



The “Up and Down” of Waves

Waves on a body of water are most commonly caused by wind. As wind passes over the water's surface, friction forces it to ripple. The strength (**speed**) of the wind, the distance the wind blows (**fetch**) and the length (**duration**) of the gust all determine how big the ripples will become. The height of a wave increases if the wind blows strongly for several hours, and waves of considerable height develop in open oceans if a strong wind blows for several days. The limiting factor in creating waves is the distance of ocean over which the wind blows ie the fetch. When the wind dies down, the waves continue to travel away from their origin before dying. This is known as **swell**. There may be swell present even if the wind is calm and there appears to be no 'sea' waves.

The highest point of a wave is the **crest** and the lowest point is the **trough**. The difference between the two is known as the **wave height**. The **wavelength** is the distance from crest to crest.

Waves **break** as they approach shallow water when the sea bed begins to affect the wave's shape and speed. Wave height increases and the crests become more peaked. As the steepness increases, the wave becomes unstable. The forward speed of the crest becomes faster than the speed of the wave and the wave breaks up the beach. This is called the **swash**. The water then drains down the beach under gravity and is called the **backwash**. A wave **period** (frequency) is time interval between the arrival of consecutive crests at a fixed point. Waves tend to come in groups.

Inshore Waves

Inshore waves can be described in three different ways according to their form. There are **dumping, surging** and **spilling** waves. Each of these waves has different looks and characteristics.

Dumping waves



Dumping or plunging waves break with a tremendous downwards force. They can throw a swimmer to the bottom and cause spinal injuries. Never try and body surf on a dumper wave! Keep out of their way or dive through them. Dumping waves usually occur when strong winds create waves with long wave periods. They can be found when there is a sudden rise in the sea floor eg on sand banks or steeply rising beaches. When these waves break, the water plunges forward and down into the trough. The steepness of the slope prevents the swash developing but the backwash is very powerful. It can carry materials down the beach and wash the sand out from beneath your feet. These waves can erode beaches. Dumping waves can help rips to form.

Surging waves



Surging waves may never actually break as they approach the water's edge as a result of the water being very deep beneath them. They tend to form on steep beaches so the waves do not lose speed or gain height. Surging waves have great force and can knock people off their feet and carry them back into deep water. For this reason they can be very dangerous especially around rocks.

Spilling waves



Spilling waves have less force than dumping or surging waves and occur when the crest of the wave (foam) tumbles down the **face** (front) of the wave. As the tide gets lower and the sandbank on which the waves are breaking becomes shallower, this type of wave will form tunnels or 'tubes'. Generally, spilling waves are the safest waves and the best for body surfing. When the waves break, the swash travels up the beach as a sheet of water often reaching the upper beach. Most of the swash soaks into the beach which means that there is very little backwash. These waves carry sand and can create a ridge at the top of the beach.



Picture right:
Spilling Waves
Source Wikipedia
Ocean Surface Waves

Picture left:
Piha waves showing
refraction and reflection
from rocks
Courtesy of Dr J Floor
Anthoni, Sea Friends



Wave refraction

Surface waves can be bent (**refracted**) or bounced back (**reflected**) by solid objects like rocks.

Tsunamis

These are caused by an under-water earthquake or land slide. These waves have a very long wavelength, far longer than ocean surface waves and can travel very quickly, so they are very difficult to spot from the air. Tsunamis are very powerful waves and can travel over great distances before reaching the shoreline. Before the tsunamis reach land there can be a period of water recession before the huge tsunami wave comes crashing in. These waves can travel a great distance inland and wreak havoc. The first wave may not cause the most damage.

Jumping into calm water

Jumping into calm water will create waves. These waves may increase anxiety in people nearby who do not have water confidence.

Waves may be dangerous, fun for playing and surfing in, provide energy (wave power), create beach erosion or construction (long shore drift or littoral drift).