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Many people recognize the correlation between the moon and the ocean tides, but few know of the correlation between the moon and atmospheric tides. The question of the moon's effects on tides found intense study, namely by Isaac Newton and Pierre-Simon Laplace. Isaac Newton's theory of gravity was implemented as the first proof of the correlation between the moon and ocean tides, approximately a century later this theory was used to predict the presence of lunar tides thanks to a quantitative theory made by Laplace regarding an ocean of a uniform depth on a spherical planet. An atmospheric tide is defined as " One of the tidal movements of the atmosphere resembling those of the ocean but produced mainly by diurnal temperature changes.

". In the atmosphere, temperature and humidity are also prone to diurnal variations. These tides can generally be measured by a combination of information including but not limited to: wind, barometric pressure, temperature, and even atmospheric density. We know that these tides are semidiurnal (meaning twice daily) the reason for this is because there are two primary causes of atmospheric tide fluctuation, gravitational pushing and thermal temperature changes caused by both the Sun and Moon. The effect of gravitational pushing is precisely known while thermal effects are not, due to the significant absorption of sunlight by the O3 (ozone) and water vapor in the atmosphere. However in this situation, because the frequency of gravitational pushing is well known, we can plausibly calculate the timing of the tides with reasonable certainty.

The moon has a semidiurnal effect on atmospheric tides that is largely similar to its effect on oceanic tides. The primary way that the moon affects these tides is gravitational. When observing the gravitational tides caused by the moon one will notice that there is a strong pull (a rising tide) of the side closest to the moon and a lack of pull on the opposite side of the earth causing the second gravitational tide. When studying the lunar effect on atmospheric tides you will find that these tides correlate with the oceanic tides almost exactly, and because of this, atmospheric tides were theorized but not actually proven until the invention of the barometer by Torricelli in the year 1643. When measuring the tidal magnitude (how big is it) many factors have to be taken into account, first one must consider the average gravitational force exerted by the Sun or Moon while also paying attention to the relative variation of this effect over the surface of the earth. The latter gives a distinct advantage of power to the moon on account of its relative proximity to earth. The Sun is a large contributor to the amplitude of the earth’s atmospheric tides. One peculiar aspect about atmospheric tides is that they are primarily solar semidiurnal.

Being aware of this fact helped Laplace correctly hypothesize that the solar dominance was primarily of thermal origin. Lord Kelvin was the first to prove this hypothesis in 1882 by collecting and analyzing data from thirty stations for diurnal, semidiurnal, and terdiurnal components. The paradoxical element of these tides is as follows: gravitational tides are semidiurnal because of the intrinsic semidiurnal character of the forcing, whilst they are thermally forced the forcing in primarily diurnal due to the rotation of the earth in correlation with the Sun. This led to the problem of finding out why the tides are still predominantly semidiurnal. Kelvin finally produced the hypothesis that the atmosphere had a free oscillation with a zonal wavenumber of 2 and a period of around 12 hours which is resonantly excited by the small diurnal component of thermal forcing. The reason for this is that solar heating only occurs during about half the day. As time passed from Newton’s discovery of gravitation it has been used to prove many things, the most interesting thesis proven with his discovery is that of semidiurnal tidal occurrences.

Laplace used this theory to dive in and correctly hypothesise the presence of atmospheric tides, setting the groundwork for Lord Kelvin proving and explaining how they work and affect the world around us, using data from stations created because of Laplace’s original hypothesis. Atmospheric tides are a major contributing factor in humans everyday lives, such as barometric pressure and even things as small but important as changes in temperature during the day. Although they may never have much notoriety the factors affecting them are very profound without which our world may be a very different place.