

## Jupiter's "Red Spot Jr."

## Astronomers Watch the Birth of a Monster Storm

Monstrous hurricanes on Earth can stretch across the entire eastern United States. These storms, however, would be considered timid on Jupiter, where an oval-shaped spot about the size of Earth has recently emerged. Dubbed Red Spot Jr., this gigantic storm is only the little brother of Jupiter's trademark Great Red Spot.

The Great Red Spot is a mammoth oval disturbance that is so large it could swallow nearly three Earths. First spotted in 1664 by Robert Hooke, the storm has been raging on the planet for at least 342 years.

Red Spot Jr. is the first storm that astronomers watched develop on a gas giant planet. The huge spot formed between 1998 and 2000, when three small, white, oval-shaped storms merged together. Two of the white spots have been observed since about 1915, but they may have been present even earlier. The third white spot appeared in 1939. In December 2005, the newly formed single white spot turned red, like the much older Great Red Spot.

Astronomers are not sure why the spots are red. Some astronomers think the storms' hurricane-force winds, which can reach 400 miles per hour, dredge up material from deeper in Jupiter's atmosphere. This material, when exposed to ultraviolet light from the Sun, undergoes a chemical change that turns it red.

The Great Red Spot is thought to tower about 5 miles (8 kilometers) above the surrounding cloud tops. When viewed in infrared light, the red spots show some similarities that suggest Red Jr. also may rise miles above the cloud tops. The swirling patterns

in the close-up image are clouds being shaped by high-speed winds.

On Earth, meteorologists routinely watch hurricanes form off the African coast, sweep across the Atlantic Ocean, and fall apart when they reach the colder waters of the northern Atlantic. Astronomers, however, rarely get the chance to witness the birth of storms on our solar system neighbors. Other planets are far away from Earth, so astronomers need powerful telescopes like the Hubble Space Telescope to track planetary weather. Storms on other planets also may take years to form.

Amateur and professional astronomers eagerly watched the emerging new red spot. Months later, Hubble snapped the first detailed images of Red Spot Jr. Researchers think the Hubble images may provide evidence that Jupiter is undergoing a global climate change.

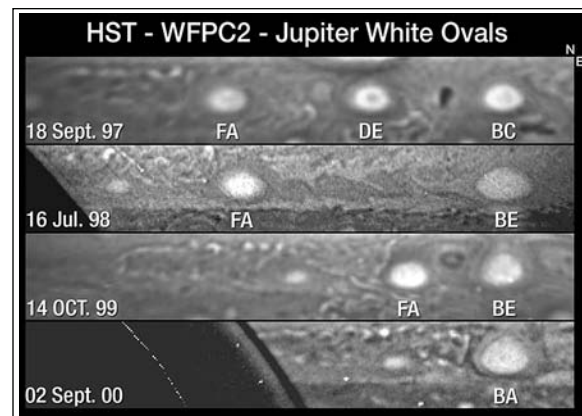
Red Spot Jr. and its big brother are moving in opposite directions around Jupiter. During the summer of 2006, they passed by one another. Astronomers do not expect them to merge because storms on Jupiter tend to remain on constant east-west paths.

*Credits for Hubble image: NASA and ESA.*

### FAST FACTS

**Distance from Sun:** 483,600,000 miles (778,300,000 kilometers)

**Diameter:** 88,850 miles (143,000 kilometers)



### A Monster Storm Is Born

These Hubble Space Telescope images show how three small, white, oval-shaped storms on Jupiter merged over three years, becoming one Earth-sized spot, dubbed Red Spot Jr. The September 1997 image shows all three storms, called FA, DE, and BC. In the July 1998 photo, two disturbances, DE and BC, have combined into one, called BE. The October 1999 image shows BE and FA approaching each other, and they later merge into a single storm, Red Spot Jr., as shown in the September 2000 image.

*Credits: NASA and the NASA Jet Propulsion Laboratory.*

You can get images and other information about the Hubble Space Telescope on the World Wide Web. Visit <http://www.stsci.edu/outreach> and follow the links.

The corresponding classroom activity for this lithograph can be found at: <http://amazing-space.stsci.edu/> or may be obtained by contacting the Office of Public Outreach at the Space Telescope Science Institute, 3700 San Martin Drive, Baltimore, MD 21218.

## National Aeronautics and Space Administration

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## In Search of ... Monster Storms

### Description

Using the “Jupiter’s Red Spot Jr.” lithograph, engage your students in a Level One Inquiry activity to compare the monster storms on Jupiter with those on Earth. A Level One Inquiry activity can help prepare students to be more independent thinkers. Students use the images and text to formulate questions, conduct research, and present a report comparing the storms on Jupiter with those on Earth.

### Grade Level

Middle school: grades 6–9

### Prerequisites

Students should be aware that unlike Earth, Jupiter is a gas giant planet. Earth is a rocky planet. Knowledge of Earth’s weather patterns and monster storms is helpful.

### Misconceptions

Teachers should be aware of the following common misconceptions and determine whether their students harbor any of them. Students may have misconceptions concerning the makeup of the solar system. Some students may think that the Earth is the center of the solar system, which consists only of the Sun and eight planets. Others may think that stars and galaxies outside the solar system are part of the solar system. In addition, students may think that spacecraft can land on Jupiter.

### Vocabulary

#### Infrared (IR) Light

A region of the electromagnetic spectrum that has slightly longer wavelengths and lower frequencies than visible light, but is not visible to the human eye. This region of light is comparable to the range of sounds that are too low for the human ear to hear. Infrared light can be detected as the heat from a fire or a light bulb.

#### Ultraviolet (UV) Light

A region of the electromagnetic spectrum that has slightly shorter wavelengths and higher frequencies than visible light, but is not visible to the human eye. This region of light is comparable to the range of sounds that are too high for the human ear to hear. Too much ultraviolet light causes sunburns.

### Purpose

The purpose of this activity is to use the images and text on the lithograph to introduce the similarities and differences between the monster storms on Jupiter and those on Earth. Students will formulate questions about Jupiter’s storms, which are shown in the lithograph. Then they will use the Internet to search for the answers and will demonstrate an understanding of the similarities and differences between Jupiter’s storms and those on Earth by presenting a report. Students also will be asked to reflect on what they have learned by determining if they have answered their original questions and/or generated any new questions.

### Materials

- “Jupiter’s Red Spot Jr.” lithograph
- Computer with Internet connection for researching

### Instructions for the Teacher

#### Preparation

- Obtain a lithograph for each student.
- Familiarize yourself with the similarities and differences between the monster storms on Jupiter and those on Earth.
- Bookmark or identify as favorites the following suggested Websites:
  - STScI — Hubble Snaps Baby Pictures of Jupiter’s “Red Spot Jr.”: <http://hubblesite.org/news/2006/19/>
  - STScI — The Great Red Spot: An Ancient Storm in Jupiter’s Atmosphere: <http://hubblesite.org/news/1999/29/>
  - STScI — Three White, Oval-Shaped Storms on Jupiter: <http://hubblesite.org/news/1995/18/>

# In Search of ... Monster Storms

## Procedure

Before beginning this activity, evaluate your students' misconceptions about Jupiter by having them write down anything they know and understand about the planet. You can use these statements to evaluate students' misconceptions. Have students volunteer their ideas about Jupiter. From those ideas, identify their misconceptions and discuss them with the class. Or, collect their papers containing their ideas about Jupiter. From those ideas, compile a list of their misconceptions and discuss them with the class.

Ask students to look at the images of Jupiter on the front and back of the lithograph and formulate three questions about the weather features visible in the image.

Collect these questions and group them by common theme. Ask students to read the information on the back of the lithograph and check to see if any of their questions have been answered. Using the Internet, have students research their questions. The Internet sites listed on the other side of this classroom guide can provide a starting point for their research. Tell students how to access other Websites.

Ask students to prepare a report in which they compare Jupiter's storms with those on Earth. This report could be in the form of a slide show, a skit, a story, a graphic organizer, a Power Point presentation, or a written report — anything that conveys their understanding of the topic to another student, a group of students, or the entire class. Ask students to review their original questions to see if they were answered. Then ask them if they have any additional questions.

## Instructions for the Student

Your teacher will ask you to write down things you know and understand about the planet Jupiter. You may be asked to share this

information with the rest of the class. Study the images of Jupiter, and write down three questions about what you see in the images. Then read the back of the lithograph, and check to see if any of your questions were answered.

Using your questions as a guide, conduct Internet research on Jupiter's monster storms. Your teacher will guide your search by providing some Websites to use. To demonstrate your understanding of the material you researched, your teacher will ask you to give a report comparing Jupiter's monster storms with those on Earth. This report could be in the form of a slide show, a skit, a story, a graphic organizer, a Power Point presentation, or whatever presentation you think will communicate the information you learned about Jupiter and its storms. You may be allowed to work individually or in small groups and make your presentations to another classmate or group of students, or the entire class.

## Education Standards

### Benchmarks for Science Literacy

#### American Association for the Advancement of Science:

<http://www.project2061.org/tools/benchol/bolframe.htm>

#### 3. The Nature of Technology

##### A. Technology and Science

By the end of the 8th grade, students should know that:

- **Technology is essential to science for such purposes as access to outer space and other remote locations, sample collection and treatment, measurement, data collection and storage, computation, and communication of information.**

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[www.nasa.gov](http://www.nasa.gov)