

Journey into the Sun Educator Guide

A resource for using QUEST video in the classroom

Watch it online <http://www.kqed.org/quest/television/journey-into-the-sun> | 12:23 minutes



QUEST SUBJECTS

Life Science **Biology**
Health
Environment

Earth Science **Geology**
Climate
Weather
Astronomy

Physical Science **Physics**
Chemistry
Engineering

CA SCIENCE STANDARDS

Grade 5

Earth Sciences

5. (a) The Sun, an average star, is the central and largest body in the solar system and is composed primarily of hydrogen and helium.

Grades 9-12

Earth Sciences (Earth's Place in the Universe)

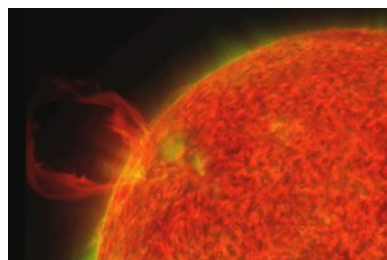
1. (e) The Sun is a typical star and is powered by nuclear reactions, primarily the fusion of hydrogen to form helium.

Physics (Electric and Magnetic Phenomena)

5. (f, h) Magnetic materials and electric currents (moving electric charges) are sources of magnetic fields and are subject to forces arising from the magnetic fields of other sources; changing magnetic fields produce electric fields, thereby inducing currents in nearby conductors.

PROGRAM NOTES

On February 11, 2010, a new solar journey kicked off aboard NASA's Solar Dynamics Observatory spacecraft. Scientists at Stanford University and Lockheed Martin are hoping that this amazing new mission will finally unlock the secrets of the Sun and provide insight into how they can predict "space weather" before it affects Earth.



In this segment you'll find...

- ⦿ what space weather is and how it's created.
- ⦿ how massive space weather events affect Earth and humankind.
- ⦿ images and data from the Sun as observed from the Solar Dynamics Observatory.

TOPIC BACKGROUND

Our Sun is a very active star. Solar flares, coronal mass ejections and other solar activities cause the Sun to expel radiation and atomic particles into the surrounding heliosphere, which is an enormous region of space around the Sun. When this continuous stream of charged particles (solar wind) or a gigantic cloud of charged material hits Earth, it changes our planet's upper atmosphere. Down on Earth's surface, these atmospheric changes may not seem like they would affect us at all, but this is far from the case. Such events in space can wreak havoc on our technological infrastructure and create unusual weather in some cases. These atmospheric changes also pose serious threats to astronauts and people who are traveling aboard airplanes. We call these inconvenient—and sometimes harmful—changes in our local space environment space weather.

Space weather can create issues with electronic signals to and from satellites. At certain times, atmospheric drag from space weather knocks expensive satellites out of orbit and sends them back to Earth. Space weather can cause airplane navigation and communication systems to go haywire, and it sometimes causes radiation dangers for astronauts in space. Here on Earth, space weather can lead to odd geomagnetic storms. Such storms can greatly impact our electrical resources and cause widespread power outages in homes and businesses in the areas where they hit.

Because we don't yet fully understand how space weather works, we've been at a loss when it comes to planning for its impacts. NASA's Solar Dynamics Observatory (SDO), launched on February 11, 2010, from Cape Canaveral, Florida, is the first mission in the organization's new Living with a Star Program. The goal of this project is to study and understand the Sun's magnetic field and learn how, when and why space weather occurs. The hope is that this knowledge will help scientists better predict patterns of space weather so we can protect ourselves and our technologies from the major damage it can cause.

VOCABULARY

Atmosphere

gaseous envelope that surrounds a planet or other celestial body

Forecast

to estimate or calculate in advance, especially to predict weather conditions by analyzing meteorological data

Fusion

a nuclear reaction in which nuclei combine to form more massive nuclei with the simultaneous release of energy

Heliosphere

the large region of space around the Sun through which solar wind and the Sun's magnetic influence both extend

Radiation

energy radiated or transmitted in the form of rays, waves or particles

Solar Flare

a sudden eruption of magnetic energy released on or near the Sun's surface

Sunspot

a relatively cool, dark spot or groups of spots on the Sun's surface associated with strong magnetic fields

PRE-VIEWING

- What is the relationship between the Sun and Earth?
- What do you know about solar storms?

VIEWING FOCUS

NOTE: You may choose to watch the television segment twice with your students: once to elicit emotional responses and get an overview of the topic and again to focus on facts and draw out opinions.

- What is space weather? How can it affect Earth?
- Why is space weather so difficult to predict? How might data from the Solar Dynamics Observatory change this?
- Describe what happens when sunspots collide.
- What are scientists hoping to learn about the Sun's magnetic fields? How can the public help with this new solar research?

For all media see:

- Segment Summary Student Sheet
http://www.kqed.org/quest/downloads/QUEST_SegSum_StudentSheet.pdf
- Personal Response Student Sheet
http://www.kqed.org/quest/downloads/QUEST_PersResp_StudentSheet.pdf

LESSON PLANS and RESOURCES from QUEST, TEACHERS' DOMAIN and NPR

Storms in Space Disrupt Travel on Earth NPR

<http://www.npr.org/templates/story/story.php?storyId=123111882>

This February 1, 2010, segment from NPR's **All Things Considered** discusses how solar activity affects air travel on Earth. Included is a time-lapse video showing three days of storm-inducing activity on the Sun.

As Sun Flares Up, Sky Watchers Check Microphones NPR

<http://www.npr.org/templates/story/story.php?storyId=123694113>

In this segment from **All Things Considered**, amateur radio astronomer Thomas Ashcraft talks about the sounds coming from the Sun. (2/13/2010)

"Hubble of the Sun" Begins Transmitting Images NPR

<http://www.npr.org/templates/story/story.php?storyId=126191021>

View five stunning images from NASA's Solar Dynamics Observatory.

Solar Flares Teachers' Domain

<http://www.teachersdomain.org/resource/wlvt07-scitech.solarflares/>

This video writing prompt from **Science Now** encourages students to reflect on how solar flares impact life on Earth.

Solar Magnetism Teachers' Domain

<http://www.teachersdomain.org/resource/ess05.sci.ess.eiu.magnetism/>

Students will learn about the Sun's magnetic field and some of the ways solar activity can affect life on Earth in this video segment adapted from **NOVA**.

Solar Wind's Effect on Earth Teachers' Domain

<http://www.teachersdomain.org/resource/ess05.sci.ess.eiu.solarwind/>

In this video segment adapted from NASA, students will learn about solar storms and how they can affect our planet and disrupt our lives.

Discuss The Journey into the Sun story on the QUEST Blog QUEST

<http://www.kqed.org/quest/blog/2010/05/18/producers-notes-journey-into-the-sun>

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Exploratorium
www.exploratorium.edu

Girl Scouts of Northern California
www.girlscoutsnorcal.org

Golden Gate National Parks Conservancy
www.parksconservancy.org

The J. David Gladstone Institutes
www.gladstone.ucsf.edu

Lawrence Berkeley National Laboratory
www.lbl.gov

Lawrence Hall of Science
www.lawrencehallofscience.org

Monterey Bay Aquarium
www.mbayaq.org

Monterey Bay Aquarium Research Institute
www.mbari.org

Oakland Zoo
www.oaklandzoo.org

The Tech Museum of Innovation
www.thetech.org

UC Berkeley Natural History Museums
<http://bnhm.berkeley.edu/>

U.S. Geological Survey
www.usgs.gov

MORE EDUCATIONAL RESOURCES FOR USING QUEST MULTIMEDIA TO ENHANCE 21st CENTURY SKILLS IN TEACHING AND LEARNING

Why Use Multimedia in Science Education?

<http://www.kqed.org/quest/downloads/QUESTWhyMedia.pdf>

- Read about the importance of using multimedia in the 21st century science classroom.

How to Use Science Media for Teaching and Learning

<http://www.kqed.org/quest/downloads/QUESTMediaTips.pdf>

- A collection of tips, activities and handouts to actively engage students with multimedia.

Science Multimedia Analysis

<http://www.kqed.org/quest/downloads/QUESTMediaAnalysis.pdf>

- Give your students the tools to recognize the purposes and messages of science multimedia.

Create Online Science Hikes with Google Maps

http://www.kqed.org/quest/files/download/52/QUEST_ExplorationCreation.pdf

- Do you like the science hike Explorations on the QUEST site? Use this place-based educational guide to create similar science-based maps with youth.

OTHER WAYS TO PARTICIPATE IN QUEST



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**KQED 88.5 FM San Francisco &
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Mondays at 6:30am and 8:30am**



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**KQED Channel 9
Tuesdays at 7:30pm**

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