Definition of wave and wind parameters

Output parameters available in waveclimate.com are

- Significant wave height (m)
- Mean wave direction (nautical degrees)
- Mean wave period (s)
- Zero-crossing wave period (s)
- Peak wave period (s)
- Wind speed (m/s)
- Wind direction (nautical degrees)

Wave parameters are found by integrating the 1-dimensional energy density spectrum given per frequency bin.

Significant wave height and **wave direction** are defined as:

$$H_s = 4\sqrt{\int F(f)df} \qquad \theta_0 = \tan^{-1}\frac{\int F(f)\sin(\theta(f))df}{\int F(f)\cos(\theta(f))df}$$

Mean wave period and **zero-crossing wave period** are defined as:

$$T_m = \frac{\int f^{-1}F(f)df}{\int F(f)df} \qquad T_z = \sqrt{\frac{\int F(f)df}{\int f^2 F(f)df}}$$

Above, f denotes the frequency in Hz, $F(f)$ the sea surface variance spectrum [in m^2/Hz] in f and $\theta(f)$ the mean wave direction in f.

The peak wave period Tp is not integrated but simply found as the reciprocal value of the spectral frequency for which the wave spectrum reaches its maximum.

Apart from wave parameters integrated from the total wave spectrum, waveclimate.com offers parameters describing **wind-sea** and **swell** separately. Wave height, wave period and wave direction can be based on the swell part or on the wind-sea part of the spectrum. A Donelan-Pearson wave spectrum, found from wind speed and wave age, is taken to be the wind-sea part of the spectrum. The swell part of the spectrum equals the total spectrum minus the wind-sea of the spectrum.

For details on this wind-sea/swell splitter, please refer to

Mastenbroek, C., Valk, C.F. de, A semiparametric algorithm to retrieve ocean wave spectra from synthetic aperture radar. Journal of Geophysical Research, Vol. 105, No. C2, p. 3497-3516 (2000).

Wind speed is defined as the hourly average at 10m above sea level. Both **wind direction and wave direction follow the nautical convention**, i.e. 'coming from' relative to true north positive clockwise (0 degrees means from north to south and 90 degrees means from east to west).