Hello and welcome, I'm John Junger. NASA public affairs stories and predictions of end of world in December 2012 have been betrayed in film, state in books and blossomed on the internet. Calif. scientists are here with us today to discuss the 2012 rumors propagated across the spectrum. We're going to ask some common questions and take some from social media if you have a question use the hash tag pound ask NASA on Twitter or on the livestream page for the event on NASA Television's YouTube channel or the stream on NASA's.
google+ page let's start with having our

panel members introduce themselves it

see my name is Mitzi Adams I'm a Helio

physicist at four Marshall Space Flight

Center in Huntsville Alabama and have a

special interest in sunspot magnetic

fields flare predict prediction and

coronal bright points I frequently serve

as a guest lecturer for the Von Braun

Astronomical Society and for science

courses at the University of Alabama in

Huntsville who have led several sessions

of theories of the universe a class that

explores how various cultures perceive
the cosmos including my favorites the Maya and Inca civilizations of Central and South America. I enjoy exploring strange new worlds and of hiked run and been cave diving in the Yucatan of Mexico and explored Maya and Inca ruins in Guatemala and Peru. So I'm Andrew Frack Noi and I'm an astronomer and the chair of the astronomy department at Foothill College near San Francisco. I have students every year who are tremendously worried about such issues so I'm delighted that we're going to be doing this Roundtable my
specialty is dealing with astronomical

00:02:01,118 --> 00:02:07,039
pseudoscience or fiction science things

00:02:04,039 --> 00:02:09,770
that are on the fringe of scientific

00:02:07,039 --> 00:02:12,019
ideas but are not really valid in

00:02:09,770 --> 00:02:15,049
examining them and helping the public to

00:02:12,019 --> 00:02:16,730
understand I'm also the only non NASA

00:02:15,049 --> 00:02:19,340
person on the panel

00:02:16,729 --> 00:02:21,139
on the outside commentator so that you

00:02:19,340 --> 00:02:27,289
can't imagine that this is some kind of

00:02:21,139 --> 00:02:30,500
government conspiracy hi I'm Luca Guha

00:02:27,289 --> 00:02:33,889
Takata I'm at NASA headquarters in the

00:02:30,500 --> 00:02:36,409
Helio physics division my profession is

00:02:33,889 --> 00:02:38,659
as a Helio physicist and I manage a

00:02:36,409 --> 00:02:41,750
program called living with a star and

00:02:38,659 --> 00:02:43,879
that star is our Sun and the goal of
this program is really to understand the

Sun and the earth as a connected system

and sun's influence not only on our

planet Earth but every other planet the

interplanetary medium this area of Helio

physics has given rise to what we know

as space weather Helio physics is the

science of space weather and I know that

space weather is an ill understood

subject today because it's still in its

infancy and so I hope in today's

discussion we'll be able to discuss some

of the ideas behind space weather and

some of the ideas of solar storms that
are floating around that are not correct

thank you my name is Paul Hertz I'm the director of astrophysics at NASA headquarters in Washington DC

my training is as an astronomer I've used telescopes all over the world as well as many telescopes orbiting in space to study interesting phenomena throughout the universe my specialty has been studying black holes and neutron stars and other objects which you've which emit large numbers of x-rays but I'm interested in just about anything that takes place beyond our planet I'm
David Morrison I'm a space scientist at NASA's Ames Research Center began career as an astronomer and planetary scientist and then became one of the founders of the interdisciplinary study of astrobiology the study of life in the universe currently I also have a joint appointment as director of the Carl Sagan Center for the Study of life in the universe at the SETI Institute for almost a decade I have been answering the questions at the public's endian about science to NASA's ask an
astrobiology webpage and that's a lot of

fun but in the last few years the real

science questions have been

well by questions about a 2012 doomsday

so I'm glad to be here to talk about

this hi I'm Don Yeomans um manager of

NASA's near-earth object program office

at the Jet Propulsion Laboratory in

Pasadena California and I'm supervisor

of the solar system dynamics group here

at JPL and it's our job to keep track of

the planets their past positions and

their future positions to keep track of

the natural satellites and also the

hundreds of thousands of asteroids and
comets that can do from time to time get close to Earth and if we do find one or two that do get close it's a job to compute impact probabilities and if there's a problem we notify observers to provide additional data in hopes that these impact probabilities will go to zero which they almost always do thank you let's start with a question from Google+ Cal sing man asks why is NASA even wasting their time doing it hangout on Google+ if we have nothing to worry about well that's an interesting question many of us have asked the same
question to ourselves because there is

no true issue here this is just a a

manufactured fantasy but the fact is

that many people are worried about it

and many of those people do write to

NASA and ask for NASA to to respond in

particular I'm concerned about the young

people who write to me and say they are

terribly afraid that they can't sleep

they can't eat some of them have said

they're contemplating suicide there was

one case of a teacher in in Stockton who

had the parents of two of her students

come and say they were planning to kill
their children themselves to escape this apocalypse so Wow it's a joke to many

people and a mystery to others there is a core of people who are truly concerned

and I think it's appropriate that NASA should answer these questions that are being sent to us thanks what is the origin of the prediction that the rule in 2012 where did that come from

Andy are you going to answer that I am my microphone was muted excuse me so uh can everyone hear me now yeah good so I think this is important to remember that this is not the first
time we've heard predictions of doomsday

158 00:07:01,348 --> 00:07:06,118 in Apocalypse those who were around in

159 00:07:03,988 --> 00:07:08,968 the year 2000 remember that there was a

160 00:07:06,119 --> 00:07:10,860 lot of calendar scare there too just

161 00:07:08,968 --> 00:07:13,348 like we're hearing now that the Mayan

162 00:07:10,860 --> 00:07:14,639 calendar is going to reset in those days

163 00:07:13,348 --> 00:07:16,829 we thought the world was going to end

164 00:07:14,639 --> 00:07:19,199 because our computer calendars were

165 00:07:16,829 --> 00:07:21,149 going to reset and I have a little chart

166 00:07:19,199 --> 00:07:26,218 which maybe we can put up that shows

167 00:07:21,149 --> 00:07:27,928 some of the very recent predictions of

168 00:07:26,218 --> 00:07:31,798 doomsday there have been predictions

169 00:07:27,928 --> 00:07:33,688 like this throughout history but in 1982

170 00:07:31,798 --> 00:07:35,698 for example there was a thought that the

171 00:07:33,689 --> 00:07:37,860 planets would align and a great
An earthquake would send California into the ocean and much to the chagrin of some California still around.

In 1999 Charles Berlitz predicted that there would be an end of the world and wrote a best-selling book about it so we've had a number of these and in each case nothing much has happened and here we come again I think there have been a lot of different people who have jumped on board once the 2012 rumors started going and brought their own particular flavor of catastrophe to bear on this particular date of the winter solstice.
of 2012 and they I would would add to

that only that that there are these
different threads as she said there's
Nibiru going to crashing to earth
there's whole shifts there's all sorts
of other things and they're really quite
unconnected
it's just that they focus on this one
date and it's become a a snowballing
process it's gone viral
there's nothing logical that why these
different calamities should be
associated with December 21st but that's
the situation we're in and David tell
the story about the movie 2012 and how

they made the website because I think

that's a great

story well it was interesting I expect

many of you have seen the movie 2012 it

was a spectacular disaster flick the

fact is that the makers of the movie did

not know about 2012 when they started it

had a different title it was just going

to be an end of the world disaster flick

and at one point when they were starting

production someone walked in and say I

just looks on the internet and heard

that there are people really scared

that there are really scared
about 2012 so let's attack our movie

onto that and give that title if the

movie wasn't about 2012 but it is

contributed to this broad concern

that is propagated primarily on the

Internet

there are thousands of websites there

are thousands of YouTube videos that are

all saying that there will be some

disaster happening in three weeks it's

interesting to point out that on the

Internet

there are no referees there are no

filters there are no reality checks so

it's a Wild West out there and folks who
hear about extraordinary claims have to look for the extraordinary evidence that's required to support those claims and sadly it's not just the web that's like this now more more sort of cable television channels are taking a tabloid approach where anything goes so it's especially important for scientists to speak up and say look even if you've heard it on the History Channel it doesn't mean it has to be true we have another question from Google+ it's Rob inventor Minh is asking was wondering how the Mayans picked a
date to start their calendar why exactly

or most likely on that day thousands of

years ago seems interesting well the

Maya believed in cycles and the current

calendar is actually one of several

cycles that lasts for thousands of years

the current calendar probably began and

somewhere around 3114 before the current

era and these cycles have gone on and if

the idea of the cycles have been

passed down through some of the

mythology of the Maya and this current

one simply ends on December 21st or 23rd

depending on who's doing the translation
of this year the reason there is no

other Maya calendar is because the

Spanish arrived and the Maya

civilization was essentially destroyed

they would have done essentially the

same thing that we do and just

create a new calendar after this cycle

ended okay thank you I have another

question here from Twitter it's baby it's

a baby GVA ass you also talk about the

Galactic Alignment sure I'll talk about

that so as you know as the earth goes

around the Sun and then different stars

are up in the night sky every night we


get up we get a sweep through the whole

00:12:13,970 --> 00:12:19,699
sky and once a year the direction to the

00:12:17,720 --> 00:12:24,050
center of the Milky Way galaxy will be

00:12:19,698 --> 00:12:26,870
right over head and or right behind the

00:12:24,049 --> 00:12:29,778
Sun and in fact in late December is the

00:12:26,870 --> 00:12:32,688
time that every year the center of the

00:12:29,778 --> 00:12:34,789
Milky Way galaxy is behind the Sun and

00:12:32,688 --> 00:12:38,120
so the earth and the Sun and the CERN

00:12:34,789 --> 00:12:40,909
the Milky Way galaxy kinda sorta line up

00:12:38,120 --> 00:12:43,698
in late December every year it's not

00:12:40,909 --> 00:12:47,299
December 21st and it's not in exact

00:12:43,698 --> 00:12:50,120
alignment the the Sun will be about ten

00:12:47,299 --> 00:12:52,758
of its own widths away from the exact

00:12:50,120 --> 00:12:54,379
direction to the galactic center when

00:12:52,759 --> 00:12:56,240
they get as close as they're going to
get this year and this year is no different than any other year and I guess it's important to point out to those of our listeners who are not astronomy buffs that the distance between us and the center of the galaxy is absolutely mind-boggling so that it's something like 26,000 light-years from each Lightyear is 6,000 billion miles so the notion that something at the center of the Galaxy could cause doomsday on earth is a complete misunderstanding of how truly astronomical the distances are between
us

and the center of the Milky Way and II

as an example even though the black hole

at the center of the galaxy weighs a

million times as much as the Sun it's so

far away that it's gravity is less than

one millionth the gravity that the Sun

grab on the earth the gravity effect of

this black hole is here in the galaxy is

less than one millionth the gravity

effect of the Sun has on the earth

there's a strange variant on this that

that said that go ahead go ahead Don

well I was just going to point out to
reinforce what Paul said that the so-called galactic alignment takes place every year without consequence and has done so for millions of years so there's nothing to worry about please go ahead people I'm just going to say it's it's a silly variant but I've heard it many times there are some people who interpret this is saying the earth is going to be in the center of the galaxy that somehow it's going to travel 30,000 light-years and collide with that black hole goodness knows where these things get going but they
are propagated on the internet and as

329
00:14:42,289 --> 00:14:47,509
has been pointed out there's nobody

330
00:14:44,090 --> 00:14:50,330
there to to moderate to say what's right

331
00:14:47,509 --> 00:14:51,860
and what's wrong it's been described

332
00:14:50,330 --> 00:14:54,290
that the Internet is the world's

333
00:14:51,860 --> 00:14:58,070
greatest library without the benefit of

334
00:14:54,289 --> 00:15:00,679
librarians could plant is it possible is

335
00:14:58,070 --> 00:15:02,270
it could plant it's a line in a way that

336
00:15:00,679 --> 00:15:03,609
could have some sort of impact on earth

337
00:15:02,269 --> 00:15:07,970
is that even feasible

338
00:15:03,610 --> 00:15:10,310
well planets align all the time but the

339
00:15:07,970 --> 00:15:12,139
only objects that have a noticeable

340
00:15:10,309 --> 00:15:13,969
effect on the Earth's tidal effects of

341
00:15:12,139 --> 00:15:15,439
the Moon which is very close and massive

342
00:15:13,970 --> 00:15:18,980
in the Sun which is extraordinarily
massive even if the Sun Earth and
Jupiter were aligned and they do a line
from time to time the effect of Jupiter
on the earth is much less than one
percent of the daily effect that our
Moon has on us so alignments occur
they're interesting from a pictorial
point of view but they real
have no bearing an effect upon the earth
isn't it also true that that in this
case when you look at where the planets
are in the sky they're pretty much
scattered all over on December 21st it's
about as far from an alignment of
planets that you could get that's true

but even if it would even if they were aligned it would make no difference

here's a question that we get asked a lot just on social media and comment

sections on the web is NASA predicting a total blackout of Earth on December 23rd
to December 25th what I don't know where it came from or we're getting out it's very complicated where some of these rumors emerge your Pandi there is a notice I've got an email going around a notice I've got an email going around sometimes some religious traditions get confused with the ideas that the Winter
Solstice is the shortest day of the year

so it's completely without scientific basis again you folks have to understand that if they see something on the internet and it's an extraordinary claim as Carl Sagan pointed out time and time again you need extraordinary evidence to back it up and there is no app's evidence for these this three-day blackout or any of these other phenomena that we're discussing this is not the first time that the thought that blackout came along by the way there was a similar kind of interest and concern
about comet Elenin the little comet that came along in 2011 and disintegrated and

there were firm predictions on the web

then that that comet was going to come between the Earth and the Sun and caused

a three-day blackout at the end of

September of last year by then the comet had disintegrated but it was a crazy idea then - it's really fascinating! think you know some of the questions that we are getting I'm wondering not this sort of fear generated in the people only in the northern hemisphere because if there is a winter solstice somewhere there is a summer solstice
going on somewhere else and so

obviously the entire planet is not

affected so it's kind of curious and for

a three day blackout to occur something

weird would have to happen with the Sun

and there's nothing we know of

physically that would allow the Sun to

turn off for three days and then turn it

back on oh thank you for shedding light

on that question hopefully people are

tuning in the van asking it and we have

one from Twitter it's a ipod 723 s been

hearing a lot about me B room the

planets the fictional plan and how it
spells certain doom for our little blue planet care to shed some light on this probably I have had more questions from the public about about this Nibiru or Planet X as they often call it and it's one of the association's also with NASA because some people go back to the 1983 IRs the first astronomical infrared satellite they carried out a survey and of course found many new objects that no one had seen before at the time there was speculation that one or more of them might be a new planet the outer edge of the solar system that wasn't true it was
the truth was found they were all extra
galactic objects millions of light-years away but there are people who think that somehow NASA has been doing a cover-up ever since a cover-up of a planet called Nibiru named by the ancient Sumerians that in the normal description has a thirty six thirty six hundred year orbit so it comes back into the inner solar system every 3,600 years and each time it comes in it either hits the earth or almost hits the earth this time it's supposed to hit the earth and destroy us and this is such a
pervasive idea that makes no sense

00:19:43,749 --> 00:19:49,419
because if it were there we could see it

00:19:46,569 --> 00:19:51,128
if there were an object of planet as big

00:19:49,419 --> 00:19:53,619
as the earth or bigger that was headed

00:19:51,128 --> 00:20:00,399
into the inner solar system astronomers

00:19:53,618 --> 00:19:57,609
like Don Yeomans and the people he works

00:19:55,990 --> 00:20:00,399
with would have been tracking it for a
decade at least and by now it would be

00:20:00,398 --> 00:20:03,819
the brightest object in the sky after

00:20:02,558 --> 00:20:06,519
the Sun and Moon

00:20:03,819 --> 00:20:09,700
anybody go out and see it you could

00:20:06,519 --> 00:20:11,289
dispel this rumor yourself you don't

00:20:09,700 --> 00:20:13,660
have to ask the government or ask

00:20:11,289 --> 00:20:17,019
scientists just go out and look at the

00:20:13,660 --> 00:20:20,560
sky and you will find no new bright
object headed for the earth similarly if
there were such a planet its gravity would be messing with the orbits of the planets and again if you go look at what scientists are studying there is no way that have changed in the orbits of the planets would happen without it being immediately detected I think it's interesting to note as Davis pointed out many times that the most recent prediction of Nibiru coming close to the earth was provided by a lady Nancy Keyes that's her named leader who claims to be channeling aliens around the star system
Zeta Reticuli

well that should raise a large red flag

right there changing subjects a little

bit

what is this polar shift theory that the

earth crust there's a 180 degree

rotation two kinds of poles we have the

pole of rotation that kind of imaginary

stick or axis which is which goes

through the earth and around which we

spin is called our rotation pole and

then we have another set of poles called

the magnetic poles where the earth acts

like a magnet in the magnetic influence
as a North and South Pole to it and over long geological periods the magnetic poles of the earth drift a little bit because of the complexity of the electrical currents inside our planet and also from time to time over timescales of millions of years or hundreds of thousands of years we can have a flip where the North Pole becomes the South Pole magnetically and the magnetic South becomes North somehow people have gotten that mixed up with the rotational pole so they say my goodness on December 21st in one day
there's going to be a flip of the

Earth's rotation

so that we're going to either rotate the

other way or the whole planet is going
to turn upside down this is absolutely

ridiculous the force required to do that

to change the way our planet rotates

would require an enormous other body to

come here and affect us and we've just

heard that such a body would be

immediately visible to all of us

and without that there's no way to

change the rotation of a huge planet

like the earth so people get mixed up

between the long geological trend of
changes in our magnetic field and our
rotation and as a result of this comes
as doomsday rumor that on the winter
solstice we're going to be rotating
wrong there's just nothing to them and
if there does if when the magnetic shift
does happen could that impact life on
earth well we we have never during
historic times experienced such a
magnetic change but we do know that it's
a very gradual process it would happen
over a long period of time perhaps
thousands of years and we know that it's
happened we have geological evidence
from the rocks where the magnetism is recorded that it's happened many times and yet life on Earth has continued to thrive and evolve so there may well be a little bit more radiation there may be more particles coming from space when the magnetic field of the earth changes but certainly we know that life has survived and we're all still here thank you and here's a question that we know is a real danger to earth and that's being hit by a meteor is there any danger possibility this could happen in the year 2012 sometime in December no
the earth is actually hit by meteors on a daily basis and I mean basketball-sized objects come in a couple times a day they don't do any damage because they've burned up in the Earth's atmosphere Volkswagen sized objects come in every couple of weeks again they're too small to make it all the way through the Earth's atmosphere but they are recorded by down-looking Defense Department sensors so the earth is limited with hundreds of tons of material every day but in order for an object to come
through your sadness fear and cause

00:24:32,500 --> 00:24:38,140
ground damage it has to be about 40

00:24:34,690 --> 00:24:40,840
meters in diameter or larger and those

00:24:38,140 --> 00:24:43,450
types of objects don't occur but every

00:24:40,839 --> 00:24:47,049
500 years and we know of no objects that

00:24:43,450 --> 00:24:48,880
are really about concern to earth either

00:24:47,049 --> 00:25:02,860
this December or for the next several

00:24:48,880 --> 00:25:07,730
years thanks I always said you should

00:24:53,920 --> 00:24:59,860
should you perhaps add that that we know

00:24:57,730 --> 00:25:02,860
these things because of the NASA's

00:24:59,859 --> 00:25:06,189
Spaceguard survey that there is a real

00:25:02,859 --> 00:25:08,289
long-term concern about possible impacts

00:25:06,190 --> 00:25:11,500
and that's why for the last almost 20

00:25:08,289 --> 00:25:13,480
years we have been scanning the sky

00:25:11,500 --> 00:25:15,759
specifically looking for asteroids
near-earth asteroids and have a catalogue of about 10,000 of them now with determined orbits and I always mentioned to people that one result of that is there has not been a single object found that's on a collision course with earth that's true I should mention the NASA program near-earth object program that is actively searching the skies on a nightly basis and finding more and more of these objects so that we can take the observations they provide and make predictions of where these objects will
be in the future and if they do get close which they do from time to time in fact we had one hit in 2008 a small one over northern Sudan and we predicted that one correctly so whereas 30 years ago or there was very little effort by anyone to observe and track these objects that is not the case any longer NASA is a very aware of this issue and is making great strides to predict any large objects that are incoming and I would add to that as I'm sure you would that the information is all made public that you have a beautiful
website updated every day there's no sort of secrecy governing these objects and people can go look for themselves for all the known objects and the newly discovered ones and see what their orbits are that's true in fact we even have a widget that's available giving the next five closed Earth approaches and we have a Twitter feed that has something like 950 thousand people taking part so this full transparency everything is put out there immediately on our website we couldn't keep a secret even if we wanted to so
it's it's all out there

00:26:57,069 --> 00:27:03,288
almost immediately I think I'd like to

00:27:00,528 --> 00:27:05,839
add to it it is not a concern just

00:27:03,288 --> 00:27:08,329
for NASA or for United States it's an

00:27:05,839 --> 00:27:12,109
international concern and there is

00:27:08,329 --> 00:27:14,089
actually an active agenda within United

00:27:12,109 --> 00:27:16,819
Nations Committee on peaceful use of

00:27:14,089 --> 00:27:19,069
outer space that actually looks at

00:27:16,819 --> 00:27:21,859
near-earth asteroid and it's it's not

00:27:19,069 --> 00:27:23,928
NASA but many other countries join in

00:27:21,859 --> 00:27:27,798
with their telescopes to really track

00:27:23,929 --> 00:27:30,440
these objects so I I think as an

00:27:27,798 --> 00:27:33,349
international community we are we are

00:27:30,440 --> 00:27:35,028
really aware of the consequences of such

00:27:33,349 --> 00:27:38,509
an object and we are keeping eyes on
this so this is this is an important topic and it is on everyone's radar screen I think it's very good to point out because many of the people who write to me just don't understand how astronomy and NASA work they think that somehow NASA controls all the telescopes in the world and all I know you control a lot of them but not all of them that the astronomers of the world all work for NASA and so NASA has a control on information when in fact there is a wide international astronomical community in the case of something like Nibiru there
are at least a hundred thousand astronomers amateur and professional in a hundred different countries that could have been looking so so there's no possibility of hiding something that's in the sky and let me just add Don pointed out that all of our data on the asteroids that we're tracking is put on the web for everybody take advantage of that's in fact true of all NASA as a data whether it's astronomical data planetary data solar data or earth science data you can go to the web and get access to all the data that NASA's
satellites are collecting we make it available so that all scientists around the world can use it and we make it available so that all interested citizens can learn from it and take advantage of it.

thanks everyone that's a really thorough explanation we have I think we were touched on this before but on Twitter Sophie Emma asked could the black hole found the center of the Milky Way have an effect on earth there's not a possibility at all I'll take that one and the answer is no as we've already
pointed out that black hole is twenty

00:29:18,980 --> 00:29:24,470
eight thousand light years away which is

00:29:21,609 --> 00:29:26,329
tremendously distant not only that but

00:29:24,470 --> 00:29:29,029
of course the reason why we call black

00:29:26,329 --> 00:29:31,639
holes black holes is because they don't

00:29:29,029 --> 00:29:34,009
emit any radiation that they only have

00:29:31,640 --> 00:29:36,020
gravitational attraction the

00:29:34,009 --> 00:29:37,609
gravitational attraction is as I

00:29:36,019 --> 00:29:40,220
mentioned before less than one millionth

00:29:37,609 --> 00:29:41,689
that from the earth we can't even see

00:29:40,220 --> 00:29:43,490
the black hole at the center of the

00:29:41,690 --> 00:29:45,080
galaxy the only reason we know it's

00:29:43,490 --> 00:29:47,569
there is because we can see stars

00:29:45,079 --> 00:29:49,849
orbiting it and that's how we can detect

00:29:47,569 --> 00:29:53,149
it and we can measure its brightness we
can also see x-rays from dust that falls into the black hole at the centre of the galaxy but those x-rays are so far away that they have no impact even on stars in their vicinity much less the earth.

Thank you have another question from Twitter it's Ramon underscore 305 asks do you have any news on solar activity what are the chances of a major solar flare hitting Earth's atmosphere I take that one for sanity probably will join me um I think we have lots of news on solar activity for one in in this case it happens to be NASA NASA spacecraft
has literally surrounded that Sun we have many spacecraft that is looking at the Sun from different vantage point and so there is nothing that happens on the surface of the Sun that goes unnoticed by the spacecraft so we are able to track the progression of solar activity now we all know that the Sun goes through an activity cycle every 11 years what you find are that the magnetic field on the Sun increases and then decreases and what happens as a phenomenon on the photosphere of the Sun and that sunspot numbers increases and
then some sunspot number decreases
sometimes it just completely vanishes
from the you know photosphere
lit up side of the Sun and that's what
we call a solar cycle maximum to minimum
in the space age that we have been
tracking the Sun let's say like some 50
years what we have seen in solar
activity is that the solar activity had
been on the rise up until this last
solar minimum the solar minimum of the
last cycle 23 was rather long and
protruded a solar minimum you know they
were almost almost 2 years when we had
were almost almost 2 years when we had
very few sunspot or no sunspots at all

and as we came out of that solar cycle

solar minimum and started rising into

solar cycle 24 you know Noah does the

prediction for solar activity solar

storms impinging on earth then what what

y they determine is that there is a scale

units it's not a very real thing and

I'll show you a graph from the Y that

told us you know what would this cycle

look like and every solar cycle

scientists kind of come together and bat

around and you know come to some kind of

understanding what is our expectation

based on the latest understanding of
physics and so what we are finding in this solar cycle in this solar cycle is sort of the wimpiest solar cycle interests me it is more than what we had even expected so now why is that important storms happen all the time on the Sun if you have a strong solar cycle the frequency of these storms increases but their intensity has nothing to do with the frequency so you can have a weak solar cycle and you can still ever really strong solar storm but the frequency is the one that gives us sort of a probabilistic sense right so the
question is there going to be a solar

storm

you know sufficiently large that can hit

us right and and that it's a

probabilistic question these these

questions are like the questions we

asked off you know 100 year flood 100

your supervolcano something like that

can it happen you know we can't say it

won't happen but we have enough

understanding to say that it doesn't

look like something like that is going

to happen but even if we were to get our

really large solar storm the interesting
thing is that now we because we can see and track the Sun from all sides we can actually predict that there is an active region emerging that the active region has the potential to create a really large storm so we can start warning people we meaning knowing this case we work closely with NOAA and and what we can do is we talk we can turn off our sensitive electronics our power grid anything that is sort of electromagnetic in nature as the potential to be impacted by solar storms these stones really have no direct effect on human
beings in terms of a huge radiation or

00:34:28,219 --> 00:34:34,849
there is no fire created none of those

00:34:31,190 --> 00:34:37,610
but electronics can be severely damaged

00:34:34,849 --> 00:34:40,819
and as we know our societies are

00:34:37,610 --> 00:34:42,950
becoming more and more technologically

00:34:40,820 --> 00:34:45,820
dependent so if you were to ask me are

00:34:42,949 --> 00:34:48,648
we going to get a major solar flare on

00:34:45,820 --> 00:34:51,019
December 21st I could tell you something

00:34:48,648 --> 00:34:54,559
because we are actually looking at the

00:34:51,019 --> 00:34:57,050
Sun and it takes about on almost a month

00:34:54,559 --> 00:35:01,279
let's say from the far side of the Sun

00:35:01,280 --> 00:35:06,140
can say you know what we can already

00:35:03,559 --> 00:35:08,539
because we have spacecraft in u.s. 10

00:35:06,139 --> 00:35:11,299
you be so who Solar Dynamics Observatory
we know all the sunspots that's out
there that's coming towards us we can
actually penetrate beneath the Sun also
with our telescopes and say what is
emerging so we will have a pretty good
idea if something is forming rapidly and
coming at us so I think we'll
be able to warn you guide you it is very
unlikely that we are going to get
something huge would you like to respond
to the question that I've received
several times
the people say ah it's not just the Sun
but there is a tear in our magnetosphere
that the magnetosphere is collapsing

that our natural protection is going away how do you answer that question yes

it's going to be a little bit difficult in terms because it's a technical jargon

but let's talk about the magnetosphere

how are we protected from these solar particles that come and impinge on us

you know there were questions before you

know about polar shift and all that now

all these are tremendously blessed and

lucky that it has a magnetosphere in

fact I might even venture as far out to

say that perhaps this magnitude sphere
which kind of shields us like a cocoon

has enabled life to have been generated

on this planet now what happens when

these particles come and impinge on the

magnetosphere these are on magnetic field lines connecting with each other

there is reconnection happening and when

this reconnection happens this particles can actually propagate into our planet

and and this is when we begin to see or

know that if we are seeing an Aurora the northern and southern lights that tells us that a solar storm has actually
generated a magnetic storm which is a

00:37:06,650 --> 00:37:11,950
storm in our own planet and then these

00:37:09,530 --> 00:37:15,620
particles can actually propagate down

00:37:11,949 --> 00:37:17,719
create electromagnetic fluctuation which

00:37:15,619 --> 00:37:22,159
creates you know different conditions in

00:37:17,719 --> 00:37:24,139
the ionosphere that controls our a lot

00:37:22,159 --> 00:37:29,599
of our satellites for communication

00:37:24,139 --> 00:37:34,519
navigation etcetera furthermore this

00:37:26,539 --> 00:37:32,090
these fluctuations have the ability to

00:37:29,599 --> 00:37:34,519
really produce huge amount of voltage

00:37:32,090 --> 00:37:36,740
fluctuation on our grid which can get

00:37:34,519 --> 00:37:38,900
tripped and which can actually go out

00:37:36,739 --> 00:37:42,439
and these things have happened like in

00:37:38,900 --> 00:37:45,050
1989 hydro-quebec failures that's how

00:37:42,440 --> 00:37:48,530
you can be in darkness because your
power system failed so yes they're these particles can penetrate through our magnetosphere but even that we are able to kind of guide people through whether a particular storm has the kind of magnetic field orientation that will allow you to connect up with our own magnetosphere but but the question I get is that somehow something recently has happened that the magnetosphere is going away and and I think you're saying it's that's not true that it's a it's still there and it's still protecting us it's
very much there and in fact we just
launched another pair of satellites are
called Van Allen probes some of those
results will be out during this upcoming
meeting that clearly shows that our
magnetosphere not only exists sometimes
it creates kind of new radiation belts
because of its interaction with solar
energetic particles you know it actually
that aside from solar flares what what
kind of solar activity eventually
whether it's thousand million years from
now could eventually impact life here on
earth yeah I mean I'm assuming that
eventually something with the Sun

eventually expansion or will eventually could could

have an impact what what is that and

when would that estimated be where we

could look at something that could have

a major event that we are you talking of

the Sun as an Astrophysical object yes

more into you know Sun is kind of a very

ordinary star so it's not going to

produce a supernova and I think all it

will do is become a red giant you know

and then it's going to expand

tremendously and at some point I think

it's going to envelope our planet core

it's going to envelope our planet core
and go all the way to Mars but that that

00:39:40,579 --> 00:39:48,489
that's billions of years away and I will

00:39:43,340 --> 00:39:48,490
ask Paul perhaps to comment on that

00:39:54,409 --> 00:40:01,879
Paul here with us sorry I was muted the

00:39:59,329 --> 00:40:04,039
Sun is a fairly ordinary star we've

00:40:01,880 --> 00:40:06,170
observed many stars similar to the Sun

00:40:04,039 --> 00:40:08,900
throughout the galaxy at different

00:40:06,170 --> 00:40:10,970
stages of their evolution our best

00:40:08,900 --> 00:40:13,068
understanding of the future of the Sun

00:40:10,969 --> 00:40:15,230
which we can only get from looking at

00:40:13,068 --> 00:40:17,179
other stars that are older than the Sun

00:40:15,230 --> 00:40:19,490
and therefore have gone through later

00:40:17,179 --> 00:40:23,118
stages of their life than the Sun has is

00:40:19,489 --> 00:40:24,979
that the Sun will indeed use up the

00:40:23,119 --> 00:40:27,490
hydrogen at the center of its core that
will cause it to expand into a red giant.

it will eventually get as B certainly as big as the orbit of Venus we don't know.

if it will get out to the orbit of the earth but it will certainly change the weather on the earth and the climate quite substantially but in case anybody is getting concerned about this happening in December that's not the case this will happen in about five billion years and so we have plenty of time to contemplate what we might do in five billion years when the Sun reaches later parts of its lifetime so I'm not
taking out red giant insurance on my home this is a this is just a general question for everybody I suppose are there in your field are there any threats to earth in 2012 or any time the near future that we should be concerned about yes I think there's any credible threats that we know about in the near future of there's an interesting closed earth approach by an asteroid called 2012 da14 next February 15th it's going to pass within four-and-a-half Earth radii of the Earth's surface which is within the
geosynchronous satellite belts though

you've got this object that's coming
closer to the earth and you've got
satellites further away there will be
announcing its arrival it's it's an
object that whose orbit is well known it
cannot get any closer than
four-and-a-half Earth radii so it's
going to be an interesting target for
astronomers especially radar astronomers
but it's it's not a threat
from an astronomical point of view 2012
it's like any other year the earth goes
around the Sun there are throat ate the
Sun is moving through interstellar space

all the planets are in their orbits and

there's nothing happening this year

that's special so if I can give you a

slightly whimsical answer but I think a

relatively important one I think one of

the greatest threats to earth in 2012 is

the low level of science education and

public knowledge and I think this entire

discussion and the fears that have been

generated illustrates how much more NASA

the scientific community and those of us

in science education still need to do

it's really sad that so many people are

worried and writing to David Morrison
it's really sad that our schools have not taught skeptical thinking and have not helped students to distinguish between the reality and the fantasy of what's going on in these areas so I think if people are concerned about cosmic threats part of that is a threat to our understanding of science that comes from insufficient science education and I hope we can all redouble our efforts to help students understand the world.

better I'm also worried about that in fact I think the great threat is really in this month because there are
literally millions of people who are afraid who think the world will end and in particular children the children who are contemplating suicide that children that are worried that Christmas won't come this year and I think it's evil for people to propagate rumors on the Internet to frighten children and I think all these frightened children are a real problem and I hope it will go away soon but we need to do protect ourselves and our children from this sort of crazy ideas as andy says the best way to protect ourselves is to
learn enough science to recognize just how silly these threats supposedly are and I'd like to add to that I think this is absolutely true science education and outreach is very very important in this regard as the matter of fact the fact that we are all here spending an hour doing this it is an outreach activity to really educate people the best we can on this short period of our time I wanted to share actually one item with you and that is if anyone is interested in tracking the Sun we have something called a 3d Sun
app both on iPhone and Android and of

1013
00:44:51,960 --> 00:44:57,119
course it's on the website NL and so you

1014
00:44:54,960 --> 00:45:01,318
can actually this is what I was saying I

1015
00:44:57,119 --> 00:45:03,568
wasn't kidding we get this sort of 24/7

1016
00:45:01,318 --> 00:45:05,670
we have data that is transmitted to us

1017
00:45:03,568 --> 00:45:08,608
by several satellite NASA satellites

1018
00:45:05,670 --> 00:45:11,818
with which we are actually seeing the

1019
00:45:08,608 --> 00:45:15,989
Sun boot the far side at the front sight

1020
00:45:11,818 --> 00:45:18,480
almost instantaneously but on this site

1021
00:45:15,989 --> 00:45:21,239
you can actually get information if

1022
00:45:18,480 --> 00:45:23,699
there is a solar flare happening if

1023
00:45:21,239 --> 00:45:26,098
there is an active region emoji so you

1024
00:45:26,099 --> 00:45:28,889
can be educated there are other little

1025
00:45:28,889 --> 00:45:34,230
tidbits in there that is informative for

1026
00:45:32,230 --> 00:45:36,210
our listeners on the Internet I would
agree with everybody about science

literacy I think that's really important

I think the greatest threat to earth in

2012 at the end of this year and in the

future it's just from the human race

important for us too without getting a
derailed into a long discussion of

global warming is to is to emphasize

that invested in fact we our own actions

may represent a far greater threat to

the planet than anything that the cosmos

is throwing at us and this this question

actually ties in well to one that was
asked to us on YouTube from Charles bill

King he has given all the myths 2012

moon landing etc what methods can a lay

person who is questioning these things

due to research and verify the research

they do to help rest their fears slash

conscerns that's an excellent question

and I

it often obviously these are complicated

scientific issues and not everybody is

going to know all the science when I

tell people first is look it up in

Wikipedia that is such a good resource

on the Internet of course it's not
perfect of course some things that are
wrong but they tend to be corrected very quickly for instance just last week
someone put up a silly thing about the and meteor ten times the size of the earth headed for the earth and it was up for just under two hours before someone took it down so you know people can write to ask an astrobiologist and other ask assign others things they can learn science that's great but when you're faced with an immediate issue when you see something that just doesn't quite make sense for you I suggest looking it
up in Wikipedia and another really good resource that we can perhaps mention is

that there's an organization of scientists educators magicians and others who are good at figuring out tricks of irrational thinking it's called the committee for skeptical inquiry the website is www Co P or RG and this organization publishes a newsletter called The Skeptical Enquirer David has been very active in writing for them I think this is an excellent source of sort of rational or skeptical examination of paranormal claims thank you and I'd be remiss if I didn't add
nasa.gov has a webpage that addresses a lot of these questions you can visit at nasa.gov slash 2012 I have one final question for the group and if you have any closing remarks to answering this question this would be a good time and it'd be nice if everybody maybe an order that we started off when it just kind of gives a question and answer this on Twitter and Esther van Gardner asks have you guys made any plans for December 21st I've made a few plans for December 21st I'm actually going to be going to
Atlanta for Christmas and on December 22nd I'm running a 5k so December 21st

I'll probably be resting a little bit and enjoying the Solstice well I I guess

the more important question is whether

we have plans for a December 22nd and thereafter I David and I participated

this summer in a colloquium for our symposium for the Astronomical Society of the Pacific where a lot of science educators were there and we've been encouraging science museums schools and other institutions to stay open if possible through that evening of
December 21st and have a little party

00:49:31,000 --> 00:49:36,130
the first hour of December 22nd I I

00:49:34,150 --> 00:49:38,619
certainly will be celebrating when

00:49:36,130 --> 00:49:40,930
December 22nd rolls around but I think

00:49:38,619 --> 00:49:44,109
more importantly what what I think we

00:49:40,929 --> 00:49:47,710
all ought to be encouraging science

00:49:44,110 --> 00:49:50,860
teachers and other educators to do is to

00:49:47,710 --> 00:49:53,530
be on the lookout for the next doomsday

00:49:50,860 --> 00:49:55,570
because for sure when this doomsday is

00:49:53,530 --> 00:49:57,670
over someone's going to come up with

00:49:55,570 --> 00:49:59,860
another date when the world is going to

00:49:57,670 --> 00:50:01,690
end and perhaps some of the tools that

00:49:59,860 --> 00:50:04,420
we've learned to use for this particular

00:50:01,690 --> 00:50:07,360
doomsday will be helpful in preventing

00:50:04,420 --> 00:50:13,780
fear about future the doomsday is to

00:50:07,360 --> 00:50:17,110
come I think I'm going to start my first
day of holiday vacation on 21st with the

00:50:13,780 --> 00:50:19,120
comfortable from college

00:50:17,110 --> 00:50:21,579
it's solstice so obviously if it's not

00:50:19,119 --> 00:50:24,519
snowing outside we'll have a bonfire be

00:50:21,579 --> 00:50:27,819
happy eat drink and be merry and I would

00:50:24,519 --> 00:50:29,699
suggest people who are celebrating

00:50:27,820 --> 00:50:32,680
winter solstice and the special holiday

00:50:29,699 --> 00:50:35,649
in whichever hemisphere you are I think

00:50:32,679 --> 00:50:40,239
just celebrate it I'm very jealous of

00:50:35,650 --> 00:50:41,950
Lika and it see for their plans

00:50:40,239 --> 00:50:44,709
I'm having a very important review here

00:50:44,710 --> 00:50:49,900
at NASA headquarters on December 21st

00:50:47,340 --> 00:50:52,630
for a project with the European Space
Agency to build a telescope put in space
to study dark end
and the whole team will be here to have
the review and get approval for the next
stage of that project
it's like superstorm sandy the droughts
the floods all of these things aren't
happening and that is a real threat to
the earth not a fantasy like December
21st 2012 doomsday yeah I'd like to
follow up where something David just
said there's a plot on the bulletin
board outside at my office of the
monthly rise in sea level as the ice
caps in Greenland disappears so global

warming is a real issue and leaks and

make sure that they don't dismiss this

type of disaster prediction as something

silly and well outside their area of

expertise and and something they don't

have to concern themselves with we all

have to concern ourselves with what the

public thinks these folks are paying our

salaries they need to know the truth

they need to know where to go for the

absolute best information be at a NASA

site or an academic site so we need to

check our colleagues into action and
make them talk to the public make them respond the way we have and I'd like to thank headquarters for putting this on I think it's a great start and for December 21st and second if history is any guide I think uh probably doing last-minute shopping again and running out the Christmas tree great I want to thank our panelists for joining us this has been a fantastic and lively conversation that concludes our 2012 Google Plus hangout if your question wasn't answered here today please visit us on the web or on social media and ask
away our twitter and google+ or on

1184
00:52:38,409 --> 00:52:42,759
Google and Google+ or Twitter

1185
00:52:40,268 --> 00:52:44,169
use the hashtag a pound asknasa and

1186
00:52:42,759 --> 00:52:45,489
we'll try and answer your question to

1187
00:52:44,170 --> 00:52:47,108
get back to you as soon as possible and

1188
00:52:45,489 --> 00:52:50,489
thanks to everyone for joining us asking

1189
00:52:47,108 --> 00:52:50,489
questions have a great afternoon