1 00:00:03,740 --> 00:00:09,900
hello again everyone and welcome to the

2 00:00:06,750 --> 00:00:13,919
iris mission science briefing here to

3 00:00:09,900 --> 00:00:16,710
talk about the iris mission is dr. Pete

4 00:00:13,919 --> 00:00:22,170
worden the center director from the NASA

5 00:00:16,710 --> 00:00:24,300
Ames Research Center Geoffrey numark the

6 00:00:22,170 --> 00:00:29,189
iris program scientists from NASA

7 00:00:24,300 --> 00:00:31,859
headquarters in Washington an allen

8 00:00:29,189 --> 00:00:33,988
title the iris principal investigator

9 00:00:31,859 --> 00:00:36,390
from Lockheed Martin's Advanced

10 00:00:33,988 --> 00:00:39,119
Technology Center solar and astrophysics

11 00:00:36,390 --> 00:00:40,649
laboratory and we'll begin first with

12 00:00:39,119 --> 00:00:43,409
comments from the NASA Ames center

13 00:00:40,649 --> 00:00:46,140
director dr. Pete worden thank you

14 00:00:43,409 --> 00:00:48,479
George this is an incredibly exciting
mission I'll let dr. title tell you a
little bit about the details of the
science but from our perspective at NASA
there's two really important points
the first one is that this is a low-cost
mission it's a small Explorer and it
demonstrates they I think the wave of
the future that we're going to be doing
a lot more with lower-cost smaller
missions at the same time getting really
earth-shaking science is I think you'll
hear this is the first mission that will
really tell us the detailed physics
that's going on at the solar surface in
the atmosphere above it it's also a real

opportunity to interact with the

computational work NASA Ames is the

center at NASA that has the agency

supercomputer and we are able to work

the computer with the data we have to

really understand what's going on in

fact that works been going on for

several years so we're very excited

about that the second key point though

is that the Sun is increasingly

important to our environment and as

those of you that we're listening a

little earlier saw the effect of power
outages well we believe that some may be

a lot of power outages actually have a

lot to do with solar activity so the

we can understand the physics going on

the better we can understand that

activity the better that we could

potentially predict and mitigate some of

these problems so it was sort of in some

sense unfortunate to delay the launch

but it's also fortuitous to highlight

the importance of this mission thank you

thank you dr. warden and now to jeffrey

new mark the iris program scientists

from NASA headquarters well thank you

I'm very pleased to be here today to
58
00:02:41,939 --> 00:02:49,109
introduce the science of iris iris is

59
00:02:46,650 --> 00:02:53,549
our newest member of our heliophysics

60
00:02:49,109 --> 00:02:55,439
fleet and hope to die by the end of this

61
00:02:53,549 --> 00:02:58,260
press conference we get an idea of the

62
00:02:55,439 --> 00:03:00,840
exciting science that we were doing in

63
00:02:58,259 --> 00:03:03,780
heliophysics I should step back and say

64
00:03:00,840 --> 00:03:05,729
what is hilly physics the physics it is

65
00:03:03,780 --> 00:03:07,680
the oldest science known to man it's the

66
00:03:05,729 --> 00:03:09,869
study of the Sun and it's also the

67
00:03:07,680 --> 00:03:11,549
newest science is the studying of its

68
00:03:09,870 --> 00:03:15,390
interaction with the earth our

69
00:03:11,549 --> 00:03:17,790
technology and the rest of the planets

70
00:03:15,389 --> 00:03:22,529
throughout the solar system if you could

71
00:03:17,789 --> 00:03:24,539
show me the first video most people
think of the Sun as a constant source of heat and light that bathed our planet.

different than a constant source you see.

here images of the atmosphere of the Sun.

the outer atmosphere of the Sun and you see the tremendous amounts of activity.

that is going on throughout these video.

I should point out that everyone will see these pictures today people think of.

computer graphics these are real images taken from our current spacecraft these.

are these are not generated so all the.

movies i'll show you today are real.
images what we're seeing here is the Sun

is a giant huge nuclear fusion reactor

at the center it is tens of millions of

degrees and over a half a million miles

as it goes outward to the surface of the Sun it slowly cools and where the surface is about 10,000 degrees then

something very strange and mysterious happens in the next just a couple of thousand miles the temperature rises again to the admin the outer atmosphere

to again millions of

grees what causes this rise how does the energy transfer from the surface that
the cool surface to this hot outer

atmosphere this is the questions that
iris the science of virus is going to
address one might ask why do we care

what haven't be seen a number of these

graphics before well as we see these
images can we explain it from just this

and as I hope to show you that no we

there is more to be to be gained if you

look at my second graphic if you can

show the second video if we step back

and we look at the Sun now as the small

in the center we see the larger extended

atmosphere of the Sun we see a
tremendous display of again of activity

we see particles streaming away from the Sun constantly this is known as the solar wind and then we see the solar storms these are the active parts that we saw earlier on the Sun these are now expanding throughout the entire solar system the snow like features you see are actually high-energy particles streaming hitting our spacecraft and distributing the cameras these high-energy particles continue on in less than an hour later can hit the earth these as dr. warden mentioned
these can have effects for us on earth

ey can affect our navigation or

communications our power systems and

especially our astronauts once they

leave the protective lower our Earth's

atmosphere they'll be quite vulnerable

along with our other systems that leave

the protective low Earth they become

vulnerable to these storms that are

traveling so why heliophysics what are

we trying to study so hilly physics is

broken down then into fundamental

questions we're looking at what causes

the Sun to vary what are the fundamental
physics processes that are going on how

do these how does this variability in
the interact with the earth and all of

the planetary

systems and what are the impacts on

humanity and as we explore all the

worlds so that is the science of hylia

physics I think by now it's obvious that

we have a number of observatories to

look at the Sun we've seen these

beautiful images if you could show my

third graphic the question then is why

is the new one why are we launching iris

iris actually fills a crucial gap we've


seen a lot of our current observatories

look at the surface of the Sun the

photosphere for instance where I just

showed you in the sunspot and then we

have the full out of Corona the million

degree corona that we see in the full

disk in between this interface region

which you see in the inserts of some of

these movies we've currently have just

some observatories now that look at the

without the necessary cadence the end

spatial resolution and spectroscopy to

really unlock those mysteries of how the

energy in meta flow what's driving the

solar wind that comes from there all
that is hoped to be learned from iris.

right and thank you that's why all right.

Thank You Geoffrey and now to Alan title

the iris principal investigator Alan

thank you George you've heard so much

about the Sun there's not very much left

for me to say ah what is this interface

region and the answer is we don't know

if it's so important why haven't we

studied it in the past well but the

answer to that was hinted at by peets

comments that this read the instruments

that look at this region in the past

have had about 20 times poor resolution
spatially and about 20 times poor resolution spectrally and spectrally allows us to measure temperatures velocities pressures ah so it's it's important to have spectroscopic information but basically we've been looking at things that happen so fast that data taken as slowly as previous instruments have done really hasn't given us any information but even more fundamentally there's not been a push to understand because the atomic physics in this region is very very very complicated and it's only been in the
last decade or so that people have

developed computer codes they can do it

what we hope is an accurate job of

simulating these regions and later in

this talk I'll show you some examples

but the pleiades culture computer

cluster at Ames has been instrumental in

doing these simulations over the past

three or four years we've used about 30

million CPU hours a year at Ames and a

comparable amount on computers in Europe

so with the first slide let's look where

the interface region is so what you can

see in the center is a big yellow ball
with little black dots on it those

little black dots or sunspots and

surrounding it is the corona and that

was a picture taken on the 13th of November of 2012 in Cairns Australia so

this was last year solar eclipse it's a particularly nice view and so the question that we're asking are hoping to answer is how we get from the bright yellow ball which is about 10,000 degrees Fahrenheit to the atmosphere above it which is a couple three million degrees Fahrenheit so if we get up next slide please ah we now see superimposed the top of the transition region and
that's where it fits and you can see that it's not completely smooth around at the edges and that's because there are a lot of three dimensional structure that protrudes from the surface into the corona and now we'll show you another movie but let's hold a movie for a second and so I can tell you what this movie is it's a series it's a movie of the edge of the Sun scene with a hinode spacecraft taken about as fast as hinode can operate which is about one image every four seconds and what you'll see
are a lot of little fine jets hairlike structures on the edge of the Sun and on the top is the direct image and on the bottom is an enhanced image and you can see the fine central cores of these structures these structures are about a hundred miles wide and about 10,000 miles long they go about 75 miles per second and they last about 10 minutes and we discovered these structures on Hinode and realize for the first time that for second exposures and just one wavelength wasn't enough to see them also on the frame of this movie is
an image of the earth and so if we could

have this my first movie so on the top

you see these jets and on the bottom you

can see these very fine central cores

and you can see some of them are as big

as the earth so they traverse the

diameter of the earth in a time between

five and ten seconds there are really

fantastic things they look like the

smallest kinds of things that you see on

the Sun but they're the size of the Los

Angeles area going 75 miles a second

which is not quite as fast as you can

drive on the freeways in less than it
was so we get out of the next movie

00:13:12,669 --> 00:13:18,469
which shows the Sun over a sunspot and

00:13:16,009 --> 00:13:20,208
and in this movie if you look at the

00:13:18,470 --> 00:13:22,639
bottom you can actually

00:13:20,208 --> 00:13:25,878
see the origins of the Jets and again

00:13:22,639 --> 00:13:28,369
that's very fast as the movie is now

00:13:25,879 --> 00:13:30,678
what I'm going to do is show you what we

00:13:28,369 --> 00:13:35,178
hope will see something like this is a

00:13:30,678 --> 00:13:38,928
numerical simulation it's three million

00:13:35,178 --> 00:13:42,078
CPU hours that means that if everybody

00:13:38,928 --> 00:13:45,499
in this room let's assume there are 50

00:13:42,078 --> 00:13:47,958
people in this room let's assume there

00:13:45,499 --> 00:13:50,778
are 30 people in this your room you all

00:13:47,958 --> 00:13:53,539
working on your computer for 10,000

00:13:50,778 --> 00:13:57,318
years you could make this movie or you
could go to ames and run it in a few hours actually it takes several weeks because you don't get the computer all the time so if we can have this movie and this pans over the movie so you can see the three-dimensional structure of the atmosphere in this wavelength which is on doubly ionized magnesium so that is just the beginning that movie is not what only thing you got for your three million CPU hours you got enough information to see what the spectrum would look like so the next movie shows the first movie head on and moving the
300
00:14:43,698 --> 00:14:48,438
spectrograph slit across it and seeing

301
00:14:45,919 --> 00:14:54,498
how the spectrum changes so we have that

302
00:14:48,438 --> 00:14:57,498
movie and you can see the spectral

303
00:14:54,499 --> 00:15:00,159
changes are very complicated the

304
00:14:57,499 --> 00:15:03,170
spectral line Wiggles it widens the

305
00:15:00,159 --> 00:15:05,389
surroundings get bright and dark and

306
00:15:03,169 --> 00:15:09,378
that all encodes the physics of the

307
00:15:05,389 --> 00:15:10,789
process that's going on and without the

308
00:15:09,379 --> 00:15:13,039
interpretation that the computer

309
00:15:10,789 --> 00:15:16,088
provides from us it would be difficult

310
00:15:13,039 --> 00:15:20,539
and probably impossible to decode this

311
00:15:16,089 --> 00:15:22,579
so with that I'll stop and turn it back

312
00:15:20,539 --> 00:15:25,998
to George all right Thank You Alan and

313
00:15:22,578 --> 00:15:27,708
we're ready now for questions and once
again please give your name and affiliation when you get the mic and we'll start here with Nora

Thank You Nora Wallace Santa Barbara

news-press several of us have newspapers that are not oriented towards science and so I'm hoping that you can explain to our readers why this mission matters to their lives and what iris will bring to the to the average person in terms of knowledge Pete hinted at it in the beginning or maybe not hinted at it my primary interest right now is how we take the kinds of discoveries that NASA
makes and communicates with society so

00:16:12,070 --> 00:16:18,310
the society can interact with what we

00:16:16,720 --> 00:16:20,350
learn is scientists because I'm well

00:16:18,309 --> 00:16:24,339
aware that all of these complicated

00:16:20,350 --> 00:16:26,500
details and three million CPU hours of

00:16:24,340 --> 00:16:29,590
computer time doesn't really translate

00:16:26,500 --> 00:16:32,919
into something that's easily grasped

00:16:29,590 --> 00:16:37,560
what but what is easily graphs is the

00:16:32,919 --> 00:16:42,309
Sun has massive explosions that put

00:16:37,559 --> 00:16:44,139
billions of tons of material moving tens

00:16:42,309 --> 00:16:46,689
of thousands of miles an hour into the

00:16:44,139 --> 00:16:49,449
Earth's atmosphere they impact the earth

00:16:46,690 --> 00:16:52,420
and they cause problems in a variety of

00:16:49,450 --> 00:16:55,120
ways and many of these kinds of problems

00:16:52,419 --> 00:16:59,370
as Pete mentioned we are now learning
are not gone so you had a power system
go out in the Santa Ynez Valley and as a result of that as a secondary effect you
had a bus barb ah fail in a transformer at Ames in the motel that I'm staying at there was a fire truck in front because when the power went out somebody got stuck in an elevator we live in a very complex society and the Sun has a very important role to play in it so people like myself now look at what what may be perceived as tiny details but are in fact the engine that runs this system and the engine that fails sometimes
perhaps I could add a little bit there

the field of Heliospheric physics is

often known as space weather and it's it

it's very similar to weather in many ways and if you can think of a hurricane

for example you know the hurricane can have dramatic effects the number of hurricanes may be related to climate

changes and so forth but in order to understand what's going on in that hurricane you have to understand the detailed physics of it so you have to understand how the heat comes off the ocean how it interacts with the
atmosphere how the hurricane starts in

fact as an old statement that says that

it was a butterfly wings flying flapping

in Africa that started the hurricane and

that's sort of what we're we're getting

at here the Sun dominates everything in

the solar system it dominates our

climate dominates our weather in many

so this is an important piece

of understanding if you will that

butterfly wing and how we can make those

predictions that that in the end will

help us understand you know power

outages that we don't understand
understand changes to the Earth's climate some of which are due to influences the Sun some of which are due to perhaps human influences and a lot of different factors so this is really ultimately about us and about how that object that we see in the sky every day affects it any further questions Janine.

record you're talking about some cool science but you guys don't seem too excited that you're I guess now two days away from launch how excited are you to get this mission underway so you can get this information we're not excited we're
terrified a mission like this starts
five years ago
hundreds of people have worked very hard
but in the end we're flying it on a device that's surprisingly reliable but ultimately it's in space it's a difficult complicated environment lots of things can go wrong and it's a mistake ever to be too optimistic you have to look at every downside we've just meant the last couple of days looking at all the way things can fail so it puts you in a sort of mood that you know you're not crossing your
fingers you're really prepared

but you're also prepared for the fact

that this is not something that just

happens this is something that's only

the result of a lot of hard work it'll

be exciting when the door opens and we

good data but until

then you know it's more

apprehension than science I just like to

add not only i agree with alan and also

i think one of the most exciting parts

is not answering the questions that that
we know it's the new things the discoveries that i'm positive iris will bring us every time we've looked at the Sun in more detail than we ever have before it opens up a new window for us and that's I think that's the most exciting part is the things that we don't know Nora Nora Wallace Santa Barbara news-press when this information becomes available is there any way to quantify for us the amount of data that you'll be receiving and also who are the anticipated users beyond yourselves okay we know exactly how much data we get and
this like all the other heliophysics

00:21:53,788 --> 00:22:02,078
experiments are available to all in near

00:21:59,199 --> 00:22:02,500
real time which means usually within a

00:22:02,078 --> 00:22:04,379
few

00:22:02,500 --> 00:22:07,210
hours and sometimes within a few minutes

00:22:04,380 --> 00:22:09,160
but they're available to all the

00:22:07,210 --> 00:22:11,500
scientists in the world and in fact

00:22:09,160 --> 00:22:16,450
anybody who wants to use the data

00:22:11,500 --> 00:22:19,359
without any restriction whatsoever and

00:22:16,450 --> 00:22:21,819
we have websites that you can log on to

00:22:19,359 --> 00:22:23,619
you can learn how the experiment works

00:22:21,819 --> 00:22:25,329
you can learn how to operate the

00:22:23,619 --> 00:22:27,339
experiment you can even learn how to

00:22:25,329 --> 00:22:34,029
propose to do experiments on the

00:22:27,339 --> 00:22:35,829
experiment additionally it of course is
the science data that the science community will be looking at but there are as I mentioned the real-time movies is real-time data that that normal citizens everyone can look at it in the movies that I show it and now showed a lot of those are people to look at them all the time we have a statistic on the web that that people are captivated by the beauty in the this tremendous star right knee right next to us is what it's doing and so this data certainly will be available to all yeah and I might add one of the most important target
audiences for this data of course it's

the scientists I'm a co-investigator on

and I can't wait to get my hands on it

but it this is really data that that

will help us get the next generation of

students and young people excited about

about the son of how it it really

dominates everything we do so there's a

very active program to make this data

available to students students at every

level so we're pretty excited about what

we can do with with everyone and you

know I it you know if you have children

we hope that they'll be bringing some of
this home and showing you what they're thinking of any further questions

all right do we have some from Twitter or online I questions from social media

at the sto AIA instrument use the full disc of the Sun how much of the Sun or what percentage of the Sun will will iris look at just just a few percent ah

it's it has a very small field of view

about 40 arc seconds compared to 1920

that aia has and the reason is that we have higher resolution and higher cadence than aia and we don't have a geo synchronous orbit which allows us to
munich communicate 24-7 like a aia has

and so we have to have an onboard memory

day to ground stations in the polar regions so but this is it's an important interesting experiment that fills in a niche between aia and hinode thank you

tell us again when that data will be available we open the doors ah 21 days

after the 28th and i imagine for a couple of weeks we'll be doing all kinds of calibrations but when we open the doors on aia we saw one of the most spectacular events that we've seen in the entire mission and that was
broadcast all over everywhere and if we
see something spectacular on day one
it'll be all over the web too

thank you and back here any further

questions all right in that event just a

programming note there is no change to

our NASA TV schedule on thursday the

27th we will start our live coverage of

the l-1011 departure at 6 p.m. pacific
time that's 9 p.m. eastern time and will
continue through spacecraft separation

and that will conclude our mission

mission science briefing as well as our
pre-launch news conference and thank you
very much for coming