
Physical Oceanography

1. Can tidal energy be used as a power source?

There are many reasons why tidal power is not used across the world and won't be used in the near future. There are only a few places in the world where the tidal range is great enough to justify the cost of building dams to harness this energy. Though the need for alternate power sources is not great enough for countries to use tidal power, France is the only country that successfully uses this power source. French engineers have noted that if the use of tidal power on a global level was brought to high enough levels, the Earth would slow its rotation by 24 hours every 2,000 years.



2. Where do the highest tides occur?

The highest tides in the world are found in the Bay of Fundy, Nova Scotia, Canada. At times during the year the difference between high and low tide may be as high as 53 feet, the equivalent of a three-story building.

3. What causes sea foam?

Sea foam is made of air bubbles separated by a film of liquid. Air bubbles in fresh water unite, while air bubbles in salt water bounce off of each other. When these air bubbles rise to the surface in the ocean, they burst and release salt spray into the air. It is believed that most of the airborne salt comes from the bursting of bubbles.



4. What is the source of the Gulf Stream?

The North and South Equatorial Currents join to flow through the passages between the Windward Islands into the Caribbean Sea. The resulting current flows through the Yucatan Channel and only has an outlet between Florida and Cuba. Other currents coming from the northern coast of Puerto Rico and eastward from the Bahamas add to the flow of the Gulf Stream northward. It is because of this route there exists a misconception that the Gulf Stream's source is the Gulf of Mexico.

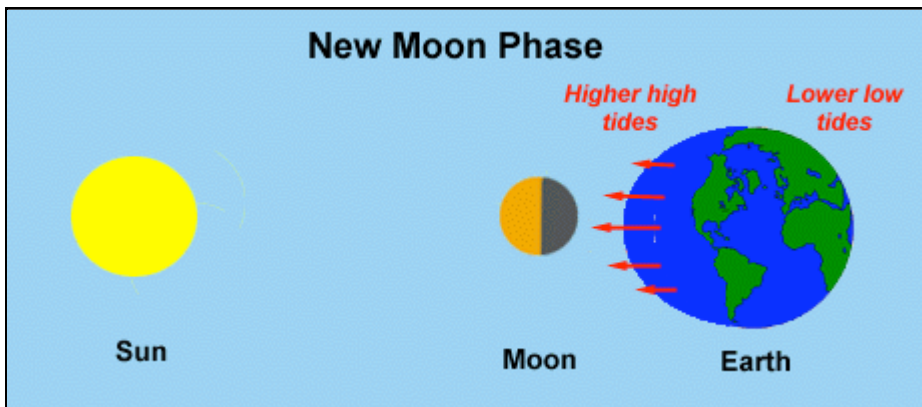
5. What is the length of the Gulf Stream?

Because the Gulf Stream is part of a larger current system, it is difficult to set boundaries of start and finish. Generally, the northeasterly flow can be charted from the Straits of Florida, at a speed of 3 - 4 knots with a rate of 26 million cubic meters per second, increasing past the Chesapeake Bay to a rate of 75 - 90 million cubic meters per second due to addition of waters from the Sargasso Sea, up to the Grand Banks of Newfoundland where the rate drops to 40 million cubic meters per second.



6. What causes tides?

The gravitational forces of the moon and sun on the water causes the tides. The moon, being nearest, has the greatest effect even though the sun is the larger of the two. High tides are generated on the sides of the Earth nearest to and farthest from the moon. During new and full moon phases the moon, sun, and Earth are aligned causing a greater gravitational pull on the Earth resulting in higher high tides and lower low tides.



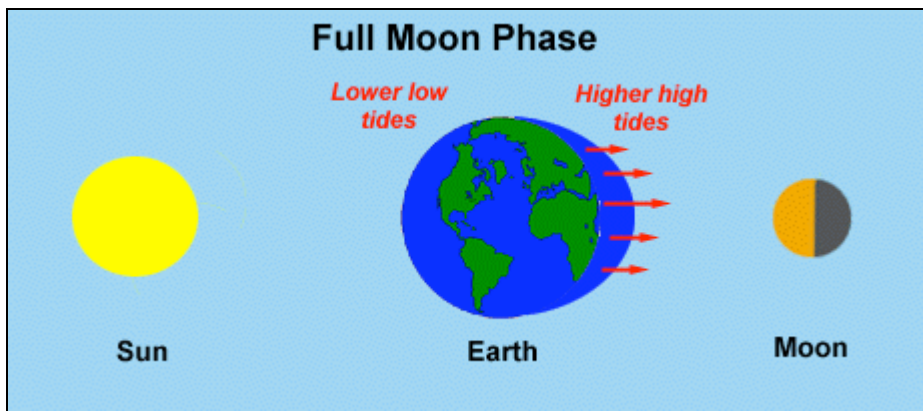


Image of the effects of

quarter moon phases

7. What is the origin of waves?

Waves are primarily caused by winds. Although, earthquakes, volcanic eruptions, and tides also cause waves.



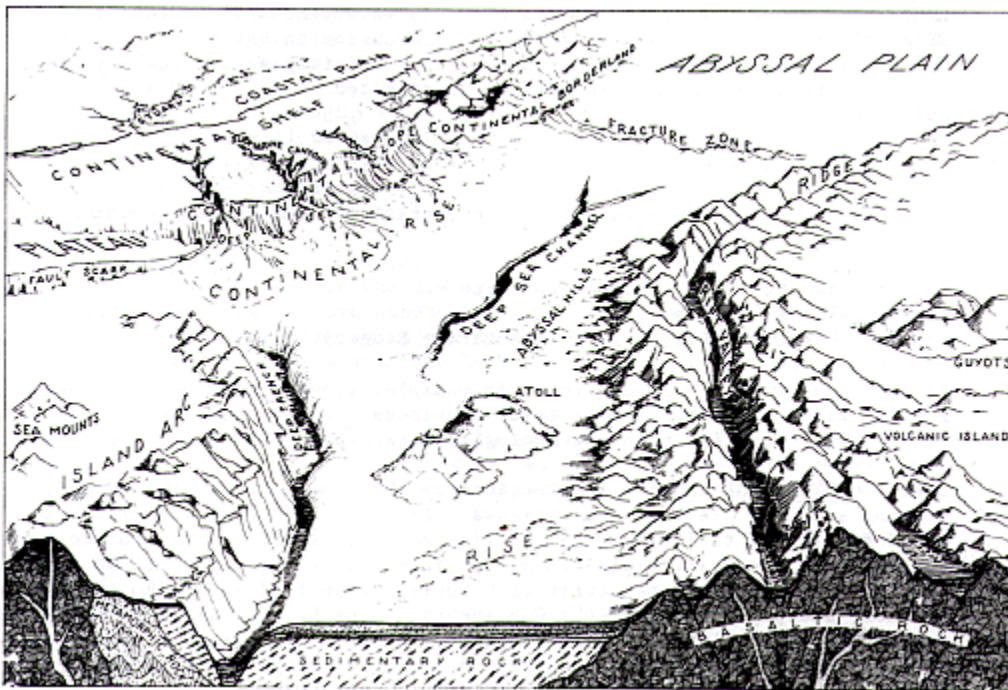
8. How much power exists in a wave?

Kinetic energy, the energy of motion, in waves is tremendous. An average 4-foot, 10-second wave striking a coast puts out more than 35,000 horsepower per mile of coast. If this seems confusing, another way to determine how much power is contained in a wave can be best visualized by looking at the damage it does when it hits the coast. For example, on the coast of Scotland a block of cemented stone

weighing 1,350 tons was broken loose. Later, the replacement pier, weighing 2,600 tons was carried away by waves. Off the coast of Oregon, the roof of a lighthouse 91 feet above water was damaged by a 135 pound rock that was carried by the high waves.

9. What does the sea floor look like?

The bottom of the sea is divided into three major areas, the continental shelf, the continental slope, and the ocean basin. The continental shelf extends for several hundred miles from the shoreline and has hills, ridges, and canyons similar to the land-based Grand Canyon. The continental slope, which exists between the continental shelf and the deep ocean basin, slopes downward at 2 to 3 degrees and as much as 50 degrees off of volcanic islands. Ocean basin features are similar to dry land, with underwater mountains higher than Mt. Everest, basins, and trenches. Many oceanographers have compared the Pacific deep ocean basin to the surface of the moon.



10. Why is polar water saltier than other ocean water?

The polar waters are the saltiest in the world. Despite the openness of the ice

structure, most impurities (salt) will not fit between its molecular structure. Thus, when water freezes, the salt "falls out" of the water, leaving saltier water behind and the fresh water to freeze in polar sheets.



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