Heliophysics Education Community Meeting-20260602_131134-Meeting Recording

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Milotte, Christina (GSFC-670.0)[ADNET SYSTEMS INC] 0:34

So these Community presentations are only one things that NASA heat does.
Christina Milat I'm one of the members.
Education specialist. So one of the products that we have that kind of anchors all of the things that.
What we do is a framework for heliophysics education, and what we've done is we've taken the three questions that drives heliophysics investigations on the NASA side on the next generation science standards, and we've created these heliophysics big ideas.
So if you're here in this community, it means you probably already know about Heliophysics.
But one of the things we're tasked with is trying to get heliophysics out to folks who don't.
Quite understand what it entails.
So not only do we give them background knowledge about heliophysics, but we give them NGSS connections, guiding questions and activities.
This presentation will also be available with for you, along with our main speakers today, so that you can see kind of how the framework fits into their presentation and some of the other things that we have to offer.
So I'm sorry, did I hear something?
OK.
Sorry about that.
So again, we have these nine big ideas that sort of encompass all of the major heliophysics topics that can be accessed at a public level.
So we tackle physical aspects of the sun like gravity, the space weather aspects.
We look at the heliosphere, the EM spectrum, the layers of the sun.
How plasma at magnetic fields?
Are related life cycles of the sun and the stars, and so when we are looking at the context of our presentation today, Northern Lights, rocket science, we're looking specifically at our big idea about space weather and how it impacts technology and Aurora of course follows falls under that.
Umbrella. So if you were exploring our framework and you were interested in Aurora or sounding rockets, you might click on this.
Idea. It would bring you to some different levels. So let's say you were preparing. You wanted to teach.
Aurora in a high school physics class, you would go towards the advanced learner.

Through our framework, it would provide you with background information, including learning constraints, extensions, differentiations for different levels of learners.
We give you videos and more background information.
NASA's imagery and data, as well as recommended resources.
So when I went into our database today and I typed in Aurora and founding rockets, I got four resources.
So we have hundreds of resources and we're adding new resources all of the time.
This is our access to our website which includes the framework and the database. So in addition to that, so this presentation itself.
Along with our main speakers today, our doctors out of Goddard, this will go into our framework and can be used as a professional development tool as we further develop our professional development resources and so without further ado, I don't know if Carolyn or Michael wants to do a.
More detailed introduction of our speakers, but I just wanted to put them in the frame of our resources and how you can use both resources.
Is to your advantage.
So thank you.
That's my part is over.

KS **Kirk, Michael S. (GSFC-6700)** 4:26
Thanks Christina.
Yeah. So I'll go ahead and introduce our feature presentation today. Our guest speakers, doctors, Marilia Samara and Robert Michel talking about sounding rockets and their chase for Aurora.
So I'll turn it over to you too.
Thank you for joining us out of Goddard and I'm looking forward to hearing what you say.
You're muted by the way.
So you have time mute yourself.

MR **Mirizio, Emma R (GSFC-673.0)[CATHOLIC UNIV OF AMERICA]** 5:00
OK.
Good afternoon everybody towards this.
Yes. So we'll speak towards this.
My name is Maria Samara and I'm here with my colleague Robert Michell, and we're thrilled that we'll be joining you today to talk about Northern Lights, rocket science.
Thank you for inviting us.
So we start with who we are.
There's many ways to describe people, but in the context of our professional work, we're basically nerd explorers and what that means is.
We're maybe more than average enthusiastic about asking the why and how's of things

and in this specific case of the Aurora, and we do this by doing a lot of field work and designing and building instruments that actually go into space as well as well as trying to combine
those kind of observations with things that we can observe from the ground, which is why you see all these different photos both getting ready for rockets and actually in the field.
I don't know if you can see my cursor at all, but I guess Robert learned a lesson this year.
Going to Beaver AK right here. But he was heading to Venetai, which will show you later is where we do a lot of our ground based observations.
So I think.
Note to self -- scarf next time or.
I don't think else.
And so we, we do a lot of hands on work and when in the context of rockets that literally means we can touch with your hands, your instrument. That's not always the case when it comes to orbital flight and sort of higher level missions where there's a really.
Long and very detailed process of documenting and who has access and how you know for working with instruments. The excitement about rocket.
Work is that we actually get to test them ourselves in the lab.
And you know, once in a while have a four year old.
Hold on to the instrument and this is really there to show that if any of you would ever visit us at Goddard and we have an instrument out that we're testing you.
Also can come along with us on that hands on ride.
What inspires us? In this context again is the Aurora.
This is a photo Robert took this year, actually avina time.
And you and the US, both the teams that we work with to make this happen, but also the teams at large and the public that actually inspire us to try and find those answers and try and communicate those answers back to you.
This is after we launched our most recent rocket, this February ******, and there's a variety of.
Involvement you see here mostly the science and engineering team that made the measurements possible.
But there's also, like a huge engineering team that's not even in this picture.
That comes from NASA Wallops that actually put the rocket together.
We are the sort of scientists that bring in the what we call the scientific payload and together with Wallops NASA integrate and create this.
You know, one big mission to study the Aurora.
And the way we do that is after we bring our payloads, our science payloads in, we launch the rocket.
So this is a I I wouldn't say an artist rendition 'cause I drew this.
This is a nerd rendition of what a rocket launch looks like.

So you basically have.
This is similar to the sort of ballistic trajectory that.
Missile would take an intercontinental missile, but this is all for peaceful science.
And what we do is we put our signs right about here.
I don't know if you can see my cursor.
Can somebody verify you can?
I know people in here can see it.
Yeah, you guys can see it too.
OK, so our scientific payload is right about here.
So there's a big launch and then this part getting to what we call Apogee, which is the highest point of our launch is sort of the nerve wracking our instrument's gonna turn on. What's gonna happen part and they turn on somewhere between here and here usually and.
This is my rendition of particles that actually make the agora 'cause. We make measurements of the particles that actually create the Aurora and those particles. Actually.
Are responsible for the light in a in a unique way.
You might already know this. The resources that Christina just showed are amazing.
Robert and I had a chance to take a look.
And there's also tutorials, more detailed tutorials about oral currents for example.
But we are all used to seeing the Aurora with our eyes and this is what the imager's on the ground trying.
Image an image is just a like fancy way to say we're taking pictures that are high resolution both in time and space.
Higher than your typical camera that you might have anywhere from your phone to a fence.
Your camera and Robert and I mostly like to combine more than one measurement together, which is why we say space and ground is sort of, you know our double love because whenever you can take two ways of measuring something and combine them, the result is a lot more.
Than really just the sum over those two.
So we look from the ground with fancy cameras at the actual visible light of the Aurora, and then in space we fly through the region where those particles down and create the Aurora. Because these particles have originated at some point in the sun, there's a process by which.
They come down the hit the neutral particles are already there and this collision between them results in this photon. This light coming off and creating the Aurora that we see.
This is a photo from Rocket launched in 2014.
We'll have an example of how we combine the two measurements a little bit later on and what you see here.
Is the rocket launching?

And this Aurora we're launching from Poker Flat, Alaska.
Usually when we study the Aurora but the apogee is farther down and the native villages of Alaska in many of our cases is over Vinata, Alaska.
So this Aurora that you see here in the background is actually toward vinata and that's what we want to launch over and take measurements over.

PN **Prudence Nwosu** 11:01
It's more convenient.
Like a table this big.

MR **Mirizio, Emma R (GSFC-673.0)[CATHOLIC UNIV OF AMERICA]** 11:07
Why the Aurora?
The Aurora is pretty much space weather, you know visible space weather is the way I think of it.
So space weather really effects every facet of our life. At this point, all the way to the ground.
But of course it affects the astronauts.
Everything that goes on between like the Earth and the sun very often may have a manifestation within the Aurora.
Not always, but a lot of the times, if something really active is going on the sun, there's going to be Aurora as a result of it.
And why signing rockets?
Because they're actually really great for signing the Aurora. We actually with rocket get to capture the particles that create at the at the time that we're seeing it.
So we get to sit on the ground and sort of select an event to within minutes of when we make these measurements and that's not something that can do with satellites. And also that region where the aurora is, if you look on the left, you know just to.
Orient us.
We have our highest mountains.
We have planes, weather balloons and science.
Actually meteors and then the Aurora and up here you know where the above it where the space shuttle used to be in the International Space Station is where satellites are hard to fly in that region consistently because orbital drag.
So rockets are sort of a cheap, fast and very fun way to look in that region.
Balloons are not even coming close.
And these rockets are basically (just to go back here) like this this whole thing, it's a very small payload compared to
maybe what you're used to seeing when you think of a big rocket launch like a Falcon Nine, I think you may have talked about the Carothers mission that launched in September. So in September, there were three scientific missions for others with.
When I'm up that launch out.
Of Kennedy on the Falcon Nine, we're talking here on order of magnitude smaller, so 10

times smaller on every aspect.
And of course, it's a very short flight.
It's a few minutes to Apogee and the whole thing is anywhere from 567 minutes, depending on how.
Far up we go.
We typically in the last.
You know, few missions have gone around 350 as our highest point.
And now when we think of the aura, most of us think of these really beautiful pictures, which is, which is very accurate.
This is what would a photo of the Aurora would look like.
There's sort of two fundamental categories of Aurora, discrete and diffuse.
While they were named mostly because of how they look, diffused aurora literally was named because it looks.
Diffuse and not as dynamic as discrete or order the naked eye.
And back when they were making the first measurements with imagers, it was hard to see any structure here.
They do have two fundamentally different physics mechanisms.
The end of it is the same.
It's particles hitting at the pole, interacting with the neutrals, creating light, but the the way that those particles make it there and their energies, those mechanism are a little bit different.
And this is sort of these are all photos Robert took.
Anything that's not attributed is from our team and these bottom photos are from Greenland.
And the rest are from Alaska.
So what we will show you will show you an example.
Robert will talk about an example from the GREECE mission where we launched into discrete Aurora and then the last three rockets we launched last year and this year in two missions are looking a little more towards the diffused aurora.
So this is what it looks like in the photo you've seen these photos before.
And now we want to sort of shift to what do we mean when we look with a camera at the aurora?
So the left side is not what we mean.
The beautiful photos we're all used to, or even the sort of global picture that we have from satellites like image from quite some time ago.
We hope there'll be another satellite in the future that will capture these global pictures.
You've seen them also from the International Space Station.
What we mean is on the right.
So this is sort of what
A typical scientific camera will look.
This aurora right here on the right is actually diffused aurora.

Now if you look at this photo here and you look at the scientific camera.
Granted, it's a different spatial scale. This is the whole sky. But you can already see that there's a big difference. Now.
From a different type of aura below we have a sort of smaller zoomed in version, not zoomed in in the sense of how you zoom in the camera, but just a camera that already has a smaller field of view.
All sky is the equivalent of. If you're thinking that you're, let's say in Alaska or somewhere, we can see aurora and we often orient them this way.
Think of yourself laying down on the ground in the middle of the night when there's aurora and just maybe your feet are pointing to the north and you're looking up so your eyes wouldn't quite catch this in the diffused aurora, but you could see something similar to this act.
When there's a lot of activity, and then imagine if you had the capability with your eyes to actually only look at a small section of the sky.
15° all the views maybe 15 by 15 kilometers. In terms of the patch on the sky and to put that in better context.
This is now a different event again aurora in 2014.
It's actually the year that we launched GREECE, but it's not when we launched GREECE and the left side is the all sky.
This is again, you're laying on the ground looking at it, and then you take a cut out of that and try to look at it with the with a camera that now not only looks at a smaller area, but also looks at.
faster. So you see, there's still more structure at it and then you take a smaller cut out of that. And at this point, even with the camera in this very instance, you see sort of fuzz.
So even in a snapshot of what is going on, you can't quite tell what's in the data, because this last, fuzzy picture or snapshot
Is just an instance in time and doesn't show you the variations because.
If this were a movie, you would see all the variations that happen.
This is why we say a picture is worth 1000 words because of the first two. And as you go to the third one, then we get to a picture worth 1000 words and then a movie.
I don't know how you multiply that many, many times over.
So these are now two smaller fields of view even though this one on the left is round.
So it maybe confusing our brain a little bit because it might be an ??, but it's not.
Both of them are about, you know, 15 by 15.
Or 20 kilometers.
And one of the left shows you the rapid motions of auroral structures.
There's these things that we call curls and other fast flows, but we'll see when we go to the next one. We'll do is that both of them show really small scale features, hundreds of meters and they also do it at very high time resolution.
Both of these cases, certainly the one on the right, but I think the one on the left too actually real time and the one on the right is flickering aurora.

This is the target that Robert had in one of his rockets.
Spoiler alert, we didn't quite get that, but we got a lot of other good aurora, and we still learned a lot.
And this is just to illustrate that just looking at the movie already, we have a lot of information what we do with these movies ourselves is we actually cut through them and look at the, you know, point by point change in time of the intensity and we act.
Try and match it to what we measured.
Going over the aurora and looking at the particles.
And that's the example that Robert is going to show you next from the GREECE.
I think that's next, yeah. From the GREECE mission in 2014. And then at the end, we'll have sort of a sneak peak of what we've been working on looking at from the last emissions, where we're looking at different types of diffused aurora. So Robert.
Over to you.

All right, so Marilia mentioned this. The GREECE is sounding rocket.
It's an acronym.

GREECE was an acronym. It stood for

MR **Mirizio, Emma R (GSFC-673.0)[CATHOLIC UNIV OF AMERICA]** 19:07
Ground-to-Rocket Electrodynamics - Electron Correlative Experiment
And so what?
Basically what we were trying to do was exactly what made it was saying we wanted to fly the rocket over the aurora, measuring the particles and fields above the aurora that are causing it and
imaged the exact same aurora from underneath at the same time.
And through a collaboration with the University of Alaska and one of the native villages which is called Venetie, which might have been mentioned, we were able to install some cameras at the downrange site in Venetie, which is underneath the apogee of the rocket.
So it's about 200 kilometers north of Poker Flat.
And so this on the left is an image from the All Sky camera where the that the rocket flew over that auroral event on the right, there's an image from the narrow field camera.
Alright, I'll show a couple of movies from those next and then on the bottom right is how we plot the electron data. Usually that we measure. These are the electrons that are coming down hitting the atmosphere.
So we're measuring them before they hit the atmosphere up above the aurora.
Then we plot them.
Usually time is on the X axis.

This is the time since launch and then on the Y axis is the energy of the electrons with the lower energies near the bottom and the higher energies near the top.
And we'll go to the next slide.
So this hopefully you can see this playing. This is a movie of the All Sky camera data.
This is speed up by about a factor of 10. You see it.
You might see a little white dot moving through.
This is we've mapped the foot point of the rocket onto here.

You might want to. Sorry to drop.
I just realized you might wanna go back and show the sorry I should have said it in the right space.
Show what you mean by mapping.
OK. Yeah.

Yeah. So when the rocket payload is in one location, we follow the direction of the magnetic field down to the altitude where the aurora is and that's the aurora. That's where we put the dot on the movie.

So it's not the actual location where the rocket instruments are, but it's that location followed down along the magnetic field line to the altitude where the aurora is.
It's just around 100 or 110 kilometers.

So you basically wanna follow the location
of where these particles are heading and creating the aurora because the velocity of the electrons that are travel at these energies are.
It's almost instantaneous that they go from the altitude where the rocket is to
the altitude where the aurora is occurring. So that's the little dot that I put on the movie.

It's the location of
Where the electrons would be hitting that were the same electrons we're measuring where they would be causing aurora and so we can see this dot moving through and we can see how active.
The aurora is moving passing over the back and forth.
We see all these fast motions, and so we're measuring the actual electrons that are causing these structures.
We should probably point out that this movie is speed up 10 times about a factor of 10 times. This was taken at 3 frames per second, but it's playing at 30 frames per second, so this one is speed up by about a factor of 10.
This whole flight takes about 5 minutes in real time.
But here it's played in lock 30 seconds or so.
And then we can go to the next slide.
So what we do is at that location where the foot point was, we extract the intensity of

the Aurora and that's what's plotted as the black line here as a function of time as well. And the in the background is the electron data just plotted with a different color scale on this on this one similar plot that we showed before where energy is on the Y axis and we can see there's a really good match between the intensity of the light.
That the electrons are creating and the structure and the electrons, right?
And we've basically we've assumed that this was the case.
We knew.
We've known it from modeling that this should be the case, but this was the first time where we really measured this for the first time in such high resolution. When Robert says we, by the way, he doesn't mean just the two of us.
He means our entire field.
I mean in the overall field in the Aurora field, yes, because the.
People have been modeling these interactions of electrons hitting the atmosphere for many decades, right?
So we kinda we know how these interactions happen.
We get.
We have an idea of how the light is generated.
We know all the physics behind these processes, but we haven't actually made this one to one comparison to actually verify all these things. And with this when we did the grease experiment, we had several different filters, so looking at several different wavelengths of light.
And several different fields of view, so both the all sky and more narrow fields.
So we were able to make some really good one to one comparisons.
We actually the graduate student working with us at the time, did his entire thesis on this experiment doing all these comparisons between the modeling efforts of what the electrons should be doing versus comparing what we actually measured.
So this was a really cool result that we were able to do with these rockets, and this was because we were able to launch exactly when the Aurora was right over the right spot.
And it was tricky to catch it right there because.
We saw from the All Sky movie.
5 or 10 minutes before this, the was not there, and then five or 10 minutes after this, the was gone, right?
We have to launch it exactly the right time to catch it right where it is so that we can write over the cameras and be able to measure it at the right time.
So that's one of the main advantages of of rockets is that you can really target specific types of AER, but you also have to be able to predict a little bit of when the error is going to be, where you want it to be.
Which is a little nerve wracking in real time.
And this was a movie from the narrow field of view camera that we had during the grease rocket.
And here again, the little white dot is that footpoint location that we mapped. We didn't know that we were gonna catch it in the narrow field of view camera, but we put one

up anyway, just in case. And it turns out we did.
It did actually go through the field of view and we measured it was in here for almost a minute, I think. And so we can really see how.
How quickly the overall structures move relative to the measurements that we're making in space.
At which point I thought this one is now real time and this one does play in real time. Yeah, you can see the timestamp at the bottom where the seconds are ticking off.
And so having the camera data really helps us figure out.
The measurements that we're making in space of the electrons we see variations in those electron precipitation features that we saw say in the previous plot, right, we see all these variations here, right?
But if you just have the electron measurements you don't know is that are you going through a bunch of different spatial structures or are you going through something that's changing in time, or a combination of both.
But then when we see the movies, we see that the aurora is just it's changing in time and in space. Having the camera data really allows us to.
Solve that time space ambiguity of things, whether it's changing in time or whether it's changing its space that we're measuring.
So that really helps us
Try to get it understanding some of the more physics that's happening behind its overall structures.
So Marilia mentioned that the more recent rocket missions that we launched last year in February 2025, we launched the GIRAFF rocket missions which was
two payloads that were identical but we were targeting two different types of aurora. The first one we were targeting was pulsating aurora with very fast variations. And I should mention that the motivation for trying to do these rocket missions came from the GREECE mission where we saw all these really rapid
Changes in time and the feature in the electron and the optical auroral features. So with GIRAFF we were targeting the fastest features that we can see in the optical aurora and we had some really high time resolution electron instruments, and we had some more high time resolution imagers on the ground.
And so we were targeting the fast pulsating aurora, which is the first one we were after, and it looks like we got some.
We're still in the process of analyzing the data.
But again, these are the electron spectrogram. We call it where energy is on the Y axis and times on the X axis, and then this is a an image from the L Sky movie on the right. Or you could see that there's aurora that fills up the whole sky and you can see that there's electrons all throughout the whole flight.
So we're in the process right now of actually matching up the electron precipitation features that we see to the rural structures that we see and that's analysis still underway.
And then on the bottom, we can see we were targeting flickering Aurora, which

sometimes happens inside these bright.
Discrete overall arcs, I can say that the these features look different between the two spectrograms and also in the image on the right. You can see that the Aurora is more aligned in these little bands of discrete arcs.
And that's what we flew through.
So that's what we're aiming at and that's some of the analysis that we're working on.
But then just recently in this past February, we launched the BADASS mission, which was looking at black and diffused aurora.
It was called the Black And Diffused Aurora Science Surveyor.
And so that one we have.
We're still working on the analysis for that one, but there's a really good interview. I highly recommend this interview talking about the BADASS mission that was put together by the University of Alaska's Education and Outreach team. Right now we'll play this cool video that was put together by the Goddard Heliophysics communication team, and we'll see if this plays.
I have never seen a better explanation of this mission.

They did a fantastic job and it's quick. It's something you can easily view.

It should be the one minute video on YouTube at http://youtu.be/IYYXk_yEOcY

But you guys should definitely when you have a chance to take a look at the other.

Links to the interview about the BADASS mission was really good, so we are just now starting to look at the data.
There's been a lot happening at NASA in the last year, and we also moved buildings, so we're still in the exciting part of just looking at 1 by 1, all of our instruments, all of the instruments worked on the mission, and we have good data, but we don't have anything to show you other than big explanation of the mission by the communication school.

So I really like about this video personally.
Is that in one minute I feel like the communications team was able to capture the essence of the entire mission, and that's sort of where Robert and I are in awe of the work that educators do and the communicators do at NASA and beyond.
So we'd love to hear from you ways we can assist with resources for classrooms or input of.
What kind of website we could have that could attract the public more.
And many of our movies, of course, are available for anybody to use in any sort of educational like, yeah, they'll have that presentation. Right, Michael?
And then and then Robert really wanted to show you a movie he took.

KS **Kirk, Michael S. (GSFC-6700)** 33:08
Yep, we'll have a recording and the presentation.

MR **Mirizio, Emma R (GSFC-673.0)[CATHOLIC UNIV OF AMERICA]** 33:14
And then I was work phone just for my iPhone.
My work phone just to show that real time.
Just looking up at that really bright aurora event that I took from phena time when I was setting up the cameras, I'm sure.
So it wasn't when we launched, but it was a couple days before, maybe the night before we launched.
This is sort of the show that citizen science and beyond.
Everybody's an explorer and everybody's taking measurements of something at all times.
The aurora is one good example because it's so pretty and it happens to captivate most of us. And so this is sort of the connection also and the comparison between how we look at it on the more rigorous scientific side and how you might look at it on the more fun, enjoyable part of watching something really, really cool that actually has not only real life and real everyday applications for you, but also connects to something that's a little bit more outside for all of us.

More in the dream space of thinking of space weather and the astronauts and you know our sort of space.
Or position in this space faring civilization that we're becoming.
So thank you so much time for questions.

So if you guys have any questions, we're happy to answer questions.

KS **Kirk, Michael S. (GSFC-6700)** 34:38
Thank you so much.
This is fantastic.

There's a few questions.
There's one in the chat from Andrea Hughes that's wondering what the difference is between diffused, discrete pulsating and flickering aurora types.

MR **Mirizio, Emma R (GSFC-673.0)[CATHOLIC UNIV OF AMERICA]** 34:56
So discrete and diffused are sort of the two umbrella terms, and then the other ones you mentioned are under each one.

So flickering happens to be more on the discrete dynamic side.
So it's sort of the standard reconnection physics of the particles being accelerated and

the magneto tail and coming all the way back, then coming down to the poles.
While the pulsating you mentioned and the black aurora that we talked on the BADASS mission are under the diffused category, which is a different science mechanism. A little bit in terms of how they get in.

Yeah, but for diffused aurora it's mostly the electrons that are already out in the plasma sheet are getting scattered by electromagnetic waves and coming down. And so we see features of that wave scattering mirrored in the electrons that precipitate. And that's what pulsating is, because there's a periodic interaction with the wave and the electrons and then we see a periodic signature in the optical aurora that's caused by those electrons.

And from flickering, aurora happens with a similar but a different electromagnetic wave acting closer into Earth that's basically modulating a stream of precipitating electrons. And that's why it causes a much higher frequency.

The flickering aurora can be at 10 or 20 Hertz, so you might not be able to see it while on the movie projected through Teams.
But if you get ahold of the actual presentation, yeah, you can.
You can play the movies themselves.
You'll see that it's really like flickering like an old CRT TV screen.
You would see it

So this final stage is the same for all, but where they came from. So when I say back and then I'm gonna tell it's outside of the screen, it's all you think of it more in the stretched side to the right of the earth.
The sun is to the left and the stretched side and the back of the earth where a connection happens is where those particles are accelerated to create the discrete. aurora, while closer in like in this area, is where you already have particles and then something happens to
Perturb them or to get them out of their state.
To get them to come down, usually it's a wave of some sort, and that's what Robert was talking about.

And the diffused aurora, we should say because of this mechanism, actually it makes sense that it's the one for which the majority of the energy coming in is actually associated with the diffused aurora you get it more of the time, longer periods of time.

Discrete is what you might associate more with what people call a sub storm,
so a more explosive energetic event happening starting at the Sun and then happening, by the way, in the back of the magneto tail.

Did that answer the question?
Hopefully, yeah. Andrea

◉ **Ng, Carolyn Y. (GSFC-670.0)[ADNET SYSTEMS INC]** stopped transcription