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The Ulysses spacecraft has entered unexplored regions of the solar system as it crossed today into the highest latitude ever achieved relative to the sun's equator of more than 32 degrees, scientists on the joint NASA-European Space Agency (ESA) mission reported.

"Ulysses is gathering important new information about the sun and its environment as it continues to journey farther south toward the sun's southern pole," said JPL's Dr. Edward Smith, NASA project scientist for the mission.

"About one year from now, Ulysses will be 70 degrees south of the sun's equator and begin its primary mission of exploring the highest solar latitudes," he said.

The heliosphere is the region of space carved out of the interstellar medium by the solar wind, Smith said. While reaching higher latitudes with respect to the sun than Voyager 1, the Ulysses spacecraft is not traveling toward the edge of the

heliosphere, as are both Voyagers, but rather is heading back toward the sun.

The spacecraft, launched by the space shuttle Discovery in October 1990, used a gravity assist at Jupiter in February 1992 to dive out of the ecliptic plane and set its course in a highly inclined solar orbit. The spacecraft's trajectory will bring it over the south pole of the sun in September 1994, at which time Ulysses will climb to its maximum latitude of slightly more than 80 degrees.

The spacecraft and its scientific instruments are in excellent condition, the flight team reported. Data coverage since launch has been consistently close to 100 percent, as a result of efforts by the joint NASA-ESA mission operations team and NASA's Deep Space Network.

Although the most exciting phase of the mission -- the study of the sun's polar regions -- will not begin until mid-1994, Ulysses has already produced a wealth of new scientific results. Those results include:

* The first direct detection of neutral helium atoms arriving from interstellar space.

* The measurement of micron-sized dust grains arriving from interstellar space.

* The first measurement of singularly charged hydrogen, nitrogen, oxygen and neon ions, entering the heliosphere as interstellar neutral atoms and then becoming ionized.

* The highest resolution measurements to date of the isotopic composition of cosmic ray nuclei.

In addition to these discoveries, Ulysses' path through Jupiter's magnetosphere at the time of the February 1992 flyby enabled mission investigators to acquire new and highly valuable data concerning this very complex and dynamic plasma environment, Smith said.

"Among the most exciting results to emerge is the possible entry into the polar cap of Jupiter's magnetosphere near the time of closest approach (on Feb. 8, 1992)," Smith said, "and the unexpectedly strong influence of the solar wind deep in the magnetosphere during the outbound passage."

With the Jupiter flyby safely accomplished, the scientific focus is now directed toward phenomena related to the increasing latitude of the spacecraft.

"Already there is strong evidence that by the end of the summer, Ulysses will be firmly in the domain of the southern polar magnetic field, having permanently crossed the boundary separating northern and southern fields," Smith said.

Following the flight over the sun's southern pole, Ulysses's

orbit will bring the space probe swinging back toward the sun's equatorial regions, heading for its second high-latitude excursion in mid-1995, this time above the north polar region.

"By the end of September 1995, Ulysses will have put our knowledge of the sun and its environment in a completely new perspective," said Dr. Richard Marsden, ESA project scientist.

"Only by studying the way the sun influences the space around it in a global manner can we hope to understand its influence on our local interplanetary environment."

The European Space Agency, which built the spacecraft along with Dornier Systems of Friedrichshafen, Germany, oversees Ulysses' in-orbit operations. NASA, which provided the launch vehicle and the spacecraft's electrical power source, is responsible for tracking and data acquisition through the Deep Space Network, and for processing and distributing scientific data.

The mission operations center at the Jet Propulsion Laboratory, Pasadena, Calif., is staffed by a joint team of ESA/European Space Operations Centre and NASA technicians. The scientific payload is provided by institutes from ESA-member states and the United States.

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