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A Field-Based Volcanology Course in Ecuador: From the Andes to the Galapagos Islands.

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Field-based educational opportunities for students who are studying geology have been shown to be a particularly powerful pedagogical approach. The amount of variation and the scales of observation that are important for understanding geologic principles cannot be duplicated in the classroom. In particular, long term geological mapping exercises require students to observe multiple data types in order to investigate complex geologic histories and features in a multidisciplinary way.

Since 2013, we have developed and implemented the Galapagos Volcanology Field Camp. This is a 3-week, 3-credit hour course for upper level university students with a major course of study in geology. The course is offered by South Dakota School of Mines and Technology, but is open to any student and is usually populated by students from many universities across the United States. The course offers the essential skills of Field Geology such as lithologic description, unit identification and correlation, stratigraphic logging, and geologic mapping. These skills are taught exclusively in the setting of volcanic rocks.

We find Ecuador to be an ideal setting to teach volcanology as it provides young and accessible exposures of a range of compositions of volcanic rocks. There are also many localities that provide exposures suitable for the pedagogical goals of data collection and mapping. Students work through a series of four exercises, each being two to five days in length. There are also office days included during which students compile professional style field reports on the geology of the study area including their original geologic maps, cross sections, and/or stratigraphic columns.

Beginning in the subduction setting of the Ecuadorian Andes, students are introduced to the regional volcanic and tectonic history. They study volcanoes that have produced andesitic, dacitic, and rhyolitic products. Students study lava flows, pyroclastic flows, ignimbrites, lahar flow deposits, and debris avalanche deposits. During the second phase of the course, the group flies to the Galápagos

Islands to examine the basaltic features of hotspot volcanism. Students study recent lavas erupted from well-developed shield volcanoes, lava tunnels and collapse features, and the history of uplift,



subsidence, and sea-level variation.

While in mainland Ecuador, students are also introduced to the volcanic hazards of the region and the monitoring efforts in place through visits to the national geophysical institute and a volcano monitoring station.

