On Orbit Validation and Calibration of Ocean Color Sensors with Underflights of the NASA Airborne Visible/Infrared Imaging Spectrometer (AVIRIS)

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OVERVIEW

- Objective and Justification
- Approach
- Current Results
- Future Plans
- Discussion
Objective and Justification

• OBJECTIVE:
  – Calibrate and Validate the On Orbit Radiometric Characteristics of SeaWiFs with Underflights of NASA’s Calibrated Airborne Visible/Infrared Imaging Spectrometer (AVIRIS)

• JUSTIFICATION:
  – Calibration is essential for the quantitative use of SeaWiFs data
  – Calibration in the laboratory of spaceborne sensors is challenging
  – Satellite sensors are subjected to trauma during launch
  – The Earth orbit environment is different the laboratory calibration environment
  – Through years of effort AVIRIS is demonstrated to be well calibration
  – AVIRIS can match the spectral and spatial observation characteristics of SeaWiFs
Approach

- Determine the calibration accuracy of AVIRIS with high confidence

- Underfly SEAWIFS with AVIRIS matching observation geometry
  - Issues: weather, satellite, aircraft, sensor, location

- Correct AVIRIS spectral image data to the top of the atmosphere

- Convolve AVIRIS spectral channels to SEAWIFS bands

- Determine and extract water with correct observation geometry

- Compare, analyze, repeat for monitoring
Activities

- SXR radiometric comparison Spring
- AVIRIS data set for Carder May
- SEAWIFS Underflight Green May
- SXR radiometric comparison Summer
- LXR radiometric comparison Summer
- SEAWIFS Underflight 990807
- SEAWIFS Underflight 990912
- CALCOFI overflight October
- SEAWIF Underflight October
- Analysis and Reporting
OVERVIEW

Solar Absorptions

Ozone Absorption

Ocean Radiance Spectrum

SeaWiFS Visible Near-Infrared Bands

AVIRIS Spectral Channels (224 from 370 to 2500 nm)

Wavelength (nm)
SEAWIFS 990807 Data Set
AVIRIS Data Set, Georectified
SEAWIFS 2 and 5 degree Common Observation
SEAWIFS Zone of Common Observation
AVIRIS 2 and 5 degree Common Observation
Preliminary SEAWIFS and AVIRIS Common Observation

R.O. Green COSPAR 20 July 2000
Preliminary AVIRIS and SEAWIFS Compare 990807

- AVIRIS circle 1 (µW/cm²/nm/ster) 990807

<table>
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<tr>
<th>band</th>
<th>aviris 2°</th>
<th>aviris 5°</th>
<th>seawifs 2°</th>
<th>seawifs 5°</th>
<th>fractional diff 2°</th>
<th>fractional diff 5°</th>
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AVIRIS Second Circle
Preliminary SEAWIFS AVIRIS Comparison Circle

![Graph showing the comparison between SEAWIFS and AVIRIS spectra. The graph plots the fractional difference in band transmission for different angles.](image)

- **aviris 2°**
- **aviris 5°**
- **seawifs 2°**
- **seawifs 5°**
- **fractional difference: 2°**
- **fractional difference: 5°**

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## SEAWIFS and AVIRIS Timing

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SEAWIFS AVIRIS Comparison 971002

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Accomplishments and Plans

- SXR radiometric comparison Spring
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- SEAWIFS Underflight Green May
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- SEAWIF Underflight October
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Discussion

- FY00 MODIS Underflight
- Plans for ADEOS II Underflights
- ...