https://data.qld.gov.au/dataset/coastal-data-system-waves-townsville

Collecting wave data helps us understand how waves behave in calm and stormy weather conditions. This can be used to protect lives and property. For example, wen a cycle is approaching the coast, data is provided to the Bureau of Meteorology and to Emergency Management Queensland to evaluate the potential impacts of waves on coastal communities.

Queensland’s wave information is used by:

* Planners and engineers in the design and construction f coastal structures and the investigation of natural coastal processes, including accretion and erosion.
* Emergency services during the cycle season.
* Individuals, tourism and recreational business for planning of fishing or small craft activities.
* Maritime organisations to plan port activities an to support navigational safety.
* Large ocean-going vessels for calibration and verification of numerical wave models. These models cover large-scale areas and provide guidance and input to forecasts and warning on the high seas for periods of up to 24 hours in advance.
* Global wave modelling to improve the reliability of wave forecasting worldwide.
* The Bureau of Meteorology as input to forecasts for specific coastal areas and up to 60 nautical miles seaward.

Coastal Data System – Waves (Townsville)

Hs – Significant wave height, an average of the highest third of the waves in a record (26.6 minute recording period).

Hmax – The maximum wave height in the record.

Tz – The zero upcrossing wave period.

Tp – The peak energy wave period.

Dir\_Tp TRUE – Direction (related to true north) from which the peak period waves are coming from.

SST – Approximation of sea surface temperature as measured by the buoy.

# Glossary of Terms

## Accelerometer

An instrument at the heart of a conventional wave monitoring buoy.

The accelerometer is designed to measure the up-and-down motions (the heave) of the buoy as it follows the movement of the ocean surface.

The device is mounted on a horizontal, stabilised platform suspended in a fluid filled sphere in the bottom of the buoy.

## Accretion

Short or long-term addition of material, above or below the water surface, which can alter shorelines and estuaries.

## Acoustic Current Meter (ACM)

An additional instrument of the latest version of wave monitoring buoy that measures the water current.

It is comprised of three separate acoustic transducers that use the Doppler method to measure current speed and direction of the water around the buoy at a range of 0.4m to 1.1m below the surface.

The transducers are mounted evenly around the base of the buoy. They report the current speed and direction every 10 minutes.

## Average water level

A calculated zero level that waves can rise above or fall below. This is shown as the horizontal line in the wave record graph.

During a wave record, we use the zero level as a reference to measure the sea surface fluctuations.

To determine this zero level and to correct for any tidal influence, we use a common statistical method called least squares adjustment.

## Hmax

The height (in metres) of the highest single wave record.

## Hsig

The significant wave height (in metres), defined as the average of the highest one-third of wave heights in a 26.6 minute wave record.

It is based on the concept that the smaller (and least significant) waves should be ignored from the observations as they have little influence on wav processes generally.

This wave height closely approximates the value a person would see.

Hsig is frequently used by meteorologists, oceanographers and coastal engineers.

This is the value used by the Bureau of Meteorology in their wave height forecasts.

## Receiver station

The receiver station can be located up to 30km from the wave monitoring buoy.

A receiver unit receives the radio signal transmitted from the wave monitoring buoy and converts it into wave data representing fluctuations of the water surface.

The wave data is then transferred to an onsite computer for storage and processing.

The computer automatically transfers the wave data over the internet to a central computer system (data server) in Brisbane for checking, further processing and archiving.

## Sampling period

The time between repeated measurements.

In the example wave record graph, each of the water surface elevations has been obtained at a constant sampling period.

In the case of non-directional wave monitoring buoys, this period is 0.39 seconds.

For directional wave monitoring buoys, it is 0.78 seconds because these buoys need to gather and transfer more information to the receiving station.

## Temperature

The sea surface temperature at the wave monitoring buoy, in Celsius.

## Tp

This is the wave period (in seconds) of those waves that are producing the most energy in a wave record.

Depending on the value of Tp, these waves could either be caused by local wind fields (sea) or have come from distant storms and moved away from their source (swell).

## Tz

The average of the zero up-crossing wave periods (in seconds) in a wave record.

## Water current

Water that moves in a horizontal direction, due to many causes, such as different temperatures and prevalent winds. Some currents may be temporary others more permanent.

Water current speed is recorded in meters per seconds (m/s) by the acoustic current meter and water current direction is recorded in degrees (°) relative to magnetic north.

## Wave direction

The direction that peak waves are coming from, shown in degrees from true north.

## Wave height

The vertical distance in metres between the crest of a wave and the following trough.

Wave heights are shown as H1, H2 and H3 in the sample wave record graph.

## Wave length

The distance in metres between one zero up-crossing of the average water level line and the next.

For a given wave period, waves in deeper water have a longer wave length.

## Wave monitoring buoy

A floating stainless-steel instrument specially designed to follow the movement of the ocean surface to measure wave height and wave direction.

Wave monitoring buoys are moored at selected sites around the Queensland coast, and can range from 0.4m to 0.9m in diameter.

The mooring system includes a length of rubber cord that is capable of stretching up to 3 times its length. This flexibility allows the wave monitoring buoy to more truly follow the fluctuating ocean surface.

The top section of a wave monitoring buoy is painted bright yellow for easy identification by day, and they have a flashing yellow navigation light so mariners can see them at night.

The electronic and the navigation light are powered for up to 24 months by a bank o dry cell batteries mounted around the inside of the hull.

Wave monitoring buoys are able to capture wave data and transmit it by radio to a shore station for recording and analysis.

## Wave period

The wave period is the time in seconds between one zero up-crossing of the average water level line and the next.

Wave periods are shown as T1, T2, and T3 in the sample wave record graph.

## Wave record

A sample of the wave climate for a given length of time.

Water surface elevations are collected by the wave monitoring buoys and stored at the receiver station computer every half hour, in 26.6-minute-long records.

The length of each record has been selected so it is long enough to allow analysis of a sufficient number of waves, but also short enough to avoid great changes in wave conditions.

It has also been chosen to provide and even number of water surface elevations for the analysis process.

Wave record graph: part of a wave record showing the height (H) in metres between the top and bottom of the wave, and wave period (T) in seconds between each wave. W1 to W4 is the numbering for each wave as it comes up and crosses the average wave level (zero up-crossing wave).

## Wave spectrum

Wave spectrum, refers to the power spectral density of a wave which is an indication of the amount of energy at a certain frequency in a signal, it is calculated using Welch’s Method.

## Zero up-crossing wave

A wave that crosses the average water level in an upward direction.

These up-crossings are shown by the large open circles, W1, W2, W3 and W4, in the sample wave record graph.

This wave includes all the water surface elevation from one point where they crossed the average water level line in an upward direction until the next upward intersection.

This allows identification of the wave crest and trough.

Note: Some organisations define waves in a record using the zero down-crossing method.