Solar wind's oxygen content to be analyzed by UCSD chemists as part of NASA's genesis mission

November 3, 1997

Media Contact: Warren R. Froelich, (619) 534-8564, wfroelic@ucsd.edu

SOLAR WIND'S OXYGEN CONTENT TO BE ANALYZED BY UCSD CHEMISTS AS PART OF NASA'S GENESIS MISSION

Chemists from the University of California, San Diego will measure and analyze the oxygen content of winds flowing from the Sun as part of a $216 million international space mission scheduled for launch in 2001.

By measuring the oxygen composition of the Sun, the scientists hope to learn more about how the solar system was formed. The UCSD work is viewed as the "highest priority measurement objective" of the Genesis mission, funded by the National Aeronautics and Space Administration (NASA).

"We will be collecting an actual sample of the Sun, and then compare these concentrations to planetary compositions," said Mark Thiemens, professor of chemistry and biochemistry at UCSD who will be conducting the oxygen studies for the mission.

"In this manner, we hope to unravel at a new level how all the planets and the solar system in general were created," he said.

The Genesis mission is part of the NASA's Discovery program of lower-cost, highly focused scientific spacecraft.

During its two-year excursion, the spacecraft will travel about a million miles and orbit about a gravitationally stable point between the Earth and the sun. There, it will collect charged particle samples from the solar wind--a stream radiating from the sun that carries with it about a million tons of ionized gases and particles per second.

In space, solar wind manifests itself in a number of ways, such as directing the tails of comets away from the sun. When solar wind comes in contact with the earth's magnetic field it is responsible, in part, for such phenomena as auroras and the geomagnetic storms that arise from disturbances in the magnetic field surrounding the earth.

For astronomers and others interested in the sun and its composition, the solar wind offers a potential avenue of discovery. It also offers a window to test alternate theories about how the solar system was created from a vast cloud of dust and gases about 4.5 billion years ago.

In particular, Genesis will focus on several intriguing constituents of the solar wind, including nitrogen, carbon, noble gases and, most important, oxygen.

Previous studies examining the composition of meteorites, asteroids and other planetary materials have found a wide variability in amounts of different oxygen isotopes, known as oxygen 16, oxygen 17 and oxygen

18. (Isotopes are atoms of the same element that have different numbers of neutrons. The most common form is oxygen 16.)

Different parts of the solar system display different proportions of the three oxygen isotopes. Scientists believe this variability reflects the composition of the original solar nebula, the cloud of gas and dust that condensed to form the sun and the planets. As such, knowing how this variability came about is critical for understanding how the solar system formed.

"We won't be able to understand how the solar system formed without understanding the origins of these variations in isotopic oxygen," said Thiemens.

Once collected, the samples only a few millionths of a gram will be returned to Earth where they will be analyzed.

UCSD researchers are developing new mass spectrometric techniques to analyze at high precision the extremely small samples of oxygen isotopes. The new study builds on previous work by Thiemens during which air from the Earth's upper stratosphere was collected and retrieved via small rockets, and then analyzed for composition.

"Genesis represents the most difficult oxygen isotopic analysis ever made," said Thiemens.

(November 3, 1997)