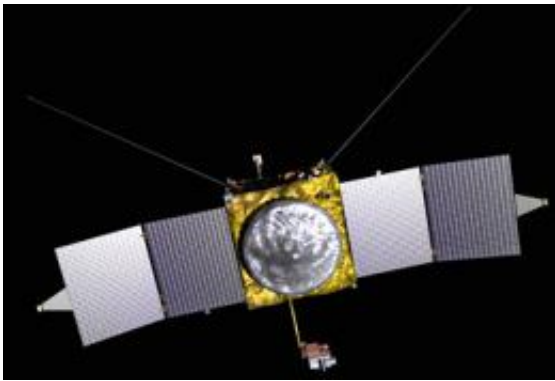


NASA mission asks why Mars has no atmosphere

October 7 2010, By Robert Sanders



Artist's conception of MAVEN Mars orbiter. (NASA/Goddard Space Flight Center)

(PhysOrg.com) -- NASA this week gave the green light to a mission to Mars that will seek to understand why and how the red planet lost its atmosphere 3-4 billion years ago.

Dubbed the Mars Atmosphere and Volatile Evolution, or MAVEN, mission, it is led by principal investigator Bruce Jakosky of the Laboratory for Atmospheric and Space Physics (LASP) at the University of Colorado at Boulder (CU-Boulder) and managed by David Mitchell of NASA's Goddard Space Flight Center in Greenbelt, Md.

More than half the instruments aboard the spacecraft, with a planned launch in late 2013, will be built at the University of California,

Berkeley's Space Sciences Laboratory (SSL) under the direction of MAVEN deputy-principal investigator Robert Lin.

"There's lots of evidence that in the past, Mars had running water, but to have running water you need a thick atmosphere, and that's gone now," said Lin, a UC Berkeley professor of physics and former director of the SSL.

During its planned one-year mission, MAVEN will collect evidence to support or refute the reigning theory that once Mars lost its magnetic field, the [solar wind](#) and solar storms scoured the atmosphere away.

"Once you lose your atmosphere, that's the end of any evolved life," Lin added. "This mission will also tell us what might happen to other planetary atmospheres, even Earth's, in the long run."

"A better understanding of the upper atmosphere and the loss of volatile compounds like carbon dioxide, nitrogen dioxide and water to space is required to plug a major hole in our understanding of Mars," said Jakosky, who is a professor in CU-Boulder's geological sciences department.

MAVEN will carry three instrument suites, totaling eight instruments, to probe the Martian atmosphere and its interactions with the sun. Among these are ion, electron and ion composition analyzers and energetic particle detectors built at UC Berkeley, a neutral gas analyzer and magnetometer built at NASA Goddard, and an imaging ultraviolet spectrometer built at CU-Boulder.

"Looking forward, we are well positioned for the next push to critical design review in July 2011," said Mitchell. "In three short years, we will be heading to Mars."

Lin and his SSL colleagues built instruments for a previous Mars mission, the Mars Global Surveyor, that discovered evidence that Mars had lost its magnetic field nearly 4 billion years ago, not long after its formation. Planetary magnetic fields, like the earth's own, protect the planet from the intense solar wind and high-energy particles emitted during solar storms. Without that protection, Lin said, the solar wind and storms could have scoured Mars' atmosphere and eliminated it entirely over about a billion years.

Building on the preliminary data from Mars Global Surveyor, MAVEN will study how solar wind particles ionize Mars' remaining atmosphere, how rapidly the ions are carried into space, and attempt to reconstruct the atmosphere's history based on past activity of the sun.

"By understanding the loss process and combining that with a model for the history of the sun and isotope ratios, we will get a good handle on how the loss process went," Lin said.

An alternative hypothesis is that the atmosphere went underground, but current evidence suggests that that process could not account for the planet's entire [atmosphere](#).

In addition to leading the MAVEN mission, CU-Boulder's LASP team will also provide science operations and lead education and public outreach efforts. [NASA](#) Goddard will manage the project, which will cost \$438 million exclusive of the separately funded government-furnished launch vehicle and telecommunications relay package. Lockheed Martin of Littleton, Colo., will build the spacecraft based on designs from NASA's Mars Reconnaissance Orbiter and 2001 [Mars](#) Odyssey missions and will perform mission operations. The UC Berkeley's Space Sciences Laboratory will help support education and public outreach efforts.

Provided by University of California - Berkeley

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