BASELINE DISCUSSION

Overview of the HyspIRI Thermal Infrared (TIR) Science Measurement Characteristics

NRC Decadal Survey Recommended HyspIRI Mission

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HyspIRI Thermal Infrared Multispectral (TIR) Science Measurements

Science Questions:

TQ1. Volcanoes/Earthquakes (MA,FF)
– How can we help predict and mitigate earthquake and volcanic hazards through detection of transient thermal phenomena?

TQ2. Wildfires (LG,DR)
– What is the impact of global biomass burning on the terrestrial biosphere and atmosphere, and how is this impact changing over time?

TQ3. Water Use and Availability, (MA,RA)
– How is consumptive use of global freshwater supplies responding to changes in climate and demand, and what are the implications for sustainable management of water resources?

TQ4. Urbanization/Human Health, (DQ,GG)
– How does urbanization affect the local, regional and global environment? Can we characterize this effect to help mitigate its impact on human health and welfare?

TQ5. Earth surface composition and change, (AP,JC)
– What is the composition and temperature of the exposed surface of the Earth? How do these factors change over time and affect land use and habitability?

Measurement:

• 7 bands between 7.5-12 μm and 1 band at 4 μm
• 60 m resolution, 5 days revisit
• Global land and shallow water

Andean volcano heats up

Urbanization

Volcanoes

Water Use and Availability

Surface Temperature

Evapotranspiration
Science Measurements
Summary Measurement Characteristics

Spectral
- Bands (8) µm: 3.98 µm, 7.35 µm, 8.28 µm, 8.63 µm, 9.07 µm, 10.53 µm, 11.33 µm, 12.05 µm
- Bandwidth: 0.084 µm, 0.32 µm, 0.34 µm, 0.35 µm, 0.36 µm, 0.54 µm, 0.54 µm, 0.52 µm
- Accuracy: <0.01 µm

Radiometric
- Range: Bands 2-8= 200K – 400K; Band 1= 1400K
- Resolution: < 0.05 K, Linear Quantization to 14 bits
- Accuracy: < 0.5 K 3-sigma at 250K
- Precision (NEdT): < 0.2K
- Linearity: >99% characterized to 0.1%

Spatial
- IFOV: 60 m
- MTF: >0.65 at FNy
- Scan Type: Push-Whisk
- Swath Width: 600 km (±25.5° at 623 km altitude)
- Cross-Track Samples: 10,000
- Swath Length: 15.4 km (+/- 0.7-degrees at 623km altitude)
- Down-Track Samples: 256
- Band-to-Band Co-registraion: 0.2 pixels (12 m)
- Pointing Knowledge: 1.5 arcsec (0.1 pixels)
Science Measurements
Characteristics Continued

Temporal
- Orbit Crossing: 11 am sun synchronous descending
- Global Land Repeat: 5 days at equator

OnOrbit Calibration
- Lunar View: 1 per month \{radiometric\}
- Blackbody Views: 1 per scan \{radiometric\}
- Deep Space Views: 1 per scan \{radiometric\}
- Surface Cal Experiments: 2 \(d/n\) every 5 days \{radiometric\}
- Spectral Surface Cal Experiments: 1 per year

Data Collection
- Time Coverage: Day and Night
- Land Coverage: Land surface above sea level
- Water Coverage: Coastal zone -50 m and shallower
- Open Ocean: Averaged to 1km spatial sampling
- Compression: 2:1 lossless
Following arrival at science orbit, the baseline data acquisition plan is established. Collect data for entire land surface excluding sea ice (Arctic and Antarctic) every 5 days at 60 m spatial resolution in 8 spectral bands.

- Data are downlinked and transferred to the science data processing center where calibration and baseline processing algorithms are applied.
- Level 1, 2 products are delivered to the scientific community and general users to pursue the science questions
  - With appropriate cloud screening, compositing, spatial, and temporal subsetting

Land and coastal acquisition