

# CU-Boulder scientists ready for MESSENGER Mission flyby of Mercury

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Artist's concept of the NASA's MESSENGER spacecraft at Mercury. Credit: NASA

NASA will point a power-packed \$8.7 million University of Colorado at Boulder space instrument at some of the last unexplored terrain in the inner solar system when the MESSENGER spacecraft whips within 125 miles of Mercury's surface Jan. 14 at a mind-boggling 141,000 miles per hour.

Launched in August 2004, MESSENGER has already flown by Venus twice and will make the first of three flybys of Mercury next week before finally settling into orbit around Mercury in 2011. The only other time Mercury was visited by a spacecraft was in 1974 and 1975, when

NASA's Mariner 10 spacecraft made three flybys and mapped roughly 45 percent of the bizarre planet's hot, rocky surface, according to NASA.

The car-sized MESSENGER spacecraft is carrying seven instruments -- a camera, a magnetometer, an altimeter and four spectrometers. The Mercury Atmospheric and Surface Composition Spectrometer, or MASCS, built by CU-Boulder's Laboratory for Atmospheric and Space Physics, was miniaturized to weigh less than seven pounds.

The instrument will make measurements of Mercury's surface and tenuous atmosphere, said LASP Senior Research Associate William McClintock, a MESSENGER co-investigator who led the MASCS instrument development team. MASCS breaks up light like a prism, and since each element and compound in the universe has a unique spectral "signature," scientists can determine the distribution and abundance of various minerals and gases on the planet's surface and its atmosphere.

"Believe it or not, scientists have only a vague idea today about the composition of Mercury's surface," said McClintock. "The instrument will make ultraviolet, visible and near infrared observations of the surface of Mercury, which together should tell us a lot more about the planet's composition, formation and evolution."

MESSENGER is slated to zip by Mercury at about 11:25 a.m. MST on Jan. 14 and take data and images for about 90 minutes, said LASP's Mark Lankton, program manager for MASCS. The data will be sent via NASA's Deep Space Network to the Applied Physics Laboratory at Johns Hopkins University -- which is managing the mission for NASA -- where mission scientists, including researchers and students at LASP's Space Technology Building at the CU Research Park, will access it electronically, he said.

The circuitous, 4.9 billion-mile-journey to Mercury requires more than seven years and 13 loops around the sun to guide it closer to Mercury's orbit. The craft is equipped with a large sunshade and heat-resistant ceramic fabric to protect it from the sun. More than half of the weight of the 1.2-ton spacecraft consists of propellant and helium.

"The LASP team is really spun up for this flyby," said Lankton. "It's very exciting, because this is the beginning of the science phase of the MESSENGER mission. It's a chance for us to make observations that have never been made before."

MASCS will scan Mercury's thin atmosphere -- known as the exosphere -- to determine its composition, and the spacecraft will fly through a comet-shaped cloud of sodium enveloping the planet during the flyby, said McClintock. "We will fly it right down the cloud's tail," he said. "Understanding how the cloud is replenished with sodium is one of the many pieces of this giant puzzle at Mercury we hope to solve."

LASP Director Daniel Baker, also a co-investigator on the MESSENGER mission, will be studying Mercury's magnetic field and its interaction with the solar wind, including violent "sub-storms" that occur in the planet's vicinity. The strong magnetic field on Mercury indicates it most likely has a liquid or molten core like that on Earth, Baker said.

Mercury is about two-thirds of the way nearer to the sun than Earth and is bombarded with 10 times the solar radiation, said Baker. Sandwiched by the sun and Mercury -- which has daytime temperatures of about 800 degrees Fahrenheit -- the MESSENGER spacecraft will "essentially be on a huge rotisserie," he said.

LASP's vast experience in space during the last several decades should serve the team well. "We are the only space lab in the world to design and build instruments that are either on the way to or have visited every

planet in the solar system," Baker said. "Because of our successes, I view our scientists, engineers and support staff and students like a Super Bowl team. We have star players at every position."

Dozens of undergraduates and graduate students will be involved in analyzing data as information and images begin pouring back to Earth from MESSENGER, dubbed "the little spacecraft that could" by LASP scientists. "This mission is going to be a field day for students, not only at CU-Boulder, but for students all over the world," said Baker.

Source: University of Colorado at Boulder

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