

Science AMA Series: I'm Stephen Gill, an oceanographer and chief scientist with NOAA's Center for Operational Oceanographic Products and Services. With a full moon and a perigee on September 28, I'm he

NOAAgov ¹ and r/Science AMAs¹

¹Affiliation not available

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Abstract

Hello! I am Stephen Gill, an oceanographer with NOAA. I've been studying sea level and tides and currents for the past 40 years. My office within NOAA is responsible for providing near real-time tides, currents, and Great Lakes water level information. These data are quality controlled to compile long-term archived data sets that can be used to produce tide and tidal current predictions among other important products such as tidal datums and sea level trends. As you may know, tides vary with the changes in the alignments of the Earth-Moon-Sun system. In general, the closer the alignment of the three bodies, the greater the tides are. One special alignment that occurs a few times each year is the perigean spring tide and we are currently experiencing one of these events right now. September 28 is especially noteworthy because Perigee and the Full Moon occur within a few hours of each other on this day, resulting in high tides being among the highest and lowest for 2015 in many coastal locations. I'll be here from 1:00 p.m. ET (10 am PT, 5 pm UTC) to 3:00 p.m. ET to answer your questions on perigean spring tides. For more information about me, my bio can be found online at <http://oceanservice.noaa.gov/news/sep15/reddit.html>

[REDDIT](#)

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ABSTRACT

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Good day to you Stephen & thank you for joining us for this AMA!

My question I pose to you is: With the amount of solid water on earth, and the increasing threat of global warming, what predictions can we draw on the maximum rise and fall of future tides under similar circumstances? Are we even able to make reasonably accurate predictions given current technology and understanding?

Thank you for the consideration, and give my personal regards to all at NOAA, you guys are doing amazing work over there.

[AK-Arby](#)

Climate change itself won't change the tides caused by the earth-moon-sun system. The effects of climate change, such as relative sea level rise, may change the elevation of the tides relative to the seashore. We may see more regular "nuisance" flooding because the tides ride on top of sea level. See a recent picture here <http://oceanservice.noaa.gov/facts/nuisance-flooding.html>

What is the biggest threat to our oceans and why? What can I do on an individual level to help?

[fawada28](#)

Pollution from all sources, marine debris, and ocean acidification are three major threats. We have

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some additional background about pollution on our website at oceanservice.noaa.gov/facts/pollution.html

How do the alignments of the sun, moon, and Earth actually interact with our oceans?

[Silznick](#)

The oceans of the world respond by moving back and forth in their ocean basins in sync with the gravitational attraction of the moon and sun on a daily basis. The tides are due to both the moon and the sun with the sun's tide producing force a little less than half of the moon. For this event, the maximum ranges of tide occur a day or so after the time of perigee and the full moon, because the oceans have inertia and can't respond instantaneously to the alignments. The moon is closest to the earth in perigee - thus more gravitational attraction. During a full moon, the sun, earth and moon are in alignment with the sun and moon acting together to cause more gravitational attraction and greater tides. When we have a perigee and full (or new) moon at the same time, then they work together to cause even larger tidal ranges. This event will especially be noticed on the East Coast of the U.S., but not so much in the Gulf of Mexico or the West Coast.

do these abnormal tides change the behaviour of some fish species?

[beheldcrawdad](#)

I'm not a marine biologist, so I can't answer your question specifically, but this event should not affect fish species any more than they normally would be affected during full moons.

You say Sept. 28 is noteworthy because full moon and perigee occurred a few hours apart. But, didn't the close alignment of sun, earth, and moon during the eclipse also contribute to especially high tides? Or, did that only make tides highest at the equator instead of at low latitudes with no change in highest magnitude?

Edited for additional question and clarity.

[dansvans72](#)

This is a fairly rare alignment of the earth-moon-sun system because the three bodies are in 3-dimensional alignment; that is, they are all on the same planar surface in space. The orbital planes are aligned with minimum declinations relative to each other, and this causes slightly more gravitational attraction. The tide producing forces are theoretically stronger at the equator, but the ocean basins respond independently and larger tidal ranges are often found in higher latitudes.

For the tide to rise, work must be done, this is the force of gravity. How does this expenditure of work affect to planetary trajectory of foreign bodies, such as the moon?

Does it draw it closer or slow down its rotation at all?

[SuperSexi](#)

The earth's rotational speed is slowing down due to the frictional effect of the oceanic tides with the days getting longer by about 1/500 of a second each day. In addition, the moon is very slowly getting further away in its orbit at a rate of about 2 inches per year. That will slowly decrease the tidal range and it will change the timing of the tide.

Hi, and thanks! Just a basic one: do you often hear from surfers in terms of supplying them information? Is your line of work essential to the professional surfing scene?

[Teh_Mongoose](#)

Any surfer who has ever checked the tide in the morning to see how it will affect the waves has come to us for info! We have tide gauges all over the country.

Hello Stephen!

So your talking about patterns, is oceanography witnessing change maybe due to global warming? What are the predictions ?

Any good sides?

I have to say though, you have my dream job A few personal questions if you don't mind? Did you always want to do that? How was school? Do you really have to be good in science & maths?

Was a pleasure to see an oceanographer A(M19)a hope it grows bigger ;) Cordialement

[Skudx](#)

During my career, oceanography has greatly changed in two fundamental ways: the first is the increase in satellite oceanography. We can view changes to the ocean and earth from space never thought possible with using only ships and ocean instrumentation. The second is hydrodynamic modeling and forecast modeling. Computer technology has advanced rapidly such that very complex numerical models are now employed to understand and predict the ocean much more accurately than ever before. I've always wanted to be a scientist, first a meteorologist but then changed to oceanography while in college. You need a very strong background in science and in math to really get into it. Take an earth science course if you can.

Do these dramatic tides affect certain species greatly.

[pfunny](#)

Any species impacted by coastal flooding and extreme low tides will be affected, including humans!

What is the average magnitude of this effect? Obviously there are going to be a number of extraneous factors but can we say in general that tides along the equator will be .xx m bigger?

[NorthernerWuwu](#)

In most places, the high tides could be higher and the low tide lower by several tenths of a foot from the tides at a normal full moon. This event causes increased ranges of tide each day. Coastal flooding is a concern for the high tides, but mariners need to be aware of extreme low tides as they navigate in shallow water. Tides are theoretically higher at the equator.

To those not familiar with this area, can you ELI 10 us your topic?

My other question is that has currents and/or tides been stronger since the past (and are currents and tides the same or different)?

[balne](#)

About three or four times a year (in the spring and the fall), the new or full moon coincides closely in time with the perigee of the moon—the point when the moon is closest to the Earth. These occurrences are often called 'perigean spring tides.' The difference between 'perigean spring tide' and normal tidal ranges for all areas of the coast is small. In most cases, the difference is only a couple of inches above normal spring tides. For the second question: The tides and currents aren't changing over time. What's changing is the interaction of the tides with the coast because of the changing sea level and changes in the coastline (erosion, changes in the sea floor, changes in inlets, etc.)

What are two things you wish more people understood about your work?

[dduncombe](#)

One of the things I always like to say is that we're working for the American public, so we take great joy in interacting in forums like this one! We're also here for the long-term and will measure sea level change for as long as possible. We work 24/7 to quality control real-time data and respond to events such as tsunamis and storm surges.

Hello Stephen, my question is: In the very far flung future when the moon is further away from the Earth how will the lessening and eventual disappearance of tides affect life on Earth (presuming Earth is still capable of supporting life)?

[warrenXG](#)

Even if the moon disappeared, we would still get tides due to the sun!

Hello Stephen!

I'm living close to the sea for the first time, and I'm still getting used to the moon/tides relationship.

My latest curiosity:

The moon comes up about 55 minutes later every day-- this I've known and been familiar with for a long time, and there's not TOO much variation.

But the tides... Sometimes the high tide happens as little as 31 minutes after yesterday's high tide. For several days in a row. Then, for a couple of days, like paying back the borrowed minutes, suddenly there's over an hour between one high tide and the corresponding high tide the next day.

So it seems the tide is less regular than the actual moon. If the tides are caused by the moon, why on Earth does this greater variability happen?

I'm on the Atlantic coast of Brazil, by the way.

[smackson](#)

If the tides were only caused by the moon they would be very regular indeed. But they are also caused by the sun. The tide producing forces of the moon and sun are in alignment at new and full moons and out of sync at other times. This affects the daily timing of the tide at any given location. In addition there are other complicating factors due to the monthly and yearly changes in the declinations of the moon and sun (that is, how high or low they are in the sky), and these changes also affect the timing of the daily high and low tides.

Los Angeles here (Huntington Beach); I'm at the beach almost every weekend during the summer / fall and I noticed particularly strong currents this year (long shore and rip), compared to the last few years. I've also been noticing a lot more marine life along the beach during low tides. Is there an explanation or am I just going crazy?

[Horsesaredumb](#)

Changes in weather (and accompanying winds) vary from year to year, and that impacts waves in the Pacific Ocean. So, one summer you could have larger waves compared to another summer, and larger waves tend to drive stronger rip currents and longshore currents.

Is the alignment of the celestial bodies and their impact on tidal levels cause for concern?

Is this an occurrence that could potentially be amplified drastically, say, in 50 - 100 years when tidal levels are already predicted to rise?

[EpicDermis](#)

This alignment is cause for concern as we notice minor coastal flooding in low-lying areas when they occur. As sea level rises in the future, the minor "nuisance" flooding will become more frequent and more significant with more higher tides and longer periods of inundation.

Does any of your work in the Great Lakes translate to other large bodies of water around the world? Also, as a high school student interested in oceanography, what advice could you give about pursuing a career in oceanography or similar fields?

[trunkyG](#)

The largest lakes of the world, like Lake Superior, do have a response to tidal forcing but the tidal amplitudes are too small (a few centimeters amplitude) to be noticed and the lake levels respond much more to meteorological forces, like wind and rain. This "supermoon" event will not significantly affect lake levels.

My mother lives in the Upper Peninsula of Michigan near the Lake Superior shore. Last night as she was watching the lunar eclipse she noticed that as the moon fell into our shadow the brisk winds that had been occurring that evening/night dropped off and there was little wind at all. As soon as the moon began to leave our shadow the winds picked up again. What might have caused the winds to die down and pick up again? Was it related to the moon affecting Lake Superior and thus the wind? Or does the moon have a strong enough pull to effect the wind all by itself?

[Mictlantecuhtli](#)

There's no link between the moon and the wind anywhere! Lake Superior has a very small tide (a few centimeters) but it's not noticeable.

What is the biggest predicted tide miss? Are there any famous stories in your profession about getting it totally wrong and what happened?

[occamsracer](#)

In terms of getting it right, accurate tidal predictions were used to help plan the Normandy Invasion in WWII as the range of tide is quite large along that coast - so timing was everything. I've personally missed-timed the tide while working in Long Island Sound when my Boston Whaler was left high and dry on the beach when the tide went out, so I had to wait until the next high tide to get home.

With the super blood moon, what were the changes if any in the tides?

Dos, is there a recurring short term in waves? It seems every seventh wave it is the biggest, but my friends and family think I am a nutcase. So is there anything like this?

Thanks man

[Penis_Balloon_Dildo](#)

The term super moon is not a scientific term, but a cultural one used to describe the event when a full moon occurs very close to the time of perigee. The more technical term is a perigean spring tide or a perigee syzygy tide. Due to the exact alignment this time, there is a total lunar eclipse with the moon on

the opposite side of the earth from the sun and during which the moon doesn't totally turn dark, but turns reddish in color as the sunlight is refracted through the earth's atmosphere and onto the moon. The phenomenon when one wave is higher isn't related to the tides, and it's not necessarily every seventh wave. It has to do with what is sometimes called "surf beat" - in other words, the interaction of waves with differing lengths and time periods.

I just graduated this summer with a bachelor's degree in Oceanography from the University of Southampton. Do you have any words of advice for recent graduates looking to follow a similar path to yourself?

[McDDDDDD](#)

Get involved in research and volunteer wherever you can. Having that research experience is important. and that could be anything from learning how to take measurements to knowing how to analyze data.

Hi! What is the easiest way to help the oceans right at my own home?

[Crazybonbon](#)

There are actions you can take, every day, to help protect our planet. Check out our infographic for some ideas: <http://oceanservice.noaa.gov/ocean/earthday.html>

Stephen, my question is a little different.

I want to become an Oceanographer, but have no idea how to begin.

Woods Hole is a bright but distant dream of mine.

What do I do?

[DemonCipher13](#)

Get a good foundation in math, statistics, and science. Take an earth science course!

How often does the Perigee and Full Moon occur together? Are there any ocean organisms which have their life stages tied into this cycle?

[snarlsdarwin](#)

The perigee and full moon occurs once every 14 months, but the alignment with a lunar eclipse only occurs every 18 years. I'm not a marine biologist, but in general organisms do respond to changes in the tide and currents. Fishermen often rely on our data to help know where and when to fish.