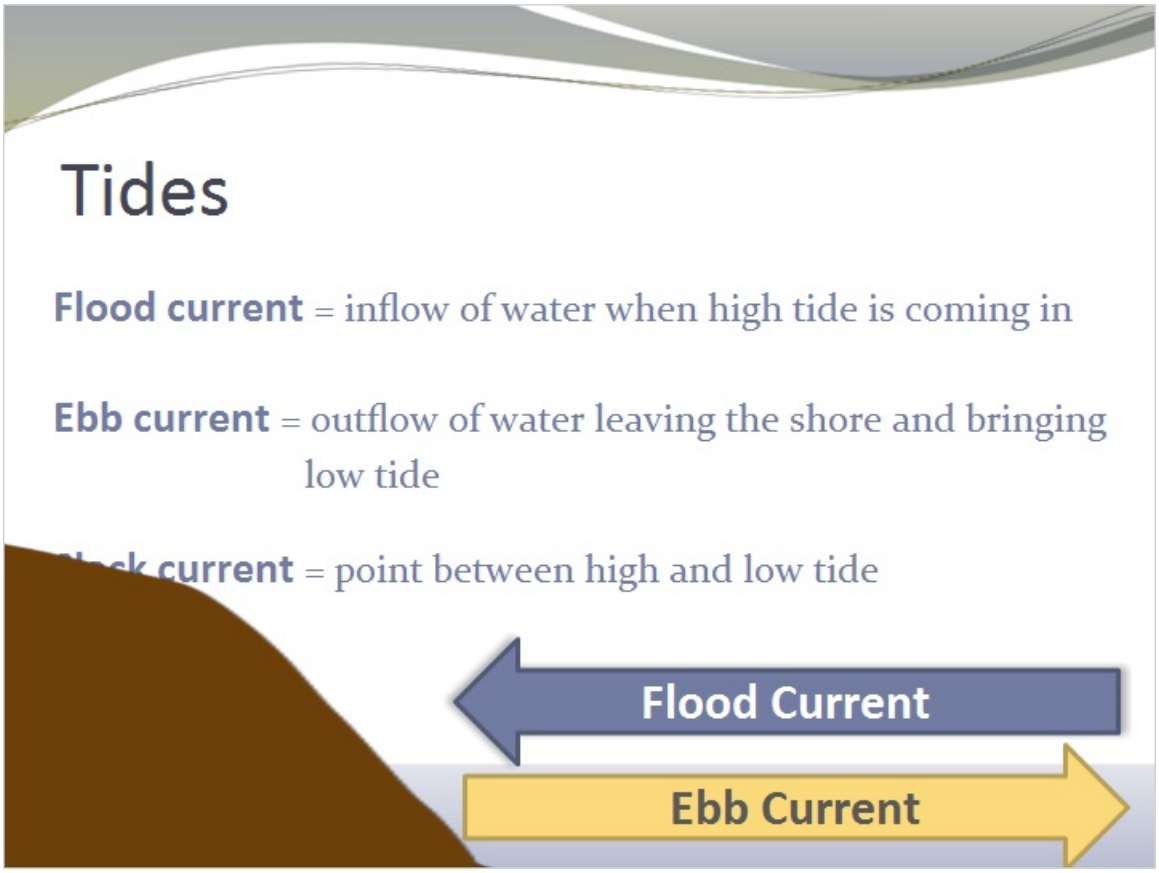
Module 7: Ocean Motion
Topic 6 Content: Causes of Tides Notes



A tide is very similar to a wave. In addition, tides actually cause two currents when entering or leaving an area. The inflow of water when high tide is coming in is called a flood current. The outflow of water leaving the shore and bringing low tide is ebb current. The point between high and low tide is slack current.

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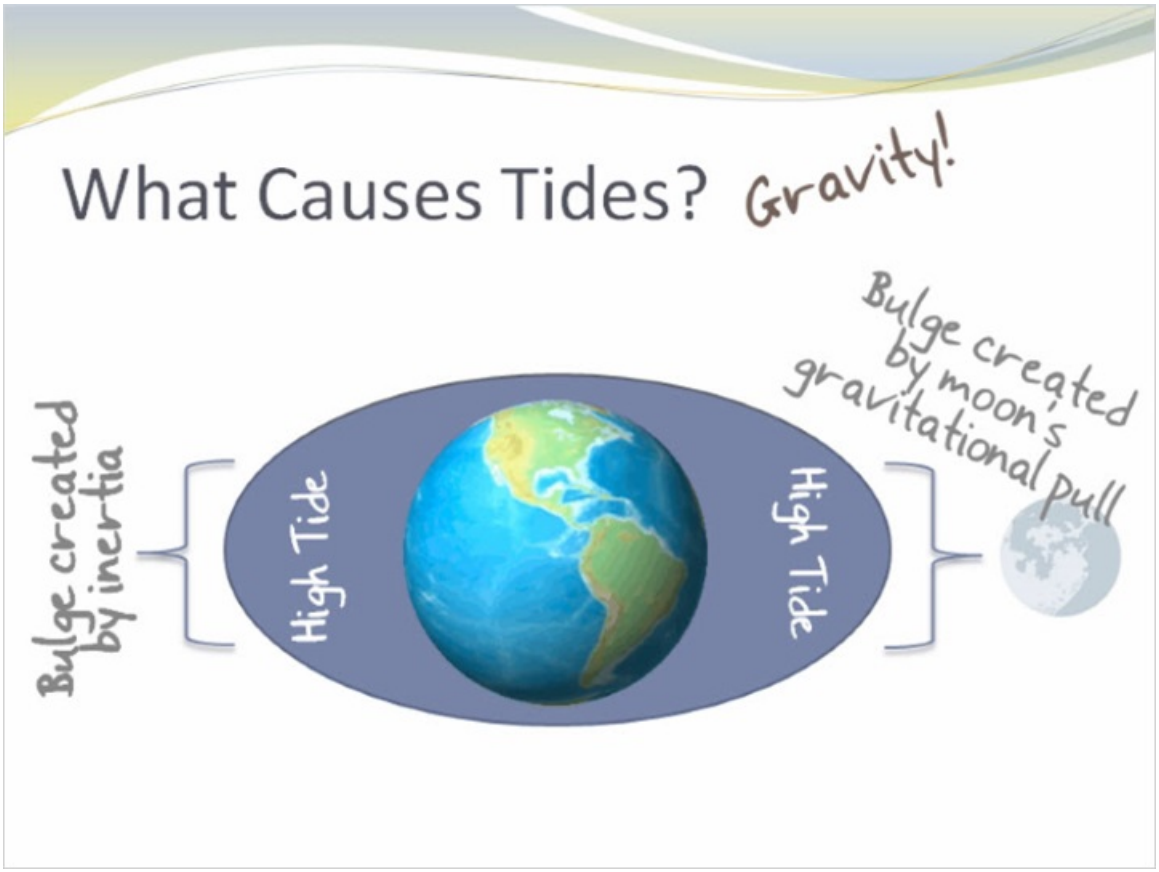

For the most part, tides are caused by gravity from the pull of the moon, and to a lesser degree, the pull of the sun. The tides are basically a giant wave the size of the ocean basin. The moon and sun create two tidal bulges on either side of the globe, with a little help from inertia. These represent the wave crest or the highest point of the wave. When an area rotates into this bulge, it will experience high tide. Of course, if the water moves into two bulges, there are also two points that have a lesser amount of water. When an area rotates out of this bulge, it will experience the wave trough and low tide. The moon and sun create the tides, and the Earth rotates into and out of the tides.

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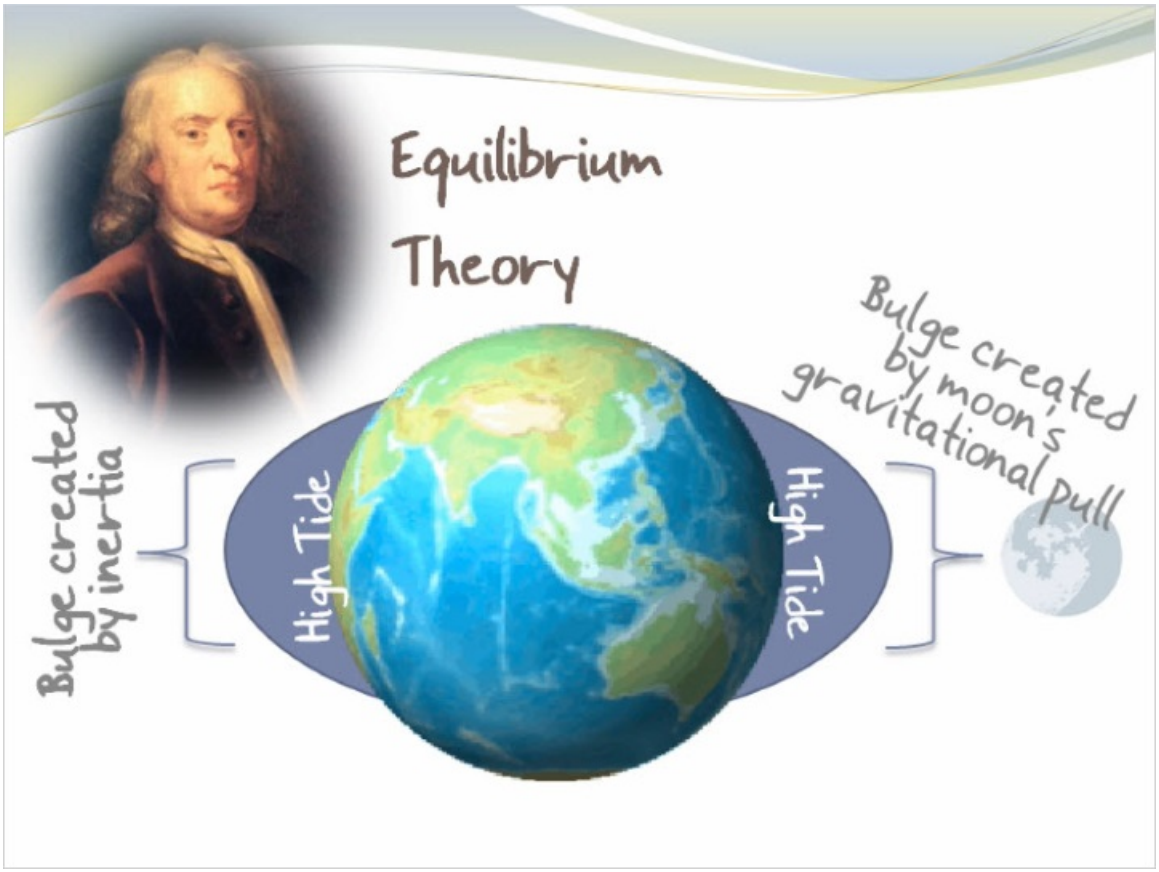

The scientist Isaac Newton proposed this simple method of tides, called the equilibrium theory. Of course, this theory would assume that all places are equal and the Earth is uniform. You can look at a map and tell that a coastline is not uniform. Also, this theory does not explain why some tides are extreme in places and others are not. It does not explain why some places have two tides a day and some have four. This model of tides really assumes that there is no land and an equal amount of ocean water around the globe.

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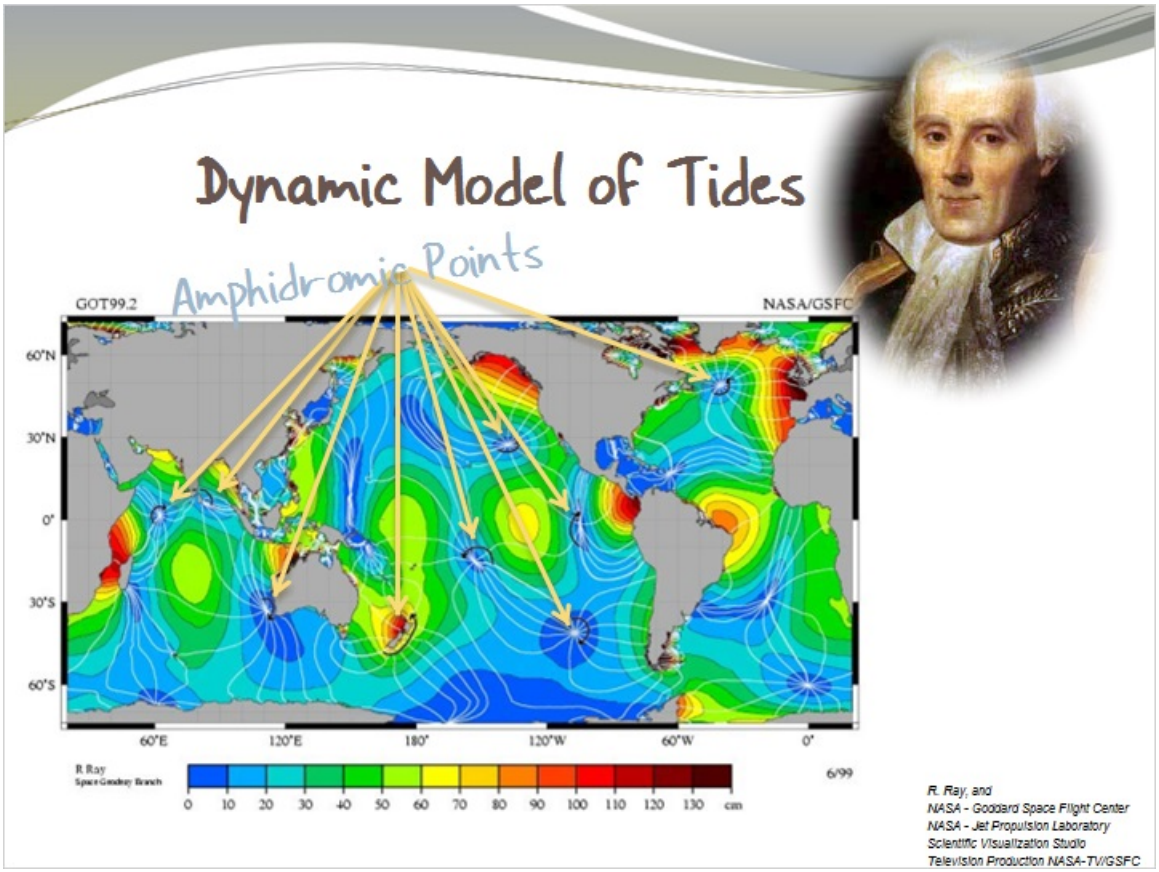

Another scientist, Pierre-Simon Laplace [pee-ayr si-moh la-plahs], modified Newton's theory. His model, called the dynamic model of tides, shows that there are not just two tidal bulges caused by the moon and the sun, but several. Newton forgot about major things like time of the month, shape of the ocean basin, and the Coriolis Effect that have effects on tides. Laplace said that tides occur around amphidromic [am- fi-drom-ik] points where water does not rise or fall with the tide. The tides that occur around these points act like standing waves. There is no vertical rise or fall of water near the point; however, away from the point there can be tidal motion, as the tides change throughout the day. Coastlines, therefore, that are farther away from an amphidromic point often experience greater differences between high and low tide heights.

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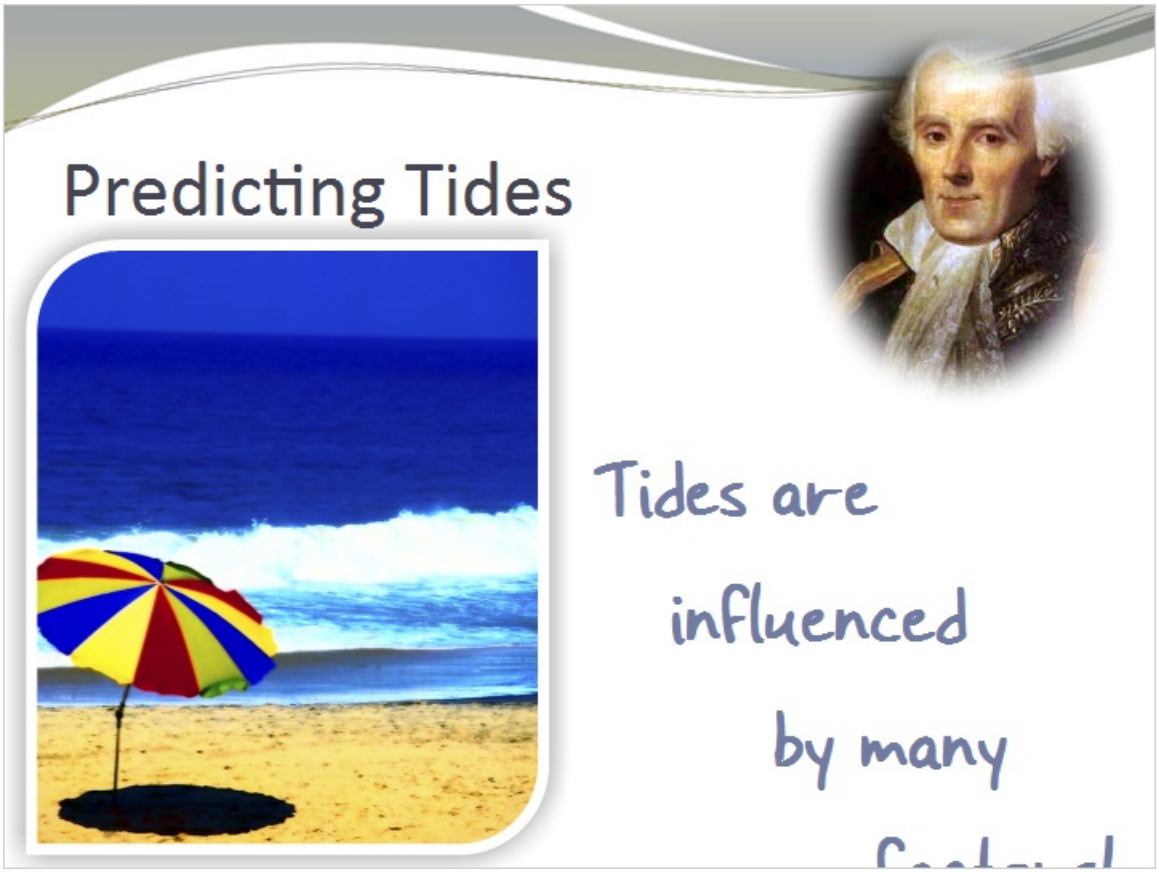

Of course, predicting the tides is very important for anyone planning on going to the beach, fishing, or boating! Miscalculating the tides can result in unwanted outcomes. Laplace proved that predicting the tides can be complicated, as the tides are influenced by many factors.

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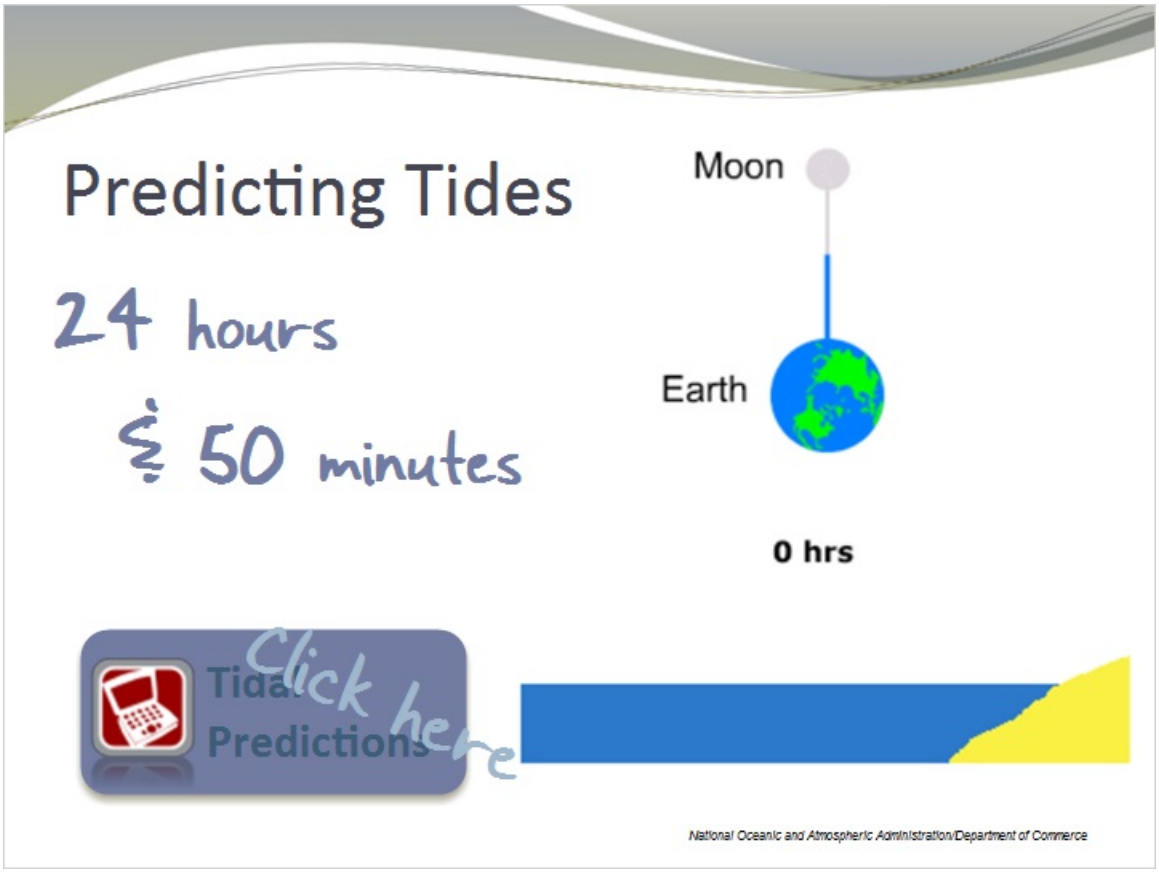

First, the tidal day is roughly twenty-four hours and fifty minutes. The major force that causes the tides is the moon, and as the Earth rotates, the moon revolves around the Earth. Consequently, the moon moves away and causes the Earth to move roughly fifty minutes to start the tidal cycle again. If high tide today is at 8 a.m., what time will high tide start tomorrow? If you said 8:50 a.m., you are correct! Of course, there are tidal charts for just about every coastal area. Click on the link shown to access the tidal predictions from the National Oceanic and Atmospheric Administration to predict tides across the United States. Try to find one closest to you.