The HySpex instrument (field-based & airborne)
- VNIR-1800 and SWIR-384 camera systems, 800 - 2,300 nm
- pushbroom HS camera with low stray light, high sensitivity to polarization, and dynamic and hard-coded像个
- across-track FOV of 17° and 16° respectively that can be increased to 34° and 32° (using a FOV expander)

In airborne mode the instrument:
- is mounted on a pressurized cabin (dampener) on an Aircraft L-8 to L-10 type (Beaver, Bushhawk, etc.)
- is connected to a high-performance data acquisition unit (DAU), connected with 1 terabyte solid state drive and a compact, rugged, field portable data acquisition unit
- is mounted on an Aviat Husky A-1B airplane or similar airplanes (Beaver, Bushhawk, etc.)
- is connected to a high-performance data acquisition unit (DAU), connected with 1 terabyte solid state drive and a compact, rugged, field portable data acquisition unit

In the field configuration:
- the two HS cameras are mounted on an automated rotation stage to allow for an overflight configuration
- the horizontal or vertical FOV of data is possible for distances of ~500 km in a single shot
- a rugged, field portable data acquisition unit is used to control the rotation stage and camera data acquisition
- power supply is provided by a generator

Our tools

Field-Based Hyperspectral Imaging for Applied Research in the State of Alaska
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What is the HyLab?
- An NSF funded research facility at the Geophysical Institute (GI), University of Alaska Fairbanks (UAF).
- Provides low-cost, in-state field-based and airborne hyperspectral data acquisition capabilities.
- Supports data acquisition, processing, and analysis for research exploration and ecological research (see lower box for an overview of our expertise).
- Coordinates education, training and outreach activities related to technique and application of imaging spectroscopy.

What is hyperspectral imaging?
- Also known as Imaging Spectroscopy, it is a remote sensing technique where images are acquired in many contiguous and narrow spectral regions, so that each pixel contains a reflectance spectrum.
- Reflectance spectrums provide the basis for the discrimination and characterization of different target materials.
- Hyperspectral imaging provides a means for detailed mapping of materials and the derivation of physical, chemical, and biological variables with unprecedented accuracy.
- Hyperspectral imagery acquired using HySpex VNR-1800 and SWIR-384 camera systems have provided unique information on terrestrial and aquatic biogeochemical parameters, and diagnostic mineral properties in exposed outcrops in selected sites in the state of Alaska. The HySpex system was configured for in-situ and field scanning by attaching it to a gimbal-mounted rotational stage on a robust tripod. Scans of vertical faces of vegetation and rock outcrops were made close to the campus of the University of Alaska Fairbanks, in an abandoned mine near Fairbanks, and on exposures of Orange Hill in Wrangell-St. Elias National Park. Atmospherically corrected integrated VNR_SWIR spectra were extracted which helped to study varying nitrogen content in the vegetation, and helped to distinguish the various minerals. Processed imagery highlighted carbonates, clays, sulfates, and alteration-related minerals. The same instrument was also mounted in airborne configuration on two different aircrafts, a De Haviland Beaver and a Found Bush Hawk. Test flights were flown over urban and wilderness areas that presented a variety of landcover types. Processed imagery shows promise in mapping man-made surfaces, phytolankton, and dissolved materials in inland water bodies.

The images above show a true-color composite together with false-color composite image of an outcrop scan at Orange Hill, Fairbanks area. This false-color composite shows vegetation in magenta and kaolinite & muscovite/clay/carbonate combinations in yellow-green. Reddish parts indicate montmorillonite.

The National Science Foundations (NSF) Major Research Instrumentation (MRI) Program, funded the University of Alaska Fairbanks (UAF), to establish a new capability in airborne hyperspectral imaging that has not previously existed, and inherently opens doors to new basic and applied research, and research training. Additional funding for instrument acquisition, processing, and research is provided by the U.S. Fish & Wildlife Service, Yukon Flats National Wildlife Refuge in the project “Use of Hyperspectral Imaging to test ‘Proof of Concept’ technique for wetland classification and water chemistry assessment of Alaska wetlands”.

www.hyperspectral.alaska.edu