

**NASA Chat: Elusive Meteor Shower Offers Opportunity for Citizen Scientists**  
**Expert Dr. Bill Cooke**  
**June 10-11, 2013**

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*Moderator\_Brooke:* Hi everyone, and welcome to the chat! Please send in your questions for Bill.

Mike\_D : What time is the peek on the west cost

*Bill\_Cooke:* Approximately 1:30 a.m. Pacific time.

Paul\_M: Has the peak been revised to be a few hours earlier? I've seen conflicting information.

*Bill\_Cooke:* Peak is still around 4:30 a.m. Eastern Daylight Time.

Talon\_Torres: Hey Bill! I'm excited on helping contribute to the scientific field!

*Bill\_Cooke:* Thank you. We look forward to your images.

Josh: What is the expected rate, if there is any at all?

*Bill\_Cooke:* Unknown. Shower duration is expected to be less than an hour and you may see 30-40 meteors in that time.

RobertPdot: What exactly about the Delphinids not make them a yearly shower? Is it just to do with orbital inclinations?

*Bill\_Cooke:* No. It has to do with how close the streams come to the Earth, which is a function of the gravitational influence of larger planets, particularly Jupiter.

StupidCloudySkies: What is the parent body for the gamma Delphinids?

*Bill\_Cooke:* Unknown. Assumed to be a comet.

michele\_thrapp: Is there any chance of seeing anything from los angeles?

*Bill\_Cooke:* Not much if you are surrounded by bright lights. You need to get out to where it is darker.

AragonRed: Greetings Bill and Moderator Brooke...thanks for hosting this chat. Just a short question...whats the best way we can do to gather information? what exactly is hoping/expecting us to do? Thanks.

*Bill\_Cooke:* The best way to gather information is to take time exposures with a digital camera and upload them to our Flickr page. We can then analyze these images and trace back the meteors path to see if it comes from the constellation Delphinus. This will give us an idea of the number of gamma Delphinids and their brightness which is related to their sizes.

*Moderator\_Brooke:* In reference to Bill's comment, this is the Flickr group where you can upload your images and video. Help us identify gamma Delphinids!

<https://www.flickr.com/groups/gammadelphinids/>

**NASA Chat: Elusive Meteor Shower Offers Opportunity for Citizen Scientists**  
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---

Brian\_: what is the chance percentage wise that the shower will take place?

*Bill\_Cooke:* We have already recorded one meteor from the shower and observers in Europe with video systems have observed several, so I would say pretty good.

RobertPdot: For viewing might I see anything more with some 7 degree true FOV 10x50 binoculars? Or am I better off naked-eye?

*Bill\_Cooke:* Better off with naked eye --- take in as much of the sky as possible.

Talon\_Torres: I'll give you guys an iPod vid if you want... Wait... one meteor already?

*Bill\_Cooke:* Video would be good if there are stars visible in the video so we can identify the field. Yes, we picked up a bright gamma Delphinid (brighter than Venus) this morning in New Mexico.

Brian\_: how do you determine if it is the Delphinids or June Lyrid?

*Bill\_Cooke:* We traced back the trail and see if the path intersects Delphinus. Lyra is sufficiently far away that we shouldn't have much contamination from the June Lyrids.

Werkb: what happened in 1910? It didn't explain above, was it just a very very good year for these meteors?

*Bill\_Cooke:* We believe this stream passed close enough to Earth to create a short outburst. This year calculations show that it will once again pass close to Earth, so we are hopeful that we will see quite a few.

Doxa: Im trying asdasd as I am trying to see this phenomena from Latin America (Bolivia) where exactly should point my view?

*Bill\_Cooke:* Point camera straight up and take time exposures.

StupidCloudySkies: Given that this shower is rare, how is it that scientists can so accurately predict when the peak will occur?

*Bill\_Cooke:* In this case, it's more of an educated guess, which is why we're asking people to go out and make observations.

Brian\_: are you seeing many (or any) June lyrids right now?

*Bill\_Cooke:* Our cameras have not recorded any.

riel190: Hi! do you know where in the sky (direction) would be best the see the shower in northern Virginia and what time would be the best to view it?

**NASA Chat: Elusive Meteor Shower Offers Opportunity for Citizen Scientists**  
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---

*Bill\_Cooke:* Lie flat on your back and look straight up 3:30-5:30 local time.

*Moderator\_Brooke:* Thanks for the great questions -- Bill is working on your questions as we speak. Also, for those asking, we're hoping for clearer skies in the Ustream feed toward morning.

Alyssa: I know the meteors are going to be fast, but how bright do you think they'll be?

*Bill\_Cooke:* Most gamma Delphinids seem to have brightnesses comparable to Mars and Saturn in the night sky.

Mike\_D: I'll be observing from Newport Beach Ca. on a dark beach in about two hours and will report back what I see

*Bill\_Cooke:* Thank you.

Paul\_M: When a person views a meteor overhead in a given location, for example, in Houston, Texas, how far away could someone else see that same entry? Would someone in Dallas see it?

*Bill\_Cooke:* In general, the same meteor can be seen by observers separated by one hundred miles or so. This varies according to meteor brightness and altitude.

Brian\_: So have the Delphinids been seen before just in very low numbers? Just curious how the brightness and speed are known

*Bill\_Cooke:* There have been a few gamma Delphinids reported in past years. Not many.

Pageboy: Bill, is the half-hour slot the peak only or will we be able to see a few loners in the hours before and after the predicted timeframe of the outburst?

*Bill\_Cooke:* If there is an outburst, it will be very short-lived around the peak time. However, meteor cameras are seeing gamma Delphinids. We saw a bright one this morning over New Mexico.

Bcarey: How long should the time exposure be?

*Bill\_Cooke:* Depends on your sky conditions and camera. Take a couple of test shots and see if you're recording stars. If you can see most of the constellation, say down to fourth magnitude stars, you're good. Longer exposures would work if there's not much trailing on the stars.

*Moderator\_Brooke:* Several people have asked about the constellation Delphinus. Here's a link where you can read more about it: <http://en.wikipedia.org/wiki/Delphinus>

Josh: In comparison to the April Lyrids, how bright are these meteors? I only saw a few April Lyrids (around 3 or 4 per hour during its peak this year), so am not sure if I will be able to see any of the Delphinids at the same location (which is on a beach just a few km away from downtown Vancouver)

**NASA Chat: Elusive Meteor Shower Offers Opportunity for Citizen Scientists**  
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---

*Bill\_Cooke:* These meteors range from magnitude +2 to 0, though we saw a -5 fireball this morning.

Paul\_M: Is the Delphind's "stream" just very narrow, sparsely populated, just not very close to our orbit, or all of the above?

*Bill\_Cooke:* All of the above.

Talon\_Torres: Bill, let's say, hypothetically, Comet ISON makes a very close flyby with Earth, say, about 1LD (Lunar Distance) away. Would there be a meteor storm when Earth crosses the debris stream?

*Bill\_Cooke:* Long period comets like ISON do not produce meteor showers, unless they come so close to a planet that there's a danger of an impact. This will never be the case with ISON.

Marty: At what magnitude of brightness is Venus right now in the western sky before sunset?

*Bill\_Cooke:* Right now Venus' magnitude is -3.9.

Doxa: well, here we have a clear beautiful sky tonight, so do you think that i can have nice long exposures shots? how long exposure?

*Bill\_Cooke:* If your sky is dark, you can do long exposures. Try 10-15 seconds and see how many stars you get. It will depend on your camera and a lot of other factors.

Brian\_: would the meteors being seen in cameras be visable to the naked eye?

*Bill\_Cooke:* Yes.

AragonRed: Bill..this may sound stupid, but how can you tell it was a meteor from gamma delphinids over New Mexico and not just from another source. Because of the trajectory and brightness? Thanks.

*Bill\_Cooke:* Because we observed it in two cameras and were able to compute its trajectory, speed and orbit, and these match what we know of the gamma Delphinids.

Talon\_Torres: Either way, should ISON take an unexpected trajectory change, as comets sometimes do, would this trajectory change bring it into a possible impact zone?

*Bill\_Cooke:* No. It's way too far away.

StupidCloudySkies: What is the next major meteor event after tonight?

*Bill\_Cooke:* Perseids in mid-August.

Josh: just wondering (and for reference), what is the range of magnitude of the stars of the Big Dipper (if you know off-hand)?

*Bill\_Cooke:* Magnitude 1.5 to magnitude 3.

**NASA Chat: Elusive Meteor Shower Offers Opportunity for Citizen Scientists**  
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**June 10-11, 2013**

---

Pageboy: will the brief outburst be anything like the Leonids of 2001? they were amazing even though we froze our bottoms off observing them

*Bill\_Cooke:* No. Much less numerous.

Calvi: Clear skies in Indiana but so far none after observing 50% of the sky for 30 minutes

*Bill\_Cooke:* The peak is not until 3:30 Central. Expect very few until close to that time.

Paul\_: I don't know if you see it, but in the article right above the chat window it states that the gamma Delphinids move "pretty fast for meteors".... Why would they be moving faster than others?

*Bill\_Cooke:* Because they are coming at the Earth from the front --- think bug on windshield.

Rmehta: I was reading the article and it said," If they exist gamma Dephinids..." Is NASA not sure of the existance of these asteroids?

*Bill\_Cooke:* We think some gamma Delphinid meteors (they are way too small to be asteroids) have been observed over the years, but this year gives us a good chance to confirm this shower's existence.

Brian\_: I realize this is an educated guess but what are the chances of the peak of the shower being before 4:30EST or just seeing a few before than? I am debating going to bed and setting alarm or taking the telescope out to pass the time just in case...

*Bill\_Cooke:* We have no idea how much the calculations can be in error. That's why we're asking people to look tonight.

*Bill\_Cooke:* Approximately 3:30 a.m. Central time is the expected peak.

Werkb: SO, the likelihood of one skipping across the upper atmosphere is minimal, i forget what they call them?

*Bill\_Cooke:* Those are called Earth-grazers.

Calvi: Can you say something about the probability of seeing different numbers of meteors at peak? I'm getting the impression that the 95% confidence interval is large.

*Bill\_Cooke:* We have no idea how much confidence to put into these calculations.

*Moderator\_Brooke:* For those working time conversions to determine the meteor shower peak in their areas, this JPL-hosted time conversion tool might be of help: <http://ssd.jpl.nasa.gov/tc.cgi>

Werkb: Is the consistency of the meteors known? rock, ice, metal?

**NASA Chat: Elusive Meteor Shower Offers Opportunity for Citizen Scientists**  
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**June 10-11, 2013**

---

*Bill\_Cooke:* We believe, based on the few orbits we have, that the gamma Delphinids have a cometary source, which means that they're icy in nature.

Paul\_: If the Delphinids are 20,000 miles away, and they travel at 127,500 mph.....wouldn't they be upon us in mere moments?

*Bill\_Cooke:* The stream is 20,000 miles away, but yes, they can cover 20,000 miles in minutes.

Paprika\_Star\_: What are the sizes of the meteors?

*Bill\_Cooke:* Based on their magnitude, on the order of a millimeter to a few millimeters.

Paprika\_Star\_{ How many meteors are contained in this shower, approximately?

*Bill\_Cooke:* We have no idea. That's why we're looking.

Paul\_M: Does the ISS have to take special precautions during times like this?

*Bill\_Cooke:* No, ISS has armor to protect it from space junk and meteoroids.

Werkb: Did the fireball that you observed leave a trail?

*Bill\_Cooke:* Yes, it did.

Alyssa: Do you think we'll be able to find out which comet (or asteroid) is causing this meteor shower after tonight, or do you think that we'll never know?

*Bill\_Cooke:* If we get enough meteors that we can measure orbits, we'll stand a chance.

RobertPdot: Isn't this EXCITING? The earth hurtling through space, intersecting the trails of matter, streaking across the sky as they burn up in the atmosphere. Its so humbling to know about these phenomena, and even more that there is still more to learn.

*Bill\_Cooke:* Yes, it is exciting. That's why I'm going to be up until 2:00 in the morning. ☺

Paul\_: I know the calculations are very rough, but based on the chart above, is the peak expected to occur over the Atlantic Ocean? Am I just reading it wrong?

*Bill\_Cooke:* Peak will occur roughly over the East Coast of the United States.

Radiotowers: Was just out for a bit, saw a lone meteor heading roughly south to north, passing just under Vega. Wouldn't appear to be consistent with a gamma Delphinid but you never know what you're gonna see with a rural sky and some patience!

*Bill\_Cooke:* Possibly.

**NASA Chat: Elusive Meteor Shower Offers Opportunity for Citizen Scientists**  
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**June 10-11, 2013**

---

huskerguy05: How much information was actually documented about the gamma Delphinids back in 1930?

Brian\_: what time was the fireball you observed in new mexico local time?

*Bill\_Cooke:* Approximately 4:30 a.m. local time.

Pageboy: do you know of any fellow still living observers who are watching tonight who also saw them way back when for comparison's sake?

*Bill\_Cooke:* Nope.

Sameeks: Is there anything that makes this year more favorable for viewing these (other than the new moon)?

*Bill\_Cooke:* And the fact that the calculations indicate that the stream will be passing close to Earth.

Werkb: This meteor shower happens every year? How do you determine if it's a good year?

*Bill\_Cooke:* We have seen very few and we determine the chances of seeing it based on calculations of the stream's distance from Earth's orbit. If it is close, that's a good year, provided the moon is favorable.

AragonRed: Thanks Bill and Brooke for you efforts. It's greatly apprecaited that you folks and your support team do all this work. You mentioned the two cameras you used to get information regarding the ealier meteor in New Mexico. Can you tell us more about the cameras? Do they belong to NASA? Are there are network of them? Thanks a lot.

*Bill\_Cooke:* The cameras are NASA cameras. They are ordinary surveillance cameras equipped with a fish-eye lens to see the entire sky and are connected to a computer running meteor-detection software. Right now we have a network of eight of these, two in New Mexico and six in the Southeast. Later on this year, we hope to deploy four more to Ohio and another four to southern Arizona.

*Moderator\_Brooke:* We appreciate these thoughtful questions coming into the queue. Bill is working on responses, so thanks for your patience.

Alex: It's truly fascinating that an object of only a mm or two could create such a clearly visible phenomenon. Would you explain why so much light is produced? And, how big would you estimate the one from this morning to have been, resulting in the observed "fireball?" Thanks!

*Bill\_Cooke:* When a one millimeter particle hits the atmosphere moving at 127,000 miles per hour, it has a lot of energy and some of that energy is converted to light. There is also light produced when the meteor ablates and this will continue until the meteoroid burns up completely or slows to under 7,000 miles per hour, at which point ablation stops.

**NASA Chat: Elusive Meteor Shower Offers Opportunity for Citizen Scientists**  
**Expert Dr. Bill Cooke**  
**June 10-11, 2013**

---

Radiotowers: Will an image of a meteor from a single observation site be useful, or do you really need multiple images of a single meteor from multiple locations to derive any useful data?

*Bill\_Cooke:* From a single site, we can determine if its direction of travel is consistent with originating from Delphinus and can estimate its size from the brightness. This is way better than nothing.

Paul\_M: Am I correct in assuming we have no means to detect where such a stream of debris would actually be via some form of radar, etc? We just have to wait until it gets here and make observations then?

*Bill\_Cooke:* Meteoroids have practically zero radar cross-section. In fact, no meteoroid has ever been detected in space by radar. So we have to wait until it hits the atmosphere and make use of the light and ionization produced to characterize its properties. Think of it like this: that millimeter size particle will produce a trail the length of a battleship, so that's kind of easy to measure from the ground.

AJ6T: Do you have any amateur radio operators lined up to listen for VHF forward scatter during this shower?

*Bill\_Cooke:* Not as far as I know. We do have the CMOR meteor radar in Canada that is monitoring the shower right now.

Paul\_M: Any new reports from Europe? Do you have any real-time contacts there?

*Bill\_Cooke:* None that I have seen recently. And since North America is favored for the calculated peak, no real-time contacts there.

LKS\_TheKiller: How can we see the event if the images are fully lustreless...? I mean, we can't visualize it well from the site

*Bill\_Cooke:* I don't understand the question.

Keninn: Where should Delphinus be in relation to the Milky Way? I spend a lot of time shooting the Milky Way and it is always fun to catch a meteor. Would i have a good chance of catching both in the same frame in the morning?

*Bill\_Cooke:* The Milky Way runs through Cygnus the Swan and Delphinus is below Cygnus, or to the east of Cygnus. It is a small constellation just north of Aquila the Eagle.

*Moderator\_Brooke:* You've heard a couple of references about the gamma Delphinid image over New Mexico from last night. I've added it to Flickr so you can see it more easily:

<https://www.flickr.com/photos/nasamarshall/9013480432/>

Brian\_: Bill just curious are you in PST? You said you would be up until 2am I assume because you are on the West Coast? Can't imagine you would go to bed before the expected peak?

**NASA Chat: Elusive Meteor Shower Offers Opportunity for Citizen Scientists**  
**Expert Dr. Bill Cooke**  
**June 10-11, 2013**

---

*Bill\_Cooke:* No, I am in Alabama on Central Time and I intend to go to bed before the peak and let the meteor cameras do my observing. I am too old to miss sleep.

Werkb: Would spaceweatherradio.com be a good place to listen for impending peak? I hear a bunch on there now as we speak.

*Bill\_Cooke:* Yes.

*Moderator\_Brooke:* Hi everyone -- we're likely to close this chat at 1 a.m. EDT, so if you have questions for Bill, now is your chance to ask!

Sameeks: I have an All-Sky camera and looking back through the images it appears the camera caught one at 2:32am CDT (Arkansas) last night. If they would be of value, do you have an e-mail address I can send them to?

*Bill\_Cooke:* Post it to the Flickr page.

*Moderator\_Brooke:* And here is that link to the Flickr group:  
<https://www.flickr.com/groups/gammadelphinids/>

Alex: Regarding the "fireball" observed this morning over New Mexico, is it possible to estimate the meteoroid's original size (prior to entry)? And if so, what is your estimate?

*Bill\_Cooke:* Approximately 15 grams.

JayBee: Good morning from Baltimore to all the skywatching night owls.

*Bill\_Cooke:* Good evening.

Alex: Only about 1/2 an ounce to produce a fireball! Very interesting! Thank You Sir!

*Bill\_Cooke:* You're welcome.

KarinaK.-Brazil: What time I'll get to see more or less the Meteors Shower in Brazil?

*Bill\_Cooke:* About 4:30 a.m. Eastern Time.

JayBee: Am I correct that they are expecting numerous fireballs?

*Bill\_Cooke:* Actually, they are expecting meteors about as bright as Mars or Saturn, which are not fireballs. We have seen one fireball.

Donpstew: Im in Branson, Mo....what is the general direction to be looking? And track?

*Bill\_Cooke:* Lie flat on your back and look straight up, 3:30-5:30 Eastern Time. Peak at 4:30.

**NASA Chat: Elusive Meteor Shower Offers Opportunity for Citizen Scientists**  
**Expert Dr. Bill Cooke**  
**June 10-11, 2013**

---

Kheider: Any hope that CAMS will pick-up some of the shower in Mountain View, California? It looks like they will also be somewhat cloudy.

*Bill\_Cooke:* If it is clear, they will see some.

Doc: Are there any reports of meteor activity associated with this shower?

*Bill\_Cooke:* We have some observations made by video systems this year of gamma Delphinids and some eyewitness accounts. Too few to get an idea of rates.

Spacecolonyfan: Is there any shipments in space collecting these rocks, for later use?

*Bill\_Cooke:* No. We have no collectors of that nature in space.

Werkb: Are those all fireballs in that flickr image?

*Bill\_Cooke:* If it is the one from New Mexico, it is a fireball. It is brighter than the planet Venus.

Battlebot: Listening to the space weather radio, I hear zero meterors. Are they not here yet?

gemini83: any estimate on how many we will see in the hour of peak time?

JayBee: Dr. Cooke, has anyone determined the source of this meteor shower?

*Bill\_Cooke:* We believe these meteors come from a comet, but have not yet determined which comet. If we can measure a fair number of orbits for these meteors, that will help determine a parent body.

Crystal\_D.: when will there be another meteor show this year?

*Bill\_Cooke:* Perseids in mid-August.

Mark: Is there any chance of another meteor storm (like Leonids 1998, 2002, etc) in our lifetime?

*Bill\_Cooke:* Yes. There may be a strong meteor outburst, or storm, next year on May 24th.

Spacecolonyfan: Can some satellite trash (lost/forgotten) orbiting around earth in space bounce toward earth because of this meteorite shower?

*Bill\_Cooke:* No.

gemini83: Thanks Bill, I always enjoy these chats and try to be online everytime there is one. One quesiton, when is next expected meteor outburst or meteor storm to take place?

*Bill\_Cooke:* May 24th of next year.

Markus: Hey, Bill - anything on the radar yet?

**NASA Chat: Elusive Meteor Shower Offers Opportunity for Citizen Scientists**  
**Expert Dr. Bill Cooke**  
**June 10-11, 2013**

---

*Bill\_Cooke:* Go to <http://fireballs.ndc.nasa.gov/> and click on the "Radar" link. This is updated every 15 minutes, so you can see for yourself what the radar says.

lipeB: What about the time in Brazil?

*Bill\_Cooke:* About 4:30 a.m. Eastern Time.

Vance: Is the NASA meteor counter app data used for this shower?

*Bill\_Cooke:* We look at it and use some of it in estimating the shower strength. We try to throw out observations that look like people are just hitting the button a lot.

Doc: May 24th? What shower is that?

*Bill\_Cooke:* Never before seen shower caused by Comet 209P/Linear.

Mark: I was wondering, if we sent up a rocket with 1 ton of sand, could we create our own meteor shower? Maybe it would be cheaper than fireworks all over the country.

*Bill\_Cooke:* If you could get the sand to hit the atmosphere faster than 10 miles per second, it will produce a shower of meteors --- for a very short period of time.

StupidCloudySkies: I heard last week there was a chaff test over the MSFC. Did that affect your cameras or any other equipment?

*Bill\_Cooke:* No.

*Moderator\_Brooke:* We have about 10 more minutes in our chat, so please go ahead and send in your questions for Bill.

GlueBiant2: I am not familiar with Delphinis nor am I clear what part of the sky to be looking tonight, clarification on this would great Bill

*Bill\_Cooke:* Look straight up.

Indra: Are lay observers making any contributions to our knowledge and understanding of this event? If so, how are they going about doing that?

*Bill\_Cooke:* I will know tomorrow, after I've seen the images uploaded to Flickr.

Spacecolonyfan: Will this meteorite shower increase noctiluent cloud capacity of earth?

*Bill\_Cooke:* If noctiluent clouds form around meteoritic particles, there may be a very modest chance of a noctiluent cloud.

**NASA Chat: Elusive Meteor Shower Offers Opportunity for Citizen Scientists**  
**Expert Dr. Bill Cooke**  
**June 10-11, 2013**

---

matt\_l: What advancements in scientific theory or technology would improve our ability to predict meteor showers?

*Bill\_Cooke:* Better meteor cameras --- more sensitive, higher resolution.

geminis83: Cool cant wait. the Leonid meteor storm of 2001 \*I think\* was far beyond anything I have ever seen, thousands and thousands of meteors that night. Most amazing night of my life for sure. Anyway what are the rates expected for May 24th?

*Bill\_Cooke:* Right now, several hundred per hour. The estimates will undoubtedly changes as more calculations/research is done.

Mark: It is great news about May 24; i had never read about this meeteor shower. Is it likely the last of our lifetime? Or is it likely there will be more every 5-10 years?

*Bill\_Cooke:* There will probably be a Draconid outburst in October of 2018 and the Perseid meteor shower may have a modest outburst in August of 2016.

Mark: Aside from May 24, if there is a big meteor storm in the next 20 years, is it more likely that it will be predicted? or more likely that it will happen without prior warning?

*Bill\_Cooke:* About 1:30 a.m. Pacific.

GlueBiant2: Imin Seattle, Wa... what timeshould I head to possibly view the shower

*Bill\_Cooke:* About 1:30 a.m. Pacific Time.

RobertPdot: Thanks for sharing your time with us Bill, we all appreciate it! We hope you get all the images you need to make some interesting discoveries.

*Bill\_Cooke:* You're welcome.

*Bill\_Cooke:* With regard to the meteor storm question, it is more likely that it will be predicted.

Kendyce: why is this predicted for the same day as 1930?

*Bill\_Cooke:* Because the Earth is encountering the stream on the same day.

Mark: Are you surprised there are only 61 people on this discussion given it was posted on MSNBC?

*Bill\_Cooke:* No.

StupidCloudySkies: Thanks for the Q&A Dr. Cooke. You're awesome!

*Bill\_Cooke:* You're welcome.

**NASA Chat: Elusive Meteor Shower Offers Opportunity for Citizen Scientists**  
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**June 10-11, 2013**

---

LightWriter: What type of images are better for the science? Short or long exposures? Also should I be tracking the sky or set up stationary?

*Bill\_Cooke:* Long exposures, but not much star trailing.

Spacecolonyfan: Could we possibly start constructing shipments or even space colony as earth civilization, for collecting "iron comet" meteor dust and rocks when we reach that day? Just for future notice. ;)

*Bill\_Cooke:* Need a reason to do so. What you're proposing sounds very expensive and even a bit beyond current capability.

Mark: thanks for your time; any advice on how to see fireballs like in 1998? i saw them on the east coast.. they were amazing... but i doubt i will see them again...

*Bill\_Cooke:* You can see fireballs during the Perseid and Geminid meteor showers. The Perseids are especially rich in fireballs.

Michael: I'm going out now...am in SE Phoenix Arizona and skies are very clear..cameras ready. Also, I am using an App called "Meteor Counter", would that be helpful if I do see action?

*Bill\_Cooke:* Yes.

Alyssa: Will there be another chat for the perseid meteor shower in August?

*Bill\_Cooke:* Yes, there will be a Perseid chat.

Doc: Thank you Dr. Cooke for providing your expertise tonight!

*Bill\_Cooke:* You're welcome!

Paul\_: I know I asked a lot of questions. Thanks so much for your time!

*Bill\_Cooke:* You're welcome.

*Moderator\_Brooke:* And that's a chat! Thanks everyone, and thanks Bill for answering these questions. Have a great night, everyone.