Terrestrial Tides

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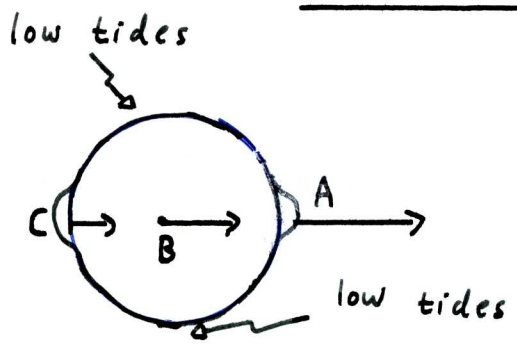

Maximum water bulges at A and C

Moon: ⟶

(Far away = 60 R_E)

A schematic representation of the tidal effects caused by the Moon. The arrows represent the acceleration of each point that results from the gravitational pull of the Moon.

The water at point A has a greater acceleration towards the Moon than does the water at point B; since the Earth is solid, the whole Earth moves with point B. Similarly, the solid Earth is moved away from the water at point C.

∴ Tides depend on the difference between the gravitational attraction of a massive body at different points on another body.

Two high tides occur daily, separated roughly by 12 ½ hours. Thus, the high tide on the side of the Earth that is nearer to the Moon is a result of the water's being pulled away from the Earth. The high tide on the opposite side of the Earth results from the Earth's being pulled away from the water. In between the locations of the high tides the water has rushed elsewhere, so we have low tides.

Since the Moon is moving in its orbit around the Earth, a point on the surface of the Earth has to rotate longer than 12 hours to return to a spot nearest to the Moon. Thus, the tides repeat every 12 ½ hours.

Though the Sun exerts the greater gravitational force on the Earth than does the Moon, the Sun is so far away ($d_S = 400\, d_M$) that its force does not change very much from one side of the Earth to the other. It is only the change in force that counts for tides.

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