

ULYSSES BEGINS EXPLORATION OF THE SUN'S NORTHERN POLE

The Ulysses spacecraft has begun to explore the northern pole of the Sun, initiating the second phase of its primary mission to study regions above and below the Sun never before explored by spacecraft.

Ulysses, a joint NASA-European Space Agency mission, climbed to 70 degrees north of the Sun's equator at 4 a.m. EDT today. The spacecraft will spend the next 110 days gathering data on the complex forces at work over this high-latitude region of the Sun, reaching a maximum northern latitude of 80.2 degrees on July 31.

The spacecraft then will begin to journey out to the orbit of Jupiter, returning in September 2000 to the vicinity of the Sun, again at high latitudes. At that time, during the peak of the Sun's 11-year solar cycle, scientists expect to find a dramatically changed global view of the Sun (the Sun is currently nearing its most inactive or "quiet" phase of that cycle, meaning that fewer sunspots -- massive storms on the Sun's surface -- form in a given period of time).

As the spacecraft begins its pass over the northern polar region of the Sun, scientists are reporting a variety of new discoveries from Ulysses' recently completed pass over the southern pole. These findings are allowing them to begin assembling a new, three-dimensional picture of the Sun. Among their latest results:

* Ulysses has verified global differences in the speed of the wind flowing out from the Sun at different latitudes. Most notably, solar winds at high southern latitudes traveled at roughly double the speed found in the equatorial zone. The solar winds flow at approximately two million miles per hour (800 kilometers per second) at high southern latitudes, while dropping in velocity to about one million miles per hour (400 kilometers) near the equator.

* As the spacecraft approached the equator, the solar wind continued to be very fast until around 20 degrees south latitude, at which time an abrupt transition to the low-speed, low-latitude solar wind was seen. Large variations in the solar wind speed and other properties then continued until the spacecraft reached 20 degrees north latitude, at which time only the fast solar wind was again observed continuously.

* The loss of material from the Sun over the south pole, caused by the flow of the solar wind, is roughly one million tons per second. This matter consists of hydrogen, helium and a small fraction of metals and heavy atoms. Results of the southern pass also revealed the outward pressure of the solar wind to be much greater over the pole than it is around the equator. As a consequence, the shape of the heliosphere -- that region of space dominated by solar particles and electromagnetic fields -- may be elongated in the polar direction, extending much farther out into

interstellar space than it does near the equator.

* High energy cosmic radiation entering the inner solar system and, eventually, Earth's atmosphere, from the galaxy is controlled at all latitudes by the level of solar activity, which is determined by each phase of the Sun's 11-year sunspot cycle. The findings suggest the Sun's control over how much cosmic radiation enters the solar system is just as effective in the polar regions as it is near the equator.

* Plasma waves -- electrical and magnetic fields that result from unstable distributions in the particles making up the solar wind -- play a role in regulating the behavior of solar wind particles and were expected to be found at nearly identical levels in both hemispheres of the Sun. However, as Ulysses crossed the Sun's equator and entered the northern hemisphere, observations revealed significantly higher levels of several varieties of plasma waves in the northern region of the Sun, compared to their presence in the southern hemisphere. The cause of this asymmetry is not yet understood, but plasma wave measurements will continue to be used as a diagnostic tool for studying the local properties of the solar wind along the spacecraft's trajectory.

Coordinated observations are under way using Ulysses and a recently launched NASA spacecraft called Wind, designed to study the solar wind flowing between the Sun and Earth. In addition, these two Sun probes are successfully tracking electrons which stream away from the Sun after the eruption of solar flares in the Sun's outer atmosphere.

These measurements will allow scientists to map for the first time the magnetic field lines along which electrons travel and provide new insights and observations into large-scale magnetic field structures occurring in the solar wind.

Ulysses also will conduct coordinated observations with NASA's Spartan spacecraft when it is launched later this summer aboard the Space Shuttle. The aim of these coordinated observations will be to study the distribution of matter in the Sun's outer atmosphere and help engineers design science software for the scientific payload of a future European-built solar probe, known as the Solar and Heliospheric Observatory.

The Ulysses mission is managed jointly by the European Space Agency and NASA to study the regions over the Sun's poles. The Jet Propulsion Laboratory oversees the U.S. portion of the mission for NASA's Office of Space Science, Washington, DC.

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