

CAR Measurements for Chesapeake Lighthouse and Aircraft Measurements for satellite (CLAMS) Experiment

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Outline

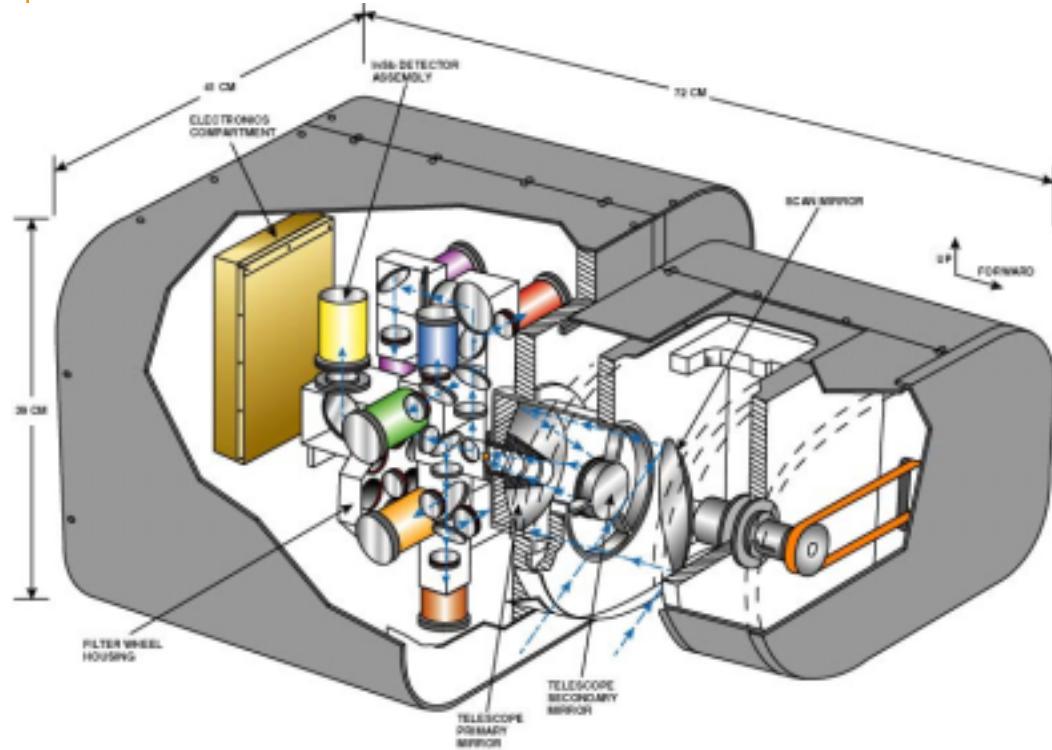
- Overview of the Cloud Absorption Radiometer (CAR)**
- Summary of CAR Measurements for CLAMS**
- Conclusion and acknowledgments**

Cloud Absorption Radiometer

Sensor Characteristics

- 14 spectral bands ranging from 0.34 to 2.29 μm
- scan $\pm 95^\circ$ from horizon on right-hand side of aircraft
- field of view 17.5 mrad (1°)
- scan rate 1.67 Hz (100 rpm)
- data system 9 channels @ 16 bit
- 395 pixels in scan line
- 3% reflectance calibration accuracy

integrated & flown on University of Washington Convair [CV-580](#)

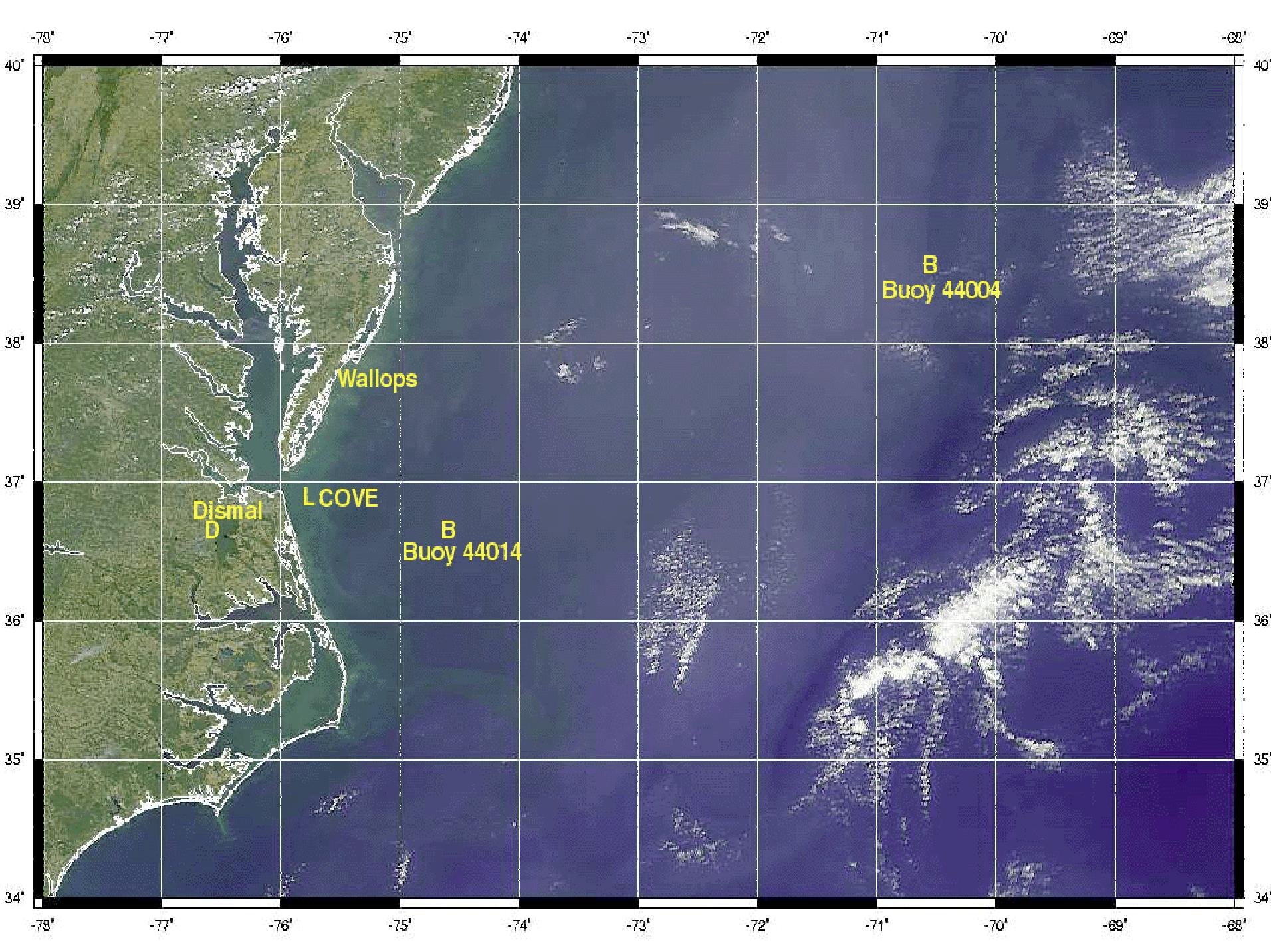


CAR Setup in the University of Washington CV-580



CAR Interface inside of the CV-580

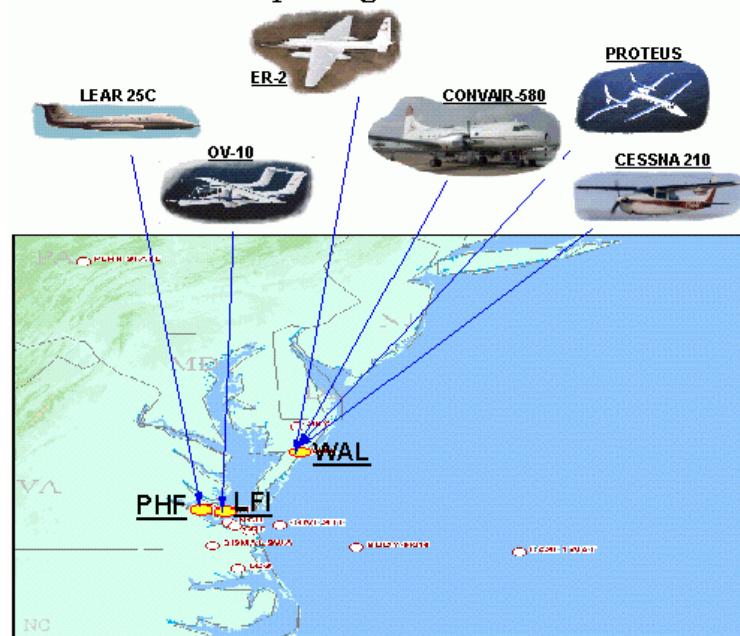




July 2001

Sun	Mon	Tue	Wed	Thu	Fri	Sat
01	02	03	04	05	06	07
08	09 ER-2	10 Cessna CV-580 ● OV-10 Prot eus	11 Cessna	12 CV-580 ● ER-2 OV-10 Proteus	13 Cessna ER-2	14 Cessna CV-580 ● OV-10 Prot eus (2x)
15 ER-2	16 Cessna CV-580 ●	17 Cessna CV-580 ●● ER-2 OV-10 Prot eus Lear Jet	18	19	20 ER-2	21 ER-2 Prot eus
22	23 CV-580 ●	24	25 Prot eus Lear Jet	26 CV-580 ● OV-10 Prot eus	27	28 Prot eus
29	30 CV-580 ●●● ER-2 OV-10	31 CV-580 ● ER-2 OV-10 Lear Jet				

CLAMS Participating Aircraft



August 2001

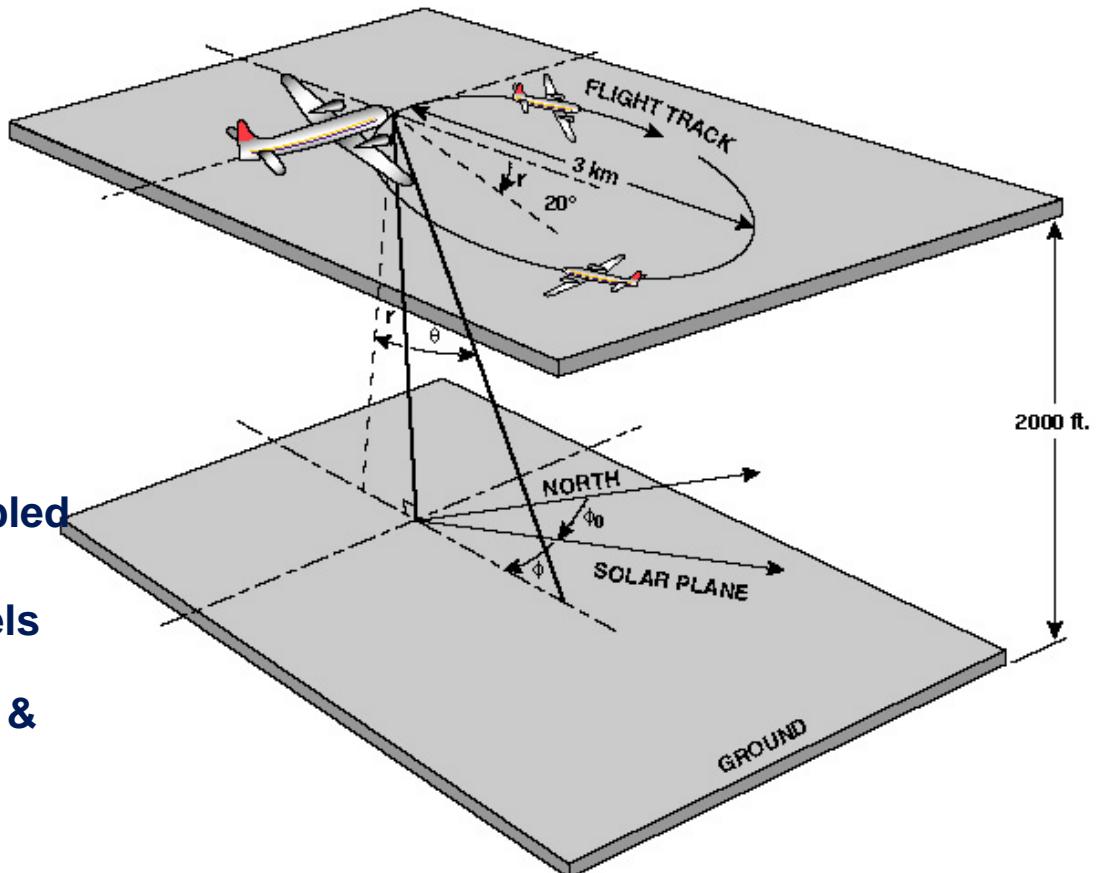
			01 ER-2 OV-10	02 CV-580 ● ER-2 OV-10	03	
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Key: ● Good brdf measurements

● Brdf cloud contaminated

Bidirectional Reflectance Measurements

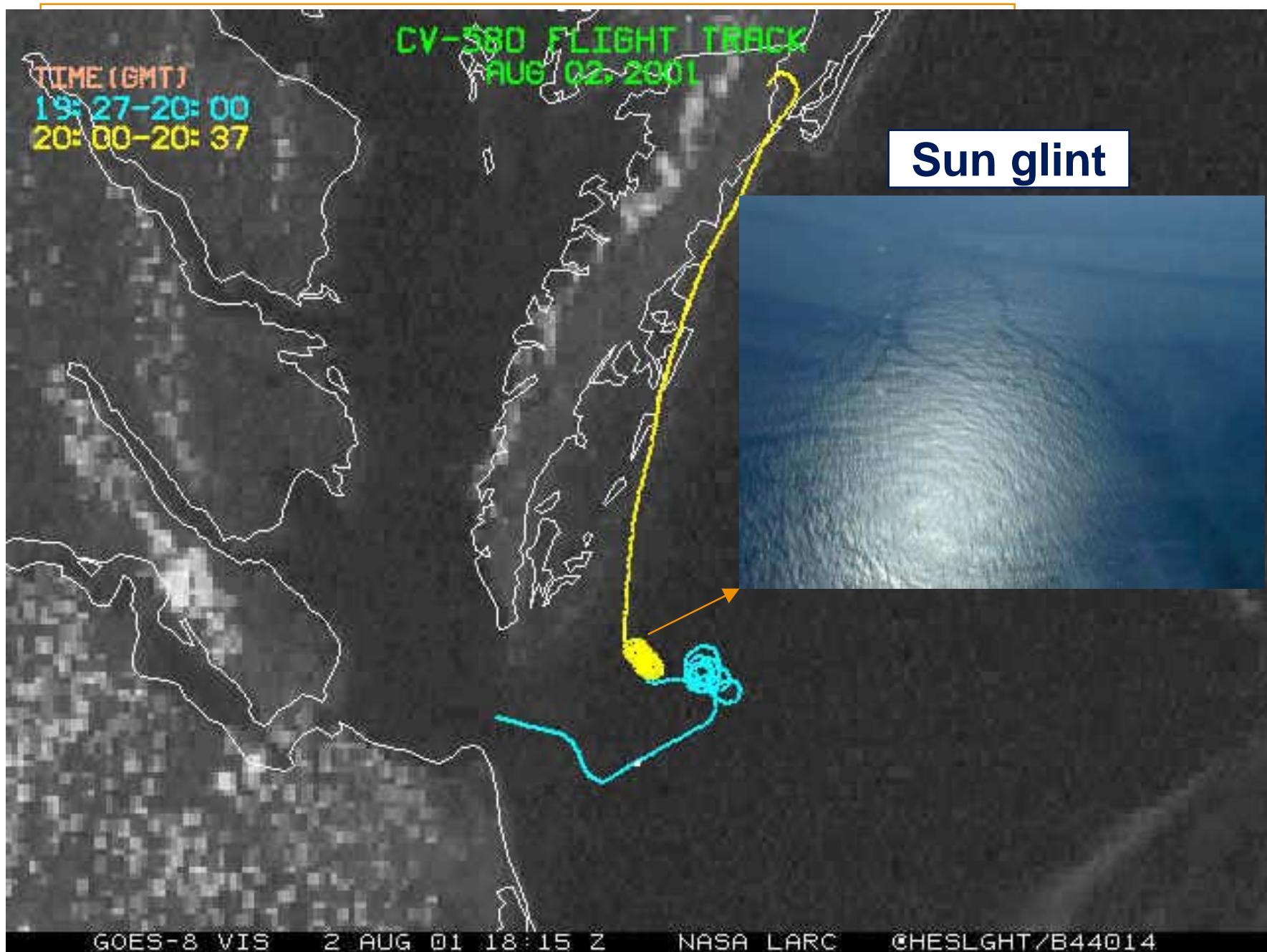
- Roll: ~20°
- Time: ~2 min
- Speed: ~80 m s⁻¹
- Height: ~30(600) m
- Diameter: ~3 km
- Resolution
 - 10 m (nadir)
 - 270 m ($\theta = 80^\circ$)
- Channels
 - 8 continuously sampled (0.34-1.27 μm)
 - 2 filter wheel channels used for BRDF measurements (1.66 & 2.20 μm)



CV-58D FLIGHT TRACK
AUG 02, 2001

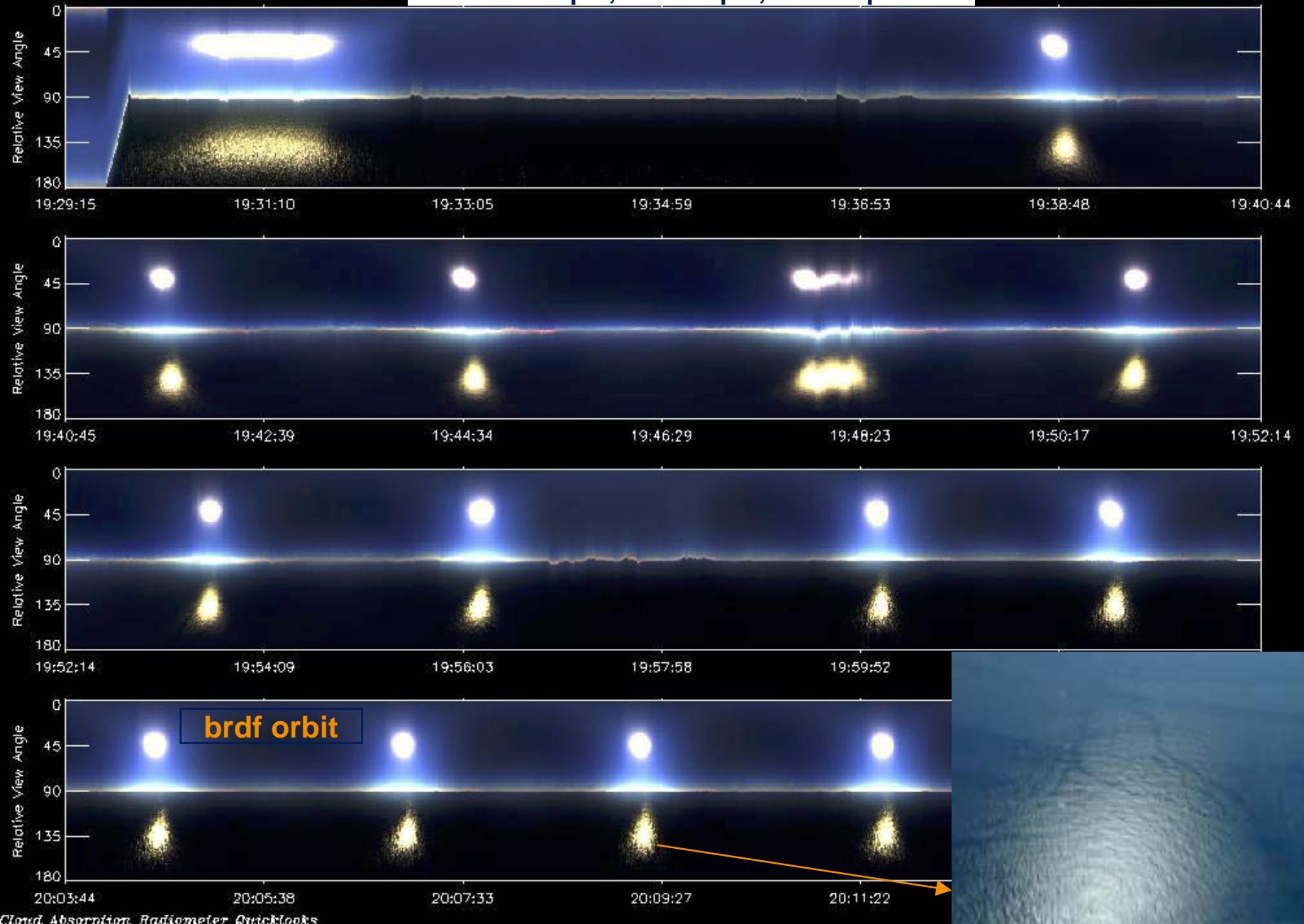
TIME (GMT)
19:27-20:00
20:00-20:37

Sun glint



CLAMS UW Flt. 1882 02 August 2001

R=0.87 μm , G=0-68 μm , B=0.47 μm



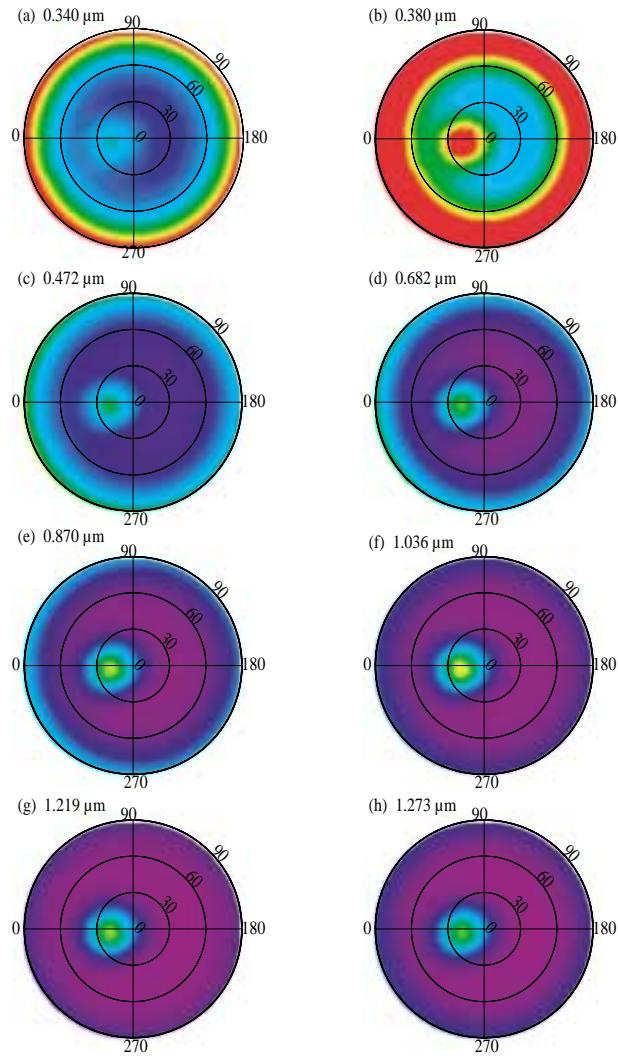
Radiometric Calibration



Results

Ch# ($\lambda \mu\text{m}$)	Pre-CLAMS [W/(m ² .sr. μm)] per count	Post-CLAMS [W/(m ² .sr. μm)] per count
Ch 1 (0.34)	pending	pending
Ch 2 (0.38)	pending	pending
Ch 3 (0.47)	0.0070	0.0069
Ch 4 (0.68)	0.0128	0.0140
Ch 5 (0.87)	0.0066	0.0066
Ch 6 (1.04)	0.0169	0.0176
Ch 7 (1.22)	0.0097	0.0097
Ch 8 (1.27)	0.0077	0.0077
Ch 9 (1.56)	0.0113	?
Ch 10 (1.66)	0.0075	?
Ch 11 (1.74)	0.0067	?
Ch 12 (2.10)	0.0041	?
Ch 13 (2.20)	0.0066	?
Ch 14 (2.30)	0.0089	?

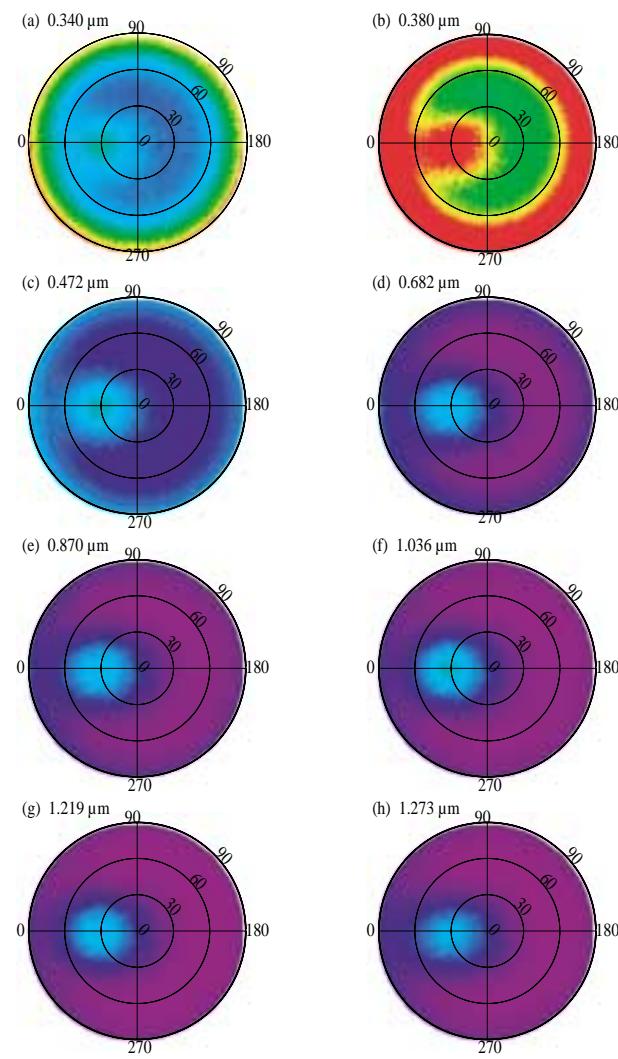
CAR BRDF AT CHESAPEAKE LIGHT HOUSE: 17 JULY 2001



Lat = 36.96° N
 Long. = 75.70 - 75.74°W
 Alt. = 169 m
 Time = 16:46-17:05 UTC
 Solar zenith angle=21.84°



CAR BRDF AT BOUY 44004: 30 JULY 2001

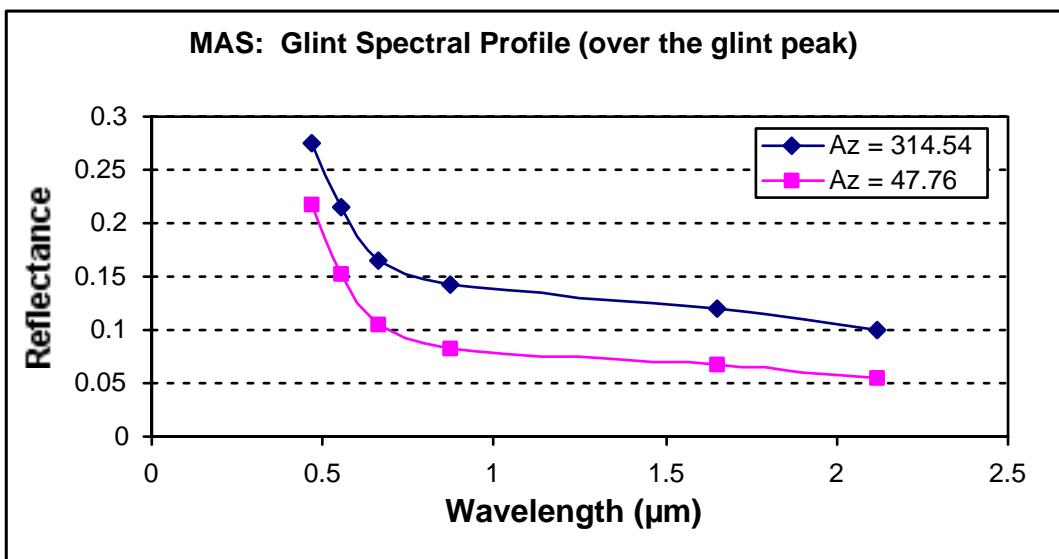
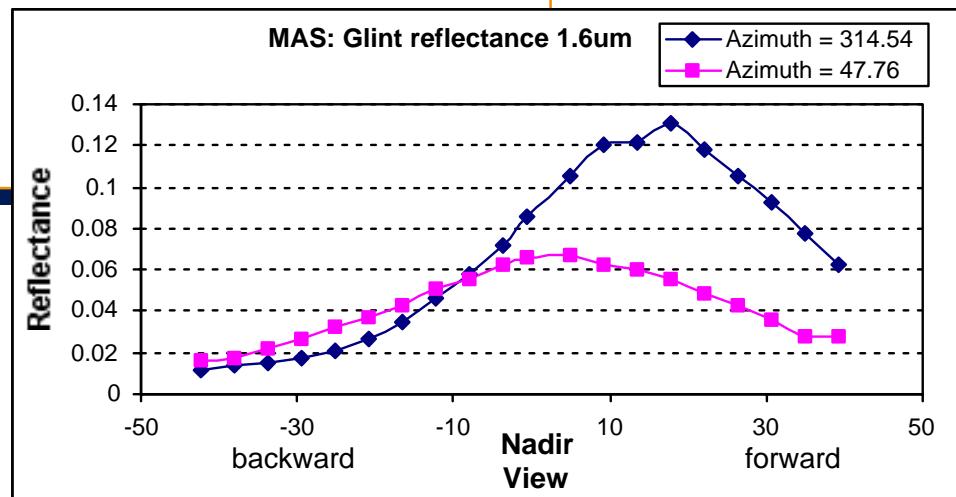
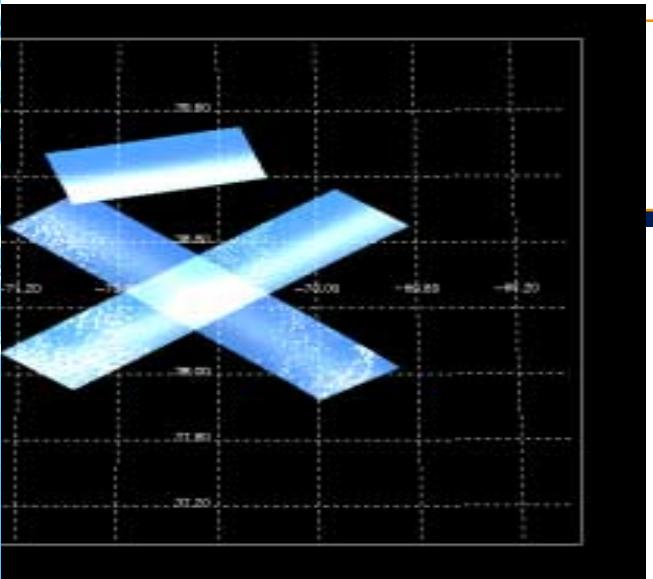


Lat = 38.58-38.51° N
 Long. = 70.63 - 70.65°W
 Alt. = 152 m
 Time = 16:52-17:06 UTC
 Solar zenith angle=17.29



Wed Feb 27 20:20:18 2002 CAR Team

Wed Feb 27 19:14:19 2002 CAR Team



Recap!!

- Number of flights flown during CLAMS were 10 (~40 hours)
 - » Measurements of coastal, offshore and deep ocean brdf were made (15 total; 8 uncontaminated by cloud) under a variety of sun angles and wind conditions for MODIS, CERES and MISR
- Calibration:
 - » Radiometric calibration is complete; looks good for most channels,
 - » Angular sensitivity measurements complete; signal drop discovered for the large CAR view angles; further investigations planned
 - » Level 1b processing in progress
- CLAMS data useful for validation of satellite-based retrievals

Acknowledgments

Persons:

- Dr. Michael King
- Colleagues: Thomas Arnold, Paul Hubanks, and Jason Li
- Peter Shu and team
- Prof. Peter Hobbs and team
- The CLAMS team - Bill Smith Jnr.

Institutions:

- NASA's EOS Project
- GEST Center/UMBC
- University of Washington, Seattle

More information !!



http://car.gsfc.nasa.gov/data_clams