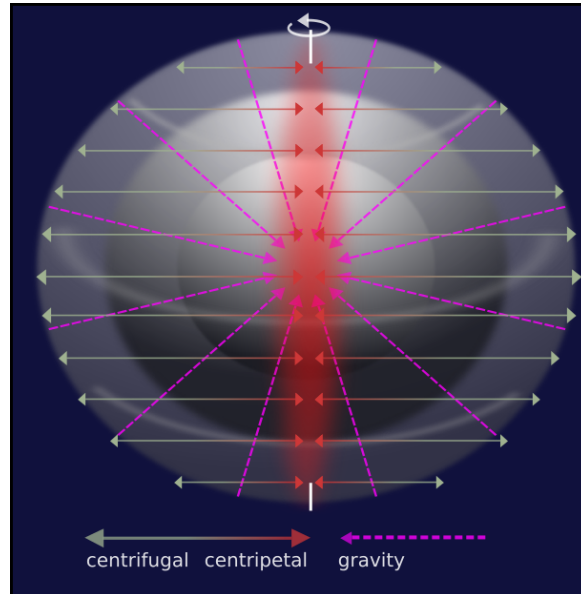


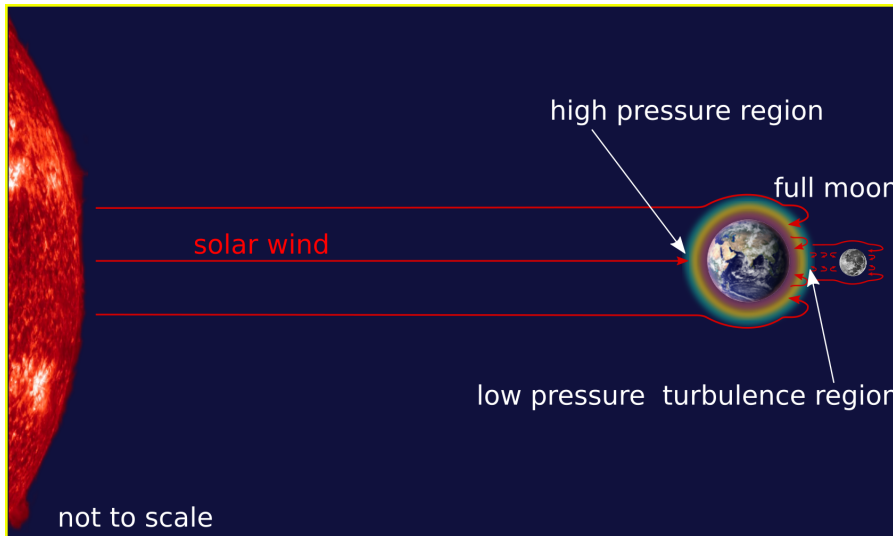
Wave and Tide Essay

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Wave Force of A Rotating Body



Location of The Moon and Tide

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Abstract

Current interpretation of tide is the rise and fall of sea levels caused by the combined effects of gravitational forces exerted by the Moon, Sun, and rotation of the Earth. However, the paradox is all falling body experiments show the fact that gravity is not a force of attraction. It has raised the question of how the Sun and Moon affect the tide when attraction force has nothing to do with it.

Wave is a fundamental action of the universe. Water waves when it is disturbed by internal or external force. And, there be higher water level when waves meet the shore.

I would say air and ocean currents are circulating in same pattern driven by centrifugal force and held down by gravity. Air has more freedom to move and less affected by landscape than water. Air is also driven by stronger centrifugal force. Certainly, ocean current encounters stronger ground resistance. The persistent direction of ocean current would cause the sea level to raise when encountered shore. However, gravity would not allow the water to go too high. Besides, there is interactions between air and water.

Additionally, I believe the flow of solar particles also affect wave and tide by interacting with gravity and centrifugal force. Alike water flowing around a rock, Moon would disturb the current of solar wind. Hence, wave and tide can also be affected by location of the Moon. High tide in low pressure region of Solar Wind, and low tide in high pressure region. It is governed by the rotation of the Earth and location of the Moon.

Furthermore, rigid layer of Earth is also under centrifugal force and gravity constantly. On top of it is the pressure of waving air and water. Earth's crust is viscous fluid riding on the fluidity of mantle. I would say it is also under the same centrifugal force and gravity. The constant uneven gravity and centrifugal compression made the primary driving force (with the reservation of Solar particles) of waving mantle along with crust, water and air.

And, there is external force coming from the Sun. I would not neglect the impact of solar particle and momentum on Earth's layers. Then, there is Coronal Mass Ejections. Despite the size of solar particle is too small to see, however, it's collected volume and momentum is massive. I suspect solar wind is also capable of disturbing rigid layer along with magnetosphere, atmosphere, and fluid. It is an external force kneading Earth dough. The magnitude could be larger than we think by far. Further study is recommended. Nevertheless, it remains to be proven.

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1 Introduction

Current interpretation of tide is the rise and fall of sea level caused by the combined effects of gravitational forces exerted by the Moon, Sun, and rotation of the Earth. However, the paradox is all falling body experiments show the fact that gravity is not a force of attraction, refer to Section 6. It has raised the question of how the Sun and Moon affect tide when attraction force has nothing to do with it. This study examines the driving forces of waving gas, liquid, and solid anew.

2 Forces of Waves

Wave is a fundamental action of the universe. Any internal or external disturbance will cause waves of all types. For example, ocean will react if air is disturbed and vice versa. Atmosphere will react if magnetosphere is disturbed and vice versa. It is the natural phenomenon of action and reaction. Fundamentally, action of an object will cause its surroundings to react, and vice versa. Here, the surroundings, or environment, is the absolute complement of an object, regardless of its size, from fundamental particle to large complex structure of galaxy. And, environment is the rest of the universe other than the object itself. The main focus here is regular forces that can disturb water.

- Gravity.
- Centrifugal-centripetal forces.
- Expansion and contraction of cold and hot zones created by energy from the sun.
- Electromagnetic force. It can induce plasma ionization.
- Solar Wind. Solar particle and its momentum.

3 Rotation, Wave, Tide, and Gravity

Figure 1 below is a screen shot of a dissolved effervescent tablet in a floating water sphere of Colorful Liquid in Space video by NASA astronaut Scott Kelly.[4]

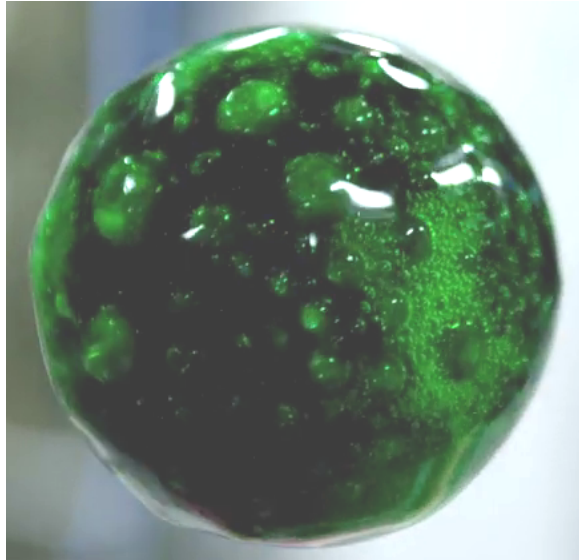


Figure 1: [Wave of A Rotating Water Sphere](#)
Courtesy of International Space Station

It shows surface waves of the water sphere when there is internal or external disturbance. Figure 2 below is a screen shot of Science off the Sphere-Rotating Sphere of Water video by NASA astronaut Don Pettit. [6]



Figure 2: [Rotating Sphere of Water](#)
Courtesy of International Space Station

It shows tealeaves, denser than water, are thrown outward and air bubbles, lighter than water, are squeezed inward along the rotating axis by centrifugal/centripetal forces. I believe it helps keeping light particles from escaping. Intuitively, high rotation rate would propel denser particles to break the bubble wall and escape. And, runaway rotation could break the bubble and scatter all elements in space.

Gravity maintains the layers of density and integrity of a body. Rotation of a body, on the other hand, creates centrifugal and centripetal forces, as depicted in Figure 3.

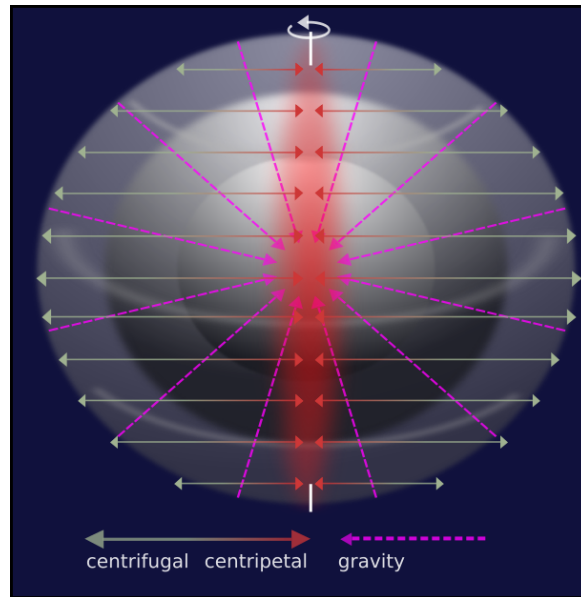


Figure 3: Force of A Rotating Body

Gravity compression on a structure is proportional to the mass density and reversely proportional to the distance from the center of gravity. The greater the density or closer to the gravity center, the stronger the compression. centripetal forces On the other hand, centrifugal force is proportional to the density and distance from rotating axis. The greater the density or distance from axis, the stronger tearing force.

Earth is composed of layers of complex densities. As the Earth rotates, the angular momentum is different from exosphere to core, layer to individual, and mass to location.

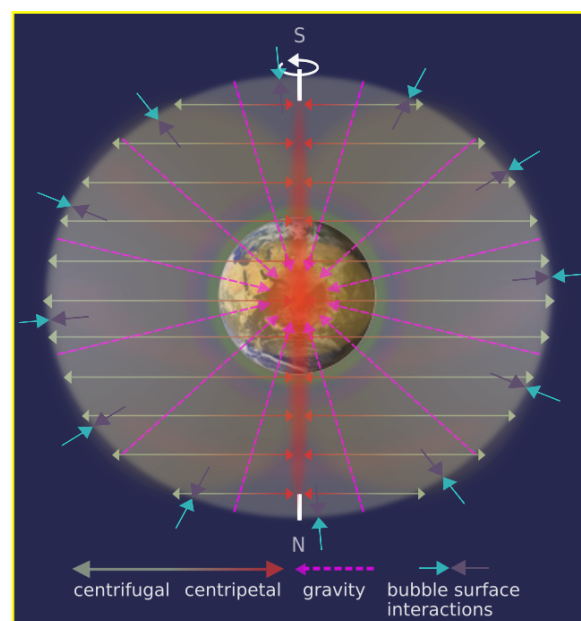


Figure 4: Force Differential of Rotating Earth

Inconsistent momentums create waves of many kinds, plasma, gas, liquid, and solid. The most visible and

understood wave by anyone is water. Steady rotation of a soft body creates long and slow waves. It will be high tide when long and slow water waves come to the shore, analogous to mild and regular tsunami.

Earth's air layer is further away from the axis of rotation than ocean. It is lower viscosity than water. Below is a comparison of trade wind[7] with ocean currents[5], Figure 5 and 6.

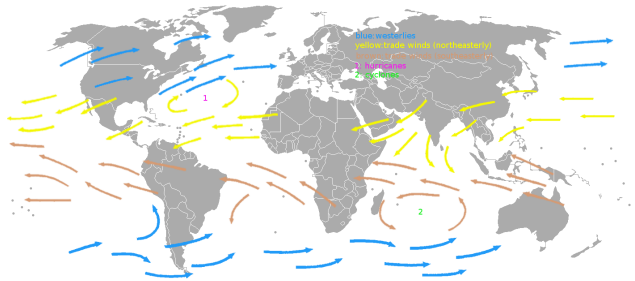


Figure 5: Trade wind

Courtesy of KVDP, wikipedia.org

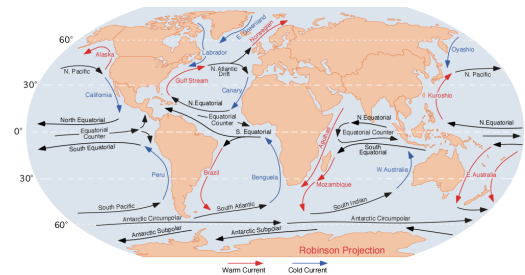


Figure 6: The ocean currents

Courtesy of Michael Pidwirny, Public Domain, wikipedia.org

I would say air and ocean currents are circulating in same pattern driven by centrifugal force and held down by gravity. Air has more freedom to move and less affected by landscape than water. Air is also driven by stronger centrifugal force. Certainly, ocean current encounters stronger ground resistance. The persistent direction of ocean current would cause the sea level to raise when encountered shore. However, gravity would not allow the water to go too high. Additionally, there is interactions between air and water.

Do you think there be tides if Moon didn't exist? I believe tide essentially is wave behavior. Suppose Earth's crust had the same viscosity of water, would waves travel through the ground in same pattern of water? Or, if Earth was a water globe? Is the rise and fall of water level wave or tide? Furthermore, is Galileo's theory of the tides far off?

4 Solar Wind, Moon, Wave, and Tide

I believe the impact of solar wind on all bodies of Solar System is understated. If it can stress the magnetosphere of the Earth, it is very likely to affect the atmosphere and liquid. Solar particles landed on Earth would delivery both mass and momentum. The physical impact of these invisible elements may not get their deserved attentions. However, it is a ceaseless and massive delivery. The impact is hardly dramatic. However, I believe there is more than meet the eye. I would say the flow of solar particles also affect wave and tide by interacting with gravity and centrifugal force. Additionally, alike water flowing around a rock, Moon would disturb current of solar wind. Hence, wave and tide can also be affected by location of the Moon. High tide in low pressure region of Solar Wind, and low tide in high pressure region. It is governed by the rotation of the Earth and location of the Moon.

4.1 Full Moon and Tide

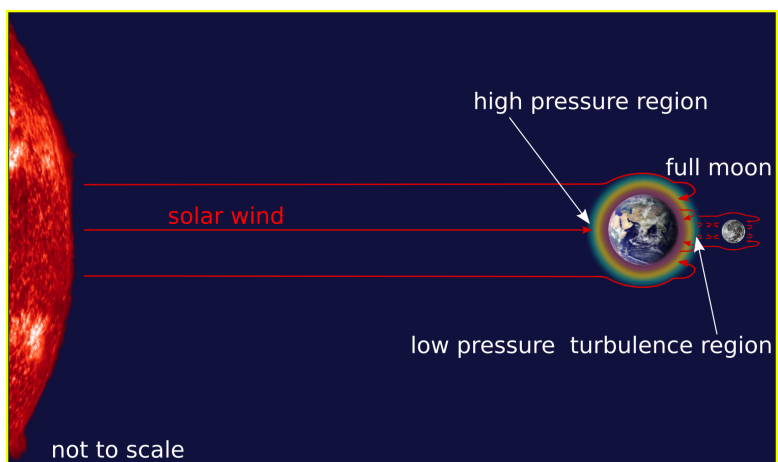


Figure 7: Full Moon and Tide

4.2 New Moon and Tide

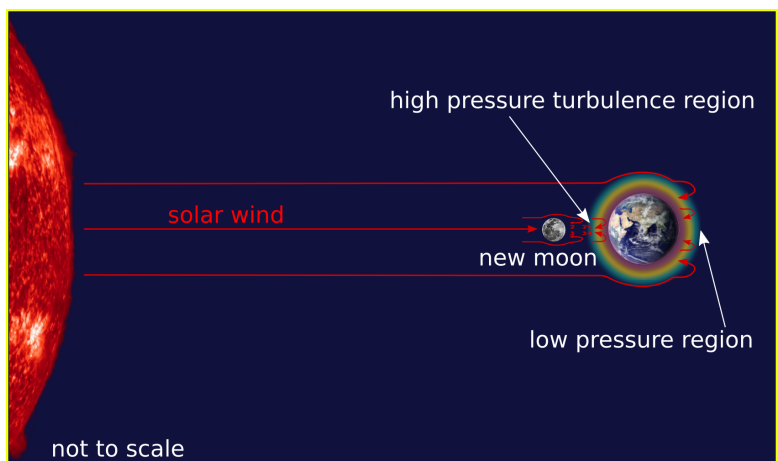


Figure 8: New Moon and Tide

4.3 Quarter Moon and Tide

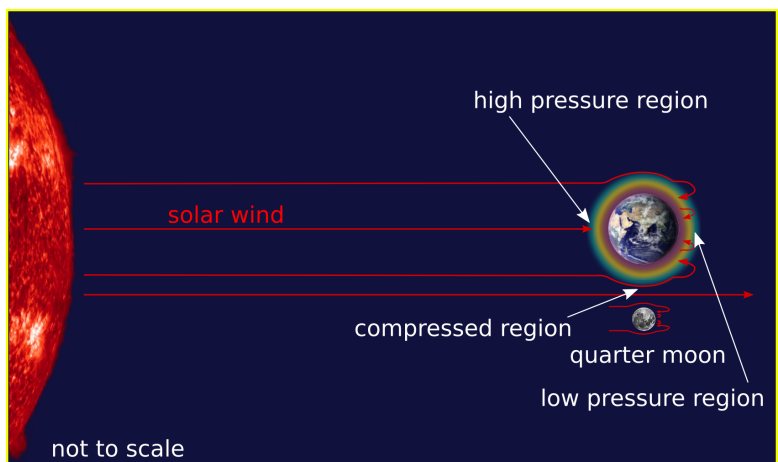


Figure 9: Quarter Moon and Tide

5 Rigid Layer

Our minuscule body and strength may have fooled us that Earth's crust is solid. However, it is quite soft in cosmic scale. Gas is thin fluid, fluid is thick gas, and solid is just rigid fluid. Crust is viscous fluid riding on the fluidity of mantle. Waves and currents of air and water are driven by the interaction of centrifugal force and gravity. Under this persistent interaction of both forces, I doubt it has no effect on rigid layer. Earth's lithosphere is unable to wave like water due to its rigid viscosity and composition. The result is cracking and snapping. I believe it is the centrifugal force making the Earth oblate spheroid. The constant uneven gravity and centrifugal compression made the primary driving force (with the reservation of Solar particles) of waving mantle along with crust, water and air.

And, there is external force coming from the Sun. I would not ignore the impact of solar particle and momentum on Earth's layers. Then, there is Coronal Mass Ejections(CME).[2] So far our attention is focused on the electromagnetic impact of CME. Consider its velocity can reach 3,200 km/s, and average ejected mass of 1.6×10^{12} kg. I would not understate its physical impacts on Earth. We've learned the consequence of incoming space rocks. Despite the size of solar particle is too small to see, however, its collected volume and momentum is massive. I suspect solar wind is also capable of disturbing rigid layer along with magnetosphere, atmosphere, and fluid. It is an external force kneading Earth dough. The magnitude could be larger than we think by far. Further study is recommended. Nevertheless, it remains to be proven.

6 Appendix - Gravity Is Not Attraction

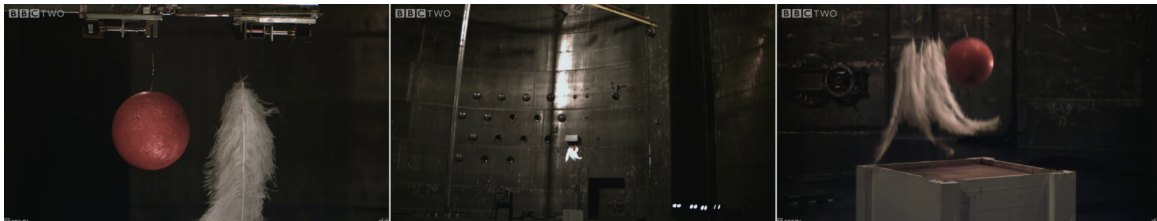


Figure 10: [Falling body experiment, Brian Cox visits the world's biggest vacuum chamber - Human Universe Episode 4 Preview - BBC Two \[1\]](#)

Gravitational acceleration is independent of mass, shape, size, surface, and distance. Contrarily, attracting acceleration is dependent on mass, shape, size, surface, and distance. Therefore,

gravity is not a force of attraction.[3]

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