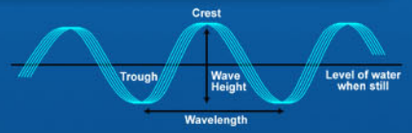
MAKING WAVES

What is a Wave?

Waves are energy transmitted through matter. The matter can be in any state; solid, liquid or gas.

Surface ocean waves transmit energy along the surfaces between air and water. As ocean waves travel particles of water in the surface of the ocean travel in circular orbits. That is why these waves are also called **progressive orbital waves.**

Anatomy of a Wave



Parts of a Wave

Crest: The highest point of the wave.

Trough: The low parts of a wave.

Waves are characterized by scientists according to several properties.

Wave height: The vertical distance between the highest point of the Crest and the lowest point of the Trough.

Wavelength: The horizontal distance between two corresponding points on a wave form, for example from Crest to Crest.

Wave steepness: The ratio of height to wavelength. When wave steepness exceeds 1/7, breakers form.

Wave period: The time that elapses during the passing of one full wavelength. Oceanographers use this unit most frequently to relate wavelength and speed.

Wave speed: The velocity at which a wave is travelling. Speed is best calculated by dividing wavelength by wave period.

Wave frequency: The number of wavelengths that pass a fixed point in one minute. Frequency is rarely used by oceanographers because ocean waves are long and slow.

Poster Credits: Photo of the Outer Banks Surf: Michael Halminski
Poster design: Patty Snow, SCSGC
Poster text: Carrie Thomas, NCSU

South Atlantic Bight WAVE FACTS

- Off Cape Hatteras, NC, the continental shelf is narrow. Ocean waves have high energy at the beach. Result: Some of the best and largest East Coast surfing waves.
- Off SC and GA, the continental shelf is wide and extends 60-70 miles (100-115 km) offshore. Long period, ocean swells "feel" the bottom well offshore, and lose energy before hitting the beach. Result: Smaller waves at the beach. During winter storms, northeast winds can reach 25-35 miles per hour (40-60 km/h), and can last over 24 hours. The fetch can be over 300 miles (500 km), and waves in deep water (80-110 ft or 25-30 m) can reach over 5 m (15 feet) in height. Storm waves with a short period (8-12 seconds) can get very steep and thus hazardous to boaters.
- Off the east coast of Florida, the Gulf Stream flows northward causing higher, steeper, offshore waves than those that are found near the beaches.
- The size of waves generated by hurricane winds in the SAB depends on the size of the storm, which influences fetch and the speed of the hurricane.

For classroom lessons and today's wind and wave information: **www.seacoos.org** South East Atlantic Coastal Ocean Observing System

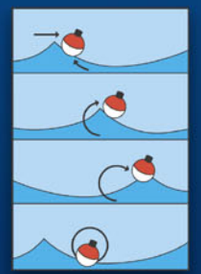
What Causes Ocean Waves?

Most waves on the surface of the ocean are created when the wind blows over the surface of the water. As waves grow larger, they capture more of the wind's energy and, as a result, the wave's wavelength and height increase. The waves also change from smooth, curved waves into pointy, crest-shaped waves.

For wind of a specific strength and fetch (distance over which the wind blows in one direction), waves will build over time until they reach a maximum size. This condition is called a fully developed sea, and wave size will not increase even if the duration (how long the wind blows) increases.

Fetch and Duration required to create a fully developed sea for several different wind speeds.

Wind Speed km/hr (mi/h	*Fetch km (mi)*	*Duration hr*
20 (12)	24 (15)	2.75
40 (25)	176 (25)	11.5
60 (37)	660 (37)	27.5
80 (50)	1682 (50)	50



A bobber floating on water as a wave passes demonstrates the orbit that molecules of water take as surface ocean waves move along the air-sea interface.

The diameter of the orbit is equal to the wave height at the ocean's surface.

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