Objective

- Develop a LWIR computational imaging spectrometer that exploits platform motion, dispersive elements, and coded sensing techniques to make a time series of encoded measurements of the optical spectrum at each pixel.
  - The design of this system will enable high performance from smaller and less-expensive components such as uncooled microbolometers, and thus be more suitable for small satellites that can be deployed in constellations.
- Demonstrate significant sensitivity and other advantages over existing imaging spectrometer designs, enabling miniaturization and improved area coverage.
- Demonstrate unique capabilities of a reconfigurable system.

Accomplishments

- Developed low-cost CRISP breadboard to validate operating principles, at LWIR wavelengths (7-13 mm, 77 bands).
- Validated performance, SNR scaling, spectral recovery, and key limits versus theoretical predictions.
  - SNR advantage over equivalent pushbroom system limited only by dark noise: 13x advantage with 2000 frames (frames correspond to number of imager rows).
- Demonstrated reconfigurable scan modes (long vs. short dwell) in field and laboratory testing.
- Demonstrated CRISP operation on an aircraft using laboratory configuration with limited ruggedization.
- Performed flight campaign over Lake Tahoe to assess CRISP performance as it relates to Sustainable Land Imaging requirements.
  - The CRISP team partnered with the Rochester Institute of Technology (RIT) to provide ground truth data and analyze flight data.
- Identified low-risk “CRISP 2.0” upgrades that would exceed SLI mission requirements.
  - Projected 0.08K NETD well below the 0.4K NETD requirement for TIR bands.

TRL_in = 3  TRL_out = 4