Airborne Compact Atmospheric Mapper (ACAM) Overview

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Outline

• Instrument description
  - Sensor specs
  - Viewing configuration during our last deployment (GloPac) → scan pattern

• Previous measurement results
  - Imagery
  - Trace gas retrievals
    - NOVICE (NO₂), GloPac (O₃)
  - Discover-AQ preparations
ACAM Sensors

- Two spectrographs + HD video camera
  - Air Quality (AQ) 304:520 nm 0.8 nm resolution (NO$_2$, O$_3$, UV absorbing aerosols, SO$_2$, HCHO)
  - Ocean Color (OC) 460:900 nm 1.5 nm resolution
  - Video camera (2592x1936 pixels) – 3 pixel FWHM

Optical bench and support electronics contained in pressure and temperature controlled enclosure

50 lbs total weight
250 watts avg. power
Viewing Configuration

GH GNC Coordinates

Zenith view fiber (2°)

Nadir scan pattern
Cross-track swath takes ~7 s
Spatial Sampling Pattern

Visible Camera 65° x 51°
Stored image rate = 2Hz

Note – OC sampling will be reconfigured to match AQ on B200

11 steps per scan
~0.7sec/step

Air Quality Ocean Color

Fiber layout

Scan Direction

Nadir Flight Track
Coverage @28,000 ft altitude

- 11-step pattern will not get simultaneous I-95/Parkway coverage
- 13-step pattern (need to test in lab) gets closer but has gaps
- Recommend centered sequential overflights
ACAM Images

OMI underpass
23:30 UT
Apr. 13th

North Alaskan
coast transition to
sea ice 16:00 UT
Apr. 23rd

NO₂ measurements during WB-57 NOVICE campaign

- Normalized NO₂ columns for OMI and ACAM during NOVICE deployment
- ACAM swath averaged data
- OMI Tropospheric NO₂, 0.25° gridded data
- 2010 AGU Poster (variogram analysis)
OMI/ACAM Spatial Matchup

Slant column precision (swath averaged 1x11) = 5e14 mol./cm²
Predicted precision for Discover-AQ (1 km x 1 km) = 1e15 mol./cm²
ACAM O₃ absorption spectra are fit to known cross-section amplitudes to produce slant column densities (no path length correction).

Correlations in structure can be seen between OMI and ACAM that can be used to validate retrieval methods.

Some features appear to be shifted in time earlier in the flight track as ACAM would have observed them a few hours prior to OMI.
Preparations for Discover-AQ deployment

- Test fit (yesterday) went well. Re-routing of zenith fiber coupler will be required

- ACAM mods
  - zenith fiber coupler
  - Replace fiber bundle-> UV/VIS – VIS/NIR spectrometers have the same spatial resolution
  - Adjust video FOV and check swath FOV
  - GPS connector and switch wire re-route

- Aircraft support tasks
  - Build flight harness
    - Power, Data, GPS feed-through
    - Power switch routing
  - Mount zenith fiber lens holder and route fiber
  - Safety qualification

- Test flight
  - DITL? We can be ready in Feb-March timeframe if this happens.
  - Ground ops

- Algorithm development and data archive prep
  - Radiances, NO$_2$ slant and vertical columns
  - O$_3$ – UV/Chappuis band?