ChemCam follows the 'Yellowknife Road' to Martian wet area

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The Mars Science Laboratory's Curiosity Rover recently took this photo of the Martian landscape looking toward Mount Sharp while on its way toward Yellowknife Bay—an area where researchers have found minerals indicating the past presence of water.

(Phys.org)—Researchers from Los Alamos National Laboratory and the French Space Agency have tracked a trail of minerals that point to the prior presence of water at the Curiosity rover site on Mars.

Researchers from the Mars Science Laboratory's ChemCam team today described how the laser instrument aboard the Curiosity Rover—an SUV-sized vehicle studying the surface of the Red Planet—has detected veins of gypsum running through an area known as Yellowknife Bay, located some 700 meters away from where the Curiosity Rover landed five months ago.

"These veins are composed mainly of hydrated calcium sulfate, such as bassinite or gypsum," said ChemCam team member Nicolas Mangold, of the Laboratoire de Planétologie et Géodynamique de Nantes, in Nantes, France. "On Earth, forming veins like these requires water circulating in fractures."

Gypsum and some related minerals can be formed when water reacts with other rocks and minerals. The presence of gypsum and its cousin, bassinite, along with physical evidence of alluvial flow patterns previously seen during the Mars Science Laboratory mission, could indicate that the Yellowknife Bay area once was home to ponds created by runoff or subsurface water that had percolated to the surface, said ChemCam team member Sam Clegg of Los Alamos National Laboratory.

Clegg and his colleagues first noticed the possibility of a gypsum signature weeks ago when ChemCam's spectrometer recorded an increasing amount of calcium and a corresponding decrease in the silicon composition of a sample. Gypsum, a sedimentary rock, is made of calcium sulfate with bound water, while most of the rocks sampled so far on Mars are primarily composed of silicon. The change in composition indicated to the team that they were seeing something new in Martian geology.

The ChemCam instrument fires a powerful laser to vaporize rocks and then uses its spectrometer to analyze the samples. Because the laser can

fire several pulses to sample rock situated below layers of surface dust, the ChemCam team was able to catch their first signs of calcium before anyone could actually see it. However, the instrument's camera later was able to view the pale veins of mineral after the rock surface had been dusted off by laser blasts.

"Being able to see what we are sampling has been tremendously useful to the team and to the mission," said ChemCam team leader Roger Wiens of Los Alamos National Laboratory.

As the rover moved down into Yellowknife Bay, ChemCam's cameras as well as others aboard Curiosity have documented the increasing presence of light-colored veins of minerals that could be telltale signs that Mars was once a wet planet. Because water is a necessary ingredient of life as we know it here on Earth, the findings are exciting.

"Since the Mars Science Laboratory mission is focused on whether Mars is or was habitable, this new evidence of water on or below the planet's surface is very exciting," Wiens said. "We should be able to learn more about what we're seeing once mission scientists can use Curiosity's drill to sample some of these larger portions of material and analyze them using the CheMin instrument."

Shifting to Earth Time and Bi-Continental Control Rooms

Meanwhile, members of the ChemCam team have shifted from Mars time to Earth time and a pair of control rooms while guiding ChemCam's activities. Since November, the team has alternated operation of the instrument back and forth between control rooms in Toulouse, France, and Los Alamos, N.M. The arrangement allows the team to communicate back and forth, while sharing direct responsibility

for the instrument between the Los Alamos and French team members. The arrangement provides synergy and allows for periods of hands-on activity and much needed rest.

"This arrangement has worked out very well and has allowed for all members of the ChemCam team to participate in the mission without working themselves too hard," Wiens said.

ChemCam is a collaboration between research organizations within the United States and France. More than 45 scientists, students and other personnel are currently active in North America and Europe on the ChemCam team. A dozen scientists, engineers, and students are leading Los Alamos National Laboratory operations of ChemCam. The ChemCam system is one of 10 instruments mounted on the MSL mission's Curiosity rover.

Provided by Los Alamos National Laboratory