SUN-EARTH DAY HIGHLIGHTS:

ERIC CHRISTIAN ANSWERS FACEBOOK QUESTIONS

[Opening Sound Clip]

[Troy Cline]
"Magnetic Storms!

[Sound clip]
My name is Troy Cline and welcome to the Sun-Earth Day 2010.

As many of you already know, Sun-Earth Day is much more than a one day event. It's actually a combination of events and programs that occur throughout the year ending with a grand Sun-Earth Day celebration on or near the Spring Equinox in March. The main goal of this program is to encourage students of all ages to explore, discover and understand the dynamic connection between our Sun, Earth and other planets.

Each year the Sun-Earth Day team wraps a fresh new thematic approach around Sun-Earth Connection science. So this year we're excited to announce that the theme for Sun-Earth Day 2010 is "Magnetic Storms". We'll learn more about that topic in just a few moments.

Now as the SED program has grown over that past 10 years, we've seen a tremendous surge of other Sun-Earth Day related events popping up all over the globe. Those events are often localized and are hosted by a growing list of educators and scientists from schools, community groups, parks, planetariums and science centers. In response to this, we plan to post a series of materials and resources that will help **you** out if you decide to host your own Sun-Earth Day event.

To get started, all you have to do is visit the Sun-Earth Day website where you'll find just about everything you need for this year's theme as well as materials from all of the past Sun-Earth Day themes.

[Music Transition]

Our growing list of Facebook 'friends' have had quite a few questions and comments not only about this year's new Magnetic Storms theme but about space weather in general. As a result, we've decided to air several of your questions and comments in this year's podcast lineup with answers from our science and education experts.

To get started we contacted NASA research scientists, Dr. Eric Christian, who graciously provided the answers we needed. Let's hear what Eric had to say…

INTERVIEW

[Troy] Hi Eric, we have a few questions from our face book crowd that we would like you to answer. First one is from Adonia French Garvin and she has a 7 year old who asked this question. And the question is pretty amazing from a 7 year old. Here it goes, Can you explain the role that protons and electrons play when plasma creates the colors in the sky? So I guess what he is asking is, what causes the aurora?

[Eric] He or she is asking, what causes the aurora? The aurora is caused mostly when electrons that have been accelerated in the Earth's magnetic field hit atoms which contain protons, electrons and neutrons and it excites them, makes them agitated and the way they remove the agitation they release light. So there are protons that hit the Earth's atmosphere that cause the excitation in the aurora, but it mostly electrons in the plasma in the magnetosphere, the magnetic field loop of the earth, are causing the aurora, but protons and electrons in the atoms of the Earth's atmosphere also play a role.

[Troy] So the misconception that people often have that colors in the aurora are actually coming from outer space or from the sun and that is the color we are seeing; that is a misconception.

[Eric] That is completely right, the colors come from different atoms and different ways they get excited in the Earth's atmosphere.

[Troy] That turned out to be a great question. This 7 year old, he or she had another question to ask. Here is the next question; how does the sun affect the Earth's magnetic field and gravitational pull during a solar storm?

[Eric] The gravitational pull is not affected at all. The Earth's magnetic field gets pushed around by the solar magnetic field in a magnetic storm. That is the definition of a magnetic storm, the short term change in the Earth's magnetic field because it has been pushed by a space weather event coming from the sun. So the entire magnetic field gets moved around and that's what causes a magnetic storm.

[Troy] Okay, Great! We have another question from Aaron Cossack, she says, I don't understand how a material possesses a magnetic affect.

[Eric] There are 2 types of magnetic affects, 2 types of magnetic fields. The intrinsic magnetic field is a function of the sub atomic particles that make up all of matter in the universe. Electrons have magnetic moments as it is called, they have an intrinsic magnetic field, but there is also electro-magnetic fields that are caused by moving currents actually electrons spinning about the nucleus of an atom has a magnetic field, like a electro-magnetic field you get when you wrap a piece of wire around piece of iron. So there are 2 types, the intrinsic type is just a natural part of what makes up the particles of the universes. We know it is tied to the spin of the particles, but exactly how it comes about we do not know.

[Troy] That's fascinating. We have a question from Susanne Kinneson, actually 2 questions. The first question- Are magnetic storms dangerous to people?

[Eric] Not on the ground, the Earth's atmosphere is a really good protection from early effects of a magnetic storm. The earth's magnetic field is also good protection, but over the poles and in outer space, astronauts might be effective by magnetic storms and people in planes at high altitudes that fly over the north or south poles of the Earth might be effected, but they are usually pretty weak effects. They keep track of them but they are not, in a typical magnetic storm, very high risk even for astronauts. The other parts of space weather that comes with magnetic storms are high energy particles that can come from the sun. They are usually associated with magnetic storms, but not part of them, those can be a lot more dangerous to astronauts and people who fly over the poles.

[Troy] I also know students often ask, why do I care about magnetic storms, solar storms, and space weather if I don't feel the effects here on Earth, why am I concerned?

[Eric] …because there are a lot of indirect effects. We are reliant on all sorts of technology that can be affected by magnetic storms. The power systems; we can have power outages that are caused by magnetic storms. That is not hurting people directly but it can cause a lot of damage indirectly. What happens then is that the moving of the Earth's magnetic field actually creates extra currents in the transmission lines that power grids uses and can short out transformers and fry them good! It can take down entire power systems from these magnetic storms. There is also trouble with communications, a lot of our communications go through satellites now, our GPS that we are so reliant on, and all of those can be affected by magnetic storms. There are a lot of possibly dangerous indirect effects.

[Troy] That is a perfect segway into Susanne's second question, what happens to satellites when there is a magnetic storm?

[Eric] There are a couple things that can happen to satellites. One is electric charging. Just like when you walk across a carpet on a dry day you can build up a static charge. Satellites can build up a static charge. So, when you touch the door knob and get a little bit of a shock, you feel a little bit of pain, but those little tiny sparks on a satellite are enough to destroy the version of electronics that make up a communications satellite for example. They also can interfere with radio communications to the satellites so we can't send commands, they can't send data back to us. That is another effect on satellites during a magnetic storm. As I said before the space weather associated with magnetic storms also includes high energy particles that can damage satellites and space weather events can also increase the size of the Earth's atmosphere which increase drag on satellites that are close to the Earth, which is called low earth orbit. That can make them re-enter early.

[Troy] Is that what the term atmospheric drag?

[Eric] Yes that is atmospheric drag.

[Troy] Is there a way for people to protect satellites? I know that when we know a storm is on the way and there is millions and millions of dollars tied up and invested into satellites we would like to protect them if at all possible. Is that possible?

[Eric] Yeah, you can do some things, especially if you know a big storm is coming or is stared, you can shut down some a lot of the power on the space craft, there are some

things you can't prevent, but a lot of the stuff is more sensitive when they actually being used so they can power them down they are a lot safer.

[Troy] Well Eric, thank you so much. That's just the first slew of questions we have from our face book crowd. We hope to see you poking around in face book with us on the Sun-Earth Days face book page to answer some of these questions directly when they pop up.

[Eric] I'll keep my eye on it an answer from now on directly the questions and comments when they come up.

[Troy] Everybody keep your eye out for Eric Christian, he is on the loose!

[Troy] I'd like to thank Dr. Christian for his time and we can look forward to more conversations with him in future podcasts and in Facebook.

[Troy Cline]
If you haven't already, I'd like to remind you to register with Sun-Earth Day in order to receive a FREE welcoming packet of materials while supplies last. You'll also get a monthly update from us about Sun-Earth Day events.

I hope you enjoyed this Sun-Earth Day Highlights podcast. We are very interested in hearing your questions and comments. If you have something to say, just join us in Facebook or send an email to sunearthday@gmail.com . If selected we'll share it on one of our upcoming podcasts!

For all other details about the Sun-Earth Day program including information about our past SED themes be sure to visit our website at sunearthday.nasa.gov.
While there, don't forget to register in order to receive Sun-Earth Day updates!
Don't forget that you can learn more about NASA by simply visiting www.nasa.gov .