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Rock Stars

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Kansas State University geoscientists explore interrelated processes to protect resources and human health

Humans have not had a long time, geologically speaking, to advance understanding of the earth and its processes. We’ve had even less time to connect knowledge in different disciplines. Geoscience researchers at Kansas State University are making those connections in everything from the formation of volcanoes and mineral resources to finding the “control knobs” for natural processes that cause sediments to release metals in water. Their work ultimately helps protect precious resources to boost food, energy and water security as well as human health.

The lost arc

If you were a kid who hoarded rocks and minerals, you can probably relate to Matt Brueseke’s specialty in petrology, or how rocks form. Brueseke’s particular interest is in igneous petrology, or rocks that solidify from lava or magma. Samples of rocks that came from magma can shed light on the relationships between volcanoes and the movement of large sections of the earth’s crust over the underlying mantle, also known as plate tectonics. Studying material volcanoes churned out in the past helps us understand hazards like Yellowstone and other volcanically and seismically active areas. The best place to do this is where there’s a plate boundary. Alaska fills the bill, specifically, Wrangell-St. Elias National Park and Preserve’s 13.2 million acres encompass a huge, complex arc of volcanoes. “We hardly know anything about them,” said Brueseke, an associate professor of geology at K-State. “We’re calling it the lost arc.”

One reason we don’t know much about the area is that it’s not an easy place to take samples. Everything is remote; so much so that Brueseke and other members of his National Science Foundation-funded team have to travel in Piper Super Cubs. The light planes can land in 30 feet when necessary, which is handy in a place where paved runways are out of the question. The planes each carry supplies for one or two people for five days in bear containers and buckets with lids. Weight limits are strict.

Brueseke said the fieldwork is more intense than he’s ever done, but the fist-sized samples he and his team haul out of the park yield a wealth of information with global implications. Back at home, the researchers look at thin slices of the rocks under a microscope and pulverize some into a powder to send to labs that determine element and isotope concentrations that indicate what melted to form the rock. Radiometric dating helps researchers piece together a history of the mysterious volcanic field: frequency and types of eruptions, relative ages of different volcanoes, and the relationship between volcano formation and plate movements. All of this helps advance understanding of how the volcanoes developed, when eruptions occurred and how dangerous those eruptions were. Many trans-Pacific flights go near and over the Wrangell Mountains, and
Brueseke said that geoscientists with training in solid geology who study mineral deposits and plate tectonics. That allows them to bring modern, advanced techniques into the classroom. “It opens up those research experiences, whether they are benefits to Kansas State University students. “You can apply the same skills and techniques that determine how ore deposits form to the process of gold and silver mineralization. Another major project of Brueseke’s is applying this understanding of both fundamental and applied aspects of volcanology to the process of gold and silver mineralization. Brueseke’s work operates at disciplinary boundaries, so he can see how different interrelated processes are going on around you. One major project of Brueseke’s is volcano hunting, and the scenery, although striking, isn’t as photo-worthy — but he says both projects have great benefits for Kansas State University students. “It’s up to those research experiences, whether they are for undergrad or grad students,” he said. “It allows me to bring modern, advanced techniques into the classroom. I teach introductory geology, mineralogy, petrology and economic geology. I can bring in first-hand knowledge of how we study mineral deposits and plate tectonics. That happens at the undergraduate level and the graduate level, in classes for both geology majors and nonmajors.” Brueseke said that geoscientists with training in solid geology need to understand mineral deposits and plate tectonics. When these volcanoes erupt again, they will affect people who live near them, and the scenery, although striking, isn’t as photo-worthy — but he says both projects have great benefits for Kansas State University students. “It’s up to those research experiences, whether they are for undergrad or grad students,” he said. “It allows me to bring modern, advanced techniques into the classroom. I teach introduct...