NISE Net Online Workshop

The Science Behind the 2018 Explore Science: Earth and Space Toolkit – Exploring Earth and the Solar System

February 27, 2018

Welcome!

Today's presenters are:

Darrell Porcello, Ph.D., NISE Net Earth & Space Co-I

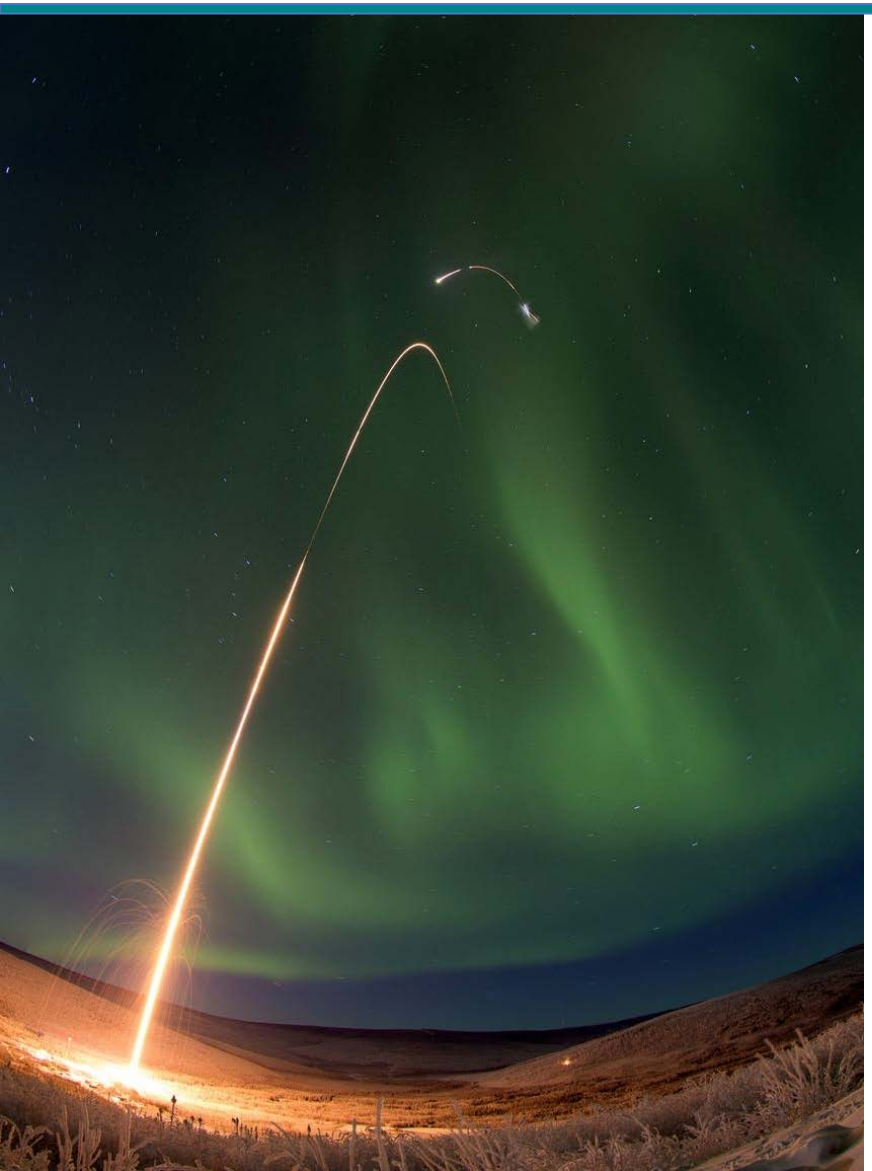
Frank Kusiak, M.A., NISE Net Western Regional Hub Leader
Lindsay Bartolone, M.S., NISE Net Earth & Space Content Expert
Laura Peticolas, Ph.D. Space Scientist and Science Educator

As we wait to get started with today's discussion, please:

- **Update your display name.** Include your first & last names, institution and location.
- **Introduce yourself**! Type your name and institution into the Chat Box
- **Questions?** Feel free to type your questions into the Chat Box at any time throughout the online workshop or use the raise your hand function in the participants list and we'll unmute your microphone.

Today's discussion will be recorded and shared on nisenet.org at: nisenet.org/events/online-workshop

Online Workshop Overview



5 min
NISE Network introductions & toolkit overview

30 min
Dr. Laura Peticolas on Exploring Earth and the Solar System

AND

Frank Kusiak with highlights from "Magnetic Fields", "Craters", "Paper Mountains", and "Stomp Rockets" activities

20 min
Q & A from our audience

Image Credit: NASA Goddard

Your Friendly NISE Net Webinar Crew

Dr. Laura Peticolas
Associate Director
Education & Public Outreach Group
Sonoma State University

Frank Kusiak, M.A.
NISE Net Western Regional Hub Leader
Lawrence Hall of Science, UC Berkeley

Dr. Darrell Porcello
NISE Net Earth & Space, Co-I
Children's Creativity Museum

Lindsay Bartolone, M.S.
NISE Net Earth & Space Content Expert
Chicago, IL

2018 Explore Science: Earth & Space Toolkit

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Kits

- Explore Science: Earth & Space toolkit
  - Earth & Space 2017 toolkit
  - Earth & Space 2017 toolkit recipients
  - Earth & Space 2018 toolkit
  - Earth & Space 2018 toolkit recipients
  - Explore Science: Earth & Space 2017 toolkit
    - Explore Science: Earth & Space toolkit recipients
- Building with Biology Kit
- Explore Science: Earth & Space toolkits
- Frankenstein200 kit
- SustainABLE Kit
- Explore Science - Zoom into Nano kit
  - Museums & Community Partnerships
- NanoDays

Explore Science: Earth & Space 2018 toolkit

In collaboration with NASA, the NISE Network has assembled a new set of engaging, hands-on Earth and space science experiences with connections to science, technology, and society.

EXPLORE SCIENCE Earth&Space

Links to download the entire digital toolkit (zip files):

Digital version of the Explore Science: Earth & Space 2018 toolkit

Zip file 1 - Open Me First	22.92 MB
Zip file 2 - Promotional Materials	32.85 MB
Zip file 3 - Explore Science Logos	39.63 MB

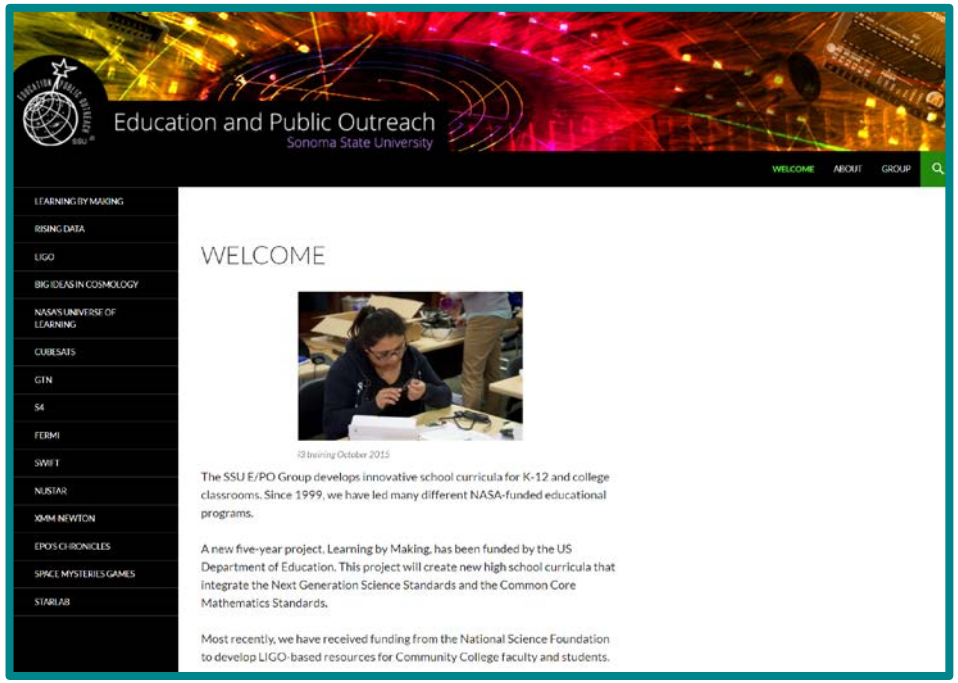
Submit your questions…

We will be collecting your Questions in the chat window to your right throughout the talk.

We will go through these questions in the Q&A section of the webinar. Those we don't get to today we will reply over email.

The Science Behind the 2018 Explore Science: Earth and Space Toolkit - Exploring Earth and the Solar System

Hi. I'm Laura.



Associate Director
Education and Public Outreach
Sonoma State University

Space Physicist

Image Credit: Lars Tiede

Image Credit: NOAA and NASA

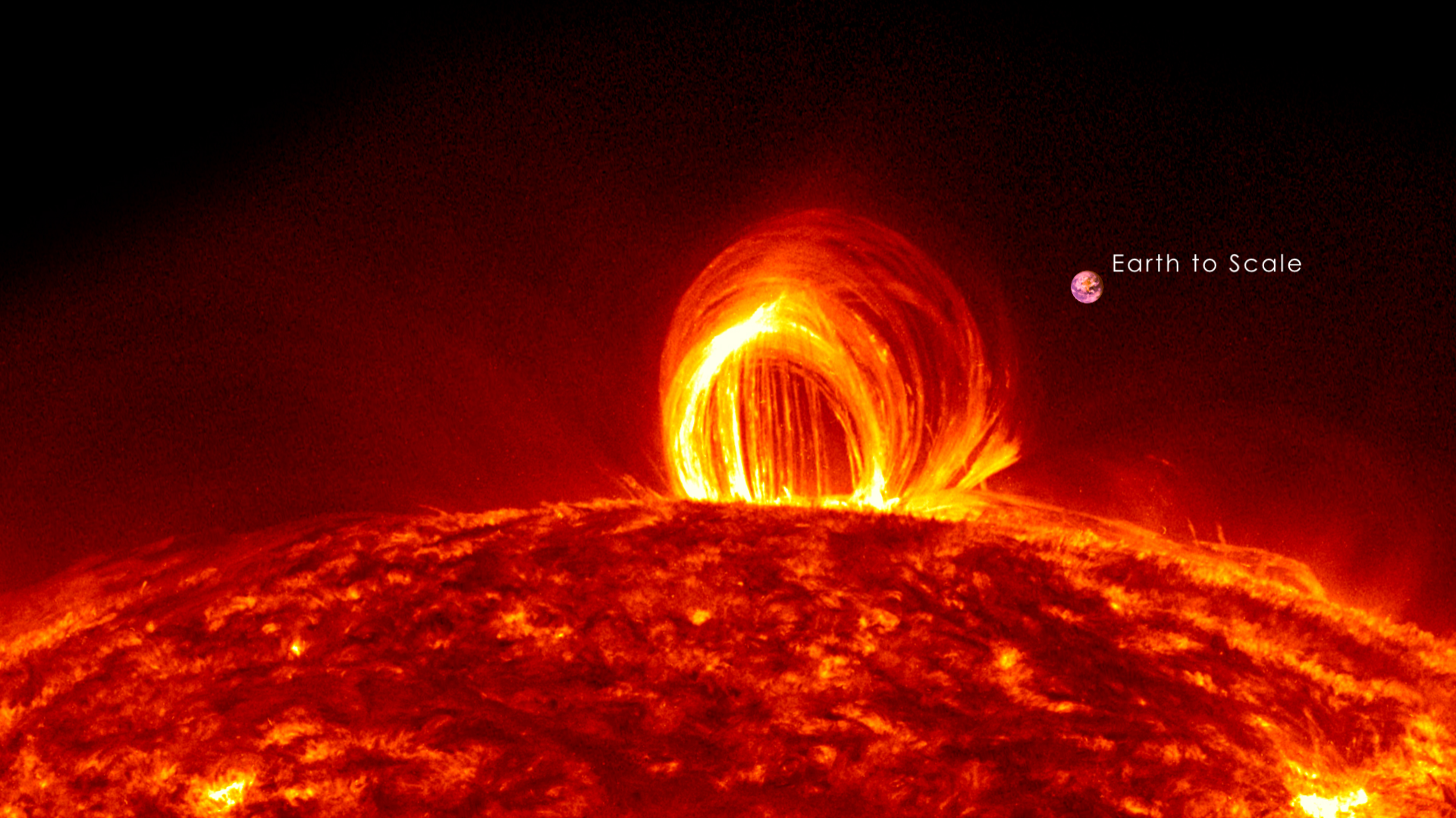
Q: What properties of Earth and the Solar System interest you?

Looking Down at Earth: Water Cycle

The Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) instrument on NASA's Terra spacecraft captured this cloud-free image over the city of Sukkur, Pakistan, on Aug. 18, 2010, showing flooding caused by heavy monsoon rains. The image covers an area of 62.4 by 77.6 kilometers (38.7 by 48.3 miles). Image Credit: NASA/JPL

Looking Down at Mars: Craters

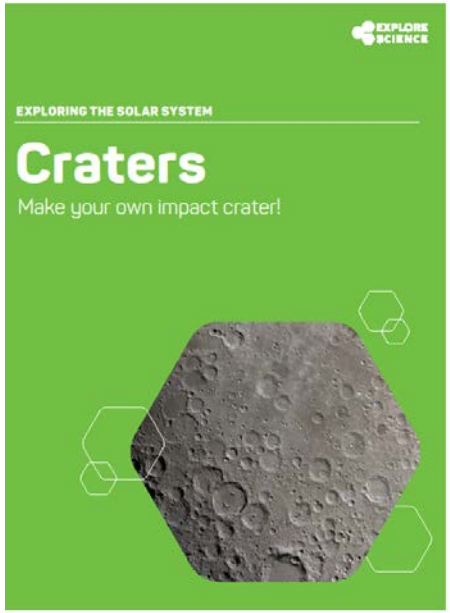
A cropped view of an approximately 1-km Martian crater near the equator of Mars. The crater shows little erosion, indicating a more recent impact. Photograph taken on March 30, 2015 by camera onboard the NASA HiRISE spacecraft. Image Credit: NASA/JPL/University of Arizona

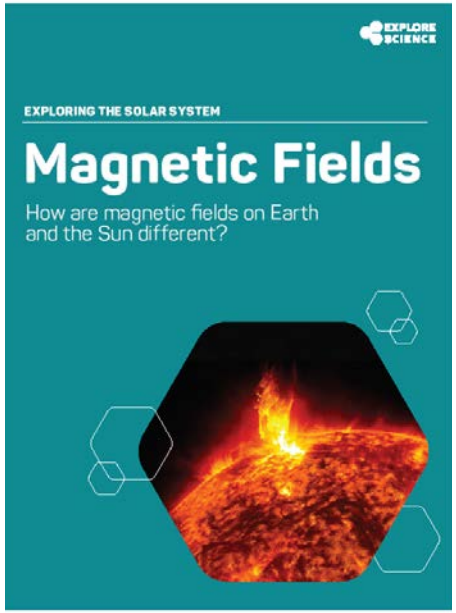


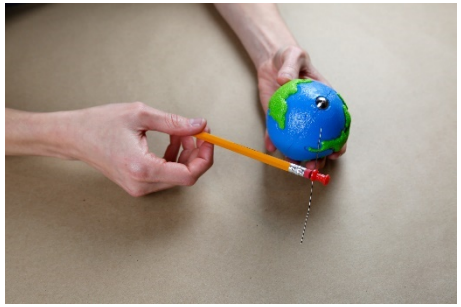
Looking at the Sun: Dynamic Magnetism

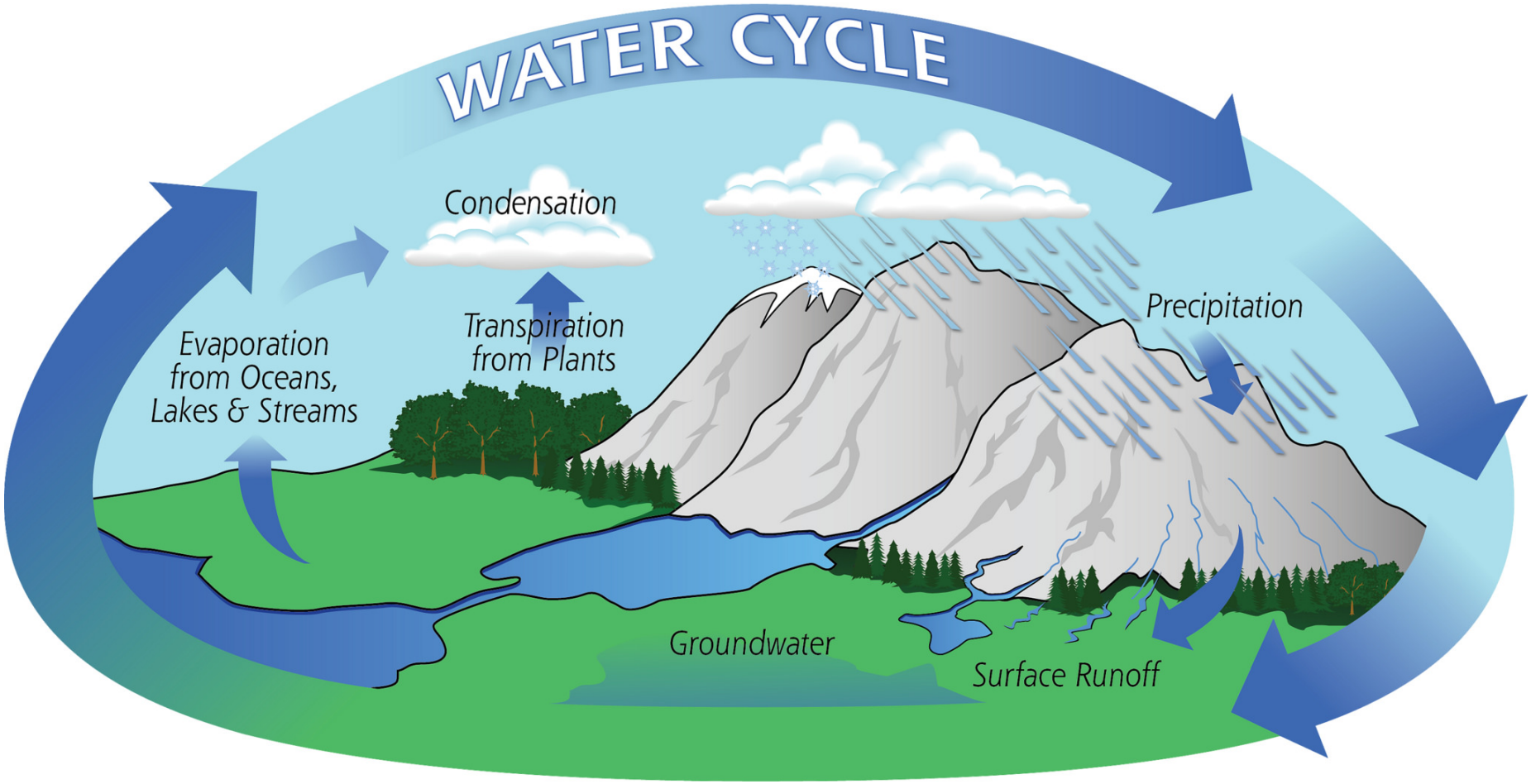
On July 19, 2012, an eruption occurred on the sun that produced a moderately powerful solar flare and a dazzling magnetic display known as coronal rain. Photograph collected by the AIA instrument on NASA's Solar Dynamics Observatory spacecraft. Image Credit: NASA/GSFC/SVS

2018 Explore Science:
Earth & Space Toolkit / Earth and the Solar System



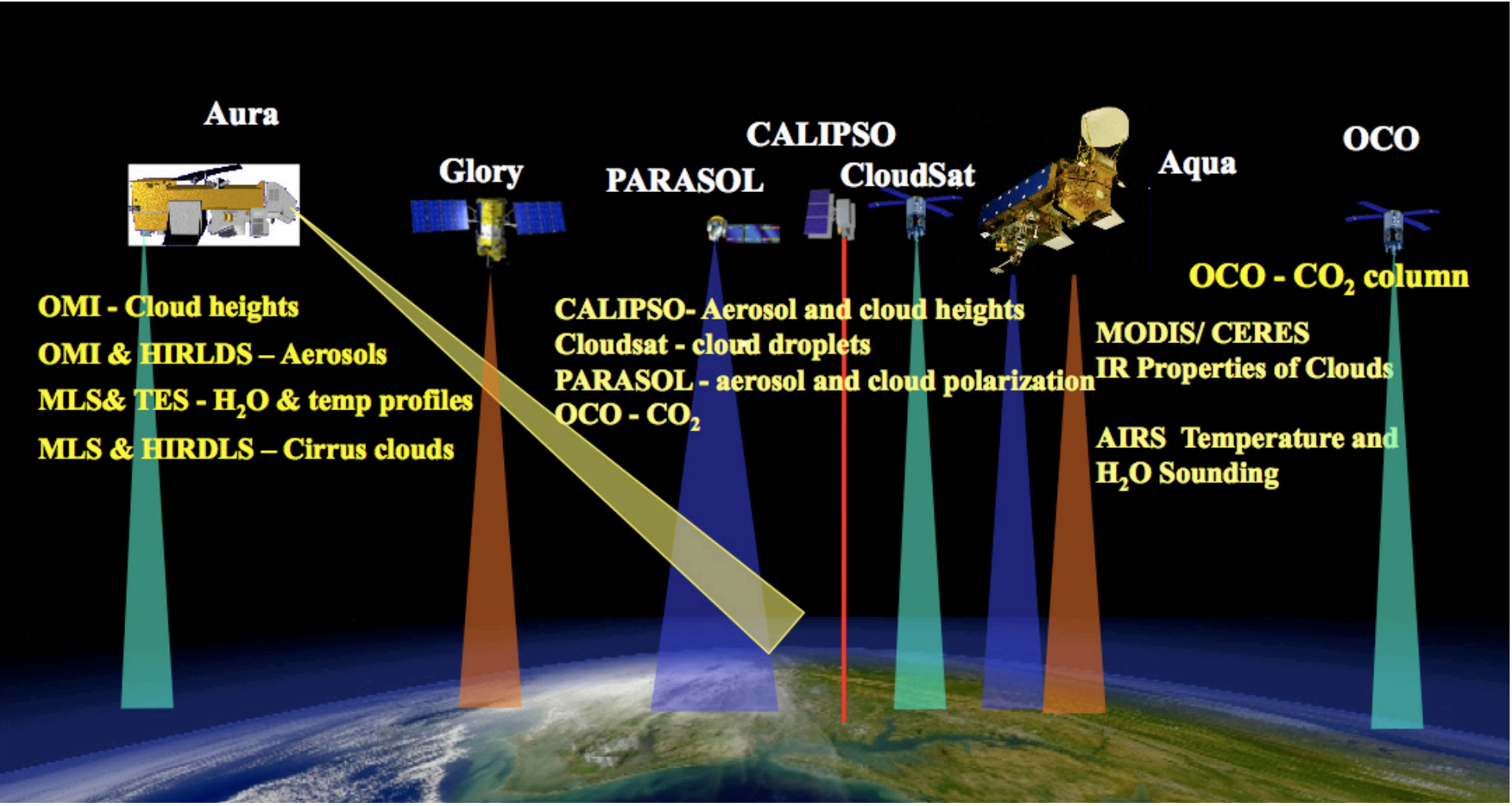






Changes on Earth: The Water Cycle

Water in many phases take part in the water cycle. Water evaporates from oceans, later, and streams and plants transpire. Water as a gas form in the atmosphere, condenses into clouds. Clouds then precipitate water or snow on mountains. Water runs of the surface and can ground water storages. NASA studies the water cycle using cameras and spectrometers on board satellites, balloons, and rocks. Image Credit: NASA AIRS mission



Studying Changes on Earth: The A-Train

The A-Train is equipped with a variety of passive and active remote-sensing instruments. The active sensors (i.e., CPR and CALIOP) emit "pencil-thin" pulses of energy that slice through the atmosphere, and strike a target. The return pulse of energy is analyzed to produce a very high-resolution view of a very small area. The passive sensors don't emit energy; they "see" reflected sunlight in the visible and ultraviolet wavelengths, and heat (infrared) that is both reflected and emitted from Earth's atmosphere and surface. Image Credit: NASA

Studying Changes on Earth: Climate

As carbon dioxide gas increases in Earth's atmosphere, it warms over decades and centuries. As Earth's atmosphere warms, the water cycle changes. Glaciers melt, cloud cover changes, precipitation patterns change thus changing watersheds, and ecosystems change.

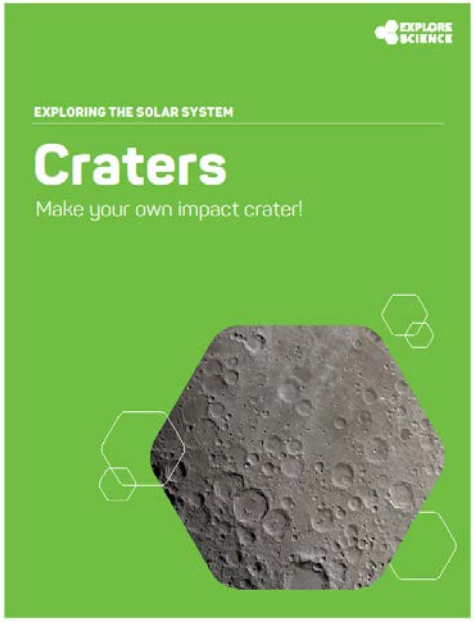
Interactive web-based NASA images: https://climate.nasa.gov/images-of-change

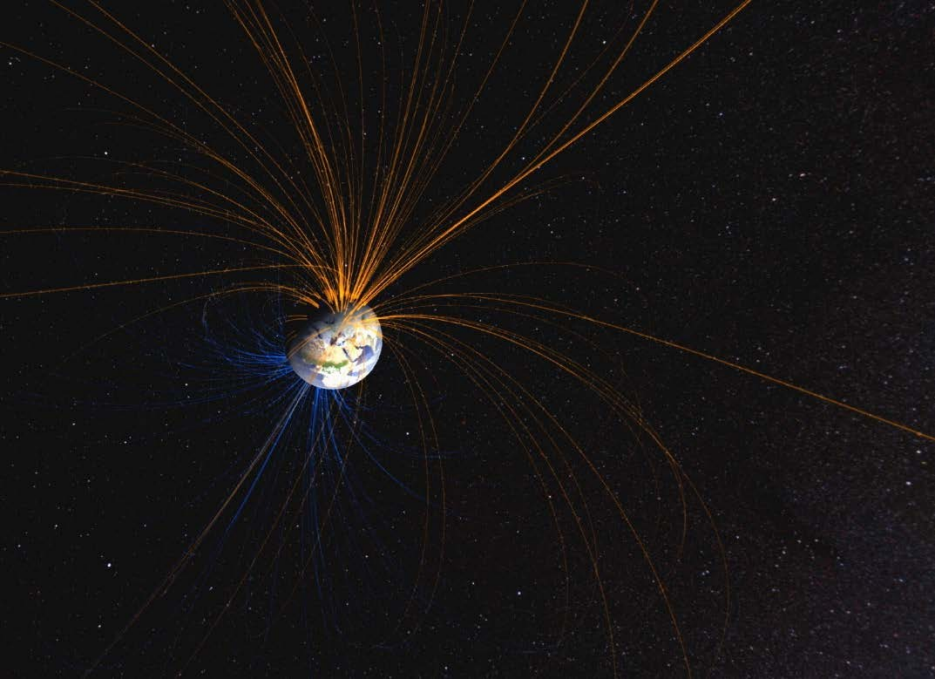
Image Credit: NASA

Studying Changes on Earth: Craters

Lake Manicouagan in northern Quebec, Canada. This NASA data from the Multi-angle Imaging Spectro-Radiometer (MISR) shows a circle of wate, indicating the remnants of one of the largest impact craters still preserved on Earth. Over time, glaciation and other erosional processes have reduced the extent of the crater. It was at one time 100 km across. Image Credit: NASA Terra Mission

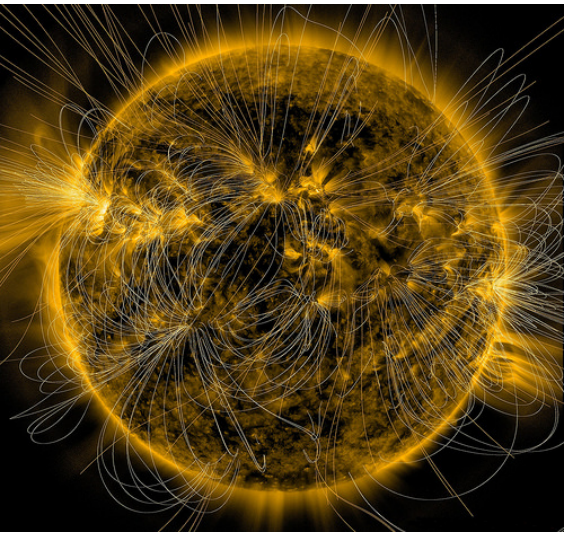
Craters and Paper Mountains





Computer simulation of Earth's magnetic field. Lines from N. Hemisphere as orange lines. Image Credit: NASA GSFC SVS

Generators inside the Hoover Dam. Magnets are pushed through a coils of wire. Image Credit: Richard Martin CC 2.0



Ultraviolet Sun and computer modeled magnetic fields. Image Credit: NASA/SDO/AIA/LMSAL

Magnetism on Earth and in the Solar System

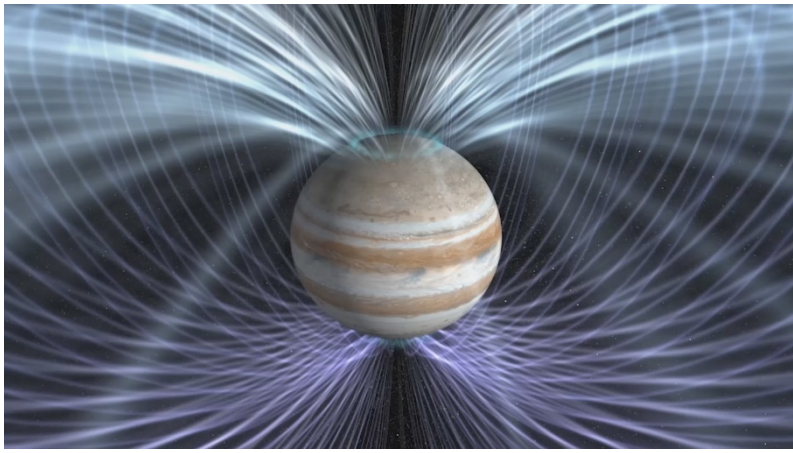
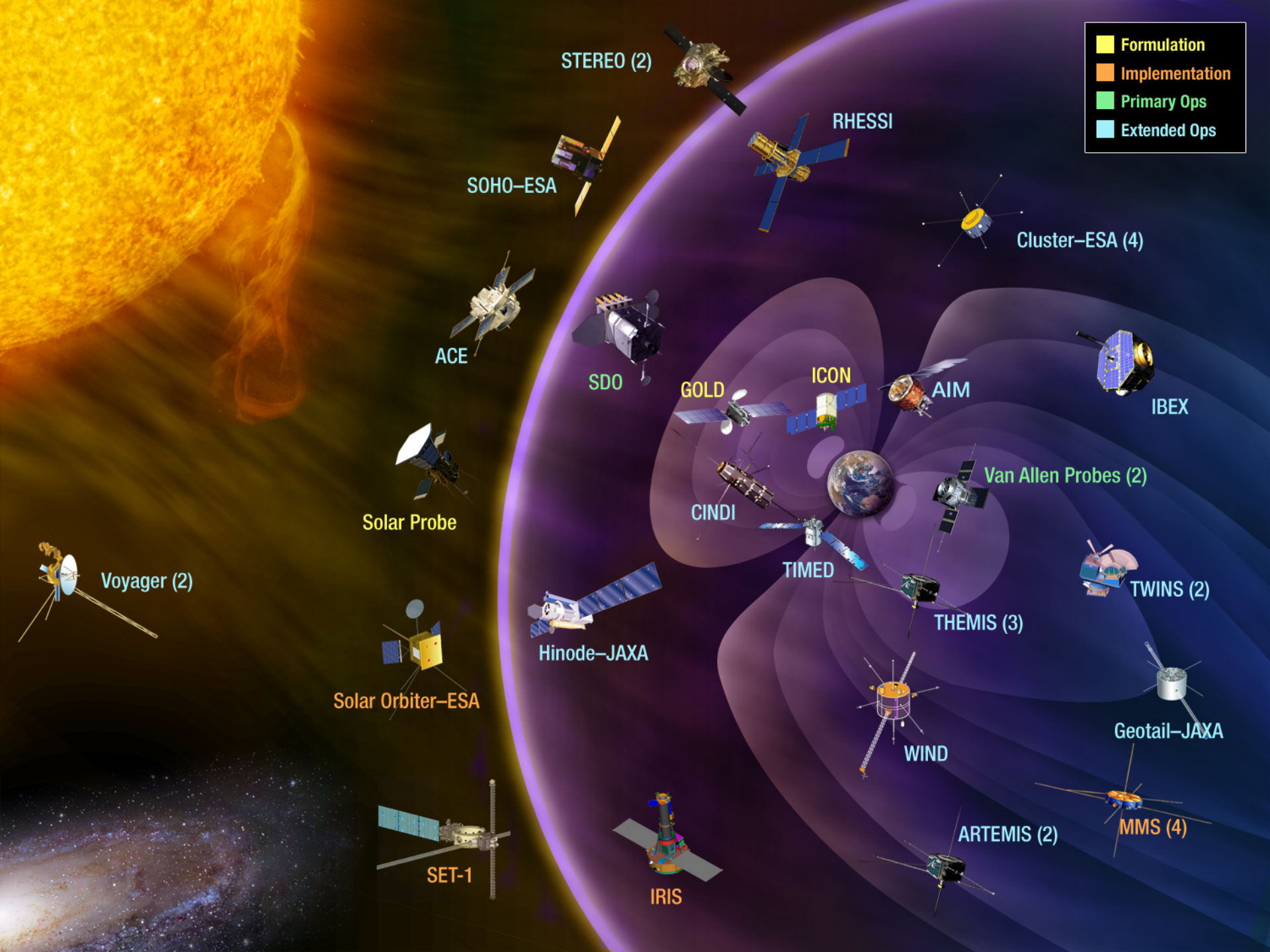


Image of Jupiter and computer modeled magnetic fields. Image Credit: NASA GSFC SVS


Formulation
Implementation
Primary Ops
Extended Ops
STEREO (2)
RHESSI
SOHO–ESA
Cluster–ESA (4)
ACE
SDO
GOLD
ICON
AIM
IBEX
Van Allen Probes (2)
CINDI
TIMED
Solar Probe
Voyager (2)
TWINS (2)
THEMIS (3)
Hinode–JAXA
Solar Orbiter–ESA
Geotail–JAXA
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SET-1
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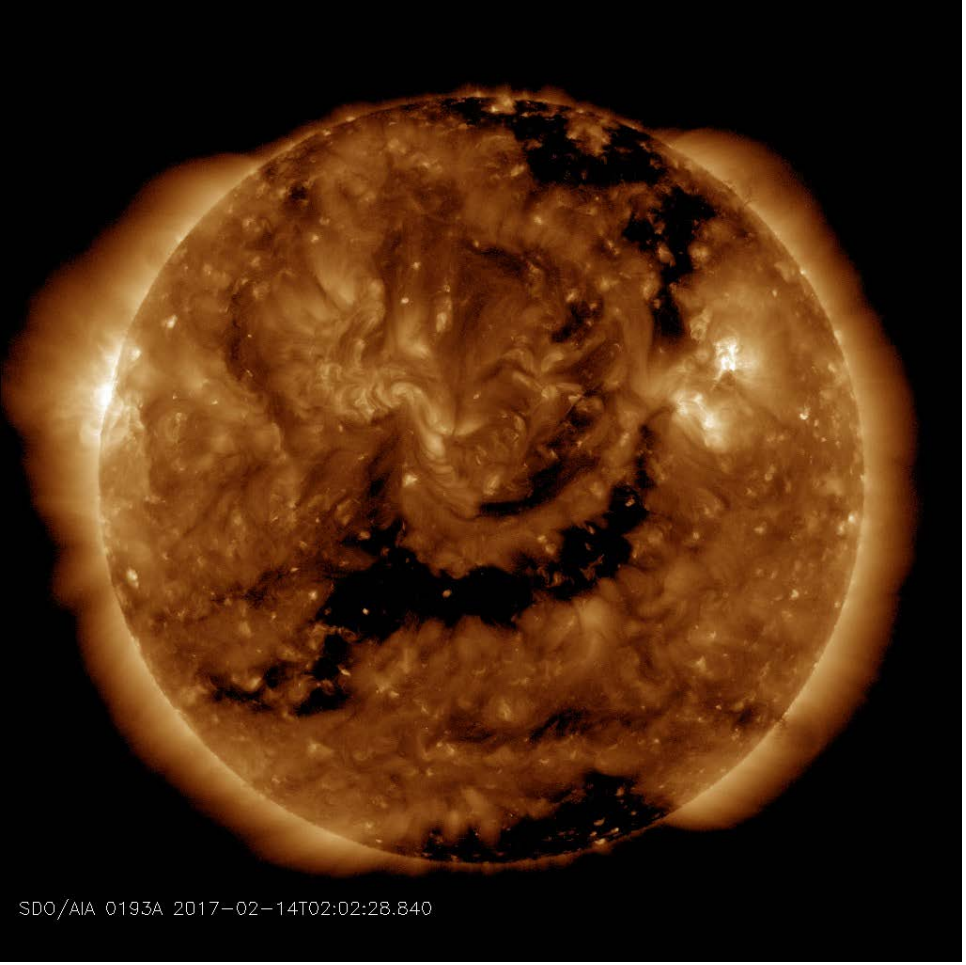


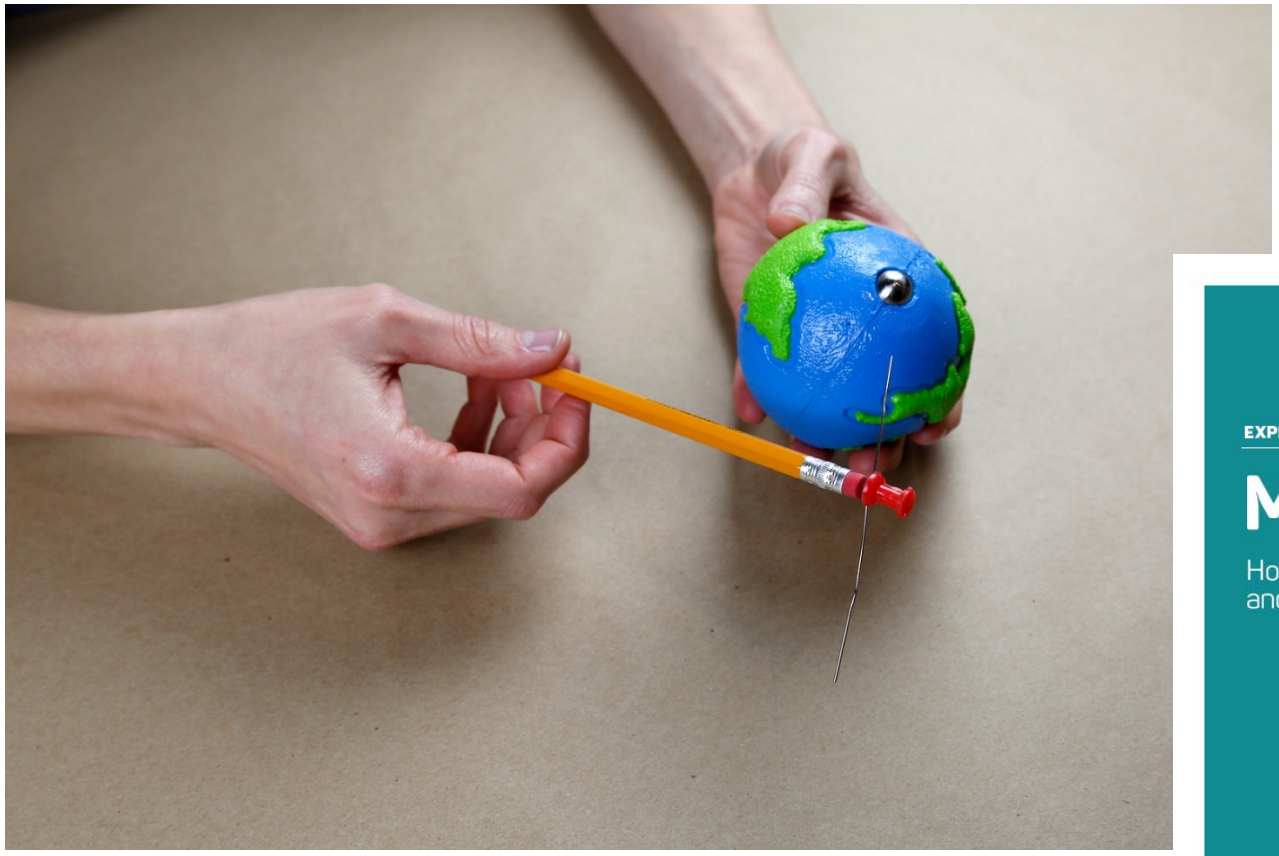
Ultraviolet Sun on Feb 14, 2017. Bright areas are typically dynamic. Image Credit: NASA/SDO/AIA

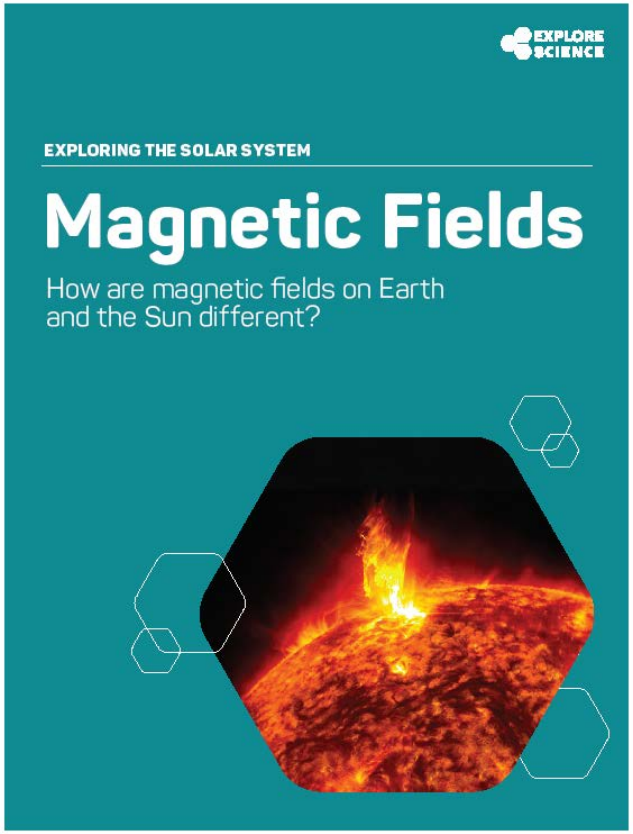
Aurora at the Poker Flat Research Range north of Fairbanks, Aurora on Feb 16, 2017. Image Credit: NASA/Terry Zaperach

Studying Magnetism in the Sun and above Earth

The Sun's energy comes in the form of light (full electromagnetic spectrum), particles, and electromagnetism. Energy from the Sun generates electrical currents within Earth's magnetic field. These electrical currents power the northern lights and can cause minor magnetic changes in Earth's surface magnetism with sometimes large electrical currents.

Magnetic Fields





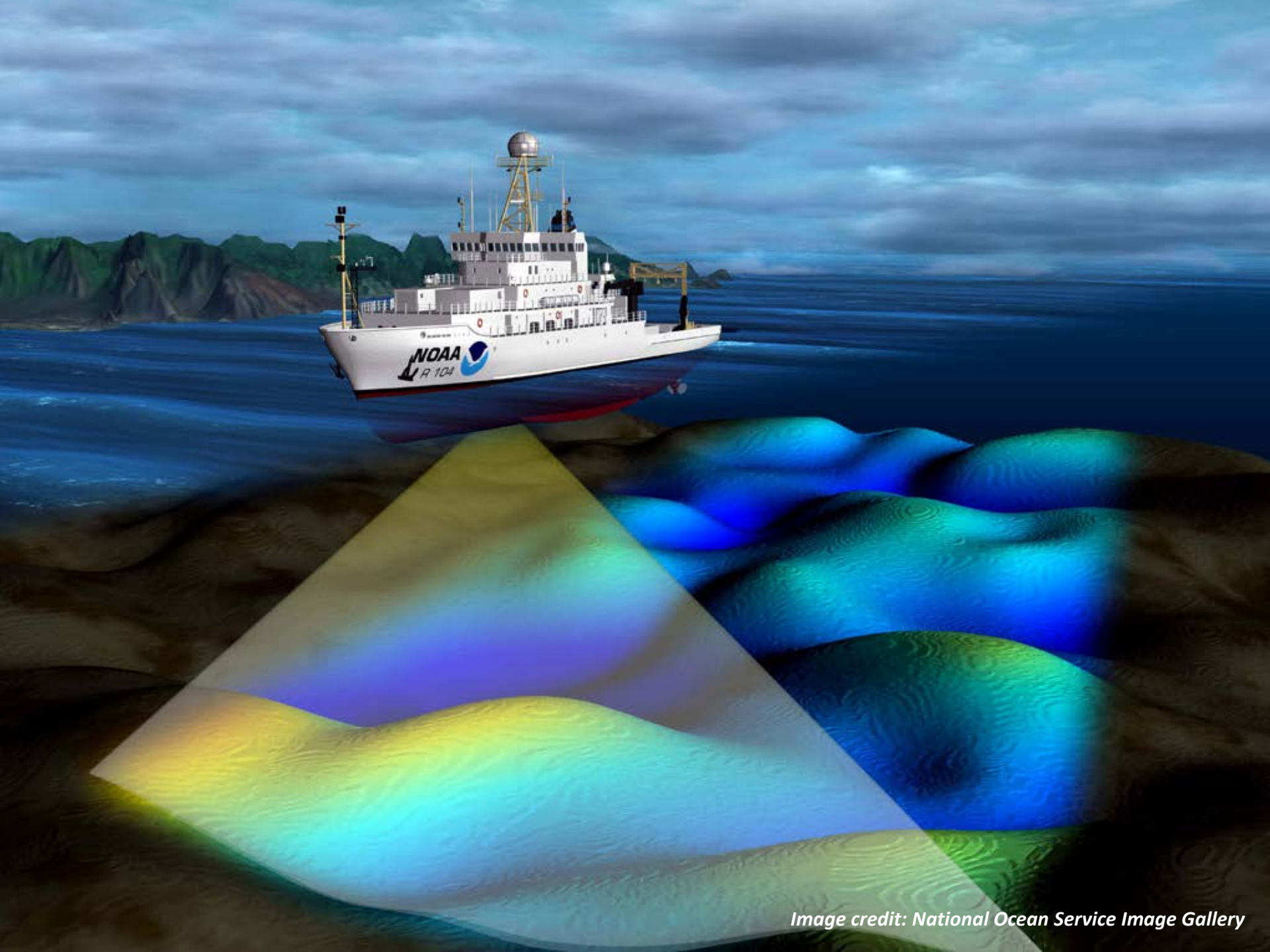
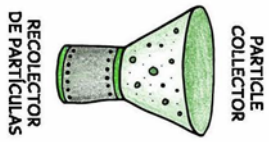
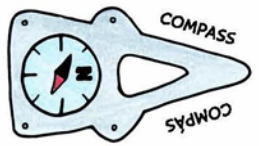


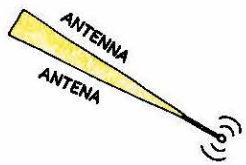
Image credit: National Ocean Service Image Gallery

Measuring in-situ particles, magnetic & electric fields, aurora brightness and spectra

Time lapse photo of the NASA Oriole IV sounding rocket with Aural Spatial Structures Probe. The rocket launched on Jan 28th, 2015 from Poker Flat Research Range north of Fairanks, AK. All four stages of the rocket are visible.
Credits: NASA/Jamie Adkins

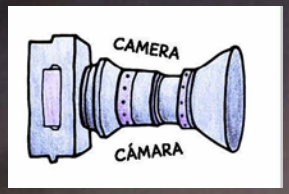


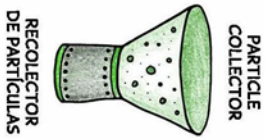


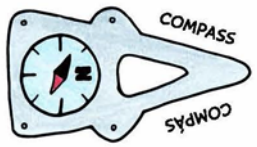


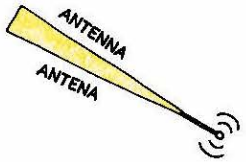
Looking into the Sky: Thermospheric Winds

A chemical trail like the one here deployed from a sounding rocket near the equator at night helps researchers track wind movement to determine how it affects the movement of charged particles in the atmosphere/ionosphere. The white and blue streaks, and the larger red glowing sphere, are from the chemical trails and give us neutral wind information. The red “cloud” is a lithium cloud. It was released by a rocket near 300 km altitude. The fainter blue and white traces are trimethyl aluminum clouds released by a second, lower altitude rocket. Image Credit: NASA

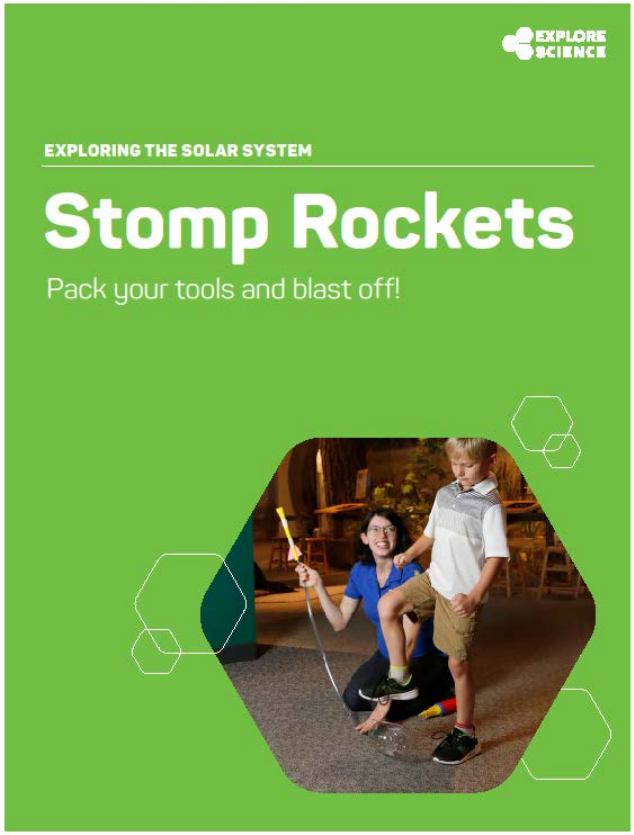






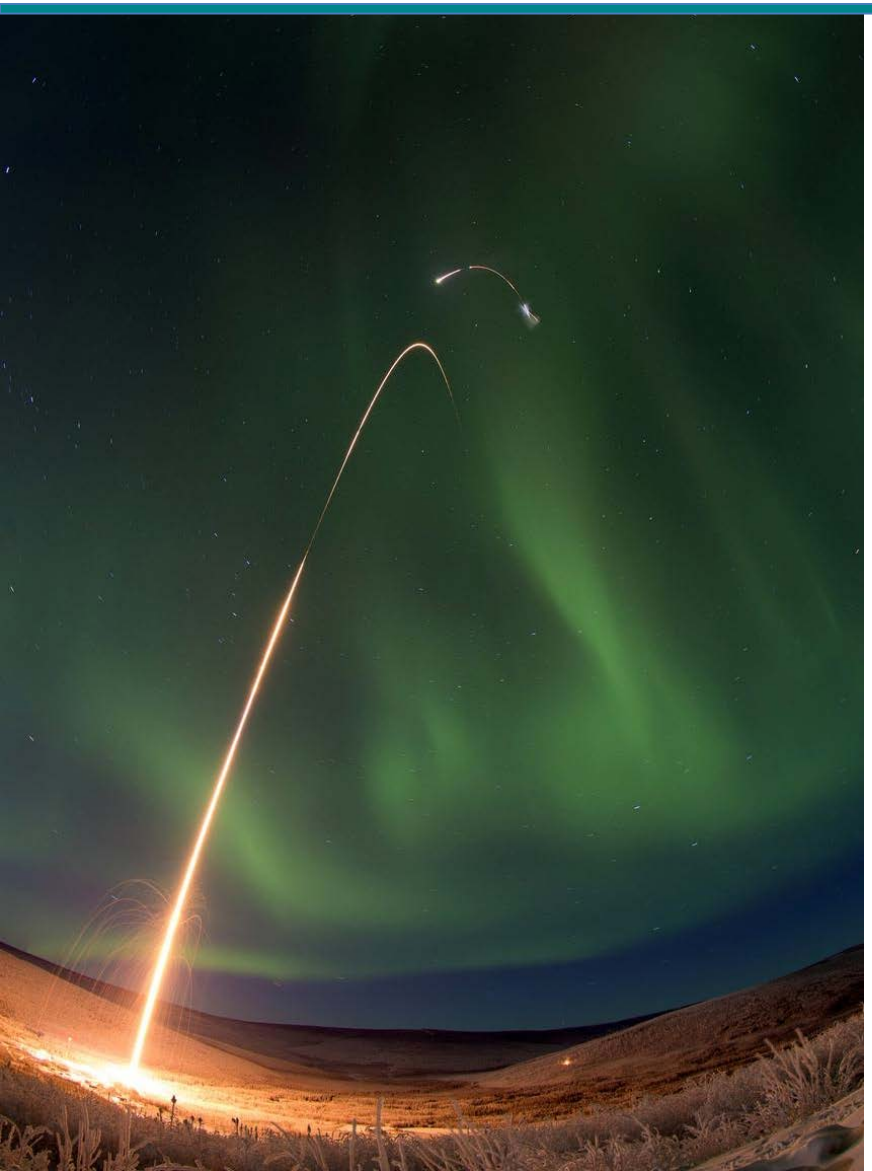


Stomp Rockets



Features and physical process of the Sun, Earth, and other objects in the Solar System are studied by NASA scientists using instrumentation onboard airplanes, rockets, balloons, and spacecraft. Artistic image called: “Voyager: Humanity's Farthest Journey.” Image Credit: NASA

Q&A



The Science Behind the Explore & Space Toolkit: Exploring Earth and the Solar System

What additional questions do you have?

Image Credit: NASA Goddard

SUN EARTH UNIVERSE
SOL TIERRA UNIVERSO

An engaging and interactive museum exhibition about Earth and space science for family audiences.

Overview and How to Apply: http://www.nisenet.org/sunearthuniverse

Applications due May 1, 2018

New webinar series from Universe of Learning and ASTC!

Wednesday, March 7: *"Understanding the Electromagnetic Spectrum (How does the universe work?)"*

Register: http://www.astc.org/profdev/universe-learning-webinars/

Our Next Workshops

The Science Behind the 2018 Explore Science: Earth & Space Toolkit - Looking Beyond the Solar System

Katherine Kornei, Ph.D.

Tuesday, March 13, 2018:
2pm-3pm Eastern/
11am-12pm Pacific

NGSS and the Explore Science: Earth & Space Toolkit - Connecting Your Toolkit to Field Trips and K-12 Programs

Lindsay Bartolone, M.S.
Linda Shore, PhD.

Tuesday, March 20, 2018:
2pm-3pm Eastern /
11am-12pm Pacific