How Much the Moon Affect the Tides of the Earth

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The moon affects our tides in many ways, but the real question was how much and what was the ratio of change if the moon was a different mass or was a different distance away from the Earth. Our hypothesis was that the ratio is linear. We hypothesized that if the moon was twice as big, then the force would be twice as strong. Then if the moon was twice as far away, then the force would be halved. We believed there was a chance that the ratio was exponential, which is why we searched for an equation. To make our results more accurate, we also tried to find how much the sun affects the tides too. We needed the information about how much the sun affects the tides because the tides are also affected by the sun. It is common knowledge that the sun affects the tides half as much as the moon but we wanted exact results. We made a program with an equation that can find the exact amount of force is affecting the tides by both the moon and the sun. We also need to keep in mind that the acceleration on the different "sides" of the Earth will be different. The side of the Earth facing the moon will have a higher acceleration than the side facing away from the moon.

We wanted to find how much the moon affects the tides and how different the results would be with different scenarios. We also need to study the solar tides because even though they are about half as powerful as the lunar tides, they still play a crucial part in the tide changes.

After finding a formula to find the force on the tides, we needed a computer program to put in values so we would have more accurate results. We programmed our code into Visual Studios. Our program allows the user to put in the various values for the many factors to the force of the tide. We also have the program state what the actual values are so the user knows the difference of their inputs from the actual values. This allowed our research to be a little more organized and allowed us to keep track what we were doing.

What we found was that the moon's mass is jointly proportional to the force on the tides and the distance between the moon and the earth is inversely proportional to the force on the tides. These results were as expected but we still experimented with the many possibilities. All of the results stayed constant with the proportionalities. The solar tides work the same way as the lunar tides. The force of the sun on the tides is just a bit lower than the force of the lunar tides. The sun is much bigger than the moon, but its distance from the earth makes the solar tides weaker. Since the sun is thousands time bigger than the moon, the distance between the moon or sun and the earth affects the tides more than the mass of the moon or sun. The moon's acceleration on the tides on the moon's side is about 1.128E-6. On the far side, it is about 1.073E-6. The sun's acceleration on the tides on the sun's side is about 5.053E-7. On the far side, it is about 5.052E-7.

What surprised us was that the acceleration was much smaller than we thought it would be. We didn't expect that even a very low acceleration can affect the tides so much. So we conclude that you need a lot of force to make even a small acceleration. On the other hand, the acceleration doesn't need to be that high to affect the tides. We decided then that the chances of even humans noticing the tides changing because the moon is spiraling away are very improbable. We decided to explore this problem because the moon is moving away from the

earth so we wondered would there be noticeable results in the tides. We decided that there should be no worry about the changes from the moon distancing itself from us because the changes will be too small to notice.

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