



FIELD REPORT – SCAP Southwestern Earth and Skies Through Time

Project scientists

Professor Patrick Young; Frank Timmes; Karen Knierman; Wendy Taylor

Country

United States

Research site / region

Arizona State University, Tempe, AZ, S.P. Crater, Government Cave, and Sunset Volcanic Crater National Monument near Flagstaff, AZ; Grand Canyon National Park

Protected area status

National Park

Date field report completed

14 Jan 2011

Period covered

12 Jun 2010 to 23 Jun 2010

Dear SCAP volunteers,

We miss you! From the first meeting in the dorm lobby to the final tears at the airport, you showed your brilliant, warm, and caring natures. I don't think I've ever seen a group bond together so quickly.

Beginning our field portion at Meteor Crater enabled us to examine one of the best preserved impact craters on Earth. Our next stop at the Grand Canyon let us look at geologic history up close. Your curiosity pressed us to go further with your scientific training than we had planned. One of the highlights of our field expedition was the quality and quantity of data you took at the SP Crater lava flow. Your transects are a wonderful addition to the lava flow database of Professor Amanda Clarke. We were also particularly impressed by how you banded together in the face of challenging field conditions.

After returning to Arizona State University, you then worked hard examining small shield volcanoes on Mars using THEMIS images. The presentation of your results and the deft handling of questions impressed the room of scientists. Your data will be used by Leon Manfredi in his thesis. Also, the THEMIS images that you targeted are currently in the image archive and being used by Mars researchers.

We were also inspired by your infectious enthusiasm and dedication to conservation and preservation of the environment.

We wish you all the best,
Patrick, Karen, Tad, Carolyn, Wendy, and the rest of the team

SECTION ONE

Top highlight from the past field season

The field work at SP Crater Lava Flow was again our most exciting part of the experience. This year we spent 2 days at the SP Crater site to give the SCAP volunteers more opportunity for exploring the cinder cone and taking measurements. We first met our guide, graduate student and volcano expert Jean-Francois Smekens, who lead the volunteers on an ascent of the cinder cone for an overview of the volcanic field and lava flow. While the climb was steep, the volunteers worked together to encourage each other and were rewarded not only with their physical accomplishment but also with an incredible view from the summit of SP Crater.

That evening we set up camp near to the lava flow so we could have an early start the next morning. After a tutorial on the Brunton compasses, we started off in small groups to measure transects of the lava flow. At first, the volunteers were uncertain about their skills, but after just a few measurements they became experts with the Bruntons and tape measures. As they crossed the uneven terrain, their teamwork skills were put to the test by negotiating the best path to the opposite side while still measuring the straight line transect. All four groups returned that afternoon with successful measurements of their transect regions and great memories.

Non-technical overview of results

The SCAP volunteers studied small volcanoes on Mars. Working with Arizona State University (ASU) graduate student Leon Manfredi and the Mars Education team, the volunteers searched the archival database of Thermal Emissions Imaging System (THEMIS) images for small volcanoes. Their project looked for correlations between the location of the small volcanoes and their relative ages. The volunteers also targeted images of Mars with the THEMIS camera aboard Mars Odyssey which are now in the THEMIS image archive.

The volunteers also participated in an ongoing project to map the SP Crater lava flow. Recent analysis indicates that the eruption occurred approximately 2000 years ago. Taken together with the eruption of Sunset Crater less than 1000 years ago, this has important implications for recent and ongoing volcanic activity in Arizona. The measurements made by volunteers help place constraints on the emplacement time and mechanics of the lava flow. Along with composition, this provides information on the nature of the magma reservoirs under northern Arizona. The transect measurements taken by the June 2010 team are incorporated into the ongoing database of ASU Professor Amanda Clarke.

SECTION TWO: TECHNICAL REPORT

REPORTING ON RESEARCH OBJECTIVES

Objective 1

Research a science question dealing with surface processes on Mars and/or the Moon

Progress towards/against Objective 1

SCAP volunteers, under the guidance of ASU graduate student and Martian volcano expert Leon Manfredi, researched small shield volcanoes on Mars using THEMIS archival data. Their project looked for a correlation between the location and relative ages of these volcanoes. The volunteers presented their results in a PowerPoint presentation to an audience of School of Earth and Space Exploration (SESE) researchers. Volunteers also targeted images of Mars

using the THEMIS camera onboard Mars Odyssey. These images are now archived in the THEMIS image archive and available for use by other Mars scientists.

Objective 2

Mapping of the S. P. Crater lava flow.

Progress towards/against Objective 2

Volunteers mapped several transects of the SP Crater lava flow using Brunton compasses and tape measures under the guidance of ASU graduate student and volcano expert Jean-Francois Smekens. Their data are part of the ongoing archive of transects of the lava flow collected by Professor Amanda Clarke and her students to measure the properties and dynamics of the flow.

Objective 3

Observe and measure volcanic edifices, lava flows and tubes, an impact crater, hydrological erosion, and aeolian, marine/lacustrine, and ashfall deposits.

Progress towards/against Objective 3

During the field portion of our program, the volunteers observed most of these features at the Grand Canyon, Sunset Crater, SP Crater, or Meteor Crater. Comparison to remote sensing data and estimates of diameter and volume were conducted at these sites as well. The planned observation and measurements at the Government Cave lava tube were cancelled due to forest fire in that area.

Objective 4

SCAP volunteers, with the guidance of the project investigators and ASU School of Earth and Space Exploration (SESE) scientists, will synthesize their data from Mars, the Moon, and Earth analogue sites to provide an overall picture of processes that affect planet surfaces. In the spirit of SESE, they will explore our Solar System's interaction with the Milky Way Galaxy and how we connect to the greater Universe.

Progress towards/against Objective 4

By studying both Martian volcanoes and SP Crater in Northern Arizona, the SCAP volunteers were able to compare and contrast how volcanoes shape Earth and Mars. Through the guidance of Mr. Manfredi and Mr. Smekens along with the PI, Co-PI's, and other SESE researchers, the volunteers were able to put their research into the larger perspective of the planetary geologic history of Earth and Mars. Volunteers were also introduced to our connection to the larger universe through guided stargazing events, a planetarium show, and telescope observing. In addition, we discussed the origin of the elements through stellar processes.

Updates to objectives

Prior planetary imaging projects have focussed on Mars, but future programs will instead take advantage of lunar observations using the Lunar Reconnaissance Orbiter Camera. This will not materially affect the structure of the expedition.

PARTNERSHIPS

The School of Earth and Space Exploration at Arizona State University is the home of the researchers involved in the project and provided space and equipment for this expedition.

The Mars Odyssey spacecraft and the THEMIS camera team provided data and analysis tools for the Mars project.

DISSEMINATION

Printed

THEMIS data of small shield volcanoes on Mars targeted and analyzed by the SCAP volunteers will appear in the thesis of Leon Manfredi at Arizona State University.

Visual: artwork; visitor centre, poster or display, slides, photographs

Photographs taken by SCAP volunteers during the expedition have been posted to Facebook.

Digital: database; websites; email group; blog; forum; CD Rom; e-newsletter

THEMIS images of Mars targeted by SCAP volunteers are located in the THEMIS image archive.

"Earthwatch Students Investigate Southwest Earth and Skies," SESE Source, July 2010, Vol. 2, Issue 4, p.4

This can be found through the link located at <http://sese.asu.edu/newsletter>

A "Southwest Earth and Skies" Facebook page was created to foster communication before the expedition and to facilitate the sharing of photos. The volunteers still communicate with each other.

Meetings and conferences: presentations/ lectures; conferences; workshops; training sessions; discussions; local community meetings and events.

SCAP volunteers presented the results of their Mars project, "Correlations between the location and relative age of shield volcanoes on Mars," to the School of Earth and Space Exploration.

LONG TERM IMPACT OF PROJECT

Ecosystem services enhanced, restored or maintained

Through visits to Grand Canyon National Park, Sunset Crater National Park, Wupatki National Monument, and research activities on BLM land as well as general discussion and education in recycling and water and other resource management, the volunteers learned about conservation practices and issues facing protected areas. Through their experiences and photographs, they will disseminate appreciation of and information on protected areas potentially increasing support and visitation for them.

Any other actions or activities that enhance natural and social capital

Through their field work characterizing the infrequent but ongoing volcanic activity in Northern Arizona, the volunteers learned about geologic hazard assessment. By participating in research of Mars, they learned about supporting space sciences research with the aim of future human exploration and utilization. During stargazing sessions, the volunteers learned about the importance of lessening light pollution to preserve the night sky.

ANYTHING ELSE?

The SCAP volunteers for our June 2010 expedition were amazing! The eight girls bonded very quickly and all became fast friends. They weathered the difficulties of being in the field without modern bathrooms (or just having a hole in the ground) and helped each other gladly and without hesitation. They are still maintaining their friendships via Facebook and letters.