NSSEC Rice U Status Report – September 2020

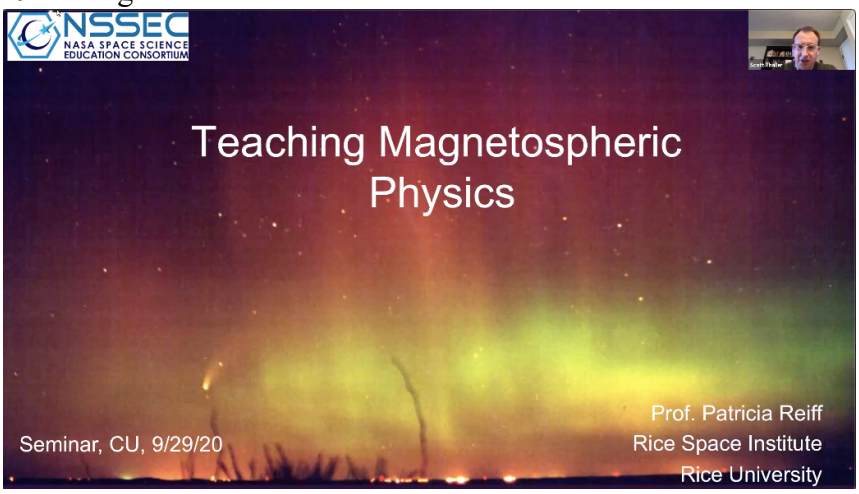
Patricia H. Reiff, Rice University

- ***Communication: next iClip underway***

HMNS is creating a new planetarium show on exoplanets and the possibility for life on other planets. Interns this summer used "Open Space" to create Mars paths both for the Perseverance rover and the "Ingenuity" helicopter. These are being used in the HMNS planetarium.

- ***Education: "Teaching Magnetospheric Physics" Seminar at CU***

Dr. Reiff gave a (virtual Zoomed) seminar at the Laboratory for Atmospheric and Space Physics (LASP) at the University of Colorado on September 29, 2020. She highlighed outreach and teaching efforts, primarily to the public, both to increase public education but also to increase the pipeline for diverse learners. She spoke about the success of the HEC/NSSEC. Number online: 19 colleagues.



Available to view: http://space.rice.edu/lectures.html . Direct link to the YouTube rebroadcast: https://youtu.be/smax6UsjoqA .

- ***Communication: Free Zoom Planetarium and star shows (diversity focus)***

We completed our summer online Zoom events. We did not advertise the Spanish versions of our shows to the spanish-speaking community, so those programs had relatively low participation.

Total of all Events (4/22 – 8/30/2020);

Total registered:	2362	(Spanish only: 29)
Maximum simultaneous streams:	1253	(Spanish only: 83)
Total extimated children (visible):	321	(Spanish only: 10)
Minimum actual users:	1574	(Spanish only: 93)

Survey of Participants

We created a survey of the participants of the zoom sessions. So far the result are very positive, with 60 responses so far. Here are some of the results:

"Overall, how would you rate this event?" Excellent: 46%; Very good 42.3%

Attitude questions:
Most agreed that it enhanced their knowledge of, and interest in, the subject matter.

	STRONGLY DISAGREE	SLIGHTLY DISAGREE	NEITHER AGREE NOR DISAGREE	SLIGHTLY AGREE	STRONGLY AGREE	N/A (I STRONGLY AGREED BEFORE THE SHOW)	TOTAL	WEIGHTED AVERAGE
I enjoyed the program	3.85% 2	0.00% 0	3.85% 2	13.46% 7	75.00% 39	3.85% 2	52	4.62
I learned something new	3.85% 2	0.00% 0	3.85% 2	13.46% 7	75.00% 39	3.85% 2	52	4.62
It enhanced my interest in the subject	3.85% 2	0.00% 0	5.77% 3	9.62% 5	76.92% 40	3.85% 2	52	4.62
I got my questions answered	5.77% 3	1.92% 1	19.23% 10	13.46% 7	48.08% 25	11.54% 6	52	4.09
I enjoyed interacting with a real scientist	3.85% 2	0.00% 0	7.69% 4	7.69% 4	75.00% 39	5.77% 3	52	4.59
I want to learn more about the subject now	5.77% 3	0.00% 0	13.46% 7	15.38% 8	59.62% 31	5.77% 3	52	4.31
I understand more now about how science (and scientists) work	1.92% 1	1.92% 1	11.54% 6	17.31% 9	59.62% 31	7.69% 4	52	4.42

Here are some comments:
Love both the show and the Q&A. Both cohosts are knowledgeable and handle the questions very well.
It was perfect! The mix of knowledge, entertainment, and interaction was well planned and made you want to join again and find out more about the topic!
Please provide more shows. Thank you
Listening to the scientific lectures as well as listening to the Professor(s) and scientists answer questions from the audience.

Word cloud for "things you liked":

Word cloud for "things you disliked":

• ***Education/Communication: Article on solar cycle in Houston Chronicle***
Reiff was interviewed for an online and in press article about the solar cycle. It appeared online on 9/15/2020 and in the front section of the paper on 9/16/2020 (attached).
Web reference: https://www.houstonchronicle.com/news/houston-texas/space/article/When-the-sun-s-north-and-south-poles-swap-15569087.php?cmpid=gsa-chron-result

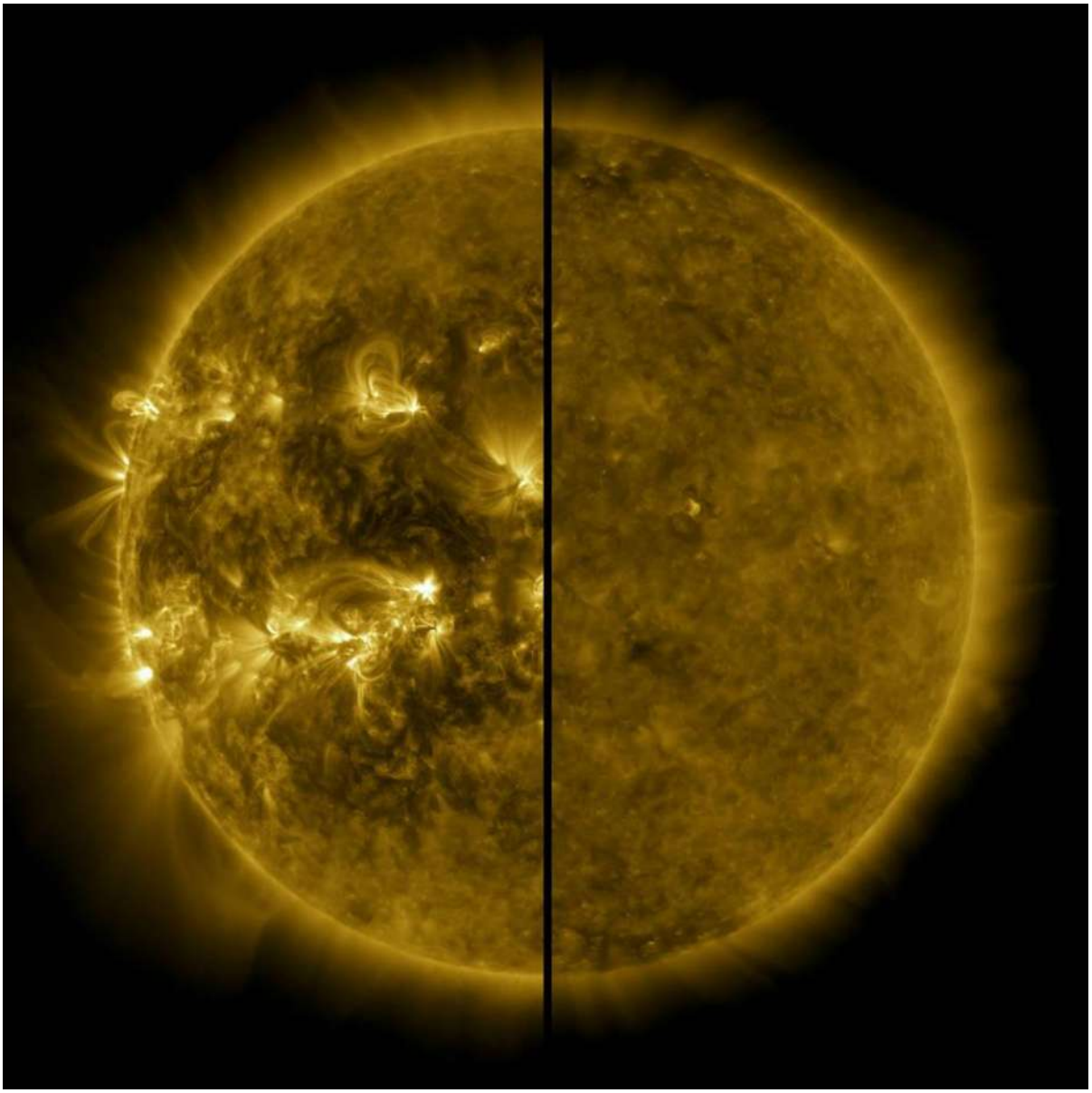
• ***Publications***
An update to our writeup of the best Zoom streaming procedures, and one on portable planetarium seating during COVID-19, plus others of our educational literature, has been posted to our website: https://www.eplanetarium.com/publications/
(also note newspaper article and seminar link above)

HOUSTON CHRONICLE

LOCAL // SPACE

Every 11 years the sun enters a new cycle. The latest has begun, NASA and NOAA say.

Andrea Leinfelder | Sep. 15, 2020 | Updated: Sep. 15, 2020 7:37 p.m.



This split image shows the difference between an active Sun during solar maximum (on the left, captured in April 2014) and a quiet Sun during solar minimum (on the right, capt December 2019 marks the beginning of Solar Cycle 25, and the Sun's activity will once again ramp up until solar maximum, predicted for 2025.
Photo: NASA/SDO

More and more sunspots will appear like freckles on the solar surface over the next five years, a forewarning of powerful outbursts outages, radio blackouts and GPS disruptions on Earth.

But don't ring the alarm bell just yet. This uptick in activity is part of a normal ebb-and-flow that occurs every 11 years or so. The su quietly, increases to its peak intensity and then declines to its next quiet phase, which then marks the start of a new cycle.

And much like economists retroactively declare a recession, NASA and NOAA on Tuesday announced that December 2019 marked t (or current) 11-year period, dubbed Solar Cycle 25.

On HoustonChronicle.com: NASA close-up pictures show 'little campfires' on the sun

Its peak activity is expected in July 2025 - around this time, the sun's magnetic field flips and the north and south poles swap places sunspot number of 115. This number, obtained by averaging the monthly sunspot number over 13 months, was 114 during the past s happened to be the weakest cycle in 100 years. The peak of an average solar cycle is at 178.

Scientists use sunspots to track solar cycles because these areas of particularly strong magnetic forces (appearing as dark spots be than other parts of the sun) are often the locations where giant explosions can spew light, energetic particles and solar material int

So basically, more sunspots mean more opportunities for violent outbursts that can affect the Earth.

"As we move toward solar maximum, we can expect an increased frequency of solar flares, coronal mass ejections and other space Doug Biesecker, co-chair of the Solar Cycle 25 Prediction Panel and a solar physicist at the National Oceanic and Atmospheric Adm Weather Prediction Center, said Tuesday during a news conference.

This can affect humanity in many ways.

Solar flares emit energetic particles traveling at almost the speed of light, said Patricia Reiff, a professor of physics and astronomy a can damage communications satellites orbiting the Earth (as well as NASA exploration missions elsewhere in the solar system), and astronauts outside of Earth's protective magnetic field. The International Space Station is protected by Earth's magnetic field, but a the moon wouldn't always be.

In fact, there was a large solar flare in 1972 during the Apollo era. Thankfully, the crew of Apollo 16 had returned to Earth and the cr yet launched. No astronauts were in space during the flare.

"Those particles are so energetic they can disrupt the nuclei of your cells," Reiff said. "They can disrupt the DNA of your body and c poisoning or even death."

Peak activity for Solar Cycle 25 is expected around the time that NASA is seeking to return astronauts to the moon (in 2024) and th a sustained presence.

"As we make these trips to the moon, it's critical for us to understand what the environment will be like," said Jake Bleacher, chief e NASA's Human Exploration and Operations Mission Directorate. "What are the weather conditions we should expect to experience expecting what's coming for us helps us to ensure the success of our trip, the safety of our astronauts and the continued operation

Coronal mass ejections send magnetic fields and pieces of the corona, the portion of the sun's atmosphere that is seen during a tot These can then cause turbulence in the ionosphere, which is part of the Earth's upper atmosphere and is used to bounce high-freq one part of the planet to another. The turbulence disrupts the bounce so a radio message might not get to its intended destination. to be an amateur radio operator and has experienced this firsthand.

A turbulent ionosphere can disrupt GPS signals being beamed down from satellites, too.

And when coronal mass ejections introduce strong electrical currents into power lines, it can exceed their intended capacity and b This has caused power outages, Reiff said, but power companies will often be proactive and reduce the current and voltage on thei lines.

On HoustonChronicle.com: Clouds of Venus could harbor life, new study shows

There wasn't an especially memorable solar weather incident during this past 11-year period, Biesecker said. But there was a time ir major flares, as well as coronal mass ejections, erupted from the sun. They were dubbed the Halloween Storms of 2003, and NASA p space weather slammed into the Earth's magnetic field from Oct. 19 through Nov. 7, causing aircraft to reroute, an hour-long power satellites to temporarily fail.

"These really big events can seriously disrupt communication and can seriously disrupt power, but they're much more common nea after solar max than they are now when the sun is really at minimum," Reiff said. "I don't think we have anything to worry about spa next few years."

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