
WAVES

How do waves form? How do they travel? How can we use them?

Waves we see regularly are generated by wind at sea. Do you ever watch the weather forecast and notice that there are Low and High Pressure systems? Look at Figure 1 and notice the 'H' just off Ireland (to the west) with 1028 written beside it. This is the centre of a High pressure system. You can see lines around this and these are called isobars - lines of equal air pressure. Look over Canada you will see a red L with 990, this is a Low Pressure system. The isobars are more tightly packed than around the High Pressure and therefore that means it will be windier!

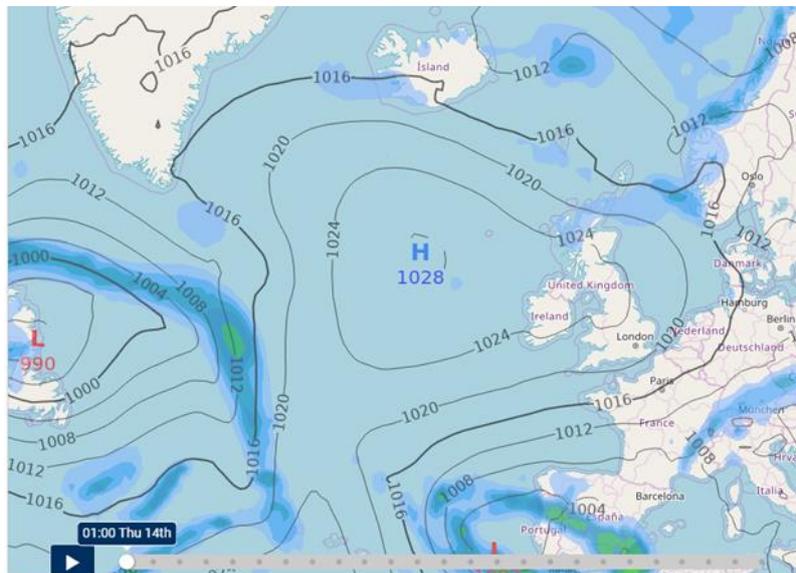


FIGURE 1: MET EIREANN WEATHER CHART¹

The Met Office has a simple video that explains Low and High pressure at <https://www.metoffice.gov.uk/weather/learn-about/weather/how-weather-works/high-and-low-pressure>

Wind starts the process of waves, they form when wind blows across the ocean surface. Friction initially forms very small waves and as the wind gets stronger and more sustained the waves propagate out into the ocean, they join and they begin to order themselves. How big they get is down to a lot of factors and some of them are spoken about in this video https://www.youtube.com/watch?v=Dl2OxgN_nus

Anyone who uses the sea usually needs to know the following information about waves:

- Wave Height, this is measured between the bottom (trough) and the top (crest) of the wave (Figure 2)
- Wave period-the time in seconds between either two troughs or two crests
- Wave direction-where the waves are coming from.

¹ www.met.ie

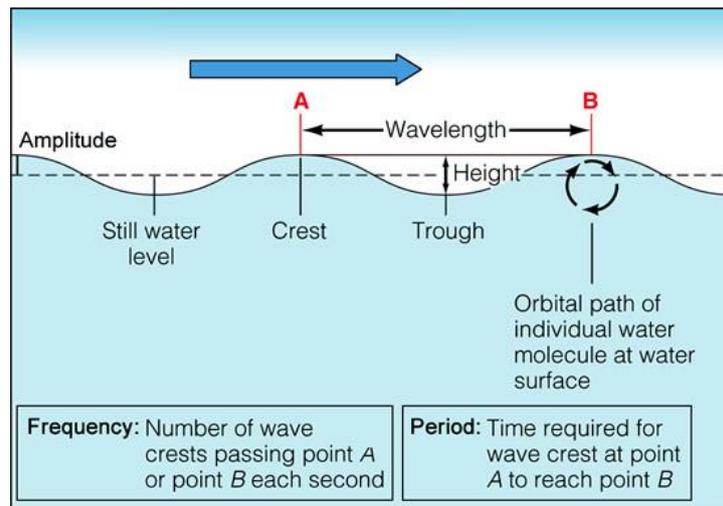


FIGURE 2: EXPLANATION OF THE WAVE HEIGHT²

As the waves travel across the open ocean the water depth is large and the seabed doesn't have any influence on the waves. Once they reach our coastline the seabed influences their behaviour. As the trough of the waves touches the seabed it slows down but the crest remains at the same speed and so the crest 'falls over' and the wave break. This process is explained here <https://www.youtube.com/watch?v=ouoodQg3XDo>

Surfing is one sport where the process of breaking waves becomes important! The best surfing waves will be a function of the shape of the seabed, wave height, period, direction as well as wind speed, direction and tides. Offshore wind helps to 'hold up' the waves as they break so that they can be surfed where as onshore wind pushes the waves over. Surfers learn how to read weather, wave and tidal charts to determine where the best surf will be.

In Ireland large swells often come across the Atlantic and when the conditions are right international big wave surfers travel here. A number of places in Ireland are now world renowned including Mullaghmore in Sligo <https://www.youtube.com/watch?v=fhhsF5HekEc> and Aileens at the Cliffs of Moher <https://www.youtube.com/watch?v=eVgULAscfb8>

WAVE ENERGY IN IRELAND

As waves travel across the ocean they transmit energy. It travels in a circular way (Figure 2). This is the difference between water currents and waves-currents transport water, waves transmit energy. When this energy is harnessed it has the potential to provide a lot of green electricity.

Ireland's coastal waters have huge potential for the generation of wave energy because it has the Atlantic on its doorstep. A number of offshore sites are available to test wave energy devices here. The following video from SEAI explains where they are. <https://www.seai.ie/technologies/ocean-energy/ocean-test-sites-in-ireland/>

Why not keep up to date on Ireland ocean energy at <http://www.oceanenergyireland.ie/>

² <http://passyworldofmathematics.com/mathematics-of-ocean-waves-and-surfing/>

COUPLE OF INTERESTING FACTS AND VIDEOS TO WATCH:

- Why is it always windy at the beach on a sunny day?
<https://www.youtube.com/watch?v=edsNPCwUglo>
- Biggest recorded waves around the world
<https://www.smithsonianmag.com/science-nature/biggest-waves-recorded-history-180952432/>
- If you want to make some waves in a bottle <http://sciencewows.ie/blog/fun-friday-make-ocean-bottle/>

This blog is brought to you by Sheena Fennell, an oceanographer in [Earth and Ocean Sciences at NUI Galway](#).

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