along the decades in the period 1970-2023 at global scale. The number of platforms is low and stable with a slight increasing trend for the first decades (until the 1990's). During the 2000 decade, they experience a clear increase mainly due to the incorporation of European historical datasets and the wave networks of US and Canada and continue increasing until recent years.

In Figure 1.1 the spatial distribution of the platforms is shown with the colour meaning the number of years covered by the station. Most of the platforms are condensed in the Northern Hemisphere and more concretely in Europe, North America, Japan, Korea and India. In the Southern Hemisphere there are some stations in South America, the Indian Ocean and Australia. In European Seas the coverage is high except in Arctic, Southern and Eastern Mediterranean and Southern Black Sea areas.

Table 1.1. Estimated coverage (number of platforms) for scalar waves (height and period) along the period 1970-2023 at global scale.

WAVES (Global)	Coverage (number of platforms)									
	1970-1989		1990-1999		2000-2009		2010-2019		2020-2023	
	Mean	Std	Mean	Std	Mean	Std	Mean	Std	Mean	Std
Height	72.5	38.7	168.7	15.7	317.4	80.0	617.9	80.9	771.8	33.3
Period	51.5	42.7	167.8	15.8	316.7	79.0	591.2	63.4	718.5	52.0

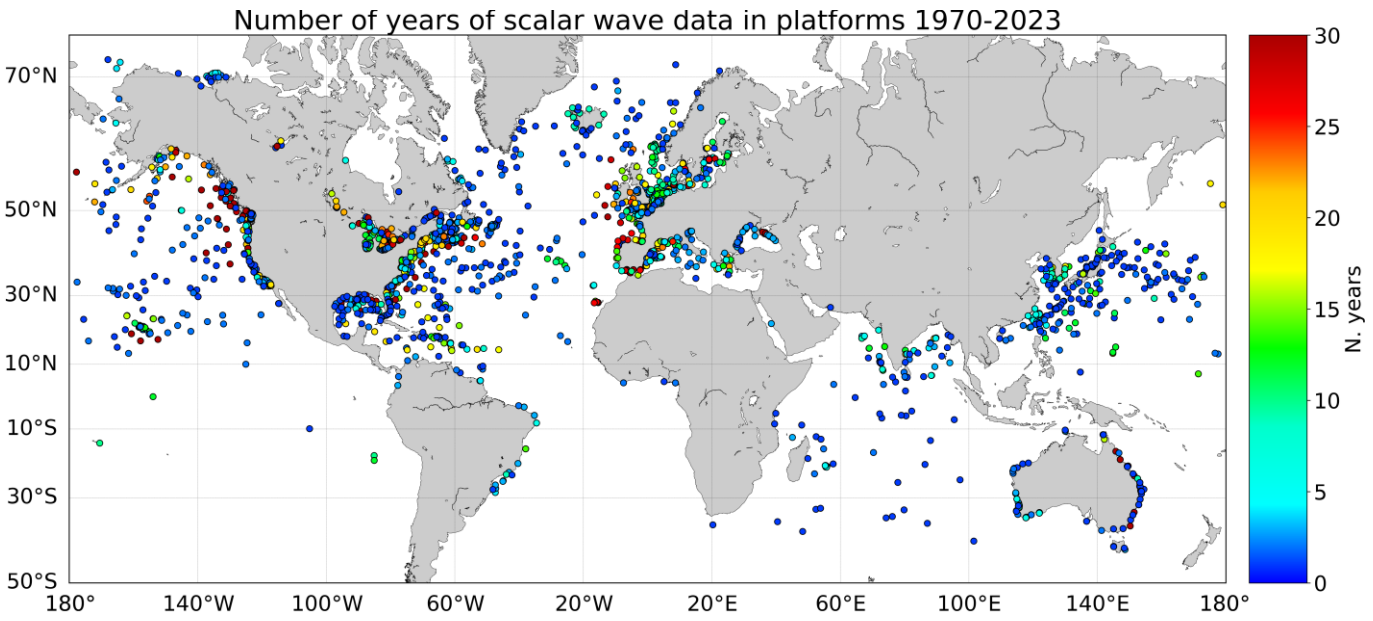

Figure 1.1. Map with the spatial distribution of scalar wave platforms.

2. Directional waves

The dataset coverage of directional waves has been increasing along the last fifty years. Table 2.1 shows the evolution of the mean and standard deviation of the number of platforms along the decades in the period 1970-2023 at global scale. As in the case of scalar waves the increase is specially noted in the last two decades.

In Figure 2.1 the spatial distribution of the platforms is showed with the colour meaning the number of years covered by the station. Most of the platforms are condensed in the Northern Hemisphere and more concretely in Europe and North America. In the Southern Hemisphere there are some stations in Australia and the Indian Ocean. In European Seas the coverage is high, except in Arctic, Southern and Eastern Mediterranean and Southern Black Sea areas. The patterns are similar to scalar waves figure, but the coverage is noticeable less in some areas. Most of the Asian stations in the West Pacific disappear and a similar situation is observed with some platforms in the North Sea and in the Canadian coast. These differences are explained by the absence of directional wave sensor in those areas.

Table 2.1. Estimated coverage (number of platforms) for directional waves (direction) along the period 1970-2023 at global scale.

WAVE (Global)	Coverage (number of platforms)									
	1970-1989		1990-1999		2000-2009		2010-2019		2020-2023	
	Mean	Std	Mean	Std	Mean	Std	Mean	Std	Mean	Std
Direction	32.5	26.0	99.6	11.2	196.2	57.1	399.1	55.3	583.2	46.1

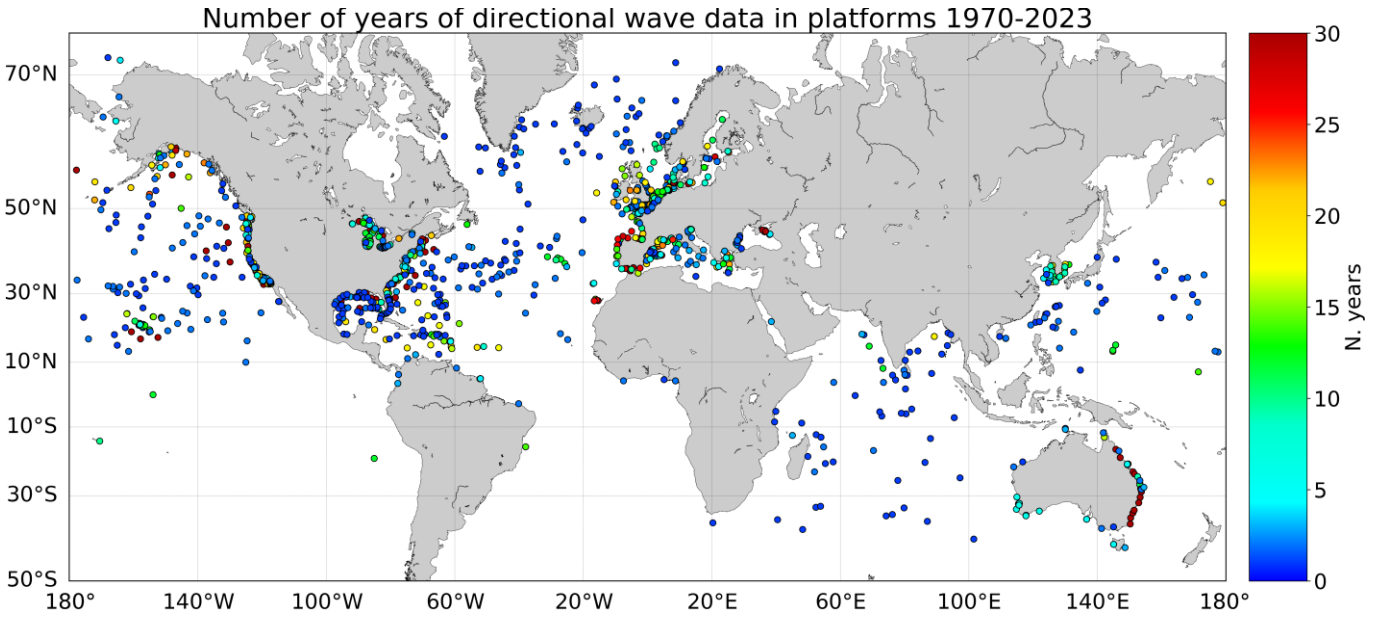

Figure 2.1. Map with the spatial distribution of directional wave platforms.

3. Wave spectra

The dataset coverage of spectral waves has increased in the last decade. Table 3.1 shows the evolution of the mean and standard deviation of the number of platforms along the decades in the period 1970-2023 at global scale. There is a low coverage in the first two decades, the coverage increases in the following decades and grow over recent years due to the technical improvements in the measurement and processing methods that have allowed the provision of spectral information.

In Figure 3.1 the spatial distribution of the platforms is showed with the colour meaning the number of years covered by the station. Only Spanish, French, US and Canada mooring networks are providing this information, with more than 20 years of data in some stations. The incorporation of the spectral information from drifters and saildrones has allowed the availability of spectra in open waters around the global ocean as reflected in the figure.

Table 3.1. Estimated coverage (number of platforms) for wave spectra along the period 1970-2023 at global scale.

WAVE (Global)	Coverage (number of platforms)									
	1970-1989		1990-1999		2000-2009		2010-2019		2020-2023	
	Mean	Std	Mean	Std	Mean	Std	Mean	Std	Mean	Std
Spectra	23.2	20.7	91.2	12.9	157.3	34.3	232.9	14.6	327.5	47.9

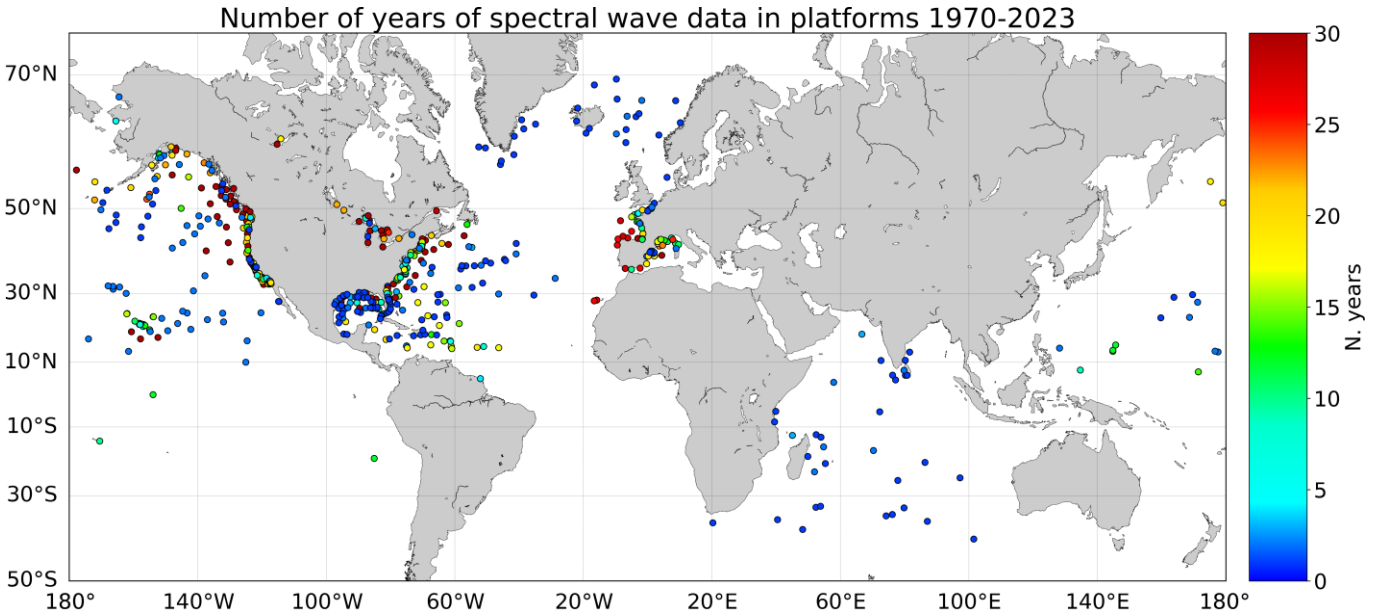

Figure 3.1. Map with the spatial distribution of platforms providing wave spectra.

References

Hernandez, F., et al., 2018: Measuring performances, skill and accuracy in operational oceanography: New challenges and approaches. In "New Frontiers in Operational Oceanography", E. Chassignet, A. Pascual, J. Tintoré, and J. Verron, Eds. GODAE OceanView, 759-796, doi:10.17125/gov2018.ch29.

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