Snow and Water Imaging Spectroscopy (SWIS) for Coasts and Snow Cover

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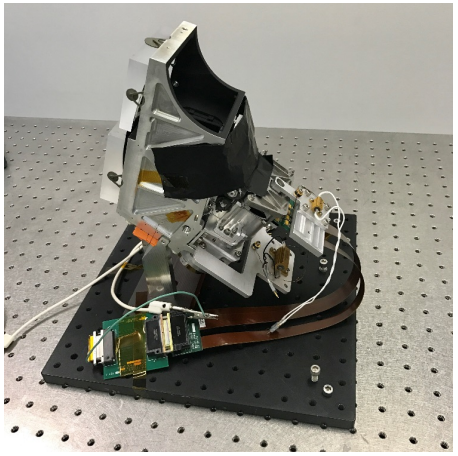
Objective

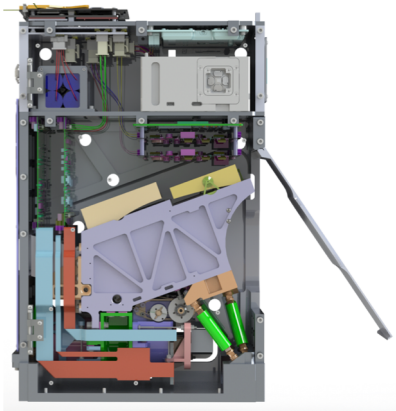
Develop and demonstrate a scalable imaging spectrometer system in the near IR region (350-1700 nm) that is suitable for small satellites, including U-class satellites, and with performance characteristics that can address the demanding observational requirements for monitoring coastal ecosystems as well as snow covered areas, including:

- high-fidelity imaging spectrometer measurements (>95% uniformity)
- high temporal sampling (daily)
- high spatial resolution (60-160 m)
- high dynamic range to cover both bright (snow) and dark (ocean) targets



SWIS spectrometer assembly including calibration mechanism and HgCdTe detector

SWIS instrument packaged in 4U of a 6-U platform



Accomplishments

- Designed and prototyped a 6U-compatible SWIS imaging spectrometer with high resolution, high fidelity, and sufficient dynamic range that operates in warmer temperature range (230-250K), and thus, without cryocoolers. The measured performance parameters have met or exceeded the designed goals:
  - Uniformity: 96% (95% goal)
  - Spectral resolution: 1.1 x sampling (goal: 1.5 x sampling)
  - Along-track and cross-track response function resolution: 1.1 x sampling (goal: 1.5 x sampling)
  - Dynamic range: 46 dB with excellent linearity (R^2 = 0.9999)
- Completed the thermal and vibration testing of the prototype SWIS instrument
- Developed a detailed system design on the 6U SWIS satellite for spaceborne operations. The flight system characteristics include: mass: 6.6 kg; volume: 100 x 226 x 366 mm^3; power: 9.6 W

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TRL_{in} = 4 **TRL_{out} = 5**