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## Science AMA Series: We're NASA scientists. Ask us anything about the science of the Aug. 21 total solar eclipse!

NASASUNEARTH [R/SCIENCE](#)

**Edit 12:46 PM ET: We are signing off! Thanks so much for all your questions. Remember to check out [eclipse2017.nasa.gov/safety](#) to make sure you are ready to watch the eclipse safely! Happy eclipse watching!**

**Edit 11:04 AM ET: We're live!**

On Aug. 21, 2017, all of North America will have the chance to see a partial solar eclipse. Along a narrow, 70-mile-wide track called the path of totality, the Moon will *totally* block the Sun, revealing the Sun's comparatively faint outer atmosphere – the corona. Total solar eclipses like this are a rare chance for solar scientists to study this region of the Sun, since we can't ordinarily see it from the ground or with satellite instruments. The sudden blocking of light also gives Earth scientists a rare chance to track how Earth's atmosphere responds to the Sun's radiation. Find out more about NASA's eclipse science (and how to watch the eclipse) at [eclipse2017.nasa.gov](#).

**Noah Petro**

I first became interested in Geology as a student at Fox Lane High School in Bedford, NY. It was while I was a student at Bates College that I was introduced to the field of planetary geology. Following my PhD work at Brown University I came to NASA Goddard as a NASA Post-Doc.

**Alexa Halford**

I am a contractor at NASA Goddard. Throughout my education I have been lucky to work at JPL NASA looking at Uranus's moons and study Saturn on the Cassini mission at the South West Research Institute. Today I stick a bit closer to home studying the Earth's magnetic field and its space weather phenomena.

**Mitzi Adams**

I am a solar scientist for NASA's Marshall Space Flight Center (MSFC), where I study the magnetic field of the Sun and how it affects the upper layer of the solar atmosphere, the corona. With a professional interest in sunspot magnetic fields and coronal bright points, friends have labelled me a "solar dermatologist".

**Bill Cooke**

The head of NASA's Meteoroid Environment Office, I help NASA in placing meteoroid protection on spacecraft and construct meteor shower forecasts for unmanned space vehicles and the International Space Station. While a graduate student at the University of Florida, I worked on instruments flying on board balloons, the Space Shuttle, Giotto (European mission to Halley's Comet), and LDEF. After obtaining my PhD in Astronomy, I came to work at Marshall Space Flight Center as a member of the Space Environments Team, where I became an acknowledged expert in meteors and meteoroids. I am one of the many NASA astronomers interacting with the public on the upcoming solar eclipse.

**Jay Herman**

I am an atmospheric scientist working on several projects. Two of them are of interest to the eclipse or other atmospheric questions. 1) The Pandora Spectrometer Instrument that measures the solar spectrum and derives the amount of trace gases in the atmosphere, such as ozone, nitrogen dioxide, and formaldehyde, and 2) The DSCOVR/EPIC spacecraft instrument that observes the entire sunlit globe from sunrise to sunset from the Earth-Sun Lagrange-1 point (1 million miles from earth). We derive both atmospheric and surface properties from EPIC, and we will see the Moon's shadow during the upcoming eclipse.

**Guoyong Wen**

I am an atmospheric scientist interested in the way radiation passes through the atmosphere. The experiment we are planning to

perform is a combination of theory and measurements to see if they match. For this purpose we are using an advanced radiative transfer calculation in three dimensions and measurements from the ground and a spacecraft. Hopefully, the calculations and data will match. If not, we can learn about whatever may be missing. The result will be improved calculation capability.

*Edit 9:18 AM ET: Added Jay Herman's bio*

*Edit 11:11 AM ET: Added Guoyong Wen's bio*

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#### CORRESPONDENCE:

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Hello! Thank you all for doing this AMA!

I understand that the phenomenon of "Shadow Snakes" during the penumbral phase, is not thoroughly understood by science quite yet.

How can amateurs go about gathering high-quality, calibrated, useful photos and video of this phenomenon that can be re-used by scientists modelling the phenomenon?

What information should we include in the photos and videos?

Are there compelling hypotheses for the explanation for the phenomenon, other than atmospheric cline effects?

Thanks!

[Bardfinn](#)

You are talking about shadow bands. Yes, you can use a box, approximately 18 in x 12 in, tape shut one side, leave the other side open so you can slide your camera into the box. On the top of the box, place a piece of tracing paper that is larger than the box (you want to tape it on) and outline the box. Move the paper off the box and cut out the top, leaving about a half inch on the sides. On the paper, draw lines vertically and horizontally that are 10 inches apart. Now you need to draw a line with an arrow that will point toward north, label it north, be sure that the arrow can be seen from within the box. You need to also draw a line indicating the direction from which the Moon's shadow will come. Now locate the middle of the box and place the backside camera (not the selfie side) at the center and orient the camera with its long side parallel with the long side of the box. Tape the tracing paper to the top of the box. Start the camera video about three minutes before totality and let it run to about three minutes after totality. Send me questions and the video. [mitzi.adams@nasa.gov](mailto:mitzi.adams@nasa.gov) --MA

Hello! Thank you all for doing this AMA!

I understand that the phenomenon of "Shadow Snakes" during the penumbral phase, is not thoroughly understood by science quite yet.

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What information should we include in the photos and videos?

Are there compelling hypotheses for the explanation for the phenomenon, other than atmospheric cline effects?

Thanks!

[Bardfinn](#)

The best you can do is use a high quality digital camera in movie mode with a fairly high frame rate. That way anything you see with your eyes will be captured by the camera. JH

Dumb question....do animals suffer eye damage during a total eclipse? Do they even care to look into the sky? The reason I ask is because I have a couple horses that live outside 24/7 and I don't want to be slapped with a major vet bill on the 22nd.

EDIT: I'm sad that's the best question I have for NASA scientists. Here's a slightly better one maybe: How did previous cultures perceive total solar eclipses? Do we live in the only time where humans have ever cared to study them, or did previous civilizations attempt to understand them scientifically?

[Poopnuggetshnitzel](#)

I have experience with horses during a total eclipse! Animals have enough common sense to not look at the sun during the solar eclipse. As far as horses, I saw the last eclipse in the lower 48 back in 1979 from a pasture filled with horses. They could not figure out what was going on and ran around the pasture aimlessly, but they did not suffer any injuries, so I think you're safe from any eclipse-related vet charges! - Bill

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[Poopnuggetshnitzel](#)

If they look at the sun, they will have the same damage as do people. However, the animals have not read the newspaper to know that there is an eclipse going on, so they will not look.

The ancient civilizations definitely looked at eclipses. The knowledge about upcoming eclipses was closely guarded as a form of power over the population. The occurrences were mapped out by trial and error of long periods, but they did not understand the science. JH

Dumb question....do animals suffer eye damage during a total eclipse? Do they even care to look into the sky? The reason I ask is because I have a couple horses that live outside 24/7 and I don't want to be slapped with a major vet bill on the 22nd.

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[Poopnuggetshnitzel](#)

As an answer to your first question, I'm definitely not an expert in animal behavior or biology but I would assume they would know not to look at the Sun directly as they seem to know not to look at the Sun normally. Perhaps a Vet or expert in animal behavior is reading and might be able to comment better about this? -AH

I live in Cheyenne but drive to Torrington,Wyo every day. 12 days out and the tensions are rising. There are fields being cut and spaces being made for the incoming barrage of visitors. Definitely

exciting for this community. There's an old farmer I deliver to who said she's lived through a few solar eclipses. She said the weirdest change is the chickens response. Chickens will head to bed as it gets dark and after their 140sec slumber they wake in complete disarray. They get very loud and extremely active for about 20min and then is back to usual "chickening". Have you guys ever seen or heard of events like this disrupting animals?

[Reyes307](#)

Hi, Yup animals definitely react to the eclipse so make sure to take a moment during totality to look around and see how animals around you are behaving. -AH

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[Reyes307](#)

Yes, I experienced this in the last eclipse I watched. It's eerie. JH

Total solar eclipses like this are a rare chance for solar scientists to study this region of the Sun, since we can't ordinarily see it from the ground or with satellite instruments.

Is there really no way to simulate a total solar eclipse using a telescope and an opaque round object that blocks all but the corona of the Sun? Why is it the Moon in particular that has to block the Sun in order to see the corona for research purposes?

[Celery\\_Stick\\_Figure](#)

Hi, We do use an opaque round object to block out the Sun. However, it is incredibly difficult to make an occult disk that would only just cover the Sun as the Moon does during the Eclipse. - But We are working on ways to try to better recreate these phenomena so that we can have the same quality of data on a regular basis. You can read more about that here

<https://www.nasa.gov/feature/goddard/nasas-beach-ball-coronagraph> - AH.

Is seeing a 100% total solar eclipse really that different than seeing it at 95%? Is it worth the 6 hour one way drive?

[MeowMixSong](#)

The difference between a 95% eclipse and a 100% eclipse is literally the difference between day and night. With any partial eclipse, you don't experience the "awesomeness" of totality. It's hard to put into words, but once you experience a total eclipse, you understand the difference. At 95%, you will barely notice anything going on -- just some slight dimming of daylight. - Bill

Is seeing a 100% total solar eclipse really that different than seeing it at 95%? Is it worth the 6 hour one way drive?

[MeowMixSong](#)

It is worth the six hour drive. Totality is spectacular. JH

What are some cool things to watch for during the eclipse that I can point out to my children? Simple things like tree shadows etc. ?

[PM MeMyPassword](#)

In the partial phases, the shadows of leaves should show you little crescent suns. There are things called shadow bands, which if you're looking at a white surface, should be little waves of light. During totality, you will see the brighter stars and the planets as well as the sun's corona. The sun will look like a black hole surrounded by a fuzzy ring of light, which is the corona. If you're up high, like in the mountains, or if you have mountains in the distance, you may see the moon's shadow approaching or leaving you depending on whether you are looking west or east. - BC

Will you guys be uploading any pictures from the path of totality? Or even, perhaps, livestreaming the view from somewhere on the path? I was considering driving to get in view, but from where I live I get somewhere around 97.7% so I figured I'd save the gas.

edit: I'm easy to convince, I'm going to give this road trip a shot!

[X-Yz](#)

Hi, Yes! NASA will have a live stream of the eclipse and activities around the nation on August 21st. You can watch the live stream here <https://eclipse2017.nasa.gov/eclipse-live-stream> -AH

Will you guys be uploading any pictures from the path of totality? Or even, perhaps, livestreaming the view from somewhere on the path? I was considering driving to get in view, but from where I live I get somewhere around 97.7% so I figured I'd save the gas.

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[X-Yz](#)

Being that close to the path of totality, it would be a crime not to experience it for yourself. Carpool so that you reduce your carbon footprint! -- MA

Will you guys be uploading any pictures from the path of totality? Or even, perhaps, livestreaming the view from somewhere on the path? I was considering driving to get in view, but from where I live I get somewhere around 97.7% so I figured I'd save the gas.

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[X-Yz](#)

Yes. If you go to NASA's DSCOVR website, <https://epic.gsfc.nasa.gov/>

You will see the shadow of the moon move across the earth in a series of images.

Hi NASA! Thanks for doing this AMA!

I've noticed significantly more "hype" about this solar eclipse over any other solar eclipses that have happened in the past. Do you attribute this to an increase in public interest in science or is there something special about the one that's about to happen?

[HansSulu](#)

This eclipse is the first one since 1918 in which the moon's shadow cuts across the United States, which is fairly rare occurrence. Practically the entire country is within a day's drive of the path of totality, so that kinda makes it a pretty big deal! - BC

Hi NASA! Thanks for doing this AMA!

I've noticed significantly more "hype" about this solar eclipse over any other solar eclipses that have happened in the past. Do you attribute this to an increase in public interest in science or is there something special about the one that's about to happen?

[HansSulu](#)

Hi, This is incredibly exciting as it's in our own backyard, but also because of all the amazing data (both done by scientific researchers and citizen scientists) that will be collected. We believe that this will be the best-observed eclipse! - AH

Hi NASA! Thanks for doing this AMA!

I've noticed significantly more "hype" about this solar eclipse over any other solar eclipses that have happened in the past. Do you attribute this to an increase in public interest in science or is there something special about the one that's about to happen?

[HansSulu](#)

Blame the internet. This is the first US eclipse that has occurred since social media have become available. JH

Will the sky still darken even if you're not on the path of totality?

[MGWaleema](#)

You will not notice the dimming with a partial eclipse, since your eyes will adapt to the change. it will look like the difference in brightness between noon and the late afternoon on a day without clouds. If you were to measure it brightness, the change is substantial. JH

Will the sky still darken even if you're not on the path of totality?

[MGWaleema](#)

Yes, but depending on the percentage of totality, you might not even notice it. -- MA

Thanks for coming to talk with us! Is the eclipse of any research interest? What sort of data are people

collecting, and what research questions do you think it has the potential to answer?

[asbruckman](#)

Hi, the eclipse is of great research interest! During the eclipse, we can see the inner portion of the solar corona. Studying the activity in this region of the Sun's atmosphere will help us better understand the transport of solar storms which, if Earth directed, can drive geomagnetic storms and space weather. This is a unique opportunity that will drive a lot of exciting new science. - AH

Thanks for coming to talk with us! Is the eclipse of any research interest? What sort of data are people collecting, and what research questions do you think it has the potential to answer?

[asbruckman](#)

The study is to test our ability to make 3D calculations of how radiation passes through the atmosphere when an occulting object of finite dimensions casts a shadow on the earth. The goal is to use this type of 3D calculation for shadows cast by clouds. We are also making measurements of trace gases that absorb sunlight - ozone and nitrogen dioxide - these will be included in the calculation to test the theory against experiment. JH

Thanks for coming to talk with us! Is the eclipse of any research interest? What sort of data are people collecting, and what research questions do you think it has the potential to answer?

[asbruckman](#)

Yes. Citizen CATE is gathering data from along the path of totality to study the inner corona in visible light, a region of the corona that our assets in space cannot see. -- MA

How far ahead of time is it possible to calculate when and where we will see a solar eclipse? How is this calculated?

[dekker44](#)

We can calculate eclipses many centuries ahead -- the big uncertainty is the slow-down and the rate of the earth's rotation. And we can easily compute eclipse circumstances with modern computers, though this has been done for centuries using hand calculations. The earth's orbit and that of the moon and fairly well-understood, so no problem predicting eclipses of any sort. - Bill

How far ahead of time is it possible to calculate when and where we will see a solar eclipse? How is this calculated?

[dekker44](#)

Many years. We now know the motions of planets and moons with high accuracy. Use of modern computers enables these calculations to be done fairly quickly. Knowing the motions makes it fairly simple to predict when the moon will cast a shadow on the earth. JH

How far ahead of time is it possible to calculate when and where we will see a solar eclipse? How is this calculated?

[dekker44](#)

See <https://eclipse.gsfc.nasa.gov> -- MA

How high would you need to be to see the shadow racing across the earth? Could someone capture that with a drone for example?

[Freeasabird01](#)

I've actually calculated the drone speed! You can see the shadow approaching from hills/mountains -- not sure exactly how high you'd need to be. But as far as drones, if you have a video camera looking down, you should see the moon's shadow move about 70 feet in a single video frame, assuming your camera is a standard NTSC camera with a rate of 29.97 frames per second. Bare in mind, the shadow will be fuzzy i.e. there will be no sharp boundary. - BC

will i actually go blind from looking directly at it?

[Imaoboxstanley](#)

Yes indeed. Contact be in braille after you are done with the experiment. Seriously, do not attempt this experiment. You can look at it during the 1.5 minutes of totality, but be careful top look away the moment the light gets brighter. Not kidding. Look away instantly. JH

will i actually go blind from looking directly at it?

[Imaoboxstanley](#)

Not during totality, but if you look at the partial phases without protection, you WILL damage your eyes. - BC

will i actually go blind from looking directly at it?

[Imaoboxstanley](#)

You can find information on how to safely view the eclipse at this link  
<https://eclipse2017.nasa.gov/safety> -AH

I'm traveling to South Carolina to watch it, is it true that the nocturnal animals come out when it happens?

[McLight123](#)

During the short amount of time of totality, animals will exhibit their twilight behavior. Remember -- it won't be totally dark. The behavior you observe in nature around twilight will be seen BRIEFLY during totality. EX. Roosters crowing, birds nesting, ants returning to their mounds... things like that. And then they will be freaked out when the sun suddenly appears! - BC

I'm traveling to South Carolina to watch it, is it true that the nocturnal animals come out when it



happens?

[McLight123](#)

Look for birds to go to roost, crickets, tree frogs, and cicadas will make their nightly noises. -- MA

Is working at NASA all it's cracked up to be? A lot of NASA's interaction with people over social media or through the [mail](#) makes it seem like it'd be a pretty cool place to work.

[Empole](#)

It's definitely all it's cracked up to be! As an intern, you're always challenged and always learning. - Bill Cooke's intern Annie Woronecki

I kinda like my job most days. Growing up with Star Trek, working for NASA is kinda a step closer to the Enterprise. - BC

Is working at NASA all it's cracked up to be? A lot of NASA's interaction with people over social media or through the [mail](#) makes it seem like it'd be a pretty cool place to work.

[Empole](#)

It is an awesome place to work! My experience has been that people working here love what they do and are continually interested in learning new things and sharing what they have learned with others. This seems to foster an incredibly exciting working environment where every day I learn at least one (if not 10 or 100) new things!

Is working at NASA all it's cracked up to be? A lot of NASA's interaction with people over social media or through the [mail](#) makes it seem like it'd be a pretty cool place to work.

[Empole](#)

Damn cool! I've worked on everything from planetary atmospheres to earth atmospheres and oceanography and human diseases. NASA is a great place to do research on almost any topic you can think of. JH

I have a friend who is into the earth being flat, will there be any physical proof during the eclipse that can help change his mind?

[mistaotoo](#)

Of course the earth is flat. Otherwise you would fall off. We are working on the problem of where the sun goes every day when it sets over a flat earth. So far, we have not seen clouds of steam when it hits the ocean. /s JH

I have a friend who is into the earth being flat, will there be any physical proof during the eclipse that can help change his mind?

[mistaotoo](#)

If they don't accept the views from space, I doubt the views from the eclipse will change their mind! - BC

How long will it be before the Moon recedes too far from Earth for a total eclipse to be possible?

[RoyMustangela](#)

A really long time. I am guessing on the order of a million years or longer. I am guessing because I am too lazy to look up the rate of motion of the moon relative to the earth. JH

How long will it be before the Moon recedes too far from Earth for a total eclipse to be possible?

[RoyMustangela](#)

About 600 million years. -- MA

My Plan A for viewing the eclipse is driving down to Charleston, SC. Plan B, if the weather looks bad in the forecast for eclipse day in Charleston, is to drive to Tennessee.

My question is, this decision needs to be made on Saturday morning. What should I be looking for in weather forecasts for Monday afternoon in order to make the best decision?

[Sacamato](#)

Good luck JH

Am I missing out by planning to go to the eclipse in 2024 instead of this year's? I live in NY and right now traveling to Kentucky or Tennessee during the work week isn't feasible.

[theseltzerking](#)

If you're willing to wait 7 years, probably not! The 2024 eclipse will certainly be more geographically convenient for people in the Northeast. - Bill

What do you expect to find in studying how the eclipse shadow interacts with Earth's atmosphere? How is it any different from studying the atmosphere at night?

[uvcr](#)

There are a lot of interesting questions. For example, the speed that the shadow is moving is nothing like the changes that we see going from day to night so we expect many different types of atmospheric waves to be set up. Here's a NASA post on some more of the science that we can do because of the eclipse <https://www.nasa.gov/feature/goddard/2017/nasa-looks-to-the-solar-eclipse-to-help-understand-the-earth-s-energy-system> -AH

What do you expect to find in studying how the eclipse shadow interacts with Earth's atmosphere? How is it any different from studying the atmosphere at night?

[uvcr](#)

How quickly does the atmosphere respond to decreasing light level and how quickly does it recover, is one example. The difference between night and eclipse is the duration and rapid change of eclipse conditions. -- MA

What do you expect to find in studying how the eclipse shadow interacts with Earth's atmosphere?  
How is it any different from studying the atmosphere at night?

[uvcr](#)

The study is to test our ability to make 3D calculations of how radiation passes through the atmosphere when an occulting object of finite dimensions casts a shadow on the earth. The goal is to use this type of 3D calculation for shadows cast by clouds. JH

Will the astronauts on the ISS be able to see the eclipse?

[pilgrim81](#)

Yes, but only the shadow on the earth JH

Do you consider the solar eclipse as an opportunity to conduct a specific type of research that is not feasible otherwise, or does it not convey any benefits compared to regular observations? If yes, what is it exactly?

[vradon](#)

Hi, Yes we will be able to observe the inner portion of the corona which we are typically not able to observe! This region is of great interest in stitching together our observations and understanding of the regions of the Sun closer in and those farther out. - AH

Do you consider the solar eclipse as an opportunity to conduct a specific type of research that is not feasible otherwise, or does it not convey any benefits compared to regular observations? If yes, what is it exactly?

[vradon](#)

The study is to test our ability to make 3D calculations of how radiation passes through the atmosphere when an occulting object of finite dimensions casts a shadow on the earth. The goal is to use this type of 3D calculation for shadows cast by clouds. We are also making measurements of trace gases that absorb sunlight - ozone and nitrogen dioxide - these will be included in the calculation to test the theory against experiment. JH

Is there a cycle of eclipses or is it totally random times? For example, will there be an eclipse in the same place at periodic intervals?

[WarLordDobby](#)

Hi, Eclipses happen approximately every 18 months. You can find the eclipses out to 3000 and I think

even beyond in these tables <https://eclipse.gsfc.nasa.gov/solar.html> Many also have links to google maps that are fun to play with :) -AH

Is there a cycle of eclipses or is it totally random times? For example, will there be an eclipse in the same place at periodic intervals?

[WarLordDobby](#)

It is not random, but the cycle at a given location is not at a uniform period, since the orbit of the moon (28 days plus a 5 degree tilt) and the motion of the earth (tilting 23 degrees every six months) are not synchronized. JH

Is there a cycle of eclipses or is it totally random times? For example, will there be an eclipse in the same place at periodic intervals?

[WarLordDobby](#)

Yes, it is called the Saros Cycle. <https://eclipse.gsfc.nasa.gov/SEsaros/SEsaros.html> -- MA

How is the eclipse moving across the country from the west to east considering the east to west track of the sun?

[woodrob12](#)

The shadow is moving at about mach 2 (1,500 miles per hour) and this is because the moon is moving in its orbit. So, on earth, its shadow moves from west to east at mach 2. - BC

How is the eclipse moving across the country from the west to east considering the east to west track of the sun?

[woodrob12](#)

It has to do with the speed of the Moon in its orbit around Earth. -- MA

As a first time observer living pretty much right in the middle of totality, is there anything you would recommend looking for that you might otherwise miss? I'd hate to go through the eclipse with a money shot of it and not pay close enough attention to a specific part and miss something. Thanks!

[13floppydisks](#)

Good question! There's a lot to look for, including other stars and planets ([https://eclipse2017.nasa.gov/sites/default/files/publications/Eclipse\\_brochure-bookmark\\_508.pdf](https://eclipse2017.nasa.gov/sites/default/files/publications/Eclipse_brochure-bookmark_508.pdf)) but also, look out to the horizon during totality to see the illuminated sky off in the distance. And listen for animal sounds, and see if you feel the temperature drop! -NP

I read that you have some jets that will be flying along with the eclipse to get 7 minutes of eclipse time. Why not get some SR-71s to watch the whole thing? I'm sure the Air Force will let you borrow them.

[osxpert](#)

The SR-71 has been decommissioned, so we no longer fly them. - BC

I just want to thank you and all your coworkers for ensuring the human race never stops learning and exploring, you scientists should be the real super stars.

[Heathen06](#)

And thank you for learning with us! - Bill

why can I look at the sun right now, but I need glasses to look at an eclipse?

[anofino](#)

You should never look at the sun without protection! You can damage your eyes without feeling pain. I know because I have a scar on my retina from not getting my eye protection back on at the end of totality during the 1979 eclipse. Please don't follow my example! - BC

why can I look at the sun right now, but I need glasses to look at an eclipse?

[anofino](#)

You cannot look at the Sun right now without damaging your eyes. To look at the partial phases of the eclipse, you need specially designed glasses. During totality and only during totality, can you safely look at the Sun without the glasses or Number 14 welder's glass. See this page for a list of reputable vendors: <https://eclipse.aas.org/resources/solar-filters> -- MA

Where can I get appropriate eye wear to enjoy the solar eclipse

[Empole](#)

We have information and links here <https://eclipse2017.nasa.gov/safety> -AH

Where can I get appropriate eye wear to enjoy the solar eclipse

[Empole](#)

Look on the NASA website for approved manufacturers.

what/where are our best chances for avoiding cloud cover?

[12wd](#)

go to eastern Washington state of Wyoming JH

Two questions: Do you have any working hypotheses regarding the corona or how earths atmosphere

interacts with the sun's radiation, and what are they? How does an eclipse provide you with an opportunity that would otherwise not be present to study how Earth's atmosphere interacts with the sun's radiation? Thank you for doing this!

[Warlocksocks](#)

Hi, Yes, and I think it's one of the most fantastic areas of research... but then it's also my field of research so I may be a bit biased with that point of view. We are often most interested in learning how storms on the Sun, like coronal mass ejections or coronal holes, end up generating geomagnetic activity and space weather at Earth. You can read more about this field here <https://www.nasa.gov/subject/3165/space-weather/> -AH

Two questions: Do you have any working hypotheses regarding the corona or how Earth's atmosphere interacts with the sun's radiation, and what are they? How does an eclipse provide you with an opportunity that would otherwise not be present to study how Earth's atmosphere interacts with the sun's radiation? Thank you for doing this!

[Warlocksocks](#)

Radiation from the Sun does affect Earth's atmosphere. During solar maximum, when there are a lot of sunspots, ultraviolet light especially, causes the atmosphere to expand and puff up, which causes drag on satellites and their orbits will decay faster. This eclipse is happening though close to solar minimum. See my previous answer about studies of the atmosphere's response to the eclipse. Also, google UAH MIPS, their equipment will be deployed at Clarksville, TN to do such studies. -- MA

Hello, I don't know if my question will be answered being under 164th. (I was never the first.)

Still, I always wanted to ask a real scientist a real life question. What is the significance of studying the Solar Eclipse for the NASA and astronomy? I don't know if it is the right place to ask such a novice question but I want to know the first-hand answer from you. Also, would you share the pictures of the eclipse over here or on your website?

[remain\\_unaltered](#)

We will be looking at the inner corona in visible light, trying to connect it with the corona in other wavelengths (see <https://sdo.gsfc.nasa.gov/>) and with the magnetic field of the photosphere. We want to understand how the magnetic field affects the various layers of the atmosphere so that we can better predict solar events that cause space weather. We will be sharing our images and results on our websites. Keep looking for updates at <https://eclipse2017.nasa.gov>, and mine, <https://solarscience.msfc.nasa.gov>. -- MA

Hello, I don't know if my question will be answered being under 164th. (I was never the first.)

Still, I always wanted to ask a real scientist a real life question. What is the significance of studying the Solar Eclipse for the NASA and astronomy? I don't know if it is the right place to ask such a novice question but I want to know the first-hand answer from you. Also, would you share the pictures of the eclipse over here or on your website?

[remain\\_unaltered](#)

Hi! Yup, there is a bunch of interesting science questions that we are hoping to look at and gain a better understanding from the data we collect. You can find out more here

<https://eclipse2017.nasa.gov/science> and we will be live streaming eclipse activities here  
<https://eclipse2017.nasa.gov/eclipse-live-stream> Hi I'm sure many photos will be added to the flicker  
page as well which you can find here! <https://www.flickr.com/groups/nasa-eclipse2017> -AH

Where will you be for the eclipse? What town etc?

[Bobnot08](#)

Somewhere in Tennessee! I won't know until I get the weather report on Friday! - BC

Where will you be for the eclipse? What town etc?

[Bobnot08](#)

I will be in Clarksville, TN at the Farm and Environmental Center of Austin Peay State University. -- MA

There was a post on Reddit recently where a user looked at scheduled commercial flight patterns for that day, and saw that one flight will be travelling almost directly in the path of the eclipse. Unfortunately, it will be going the wrong way. If it had been going the right way, how much extra eclipse time could that flight possibly get? And does the altitude have an effect on how it's observed?

[ucrbuffalo](#)

The extra time would be in the tens of seconds, you'd have to be moving at nearly the speed of the eclipse (~1600 mph) to extended it significantly. In 1973 astronomers flew on a Concorde to observe an eclipse for ~73 minutes ([https://motherboard.vice.com/en\\_us/article/8q8qwk/the-concorde-and-the-longest-solar-eclipse](https://motherboard.vice.com/en_us/article/8q8qwk/the-concorde-and-the-longest-solar-eclipse) and [https://en.wikipedia.org/wiki/Solar\\_eclipse\\_of\\_June\\_30,\\_1973](https://en.wikipedia.org/wiki/Solar_eclipse_of_June_30,_1973)) -NP

Thank you for elucidating the science behind this eclipse for us!

I am curious to know what research, if any, has been done about eclipses on other planets? How does an eclipse on, say, Jupiter, compare to our lunar eclipses?

[signedupjusttoask](#)

Our Sun, Earth, Moon system is quite unique! But we do use transits for a lot of science. You can read more here <https://eclipse2017.nasa.gov/transits-and-occultations> -AH

I'm worried it'll be overcast where I am on the day of the eclipse. I'm driving down to the line of totality. What can I observe if it's cloudy?

[Froguy1126](#)

If it's cloudy it will still get dark during totality. But Boo clouds during eclipses! -NP

Will we be able to see any stars, that are typically located behind the sun, due to the curvature of spacetime around our star?

[queeflatifah321](#)

There's a PDF with some of the other visible stars and planets  
([https://eclipse2017.nasa.gov/sites/default/files/publications/Eclipse\\_brochure-bookmark\\_508.pdf](https://eclipse2017.nasa.gov/sites/default/files/publications/Eclipse_brochure-bookmark_508.pdf)). I'm sure astronomers will be looking to prove Einstein right again! -NP

Is this company a reputable source for eclipse glasses? Aka, will I go blind if I use these?  
<https://imgur.com/gallery/eN17K>

[pilgrim81](#)

The American Astronomical Society has a page on eclipse safety and have a list of reputable vendors.  
-- MA

An eclipse is an occlusion of sunlight that happens to align in our direction with the moon being the object.

Why is this different from the shadow under a tree or a stray cloud?

Don't the earth and the moon always have umbras and penumbras? Why does observation of one have scientific value?

Please enlighten me/us on why an eclipse is so special. Thx.

[Foodei](#)

A lunar or solar eclipse happens because sunlight is blocked by either Earth or Moon. For a lunar eclipse, Earth is between Sun and Moon and the Moon moves into the shadow of Earth. For a solar eclipse, the Moon is between Earth and Sun and it is Earth that moves into the shadow of the Moon. But the Moon's shadow is quite narrow compared to Earth's shadow, for this eclipse it will cover an area only about 70 miles wide. This is the reason that fewer people get to see a solar eclipse. When there is a lunar eclipse, half the planet, the half that is in darkness, can see it.

Because the Moon completely covers the Sun during a total solar eclipse, the Sun's bright surface is covered over, and we can see the Sun's corona, the outermost layer of the Sun's atmosphere. This is the only time that we can see the inner part of the visible light corona. -- MA

Is eye damage possible when looking at the sun in totality?

[thisguy-thatguy](#)

You can find more information when it is okay to take off the solar eclipse viewing glasses here  
<https://eclipse2017.nasa.gov/safety> -AH

Is eye damage possible when looking at the sun in totality?

[thisguy-thatguy](#)

No, but be prepared for the end of the eclipse, you do not want to be looking when the Diamond Ring appears at the end of totality. Stop looking maybe five to ten seconds before the end. -- MA



I've offered multiple blood sacrifices to appease the great sky gods; will this evil omen still affect my crops?

Seriously though; how uncommon are total solar eclipses? We've had a number of partial eclipses the past few years, but how often does a total eclipse roll around?

[echisholm](#)

We're rooting for your crops!!

On the average, there is one total solar eclipse somewhere on earth every 18 months. - Bill

If the ISS were to pass through the shadow of the eclipse, what would they see? Is it any different from how we would experience it from Earth?

[kylestephens54](#)

The sky would be black, but they would see essentially the same thing - the corona and other things. But there would be no atmosphere to refract the light. The cool thing is that astronauts looking down will see the shadow below them, which is kinda a unique perspective. - BC

I live in Tennessee and I'm close enough that I plan on getting into the dead center of the Eclipse path. Do you have any recommendations as far as trying to witness shadow bands? Do the shadow bands occur with every total solar eclipse?

[Jxcellent](#)

Put a white sheet on the ground. That is all there is to it.

Shadow bands are not seen with every total solar eclipse. I have seen four total solar eclipses, but only once did I see shadow bands. -- MA

I live in Tennessee and I'm close enough that I plan on getting into the dead center of the Eclipse path. Do you have any recommendations as far as trying to witness shadow bands? Do the shadow bands occur with every total solar eclipse?

[Jxcellent](#)

They do occur with every total solar eclipse! To see shadow bands, you need a white surface nearby. Some people have recorded shadow bands on white cars. So, a white surface nearby, a sheet, a car, etc. will help you see the shadow bands. - BC

Hi as a fellow science student wanting to go into Astrophysics, I simply have one question.

When did you realize that space was something you wanted to pursue a career in?

[Not\\_a\\_pace\\_abuser](#)

Hmm, I'm not sure when I first knew when I wanted to study something in space or more general science, but I first learned of space physics in particular during my Freshman year of college. I started research my second semester and was immediately hooked!

I live in Atlanta where it will be a 97% eclipse. Is it worth driving an hour or 2 to see the full thing?

[Meximanny2424](#)

Yes! If you have a place to go! Be prepared for traffic! -NP

I live in Atlanta where it will be a 97% eclipse. Is it worth driving an hour or 2 to see the full thing?

[Meximanny2424](#)

In my opinion, yes! Road trip! - BC

If it's cloudy, will it still be possible to see anything?

[TheLoyalTheorist](#)

It will get dark if you're in the path of totality! But it is a weird dark! Other than that, no. - BC

What is a safe way to observe the eclipse? Could I use shades?

[arthurjrreyes](#)

Shades are definitely not a safe way to view the eclipse. There are eclipse glasses you can get either free or for a dollar or two. The NASA Eclipse site: <https://eclipse2017.nasa.gov/> gives more details on reputable vendors for these glasses. If you can't find a pair of eclipse glasses, you can try to find number 14 welder's glass from welding supply stores -- No other number welder's glass will do! Number 14 is the best. You can also use a simple pinhole projection to see the eclipse on a white piece of paper or cardboard or something like that if all else fails. - BC

When will the next solar eclipse in America happen and when was the last one?

[fostboss](#)

The next solar eclipse will be in April 2024 and the path will go from Texas to the Northeast.

The last total eclipse in America was in Hawaii in 1991.

P.S. There can be as many as 5 partial solar eclipses per year! - Bill

You mentioned that this gives you an opportunity to study a different part of the sun, which normally can't be seen. What else does an eclipse offer for scientists to study that cannot normally be studied? I'm curious about how well we can understand things which we cannot normally gather data from.

Thank you everyone for the AMA, and good luck with your studies!

[brownaj010](#)

Hi, You can find out about some of the fantastic eclipse science here  
<https://eclipse2017.nasa.gov/science> -AH

Is the eclipse visible on airplanes?

[Metrocore](#)

If the plane is flying through the path of totality, during totality, it will be visible. Other planes flying on the 21st will have a chance to see the partial eclipse. <https://www.youtube.com/watch?v=YBoa81xEvNA&t=84s> -NP

Have any observatories been built in or moved to the path of totality for this specific occasion?

[AcidicJello](#)

Lots of telescopes will be placed along the path of totality, but the larger observatories can't be moved. <https://eclipse2017.nasa.gov/science-ground> -NP

Is there any real way for an average guy like me with no special equipment to photo/video this? I'd love to capture the moment...at least a little.

Should I even bother trying, or should I just enjoy the experience and wait to see what the experts come up with?

[catch10110](#)

There are some resources here: <https://eclipse.gsfc.nasa.gov/SEhelp/eclipsePhoto.html>

However, if this is your first eclipse, you should try to enjoy it, take photos before and after totality (maybe one during too), but I'd let the experts try to get the beauty shots. -NP

If it's cloudy that day and the city I live in is in the path of the eclipse, how big of a fan would I need to blow the clouds away so I can see the eclipse?

[omarmctrigger](#)

A huge one! - BC

How likely/common would you think an alien world has an eclipse like ours? Mars's asteroid-moons barely cover the Sun, while viewing from the surface of Jupiter/Saturn is a tad hard.

[Aximill](#)

We on earth are fairly fortunate in that our sun and moon are about the same apparent size in our sky. It would be very difficult to get this repeated elsewhere in the solar system or even in other star system. So, enjoy this feeling of uniqueness while it lasts. In about 600 million years, we will no longer have total solar eclipses (because the moon is slowly receding from the earth.) - BC

A little late to the party but this is directed at Noah Petro. I'm currently a undergraduate student in geology located in Canada and if you could I was wondering if you briefly describe your path into planetary geology, it's a field I've wanted to study but being in Canada Oil and Gas is king in terms of

career paths ( one which I'd rather not take). I was also wondering what masters program would you recommend to specialize in. My dream is to work for NASA and this is a route I'm currently committed to. Your reply is appreciated though improbable I'll receive.

[\\_Blase](#)

Great question! I got interested in geology in High School, and planetary science in College (Bates College!). I took a summer internship working with the USGS in Flagstaff, AZ and that's where I learned that I could go forward as a graduate student. This guy is awesome!

<https://www.uwo.ca/earth/people/faculty/osinski.html>

[https://www.youtube.com/watch?v=2M\\_-3YImVO8](https://www.youtube.com/watch?v=2M_-3YImVO8) Best of luck! -NP

Did you guys see the article about the eclipse on the front page of the Wall Street Journal? I'm one of those brides. Do you have any advice for my eclipse wedding?

[spockgiirl](#)

Don't lock your knees, drink lots of water, make sure you get some appetizers, have fun, and congratulations! Make sure you and your guests have eclipse glasses!

<https://eclipse2017.nasa.gov/safety> -NP

What kind of welding goggles could be used to not get blinded? And could it be used on a telescope?

[Chukedog](#)

"Viewing with Protection -- Experts suggests that one widely available filter for safe solar viewing is number 14 welder's glass. It is imperative that the welding hood houses a #14 or darker filter. Do not view through any welding glass if you do not know or cannot discern its shade number. Be advised that arc welders typically use glass with a shade much less than the necessary #14. A welding glass that permits you to see the landscape is not safe. Inexpensive eclipse glasses have special safety filters that appear similar to sunglasses, but these do permit safe viewing." From

<https://eclipse2017.nasa.gov/safety> -NP

What kind of welding goggles could be used to not get blinded? And could it be used on a telescope?

[Chukedog](#)

Number 14 welder's glass and no -- not use it on a telescope. - BC

Is it going to happen in someother place other than America too?

[Botikal](#)

The path of totality will cross 12 states from Oregon to South Carolina, but it will only touch United States soil. So, this eclipse is an American eclipse. The 1918 eclipse also crossed the U.S., but the shadow also touched some islands in the Caribbean. - BC

If I live in Pennsylvania what time do you estimate the sun will be totally blocked?

[TheShortSword](#)

In PA the Sun will only be partially blocked. But the peak time when most of the Sun is blocked will be around 2:30 PM and will be in the 75% obscuration.

[https://eclipse2017.nasa.gov/sites/default/files/interactive\\_map/index.html](https://eclipse2017.nasa.gov/sites/default/files/interactive_map/index.html) -NP

I'm trying to get my nephew in science because I was never given to experience the fun side of science so I'm hoping if I nudge him in the right direction he would want to be more curious about his surrounding. So my question is can the eclipse be seen in ft Lauderdale FL and what cool facts can I tell him about it??

[Patient\\_Zero\\_V](#)

About 80% of the The Sun will be blocked by the Moon in Ft. Lauderdale. The eclipse starts at 1:26 PM and peaks at 2:57 PM. [https://eclipse2017.nasa.gov/sites/default/files/interactive\\_map/index.html](https://eclipse2017.nasa.gov/sites/default/files/interactive_map/index.html)  
More eclipse facts are at: <https://eclipse2017.nasa.gov/eclipse-who-what-where-when-and-how> -NP

I'm curious about the electron content in the ionosphere and how it will change during the eclipse. Is there any possible impact to navigation satellites?

[SEND\\_ME\\_FREE\\_THINGS](#)

There may be an effect to GPS satellites, that's something we'll be looking out for on the 21st! - NP

Dumb question here, does the Sun's energy pass through the moon? If so, calculations on this would be neat!

PS: I will be volunteering to do temperature logging for NASA during the total solar eclipse in Carbondale, IL, are you guys going to record temperatures too? :D

[SuupaX](#)

No - the Sun's energy does not pass through the moon.

As a matter of fact, I will be recording temperature and light levels from my location in Tennessee just for funzies and because I'm a major nerd! - BC

I live in Eastern NC, is the view worth staying where I am or should I head to Charleston SC?

[The-Swat-team](#)

Yes! Keep in mind that lots of people will be making that trek, you might consider any other location along the path! <https://eclipse2017.nasa.gov/sites/default/files/sc.jpg> -NP

What can people not in North America expect? Or more specifically, people from Suriname?

[RandomMassOfAtoms](#)

In Suriname the eclipse will be a partial eclipse, with about 50% coverage by the Moon.

[https://eclipse2017.nasa.gov/sites/default/files/interactive\\_map/index.html](https://eclipse2017.nasa.gov/sites/default/files/interactive_map/index.html) -NP

Why do eclipse tracks move eastward even though the Earth rotates from west to east?

[condor2](#)

The track of the eclipse from west to east is due to the movement of the Moon in it's orbit around the Earth, which takes it in that direction. -NP

I live in Los Angeles. I'm not planning on driving 13hrs to Salem Oregon , it's just way too far and i hear it's going to be insanely packed.

With that said,

Would i be able to see more of the eclipse if i was at a higher elevation? Like say the Half Dome in Yosemite with an elevation of: 8,839'

[optionalhero](#)

While the elevation does play an important role along the path of totality (check out this video: <https://svs.gsfc.nasa.gov/12412> and <https://svs.gsfc.nasa.gov/4517>) if you are out of totality the effect will be minimal, but you might be above clouds! -NP

I live in Los Angeles. I'm not planning on driving 13hrs to Salem Oregon , it's just way too far and i hear it's going to be insanely packed.

With that said,

Would i be able to see more of the eclipse if i was at a higher elevation? Like say the Half Dome in Yosemite with an elevation of: 8,839'

[optionalhero](#)

Nope it won't help! - BC

For the two mins that the sun is fully covered, do we need to keep our special shades on?

[cronedog](#)

No - you won't see anything! Be sure to put them back on before totality ends! Tip: Set a timer! We want you to be safe! - BC

For the two mins that the sun is fully covered, do we need to keep our special shades on?

[cronedog](#)

Nope! During totality you can take them off! <https://eclipse2017.nasa.gov/safety> -NP

I live near NYC and am concerned about driving down for this (already giving up on the idea of flights/hotels.)

Where in the world is the next totality? I know about 2024, but is there some other country worth visiting for totality before then?

[chevymonza](#)

The next total eclipse will be on Dec. 4, 2022 from Antarctica. Dress warmly!! - BC