

## Ocean

Most of the waves we see are the result of wind driving against water. When the wind begins to blow across undisturbed water, the first waves formed are ripples. These small wavelets are controlled in part by the surface tension of the water, and do not last very long. If the wind continues to blow at speeds greater than a few miles per hour, the size of the waves increases and the surface of the water takes on an irregular character in which it is difficult to identify individual waves. This confused mixture of waves is called a sea. When the waves move out from under the wind, they become a swell. A swell is a regular surge of movement that travel thousands miles.

How big a wave gets depends not only on how long and strong the wind has blown but also on the distance over which the wind has acted on the water, this third variable is being called a fetch. It is on the open sea, where the wind is free to blow over a fetch of thousands of miles, that big waves are formed. One rule of thumb holds that the height of a wave in feet will usually not exceed half the wind's speed in miles per hour, which means that an 80 mile per hour hurricane can stir up waves 40 feet high. However, waves whipped up by a storm can move at different velocities at times combining to form super waves far higher than this rule would predict. These storm surges are associated with violent storms, including hurricanes and typhoons. That said, most waves are less than 12 feet high. Waves over 25 feet high are rare; in excess of 50 feet develop only during very severe storms, as mentioned. The highest wave that has been measured with any degree of certainty was recorded by an American tanker, the USS Ramapo, in 1933, while it was en route from manila to

san Diego, 112 feet high, produced by gale winds operating over a fetch of several thousand miles.