

The Study of the Relation of Earth, Moon and Sun by Tides

Kasira Wannasiri penypinn.x@gmail.com

Piboonbumpen Demonstration School Burapha University, 73 Saen Suk, Chon Buri, 20131, Thailand

Boonsong Henngam. nokkok234@hotmail.com

Abstract

The relation of Earth, Moon and Sun causes tides differently in each day. Tide levels affected by gravitational force that directly dependent upon the masses of objects and inversely to the square of the distance. In order to analyze this relation, I collected tide levels and the distance from *Tide Tables Thai Waters Mae Nam Chaophraya- gulf of Thailand and Andaman Sea 2015*. In the section1, I studied the relation of the Earth and the Moon I found that the difference between the highest – lowest tide levels depends on the moon's distance and the average tidal force of the Moon is 6.63×10^{18} N. While the section 2, the various Sun's distance in year influences the average tide levels in each month and the average tidal force of the Sun is 3.03×10^{18} N

Introduction

The Sun is the center of our solar system. The Earth and the Moon move around the Sun. The Earth orbits the Sun as the Moon orbits the Earth that occur the relation of Earth, Moon and Sun. This relation affects different phenomena on Earth, including day and night, phases of the Moon and tides.

Tides are the regular rising and falling of Earth's surface water. Tide levels fluctuate daily as the sun, moon and earth interact. Gravity is one major force that creates tides. Because orbits of the Earth and the Moon are not perfect circles leads to the change in distance, gravitational force and also tide levels.

Materials and Methods

Section1: The Relation between the Earth and the Moon (The distance from the Earth to the Sun is defined as a constant)

- Collected the data of the tides levels at Sattahip Bay, Thailand during July 16 – August 14, 2015for a month from *Tide Tables Thai Waters Mae Nam Chaophraya – gulf of Thailand and Andaman sea 2015*
- Collected the data of phases of the moon each day from <http://time.unitarium.com/moon>
- Summarized the data of tide levels and the phases of the moon in a line graph
- Collected the distance from the Earth to the Moon each day from <http://www.timeanddate.com>
- Calculated the tidal force of the Moon

Section2: The Relation between the Earth and the Sun (The distance from the Earth to the Moon is defined as a constant)

- Collected the data of the tides levels on every full moon days in 2015from *Tide Tables Thai Waters Mae Nam Chaophraya – gulf of Thailand and Andaman sea 2015*
- Collected the distance from the Earth to the Sun each every full moon days from <http://www.timeanddate.com>
- Summarized the data of tide levels and the distance from the Earth to the Sun in a line graph
- Calculated the tidal force of the Sun

Results and Discussion

Section1: The Relation between the Earth and the Moon

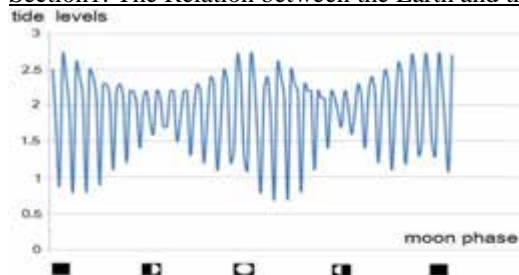


Figure1. The graph between tide levels and the phases of the moon

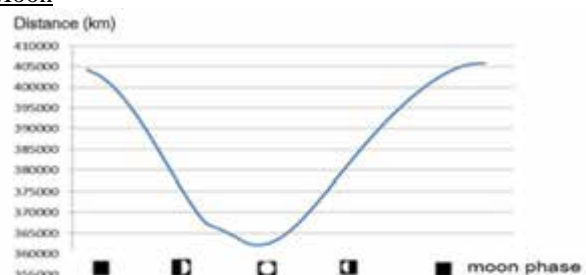


Figure2. The graph between the distance and the phases of the moon

Figure1 shows that in the new moon and full moon day, the difference between the highest – lowest tide levels is the greatest. In contrast, in the half moon days, the difference between the highest – lowest tide levels is the least.

Figure2 shows the difference between the highest – lowest tide -levels increase when the distance from the Earth to the Moon become lower. And Calculated from $F_t = 2GMm(R/r)/r^2$ the average Moon's tidal force is 6.63×10^{18} N

Section 2: The Relation between the Earth and the Sun

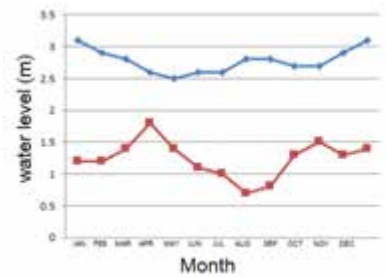


Figure 3. The graph highest – lowest tide levels in 2015

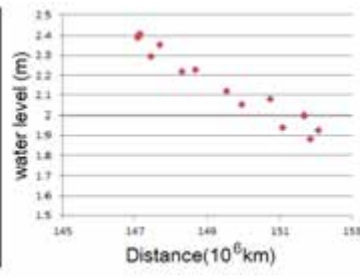


Figure 4. The graph between highest – lowest tide levels in 2015

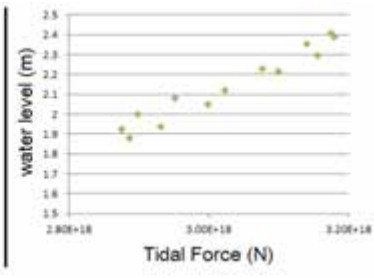


Figure 5. The graph between highest – lowest tide levels in 2015

Figure3 on July 30, 2015 has the greatest difference between the highest – lowest tide levels

Figure4 shows the average tide levels are direct variation with the distance from the Earth to the Sun

Figure5 shows the average tide levels are inverse variation with the Sun's tidal force And Calculated from $F_t = 2GMm(R/r)/r^2$ the average Sun's tidal force is 3.03×10^{18} N.

Conclusions

The tidal force is responsible for the tides. The distance and position between Earth, Moon and Sun on tidal force are important factors of tide level. The moon influences the highest – lowest tide levels in a day. While the Sun influences the average tide levels in a month. The moon is a major influence on the Earth's tide, but the sun also generates considerable tidal forces. From calculating tidal forces shows that the average Sun's tidal force is about 31.37% as strong as the average Moon's tidal force.

Acknowledgments

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