Waveclimate.com Vs Consultancy

Waveclimate.com provides a preliminary appraisal of the ambient wind and wave climate on open sea as well as for relatively simple nearshore sites.

This note briefly explains and illustrates the differences in *offshore* wave model data from waveclimate.com and from project based consultancy in terms of methods and data accuracy.

We are aware of the fact that waveclimate.com wave data differ from wave data produced by our consultants. In general we find differences of up to about 5% in terms of average significant wave height and up to say 10% in zero-crossing wave period.

The major reason for this difference is the fact that waveclimate.com uses 25 spectral bins whereas we use 35 (global grid) or 30 bins (regional grids) for consultancy. Also as opposed to consultancy practice, waveclimate.com does not append an analytical tail to the highest frequency bin. Consequently, some energy is lost in the high-end part of the wave spectrum. This leads to underestimation of the (very) short wind waves (up to 5%) and overestimation of the corresponding wave period, in particular the zero-crossing wave period (up to 10%) which is especially sensitive to energy in the high end of the spectrum.

The table on the next page provides more details on the simplifications used by waveclimate.com relative to our project based consultancy.

The plots below illustrate the differences found between waveclimate.com and consultancy based average wave parameters at points in the global grid (GL), the EU-shelf grid (EU) and the Mediterranean grid (MD).

The following data sources are seen in the legend of the plots:

- Un-calibrated waveclimate.com wave parameter (wc-raw)
- Un-calibrated consultancy based wave parameter (bmta-raw)
- Auto-calibrated waveclimate.com wave parameter (wc-auto)
- Auto-calibrated consultancy based wave parameter (bmta-auto)

Auto-calibrated means that the waves are corrected by altimeter in a fully automated way using location-specific corrections (scale factor and intercept).

The points analysed are:

- An EU-location in the southern North Sea at 54°00’N, 6°15’E.
  See Figure 1 to Figure 5.

- A GL-location in the northern North Sea at 66°00’N, 00°00’E.
  See Figure 6 to Figure 9.

- An MD-location near Greece at 37°15’N, 23°45’E.
  See Figure 10 to Figure 13.

The next table lists the simplifications used by waveclimate.com relative to our project based consultancy.

Consultancy	Waveclimate.com
1- Manual calibration for ambient *and* extreme wind and wave climate by means of satellites. Influence of land, storms and squall-like events accounted for.	1- Fully automated satellite based calibration of wind and integrated wave parameters per grid point, focusing on the removal of the systematic bias in the ambient offshore climate.
2- Manual calibration of *wave spectra*, keeping spectral steepness constant. All wave parameters (total/sea/swell) are re-integrated from the corrected wave spectrum, including wave direction.	2- Auto-calibration of integrated wave parameters (total/sea/swell).
3- Smooth transition of corrected spectral energy towards zero and (indirect) of wave height and -period.	3- Simplified smooth transition towards zero directly applied to corrected wave height/period (no spectra involved).
4- No significant rounding.	4- Rounding of wave spectra for compact storage and quick access per point.
5- Append high-frequency tail to the highest discrete energy bin.	5- No high-frequency tail.
6- Peak period computed by fitting a parabolic through peak and its neighbours.	6- Peak period simply found as reciprocal of frequency with maximum energy.
7- Global grid: 35 spectral frequencies 0.0345 Hz (~29s) to 0.8827 Hz (~1.1s) EU-shelf grid: 30 spectral frequencies 0.0418 Hz (~24s) to 0.6631 Hz (~1.5s) Med grid: 30 spectral frequencies 0.0345 Hz (~29s) to 0.5481 Hz (~1.8s)	7- All grids use 25 spectral frequencies ranging from 0.0417 Hz (~24s) to 0.4117 Hz (~2.4s).
8- Steepness based sea-swell splitter; Optional use of other splitters such as the Hanson-Phillips (HP) splitter to detect multiple swells.	8- Traditional wind based sea-swell splitter.

Table 1 Methods and data used by consultants and by waveclimate.com

Note:
Consultancy based wave parameters shown in the plots below were auto-calibrated i.e. wave spectra were corrected to remove the systematic error from the wave climate (no additional corrections for the more extreme sea states).

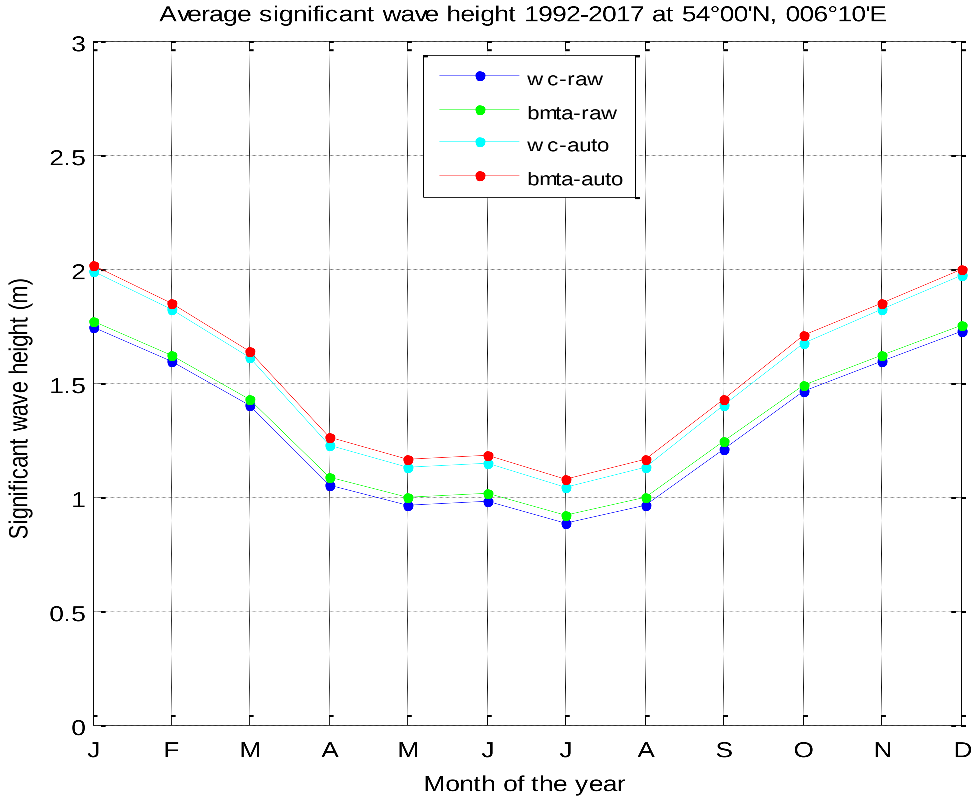

Figure 1 Consultancy vs waveclimate.com significant waves at EU-point in the southern North Sea

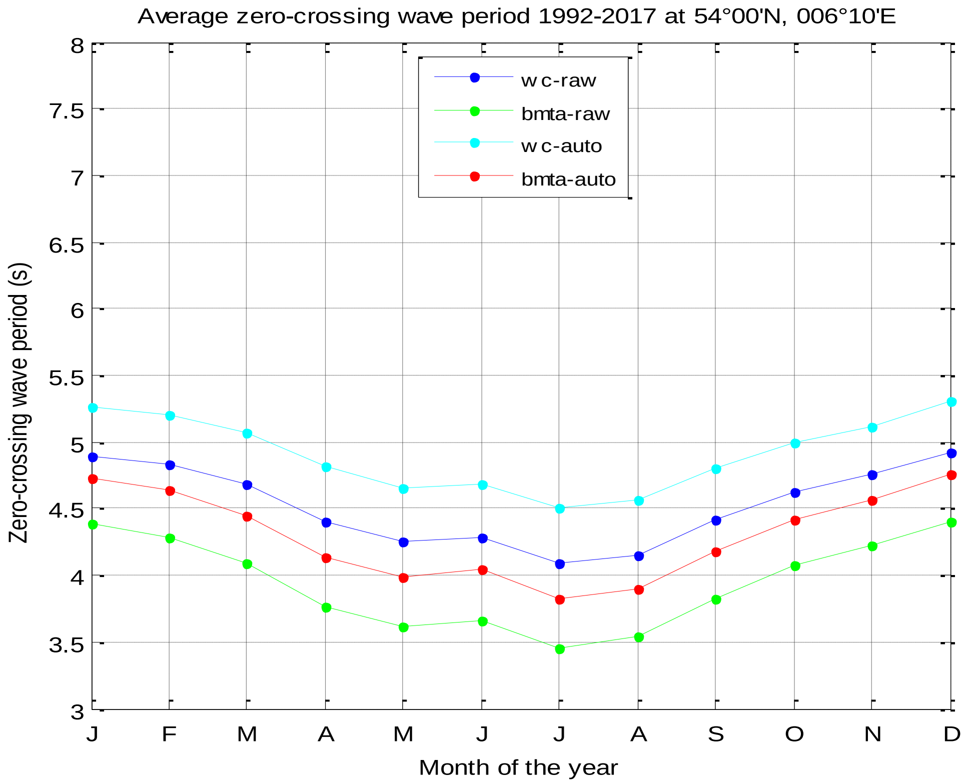

Figure 2 Consultancy vs waveclimate.com zero-crossing wave period at EU-point in the southern North Sea

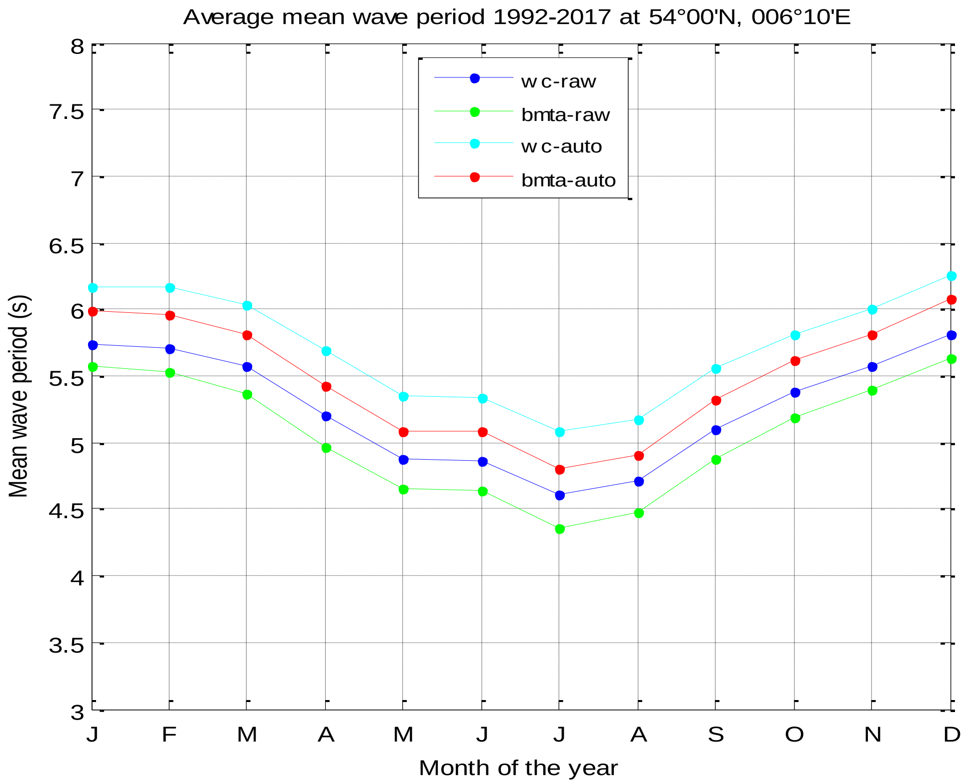

Figure 3 Consultancy vs waveclimate.com mean wave period at EU-point in the southern North Sea

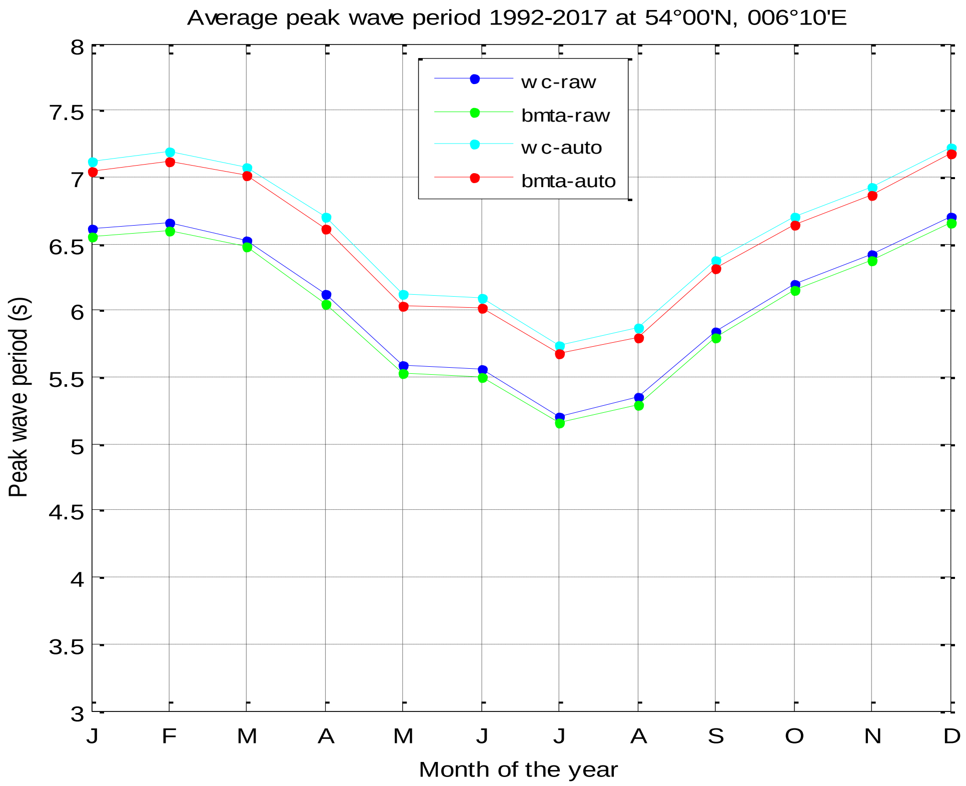

Figure 4 Consultancy vs waveclimate.com peak wave period at EU-point in the southern North Sea

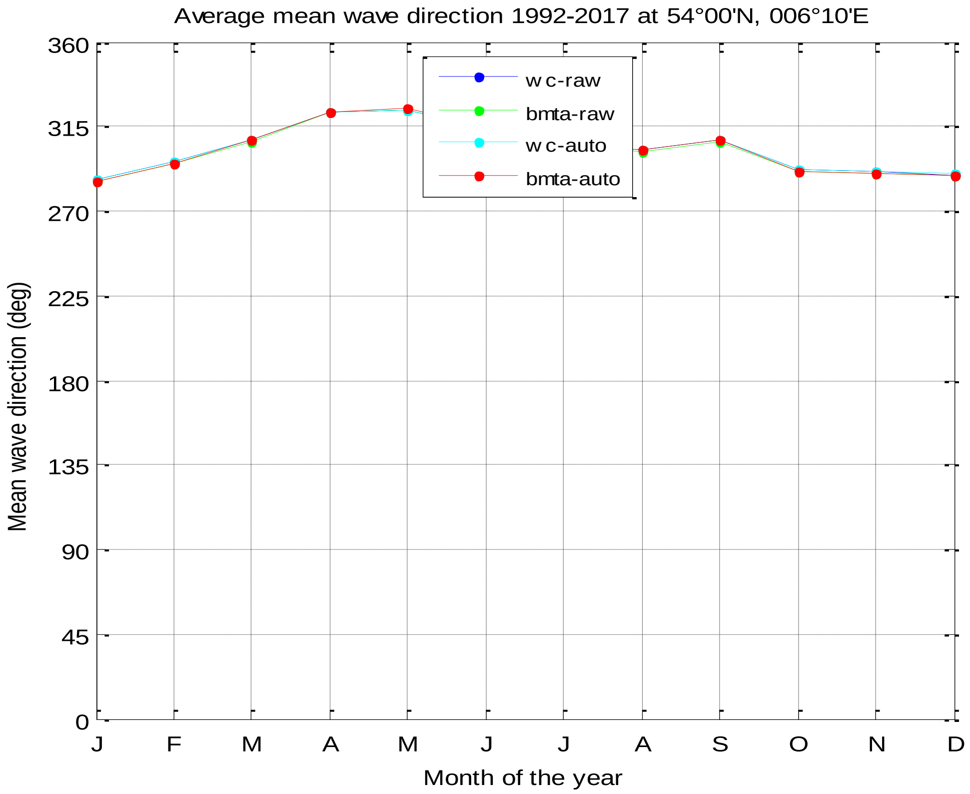

Figure 5 Consultancy vs waveclimate.com mean wave direction at EU-point in the southern North Sea

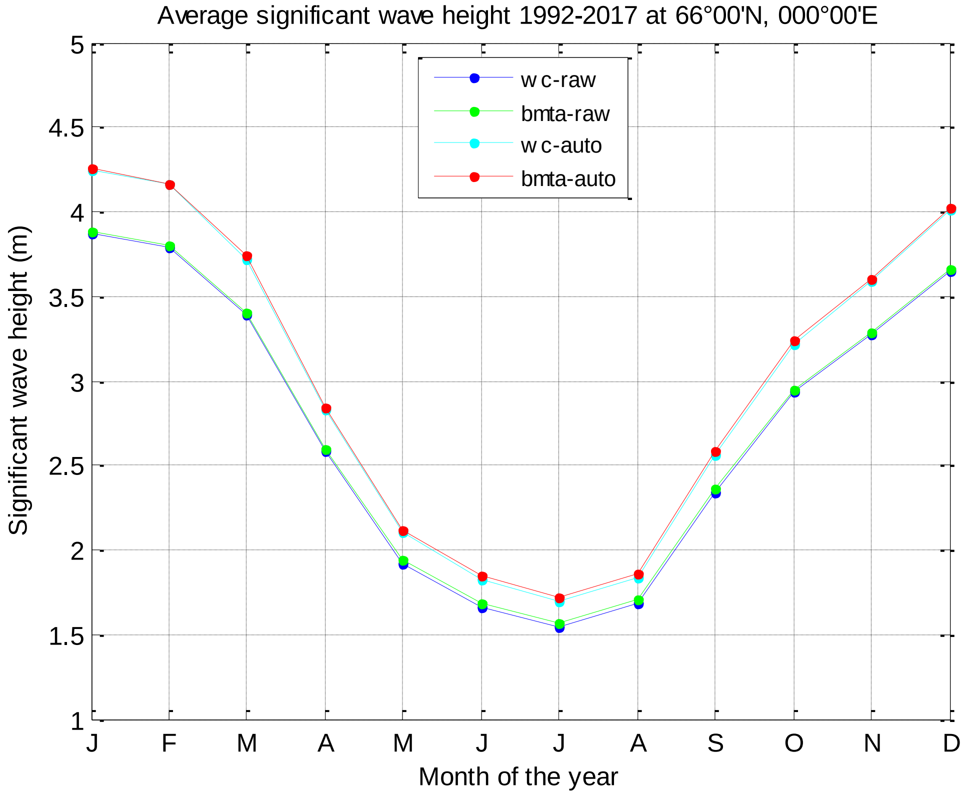

Figure 6 Consultancy vs waveclimate.com significant wave height at GL-point in the northern North Sea

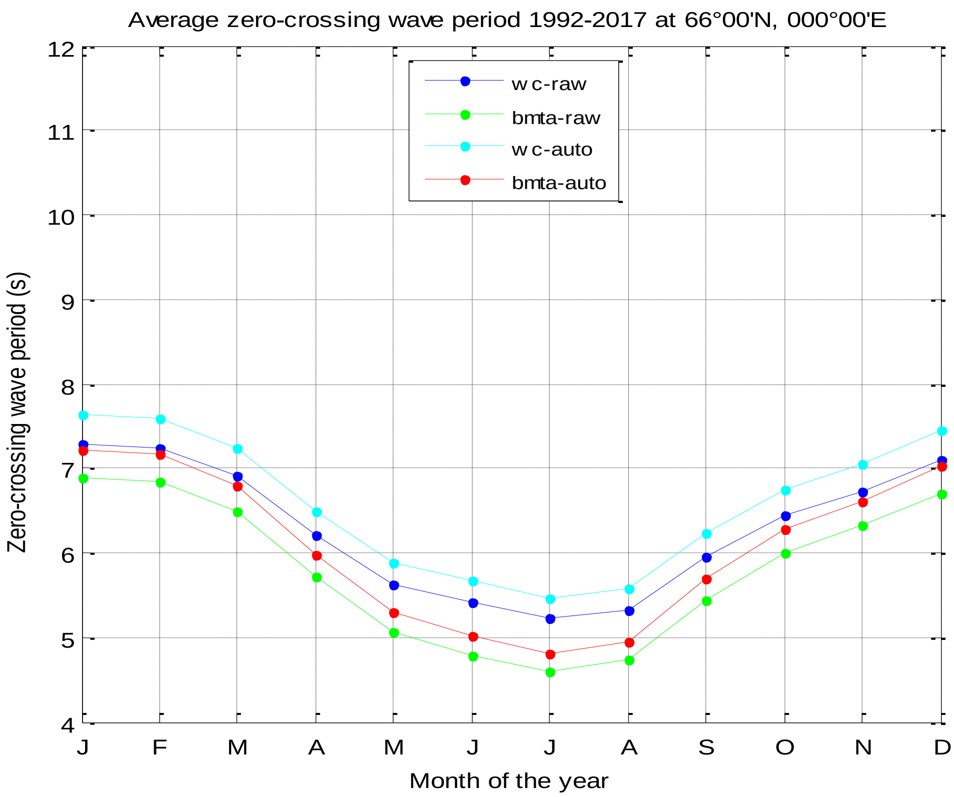

Figure 7 Consultancy vs waveclimate.com zero-crossing wave period at GL-point in the northern North Sea

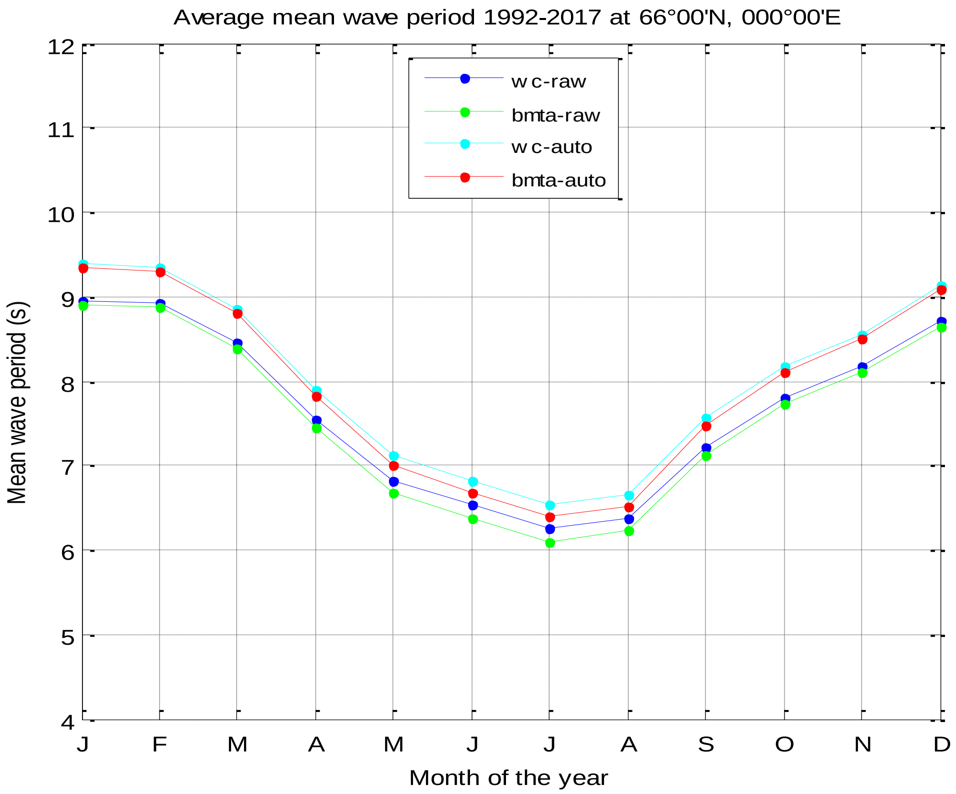

Figure 8 Consultancy vs waveclimate.com mean wave period at GL-point in the northern North Sea

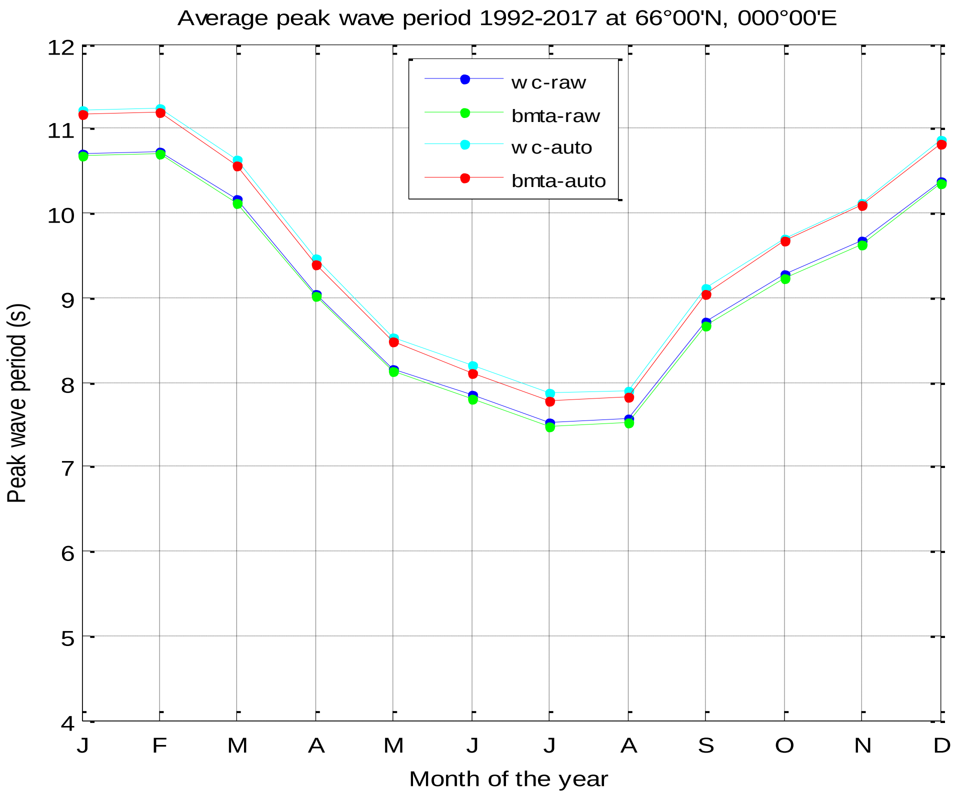

Figure 9 Consultancy vs waveclimate.com peak wave period at GL-point in the northern North Sea

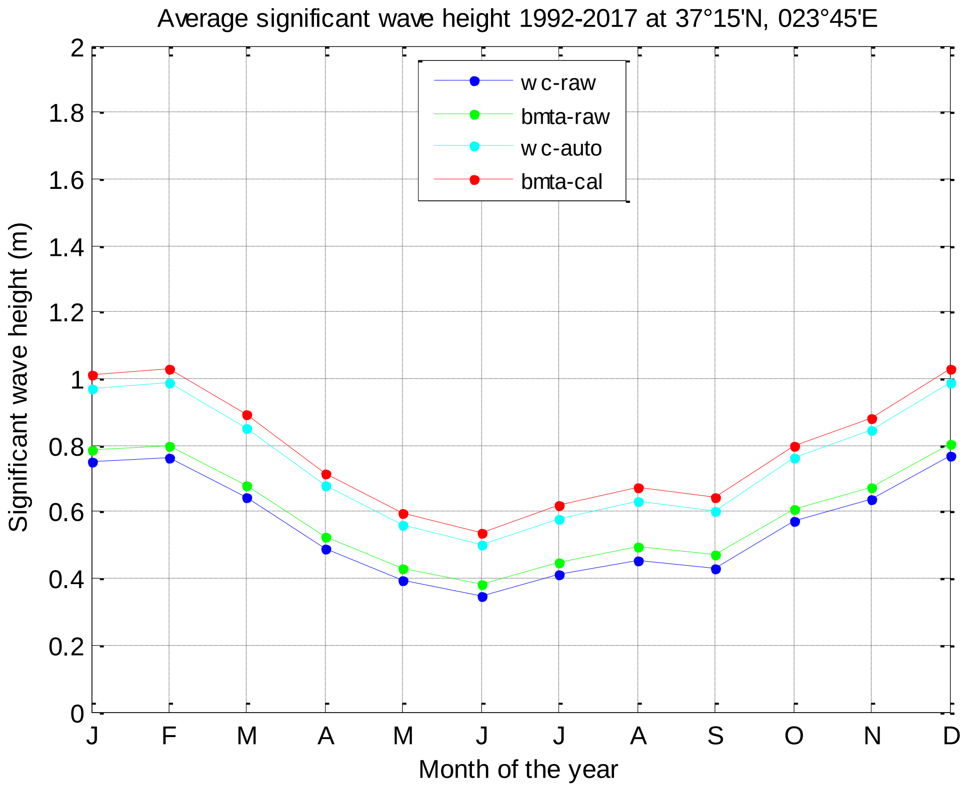

Figure 10 Consultancy vs waveclimate.com significant wave height at MD-point off Greece

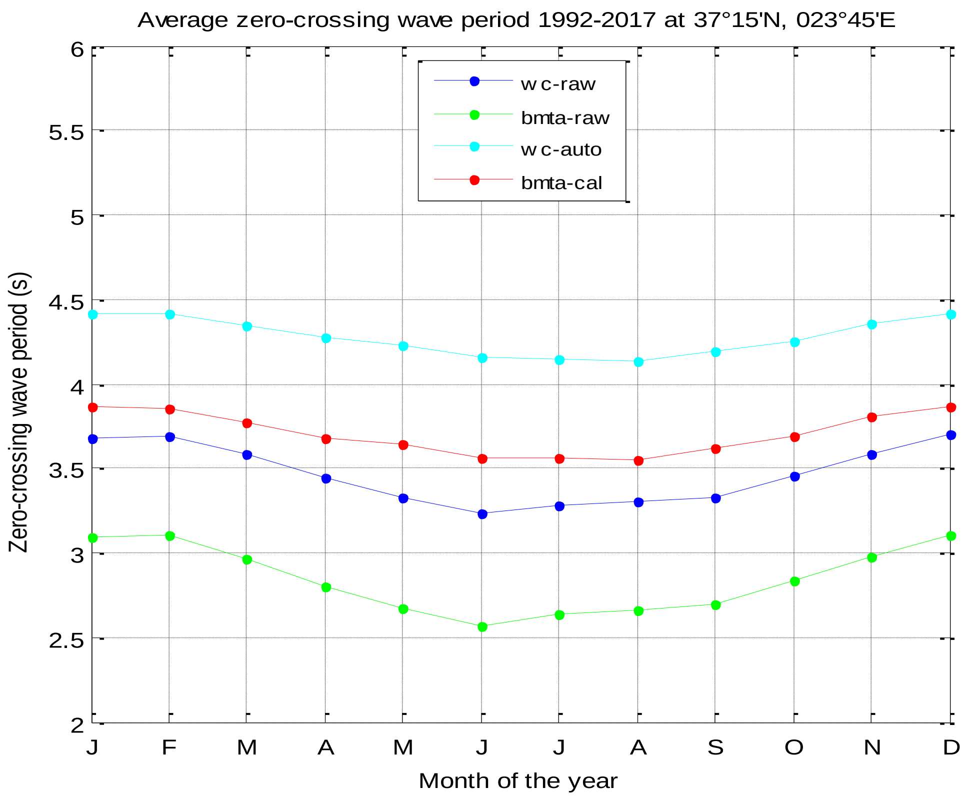

Figure 11 Consultancy vs waveclimate.com zero-crossing wave period at MD-point off Greece

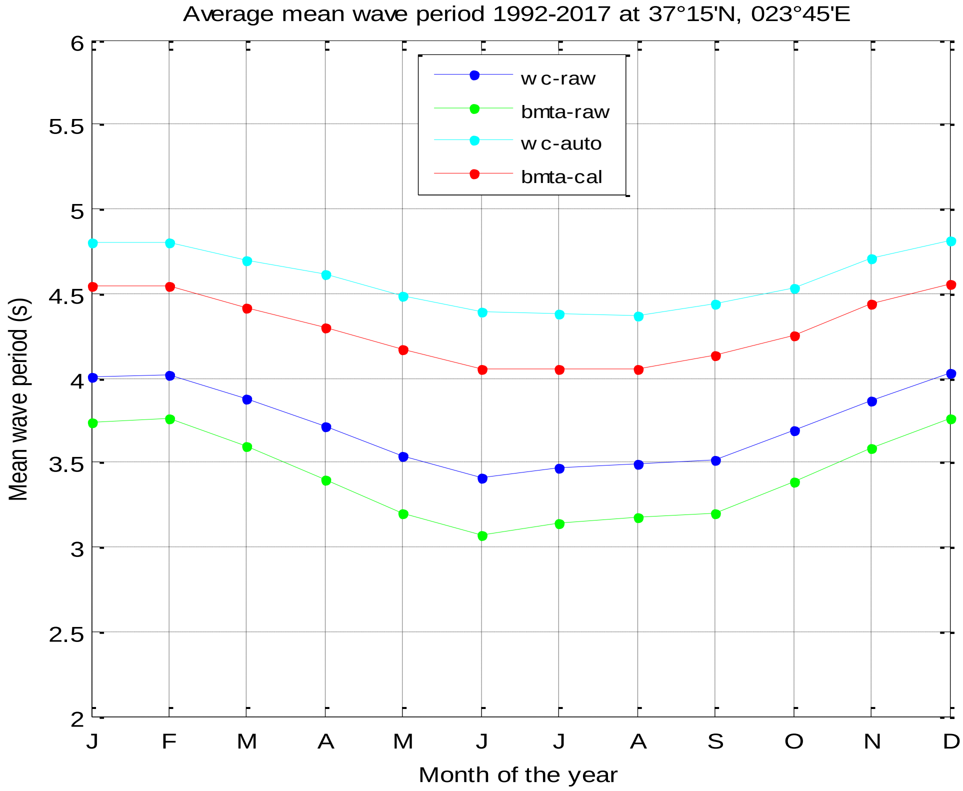

Figure 12 Consultancy vs waveclimate.com mean wave period at MD-point off Greece

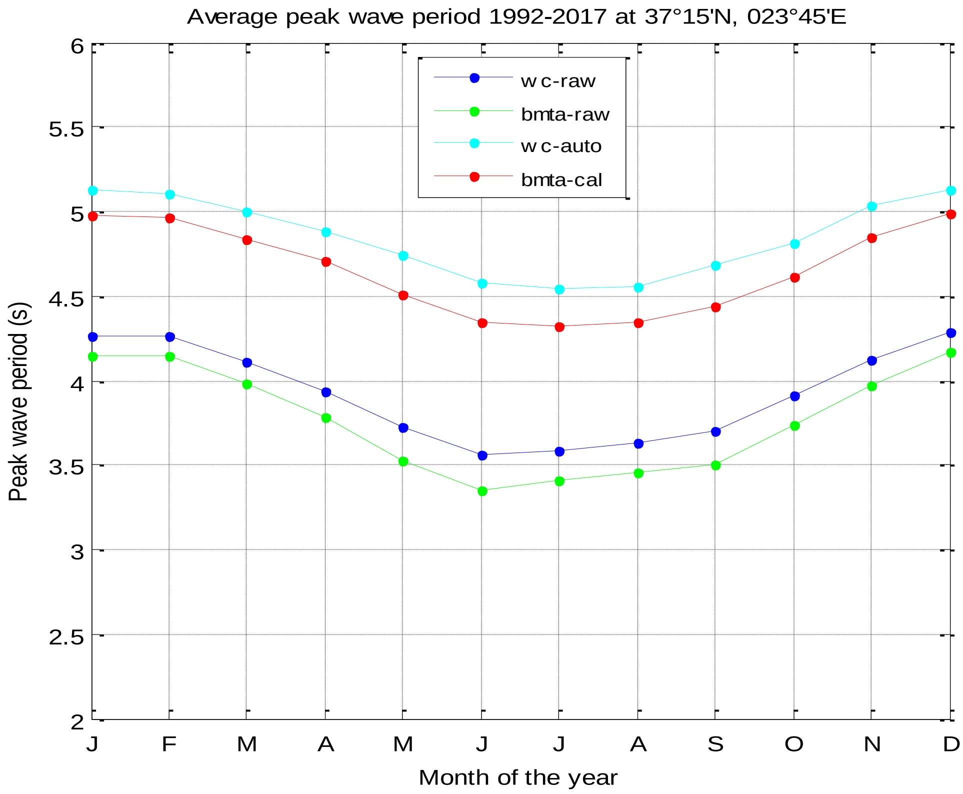

Figure 13 Consultancy vs waveclimate.com peak wave period at MD-point off Greece