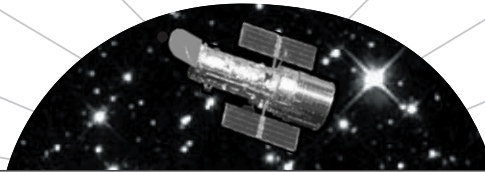




THE STAR★WITNESS



A PUBLICATION OF NASA'S "AMAZING SPACE" EDUCATION PROGRAM

Special Feature

No Spring Picnic on Neptune

By NASA's Amazing Space reporters
September 2003

IMAGINE A SPRING where flowers don't bloom, birds don't chirp, and children don't run outside to play. Welcome to springtime on Neptune.

Take your parka. Neptune's springtime weather brings blustery storms, temperatures of minus 400 degrees Fahrenheit at the cloud tops, and fierce winds that sometimes gust to 900 miles per hour. What is remarkable is that Neptune – the farthest and coldest of the major planets – exhibits any evidence of seasonal change. After all, the Sun is 900 times dimmer than it is on Earth (see graphic, page 2, top).

A warming trend is on the way

So, how can astronomers tell that springtime has arrived at all? Researchers at the University of Wisconsin-Madison and NASA's Jet Propulsion Laboratory in

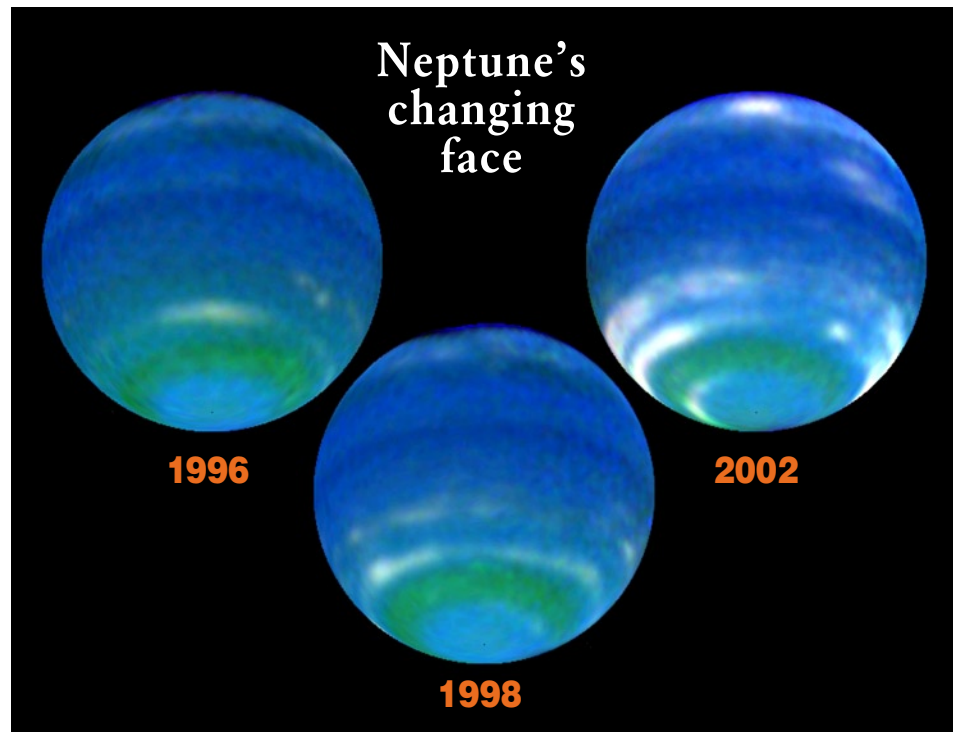


IMAGE: NASA, L. Sromovsky, and P. Fry (Univ. of Wisconsin)

Neptune's changing face: Neptune has been getting brighter, especially in the southern hemisphere, as shown in these Hubble Space Telescope photos that were taken over a period of six years.

Pasadena, Calif., used NASA's Hubble Space Telescope to study the planet over time, making three sets of observations in six years. The images reveal that the bands

of clouds encircling the planet's southern hemisphere increase in brightness over time. Astronomers believe the cloud bands are

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getting brighter because the Sun is warming the atmosphere in the south more than in the north. The amount of sunlight each hemisphere receives at a given time plays a major role in determining Neptune's seasons.

A slant on the seasons

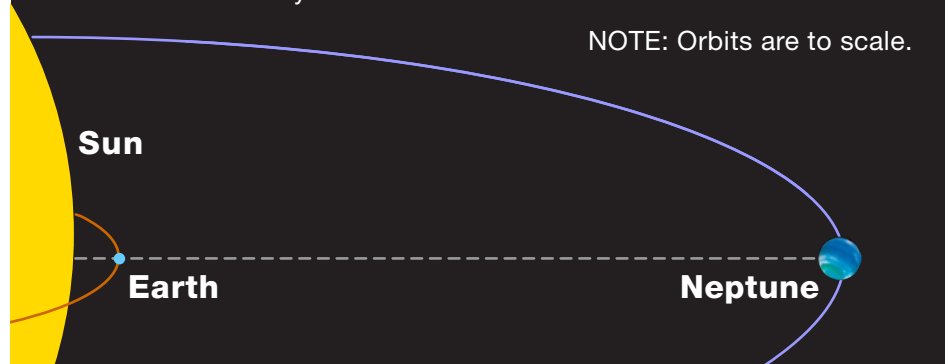
Seasons on Neptune occur for the same reason as on Earth. The seasonal changes on both planets occur because their axes tilt slightly. Earth is inclined 23.5 degrees. Neptune is tipped at an even greater angle: 29 degrees. As both planets circle the Sun, one hemisphere is always tipped toward the Sun; the other is tilted away from the Sun. When the southern hemisphere tips toward the Sun, it receives more sunlight than the northern hemisphere. That means it's summer in the south and winter in the north. The opposite is true when the northern hemisphere is tilted toward the Sun. The north receives more sunlight, which means it's summertime (see graphic at right, bottom).

Unlike Earth, Neptune's seasons last for years, not months. A single season on the planet, which takes almost 165 years to orbit the Sun, can last more than 40 years. ★

Neptune's distance from the Sun makes its springtime unlike Earth's

Scientists were surprised to find that Neptune has seasons. After all, the planet is about 30 times farther from the Sun than is Earth. So, every season, including spring, is cold and harsh. And long! One orbit of Neptune takes almost 165 Earth-years, and any one of its seasons lasts more than 40 years.

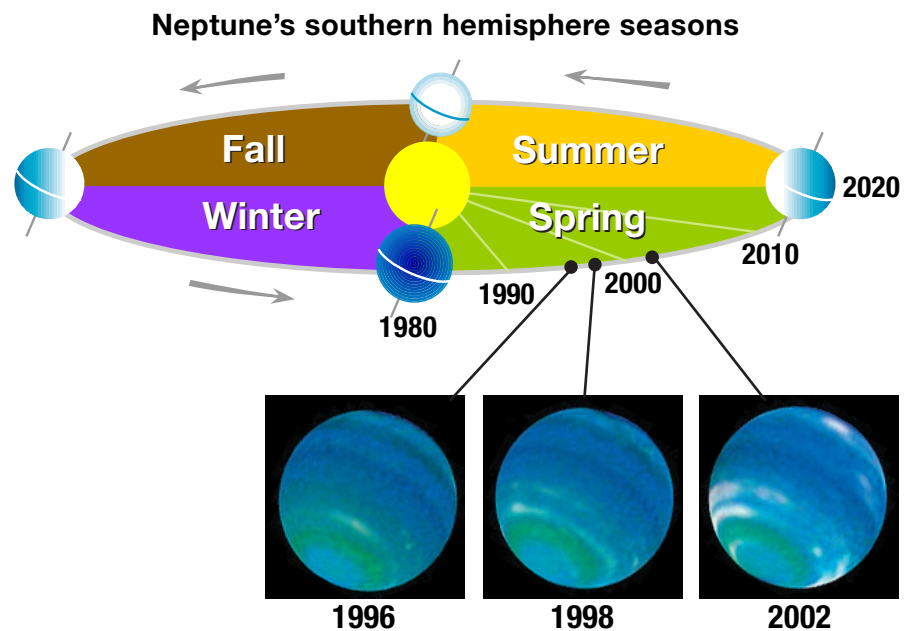
NOTE: Orbits are to scale.



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Tilting toward a 40-year spring

Neptune's tilt, like Earth's, means that one hemisphere usually receives more direct light than the other one. This gives Neptune its seasons and, surprisingly, an observable spring, as shown in these Hubble images. Cloud bands in the planet's southern hemisphere have been gradually getting brighter since 1980. With a spring that lasts 40 years, the cloud bands are expected to continue to brighten for another 20 years.



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Are the other planets tilted?

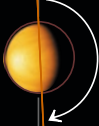
Planets are not shown to scale.

Axis tilt:

Mercury:
 0°



Venus:
 177.4°



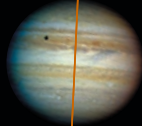
Earth:
 23.5°



Mars:
 24°



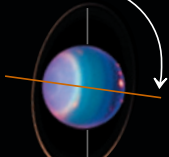
Jupiter:
 3.1°



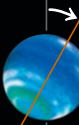
Saturn:
 26.7°



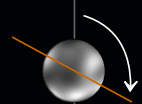
Uranus:
 97.9°



Neptune:
 29.6°



Pluto:
 118°



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All photos except Mercury, Venus, and Earth were taken by the Hubble Space Telescope. Venus image is from the Galileo spacecraft. All photos are visible light images except Uranus, which is an infrared image.

Axis tilt source: *The Solar System: The Cosmic Perspective* by Bennett, Donahue, Schneider, Voit, 2002.

SEE MORE Hubble images and read more Star Witness news stories at Amazing Space, NASA's award-winning educational Web site for K-12 students and teachers.

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