HANDHELD LIBS FOR GEOLOGICAL FIELD RESEARCH

SciAps LIBS Used in Lunar Simulation Funded by Canadian Space Agency

Researchers recently used SciAps handheld LIBS Z-300 in a lunar analog simulation that will be a resource for future missions to the moon. The Canadian Space Agency funded the simulation, and the Institute for Earth and Space Exploration (Western Space), formerly CPSX, at The University of Western Ontario, ran the mission.

To perform the geochemical field research project, dubbed CanMoon, Western Space's team needed an instrument that provided quantitative measurements of a rock's elemental composition.

Matt Svensson, University of Western Ontario

"We used the SciAps LIBS to simulate what LIBS on a real rover would do and what kind of data it would return," says Matthew Svensson, one of the team members at the University of Western Ontario and their expert in LIBS technology. The field team simulated the work of a lunar rover in the remote, volcanic landscape of Lanzarote, Spain. Mission control was stationed at the university in Ontario.

Geochemistry applications

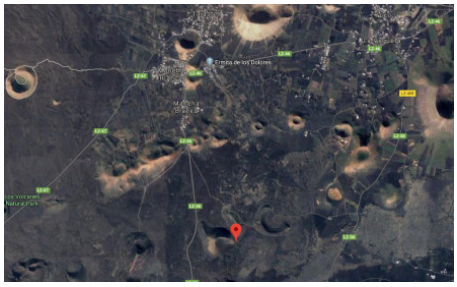
The field team used the SciAps LIBS to take three different analyses in the same spot and averaged the results. SciAps geochemical apps played a key role. The Geochem App reported the elemental composition of the target rocks by weight percent, and the Geochem Pro App allowed them to create a 16×16 point raster heat map that showed where the concentration of certain elements was higher or lower.

"The LIBS did really well," says Svensson. "The science team that was interpreting the LIBS results were able to create some meaningful plots about the material they were analyzing."

The CanMoon team also used other instruments to improve the simulation. A Raman and VisIR spectrometer both produce qualitative data products. "The LIBS stood out in that it was able to give us quantitative data about a rock's elemental composition," Svensson says. In some cases, the LIBS cross referenced the data they received from the Raman and VisIR—for example, verifying the presence of olivine based on the reported amounts of magnesium and silica.

Ease of use

Svensson says the field team working in the field appreciated the camera mounted on the nose of the LIBS because it allowed them to see as close to the target as possible. And they were surprised to discover that the laser did not significantly damage the material they were analyzing. "We were expecting the blast from the laser to leave a significant crater behind, which would then interfere with other analyses, but it didn't leave a visible scar or hinder our ability to take pictures," Svensson says.



Sample locations in Lanzarote, Spain

The SciAps Z-300 also simplified data acquisition and handoffs from the field team to mission control. "In a setting like this we have to hand off data rather quickly in order to meet our deadlines," he says. They could adjust which elements and results to export directly on the LIBS—no need to plug into a computer other than for the purposes of data transfer or for installing a calibration. "And once we plugged into a computer, we could copy-paste data files from the instrument itself into our shared folder so that mission control could analyze them." With some of the other instruments, the process was not so easy: "We needed two people: one holding the instrument to keep it steady, and the other person holding a computer to operate the instrument," Svensson says.

Customized calibrations

Using SciAps ProfileBuilder software, the team created their own calibrations with standards from prior missions, in order to get the best results possible.

"As a standard we used basaltic rocks from elsewhere in the world and compared them to the default profile for geochemical analyses that came with the LIBS," Svensson says. The team found it to be a smooth experience to build their own profile. "For someone who has never done this before, the step up to using the calibration software was actually much easier and much more intuitive than I thought it would be."

In future ventures, the team will use the LIBS to create profiles instead of having to bring a rock sample to their lab first.

About CanMoon

The 2019 CanMoon Mission is a Canadian lunar sample return analog joint mission between Western University, the University of Winnipeg, and the Canadian Space Agency, aimed to position Canada for potential future contributions to lunar rover missions by training highly qualified personnel.