Hindcast variables concepts and definition

Integrated vs partitioned wave parameters:

A given sea state may contain one (uni-modal) or more (multi-modal) wave systems. In case of a multi-modal sea state, each wave system can present different wave parameters (i.e., wave height, period, direction, etc.) or be of distinct wave types, such as wind-sea or swell waves.

Integrated wave parameters are calculated based on the whole spectral representation of a sea state, regardless of how many wave systems are present. Therefore, the values of wave height, direction and period are integrated along the wave spectra, what may incur in loss of information and accuracy, specially regarding the wave direction.

Partitioned wave parameters are estimated using an algorithm that is capable to recognize the different wave systems present in a multi-modal sea estate. Based on characteristics of wave age and direction, and of wind speed and direction, the algorithm identifies wind-sea and swell waves, calculating and storing their parameters in different partitions. The first partition contains wind-sea wave data and the remaining contain swell wave data, from higher to lower energy.

The wind-sea partition is roughly defined along the wave spectra by an area that depends on the wind speed, the angle between the wind and wind-sea direction, and a factor (w*mult*) over the wind speed. The value of w*mult* defines the size of the spectral area where the wave systems found are classified as wind-sea. It is worth to mention that, despite most wave models use the same partitioning algorithm, they use different default values of w*mult*. For instance, while the original algorithm uses w*mult = 1.5,* WW3 uses *wmult = 1.0* and SWAN uses *wmult = 1.7*. Hence, care should be taken when comparing partitioned values of windsea and swell from different wave models.

Variables definition:

The variables available in this hindcast were computed by SWAN wave model and a short description of them is shown in the table below. The last two columns of the table indicate whether the variable is available as an **Int**egral or **Part**itioned parameter. A more comprehensive description of each variable can be found in **Appendix A** of SWAN's users manual.

Name	Definition	Int	Part
Hsig	Significant wave height, in metres.	X	X
Hswell	Significant wave height associated with the low frequency part of the spectrum, in metres. The swell cut-off frequency is 0.1 Hz.	X	
Dir	Mean wave direction in ^{o}, Nautical convention.	X	
PkDir	Peak wave direction in ^{o}, Nautical convention.	X	X
Tm01	Mean wave period using spectral moments of order 0 and 1, in seconds.	X	
Tm02	Mean wave period using spectral moments of order 0 and 2, in seconds.	X	
Tm_10	Mean wave period using spectral moments of order -1 and 0, in seconds.	X	

Tpeak	Absolute peak period, related to the absolute maximum bin of the discrete wave spectrum, in seconds.	X	X
TPsmoo	Absolute peak period, obtained as the maximum of a parabolic fitting through the highest bin and two bins on either side the highest one of the discrete wave spectrum. This “non-discrete” or “smoothed” value is a better estimate of the ’real’ peak period compared to the quantity Tpeak.	X	
Dspr	Directional spread or directional standard deviation, as the one-sided directional width of the spectrum, in ^{o}.	X	X
FSpr	The normalized frequency width of the spectrum (frequency spreading).		
Wlen	Mean wavelength, in metres.	X	X
Qp	Wave spectrum peakedness.	X	
Lwavp	Peak wave length, in m.	X	
Steep	Wave steepness computed as Hsig/Wlen.	X	X
Wfrc	The fraction of a given partition that is actively being forced by the wind.		X
Depth	Water depth, in metres.	-	-
Windv_x	Horizontal component of wind velocity, in m/s.	-	-
Windv_y	Vertical component of wind velocity, in m/s.	-	-