

The Dynamic Nature of the Sun

Middle School Grades

Lesson Summary

Students develop an understanding of the dynamic and variable nature of the Sun by comparing and contrasting images that differ with respect to time, scale, or instrumentation used to create the images. Students identify the similarities and differences between images and share their findings with peers. Students discuss how learning about the dynamic nature of the Sun has changed their understanding of the Sun.

Prior Knowledge & Skills

Ability to:

- Make and record observations

AAAS Science Benchmarks

The Nature of Science

The Scientific World View

Scientific Inquiry

The Nature of Technology

Technology and Science

The Physical Setting

The Universe

Energy Transformations

Motion

NSES Science Standards

Science as Inquiry

Abilities to do Scientific Inquiry

Understandings of Scientific Inquiry

Physical Science

Transfer of Energy

Earth and Space Science

Earth in the Solar System

History and Nature of Science

Nature of Science

Teaching Time: One 45-minute period

Materials for the Facilitator

- *Dynamic Sun* PowerPoint (available from UCAR Education and Outreach)
- Transparency of *Two Views of the Sun* for modeling the activity
- Overhead projector or laptop and projector
- Chalkboard and chalk or Dry Erase board and markers

Materials for Students

- Image Card (1 per team)
- Venn diagram (1 per student)
- Pen/pencil

Advanced Planning

Preparation Time: 20-30 minutes

1. Review the lesson plan
2. Photocopy (and laminate-optional) image cards.
3. Form student teams
4. Arrange supplies so that students will have easy and organized access to them.
5. Set-up and check your audiovisual equipment.

Exploring the Dynamic Nature of the Sun

Grade level: 5-8

Earth Systems Science

Materials for the Facilitator

- *Dynamic Sun* PowerPoint
- Transparency of *Two Views of the Sun* for modeling the activity
- Overhead projector or laptop and projector
- Chalkboard and chalk or Dry Erase board and markers

Materials for Students

- (1 per team) Image Card
- (1 per student) Venn diagram recording sheet
- (1 per student) Pen/pencil

Colorado State Standards

Science: 1, 4.1e, 4.2a, 4.2c, 4.4d, 4.4e, 5c, 5d, 6

Learning Goals

Students will:

- Make and record observations
- Communicate scientific understanding to peers
- Develop an understanding of the Sun as a dynamic and variable object
- Compare and contrast the appearance of the Sun with respect to the variables of time, scale, and instrumentation
- Develop an understanding of scientific instruments and technologies used to study the Sun

What Students Do in this Activity

Students develop an understanding of the dynamic and variable nature of the Sun by comparing and contrasting images that differ with respect to time, scale, or instrumentation used to create the images. Students identify the similarities and differences between images and share their findings with peers. Students discuss how learning about the dynamic nature of the Sun has changed their understanding of the Sun.

What the Scientist Does in this Activity

The scientist demonstrates the activity and facilitates the work students by modeling skills and techniques particularly useful to problem solving and inquiry. The scientist helps students to clarify and extend their ideas by posing questions, suggesting additional work, and summarizing student findings. The scientist shares her/his work and responds to student interests and questions.

Advanced Preparation

1. Prior to your classroom visit, meet or speak with the teacher. Review the [checklist](#) with your host teacher and make any specific arrangements with respect to classroom materials, management, and audiovisual equipment.
2. Ask the teacher to create teams of 2-3 students and let you know the total number of teams to expect.
3. Review the activity described below.
4. Check that the kit contains all necessary items.

5. Practice your presentation.
6. Review the document on [K-12 Instruction for Scientists as Educators](#)
7. Upon arrival in the classroom, arrange your supplies so that students will have easy and organized access to them. Set-up and check your audiovisual equipment.

Classroom Activity

Introduction

- Briefly introduce yourself to the students
- Write your name on the board and give students instructions for its pronunciation.
- Provide students with nametags to complete and wear
- If the teacher has not done so, ask students to
 - a. Respect each other and the materials
 - b. Follow directions
 - c. (optional) Request that students raise their hands to speak or request your assistance.

Introduce the Activity

- Identify student knowledge about the Sun. Ask students:
 - ? If they have studied the Sun in this or prior science classes and to volunteer what they recall having studied.

OR

- ? Ask students to form and describe a mental image of the Sun. (*For all students, but especially for younger students, closing their eyes and creating the mental picture may help them engage in the activity.*)

Keep in mind that student images of the Sun will combine their direct experience of having seen the Sun throughout the day, at sunrise, and sunset AND what they have learned about the Sun through formal and/or informal education.

- Explain that students will learn about the dynamic nature of the Sun.
- Explain that scientists often make and record observations of the Sun, and that learning to interpret images is an important skill.

Model the Activity

- Project two images of the Sun on the screen using either overhead transparencies or PowerPoint.
- Ask students to compare and contrast the images and share their observations with the class. Point out that for this activity, knowing the meaning of the image is less important than practicing and developing observational skills.
- Record student observations in a “*Venn diagram*” on the board or overhead. ([Link to image of Venn diagram](#))

Enlist students as assistants, provide them with responsibilities such as distributing and collecting the materials, keeping class notes on the board or overhead, and keeping track of the time.

Create Student Teams

- Explain to students that they will work in small groups to compare and contrast two images of the Sun found on image cards that you will distribute. Each group will record their observations on a Venn diagram and eventually share these with the class.
- Explain that you will circulate around the room to support students as they work.
- Tell students that they have about 10 minutes to make and record their observations of the images before sharing the contents of their Venn diagram with the class.
- Ask if students have any questions about the instructions.
- Remind them to review the directions on the image card.
- Divide the students into small groups or pairs and distribute one image card per team and one Venn diagram to each student.
- Have them begin work.

Facilitate Student Inquiry

- As students work, circulate throughout the class observing and speaking with each student or team.
- Ask open-ended questions to encourage students to explain their ideas to you.
- Remind students to record their observations on the Venn diagram, to answer the questions on the student activity sheet, and prepare to share their observations with the class.
- Remind students when they have 3 minutes remaining to and to use the time to prepare their brief presentation.
- Give students a 1-minute warning.
- Bring work to an end.

Summarize Student Inquiry

- Pair two teams that worked with different image cards. Use the [shared-pair](#) method to allow each team to share their work with the other team.

OR

- Have each group share one idea they formed about their images as you project the images on a large screen
- After all teams have reported, review all the image sets using the PowerPoint presentation *DynamicSun.ppt*. Many students need to see the images while listening to the explanation, so be sure to write or illustrate the main ideas as you summarize.

The summary should clearly state the main points of the lesson, including but not limited to:

- The Sun is dynamic and variable; it changes over short and long time periods
- The Sun appears different when viewed at different scales
- The Sun appears different when viewed with different instruments

Share Your Work

Personalize your visit by sharing your work with the students.

- Encourage students to ask questions
- Show images of your work such as instruments and data that you have collected
- Discuss the roles and responsibilities of various members of your research team
- Explain the importance having education goals and how these help one to prepare for any career but especially one in mathematics, science, and engineering.

Extend Student Inquiry

If students work quickly or a teacher requests ideas for follow-up activities, consider the options below:

- Provide students with additional images that challenge their observational skills.
- Have students create their own graphic organizer to remember the similarities and differences between the images and image sets. Students are familiar with Venn diagrams.

- Challenge students to find other examples of images that show an object that changes over time, changes with scale, or changes depending upon the instrumentation used for observations. For example, students might find images of the human body created with the use of visible light, x-rays, or other imaging instruments.

TWO VIEWS OF THE SUN

Image A

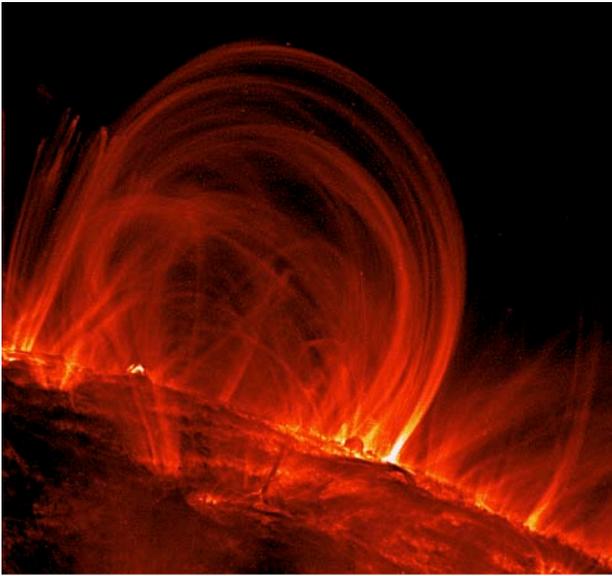


Image B

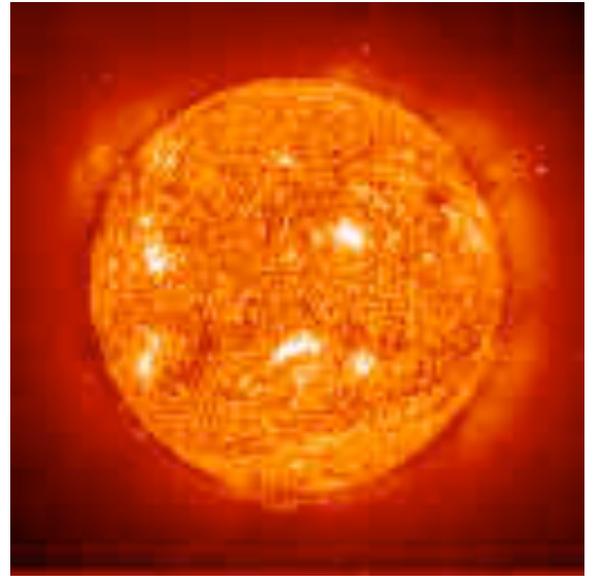
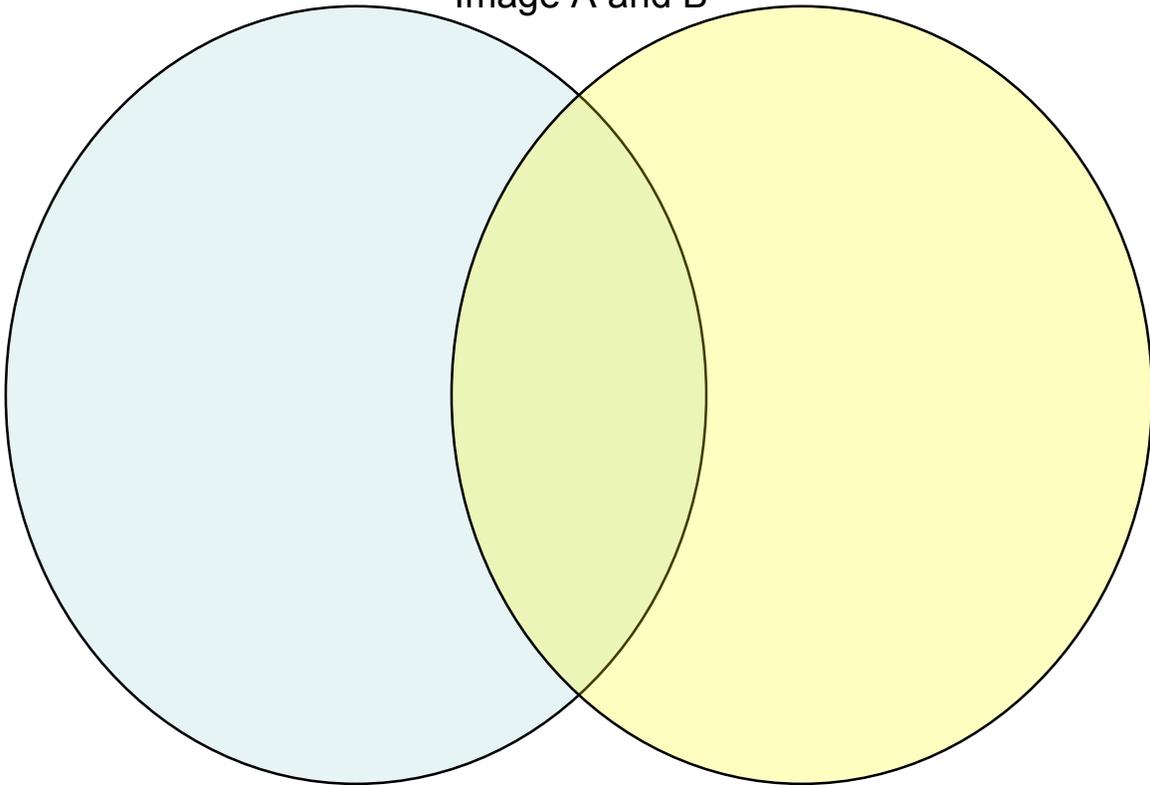


Image A

Image A and B

Image B



Team Name: The Prominences

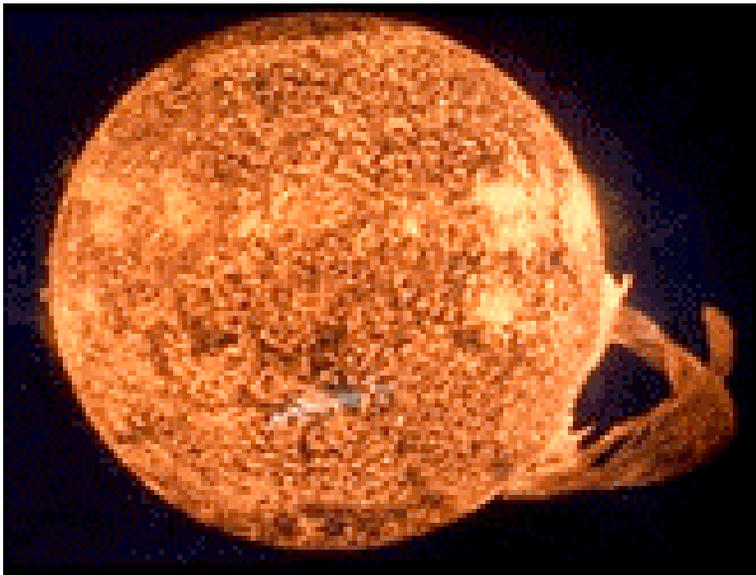
Directions

Compare and contrast the images shown below.

Record your response to the following questions on the Venn diagram

- What are some of the similarities and differences between the images? Give some examples.
- In your opinion, do the differences in the images result from:
 - A. a change over time
 - B. a change in the size of the image
 - C. a change due to observing the Sun with different instruments

A



B



Team Name: The Eclipses

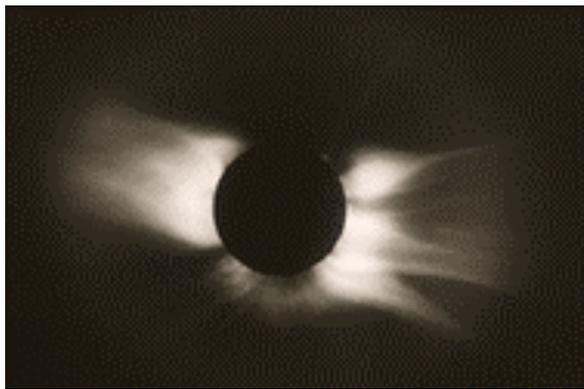
Directions

Compare and contrast the images shown below.

Record your response to the following questions on the Venn diagram

- What are some of the similarities and differences between the images? Give some examples.
- In your opinion, do the differences in the images result from:
 - A. a change over time
 - B. a change in the size of the image
 - C. a change due to observing the Sun with different instruments

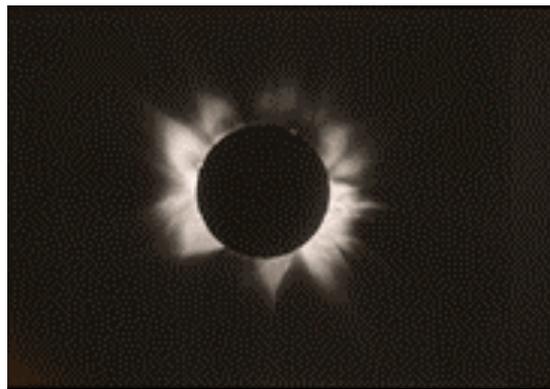
A



Date: 1973

Location: Kenya, Africa

B



Date: 1980

Location: India

Team Name: The Coronas

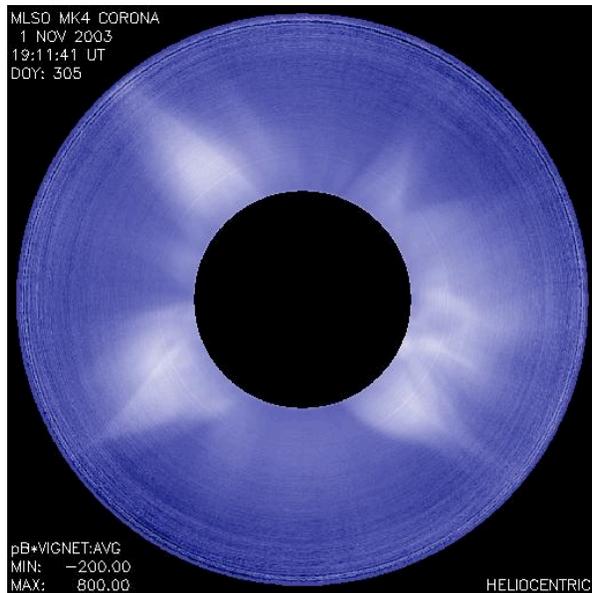
Directions

Compare and contrast the images shown below.

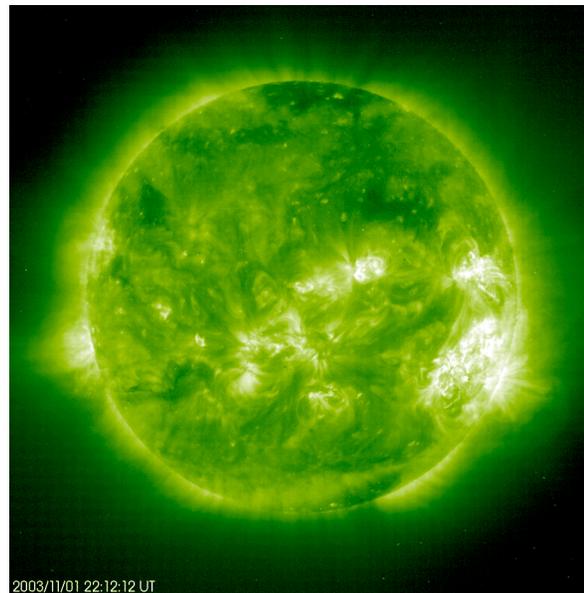
Record your response to the following questions on the Venn diagram

- What are some of the similarities and differences between the images? Give some examples.
- In your opinion, do the differences in the images result from:
 - A. a change over time
 - B. a change in the size of the image
 - C. a change due to observing the Sun with different instruments

A



B



Team Name: The Big Spots

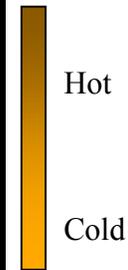
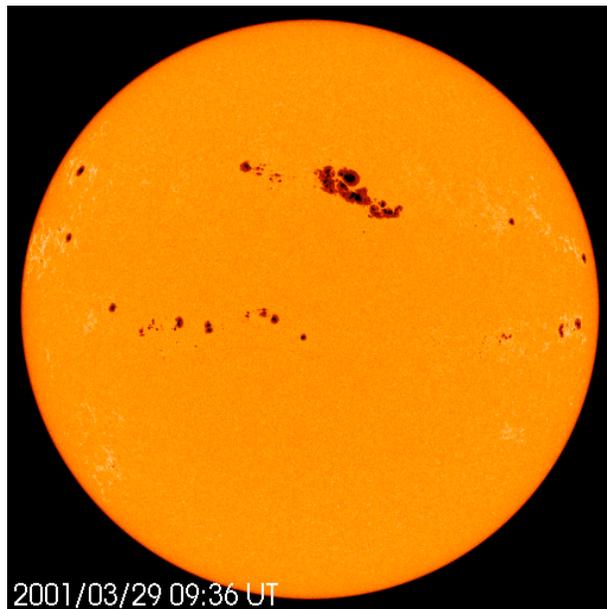
Directions

Compare and contrast the images shown below.

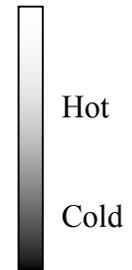
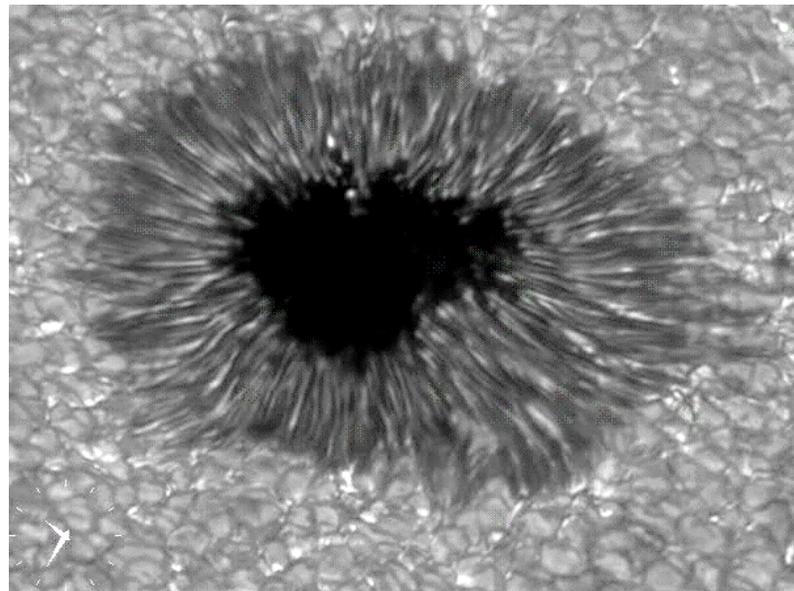
Record your response to the following questions on the Venn diagram

- What are some of the similarities and differences between the images? Give some examples.
- In your opinion, do the differences in the images result from:
 - A. a change over time
 - B. a change in the size of the image
 - C. a change due to observing the Sun with different instruments

A



B



Team Name: The Coronal Mass Ejections (CMEs)

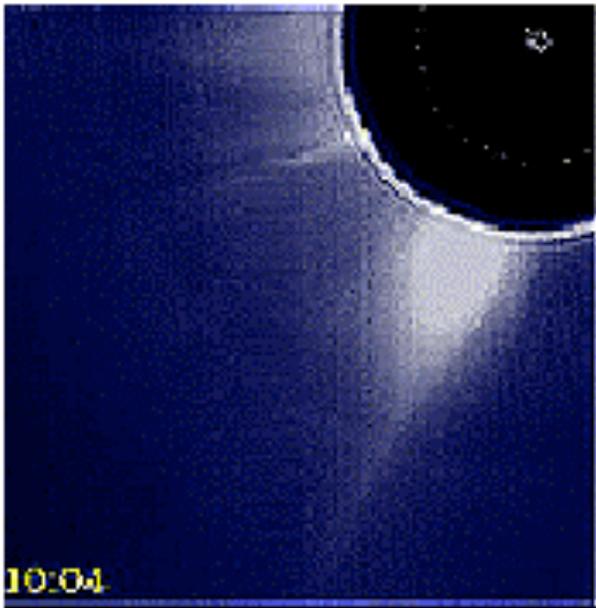
Directions

Compare and contrast the images shown below.

Record your response to the following questions on the Venn diagram

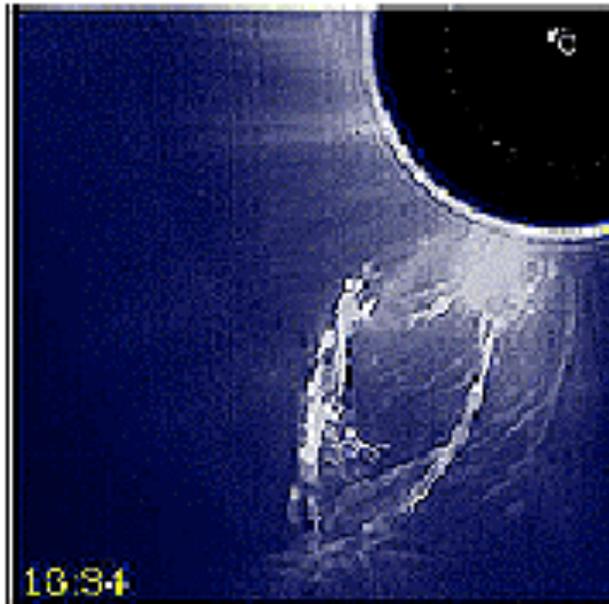
- What are some of the similarities and differences between the images? Give some examples.
- In your opinion, do the differences in the images result from:
 - A. a change over time
 - B. a change in the size of the image
 - C. a change due to observing the Sun with different instruments

A



Date: August 28, 1980

B



Time: 10:04 AM and 1:31 PM

Team Name: The Filters

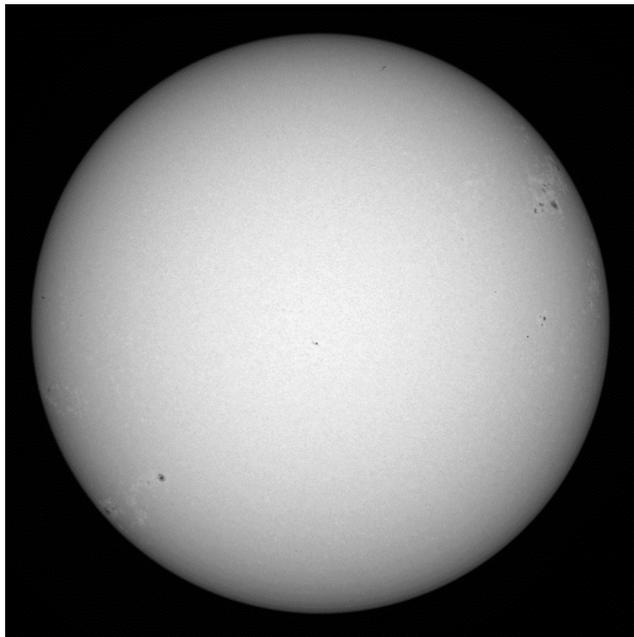
Directions

Compare and contrast the images shown below.

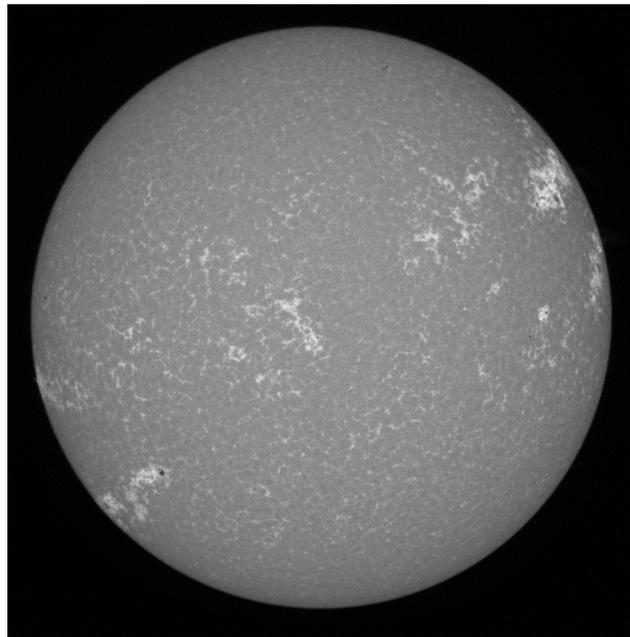
Record your response to the following questions on the Venn diagram

- What are some of the similarities and differences between the images? Give some examples.
- In your opinion, do the differences in the images result from:
 - A. a change over time
 - B. a change in the size of the image
 - C. a change due to observing the Sun with different instruments

A



B



Team Name: The Flares

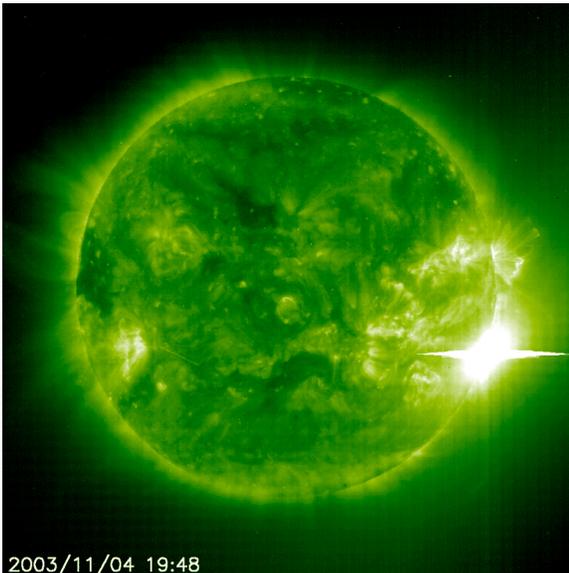
Directions

Compare and contrast the images shown below.

Record your response to the following questions on the Venn diagram

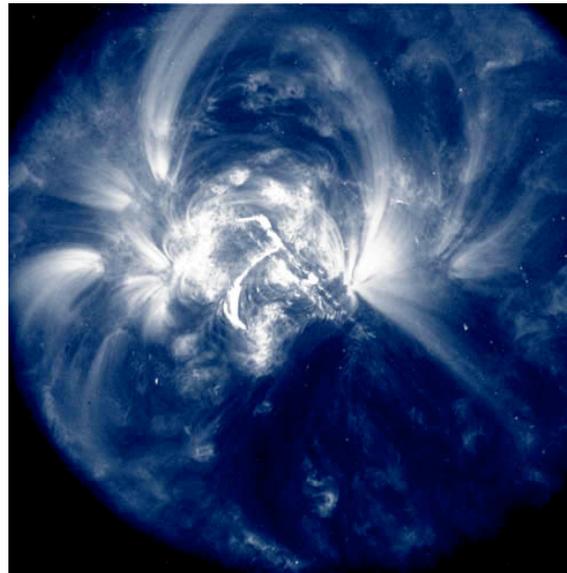
- What are some of the similarities and differences between the images? Give some examples.
- In your opinion, do the differences in the images result from:
 - A. a change over time
 - B. a change in the size of the image
 - C. a change due to observing the Sun with different instruments

A



November 4, 2003

B



May 31, 1998

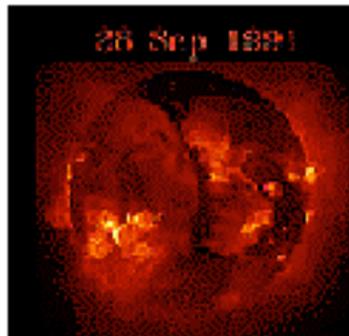
Team Name: The Cycle

Directions

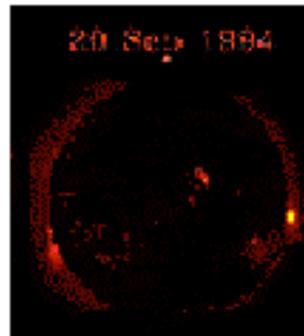
Compare and contrast the images shown below. (Pick one of the following pairs: AB, AC, CD, or BD)

Record your response to the following questions on the Venn diagram

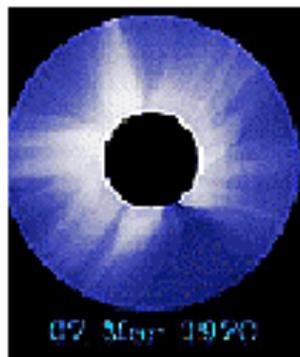
- What are some of the similarities and differences between the images? Give some examples.
- In your opinion, do the differences in the images result from:
 - A. a change over time
 - B. a change in the size of the image
 - C. a change due to observing the Sun with different instruments



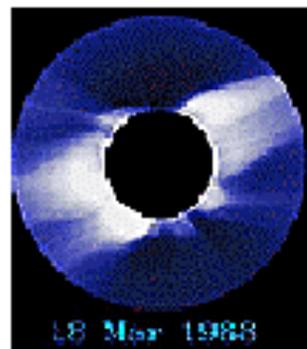
A



B



C



D

Exploring the Dynamic Nature of the Sun:
Student Recording Sheet

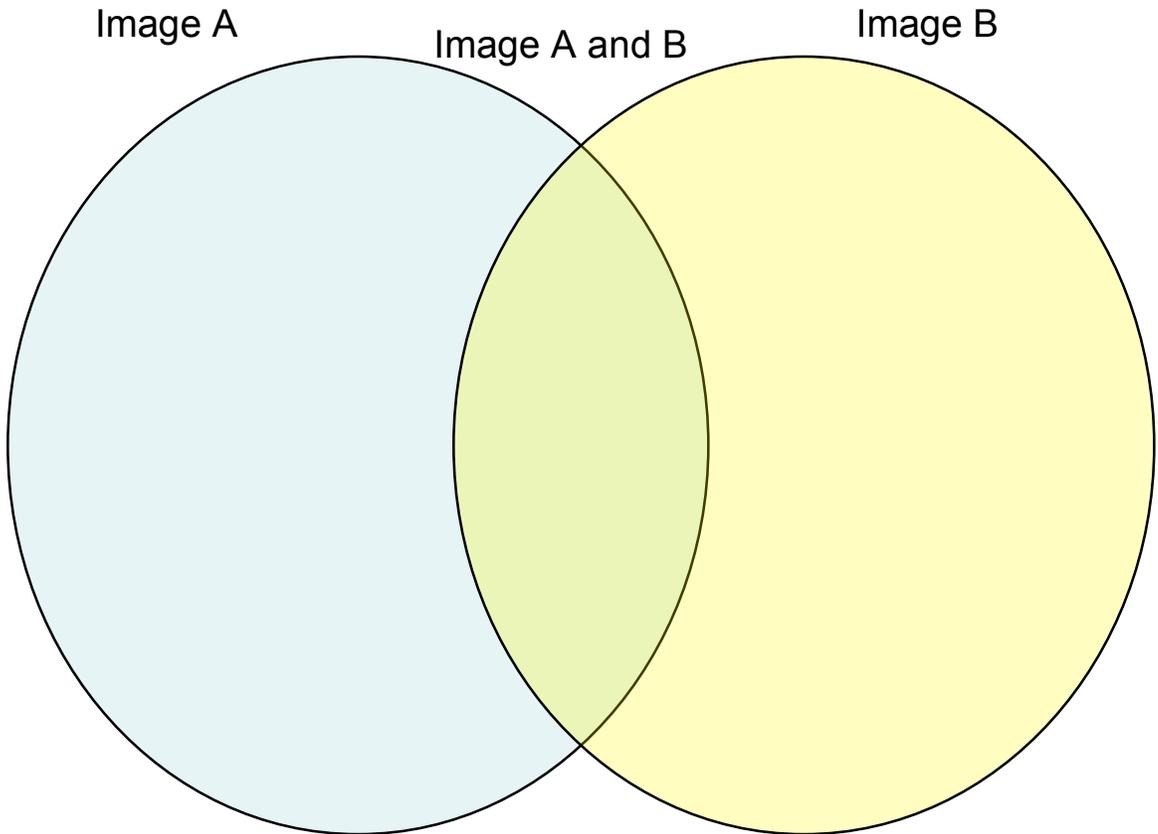
Name(s)
Date
Class

Team Name

Directions

Compare and contrast the images of the Sun.

Use the Venn diagram to record your observations.



In your opinion, do the differences in the images result from either a:

- change over time
- change in the size of the image
- change due to observing the Sun with different instruments

Use examples from your observations to explain your answer.

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