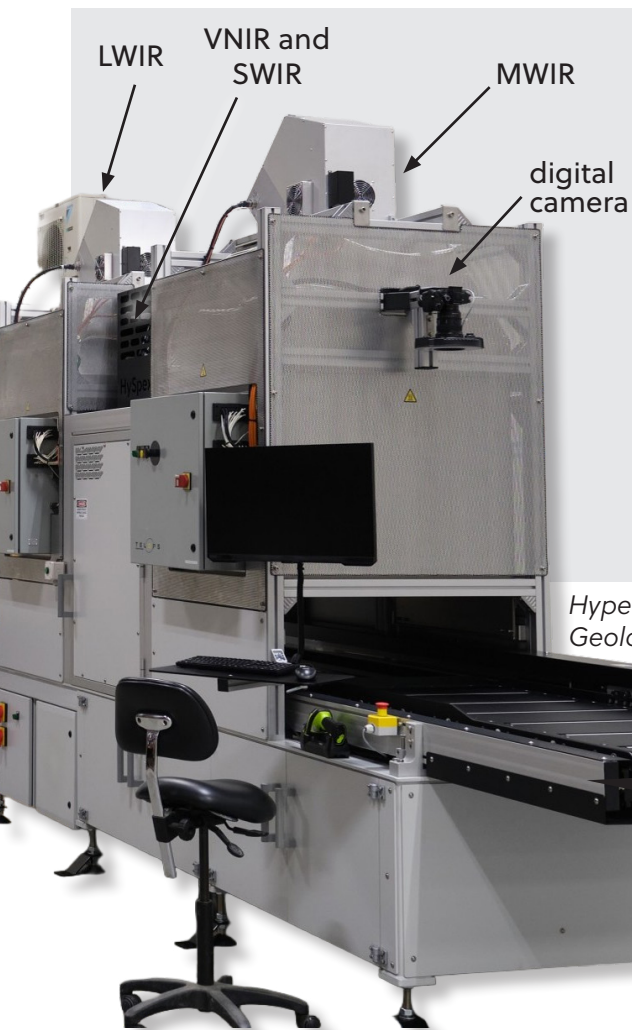


Hyperspectral Scanning

Alaska Division of Geological & Geophysical Surveys



The DGGs hyperspectral scanning program

Building a digital library of Alaska's geologic sample archive

The Alaska Geologic Materials Center (GMC) stores more than **500,000 feet of core samples** from across Alaska. To enhance the digital accessibility of this collection, the GMC operates a hyperspectral scanning instrument with **infrared spectroscopy** to identify minerals and rock properties in each unique sample.

The scanner at GMC integrates HySpex Classic VNIR-1800 and SWIR-640 cameras, HyperCam Mini MWIR and LWIR cameras from Telops, a 3D laser profiler to characterize surface topography, and a high-resolution digital (RGB) camera. Together, the infrared spectra, high-resolution photos, and surface topography information create digital records of the GMC sample collections.

Hyperspectral scanning system at the Geologic Materials Center



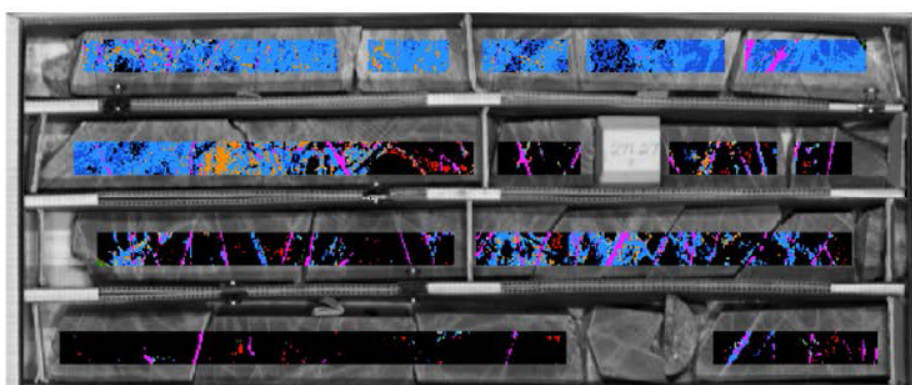
Drill core sample box

How does the hyperspectral scanner work?

Just as the human eye can see light in the visible wavelength range from approximately 400 to 700 nm, hyperspectral spectroscopy uses light from the visible wavelength range and far into the infrared wavelength range to "see" variations between different rocks, minerals, and material properties. The scanner illuminates each sample with infrared light and records the reflected light as spectra from 400 to 12,500 nm.

Like a mineral "fingerprint", the high spectral resolution of the scanner reveals peaks and dips in the spectra. This can be used to estimate the type and abundance of minerals in each pixel of the image. Mineral

maps from the downhole sequence of cores show how rock types and mineral amounts change through the subsurface at the location where the cores were collected.

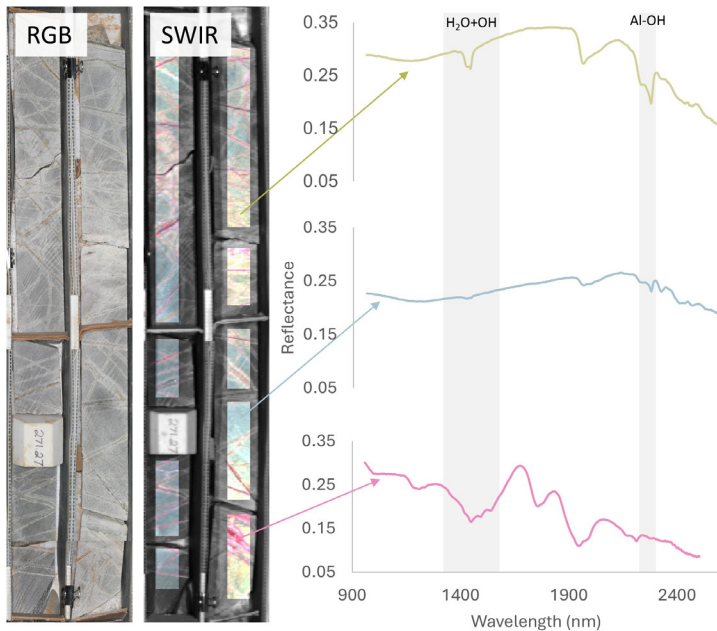


■ Kaolinite
■ Gypsum
■ Muscovite
■ Epidote/chlorite

Bee Creek copper porphyry: USGS PRISM MICA spectral library match

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Mineral core in both RGB and false color SWIR, and comparison of spectra from 3 selected SWIR pixels.

Who benefits from the hyperspectral scanner?

GMC geologic collections are frequently accessed by global industry and academic researchers. Rock samples at the GMC have been used to characterize the potential for lithium, rare earth elements (REE), and other critical mineral exploration in Alaska. As new industries develop, like geologic carbon storage and natural hydrogen generation from ultramafic rock suites, archived samples allow for analyzing previously studied rocks and minerals in a new light. Hyperspectral data offer an internally consistent and reproducible dataset that both adds value to the existing Alaska geologic sample collections and reveals geologic insights into samples from newly explored areas.

Instrument acquisition and scanning work has been supported jointly by the State of Alaska and the USGS National Geological and Geophysical Data Preservation Program (NGGDPP), in alignment with the NGGDPP vision for public domain physical samples and geological resources to be readily discoverable, accessible, and re-usable by the public.

Geologic Materials Center

The GMC archives and indexes publicly available geologic materials to advance knowledge of Alaska's natural resources. The 100,000 square foot repository is home to Alaska's archive of geologic samples including more than **750,000 items** with an estimated replacement value exceeding \$35 billion.

The hyperspectral scanning instrument is the centerpiece of a major effort to create a digital record of the geologic properties of thousands of boxes of rock core stored at the GMC. This instrument began operation in June of 2026, joining the existing rock sample characterization capabilities housed at the GMC including petrographic microscopes, core viewing rooms, and a SciAps hand-held X-ray fluorescence (XRF) analyzer that provides complementary chemical information of rock samples.



The Alaska Geologic Materials Center in Anchorage, AK. Photo: Kurt Johnson.

Learn more online at <https://dggs.alaska.gov/gmc/hyperspectral.html>
Contact information for Kurt Johnson: kurt.johnson@alaska.gov

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<https://doi.org/10.14509/32170>