Chesapeake Lighthouse and Aircraft Measurements for Satellites

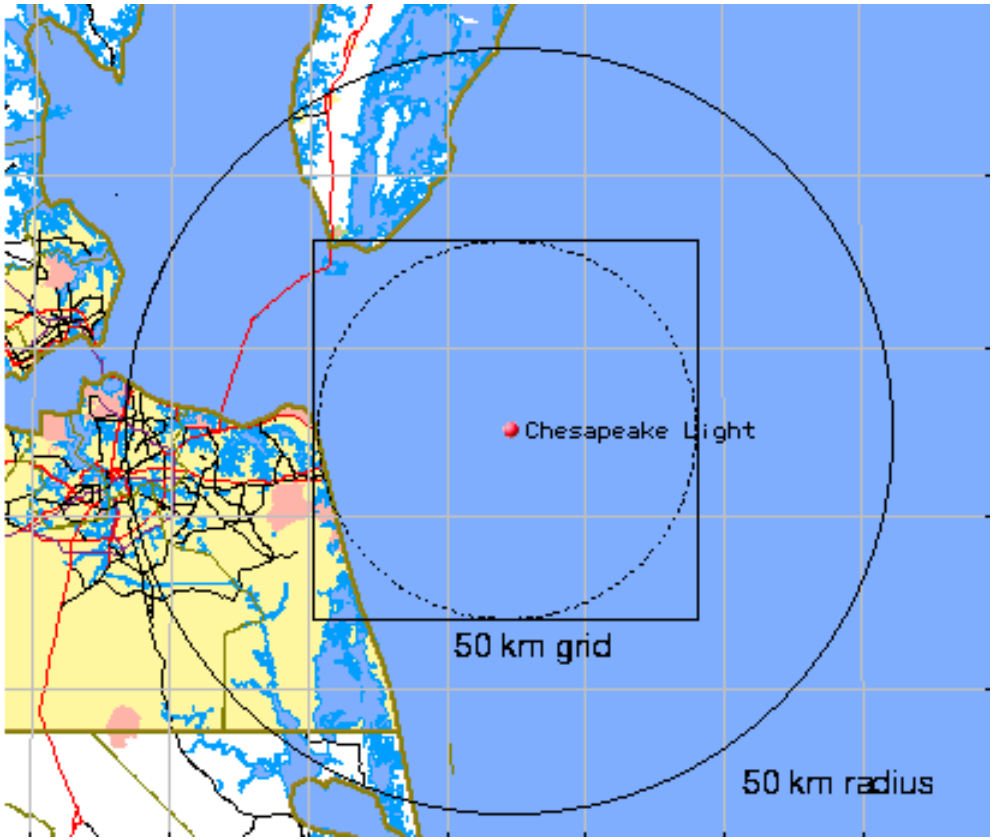
“CLAMS”

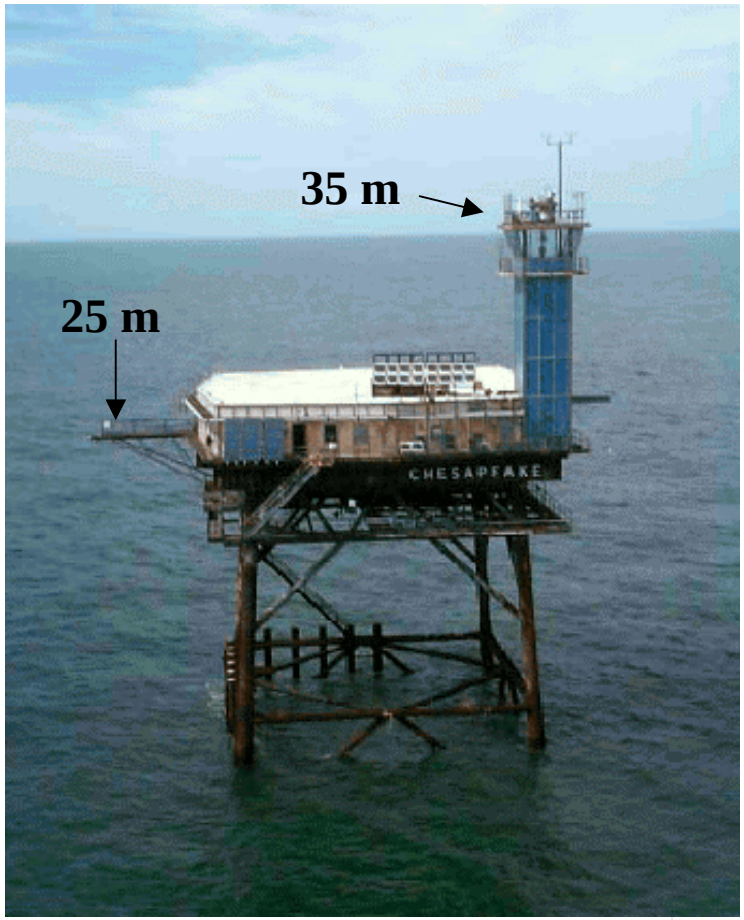
July 12 – Aug 1, 2001

W. L. Smith Jr., T. P. Charlock
NASA LaRC

CERES Science Team Meeting
Williamsburg, VA, Jan. 23-25, 2001

CERES Ocean Validation Experiment "COVE"

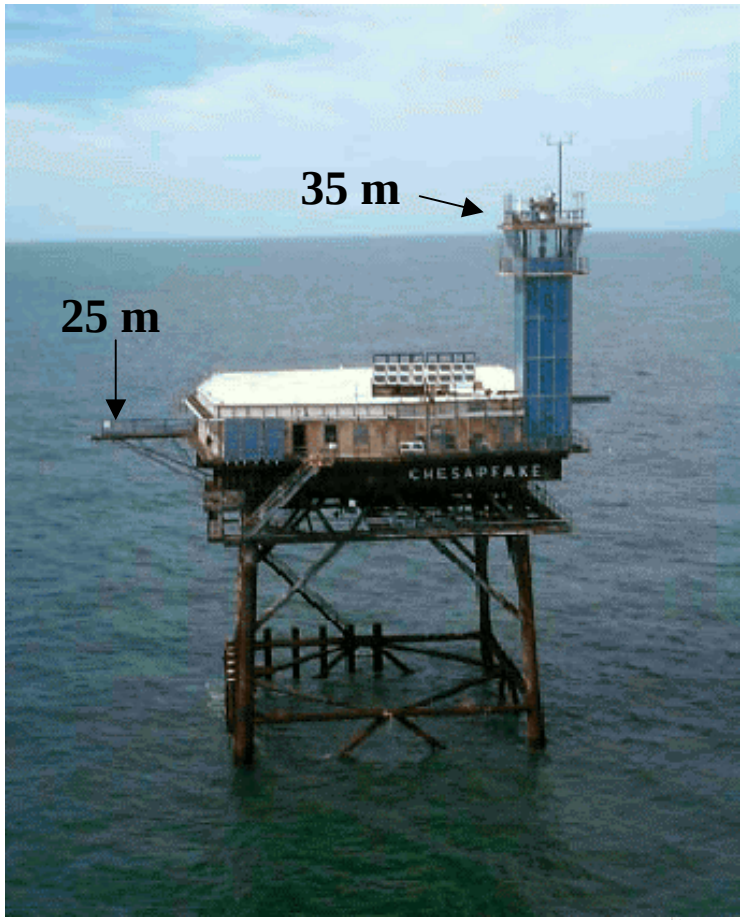


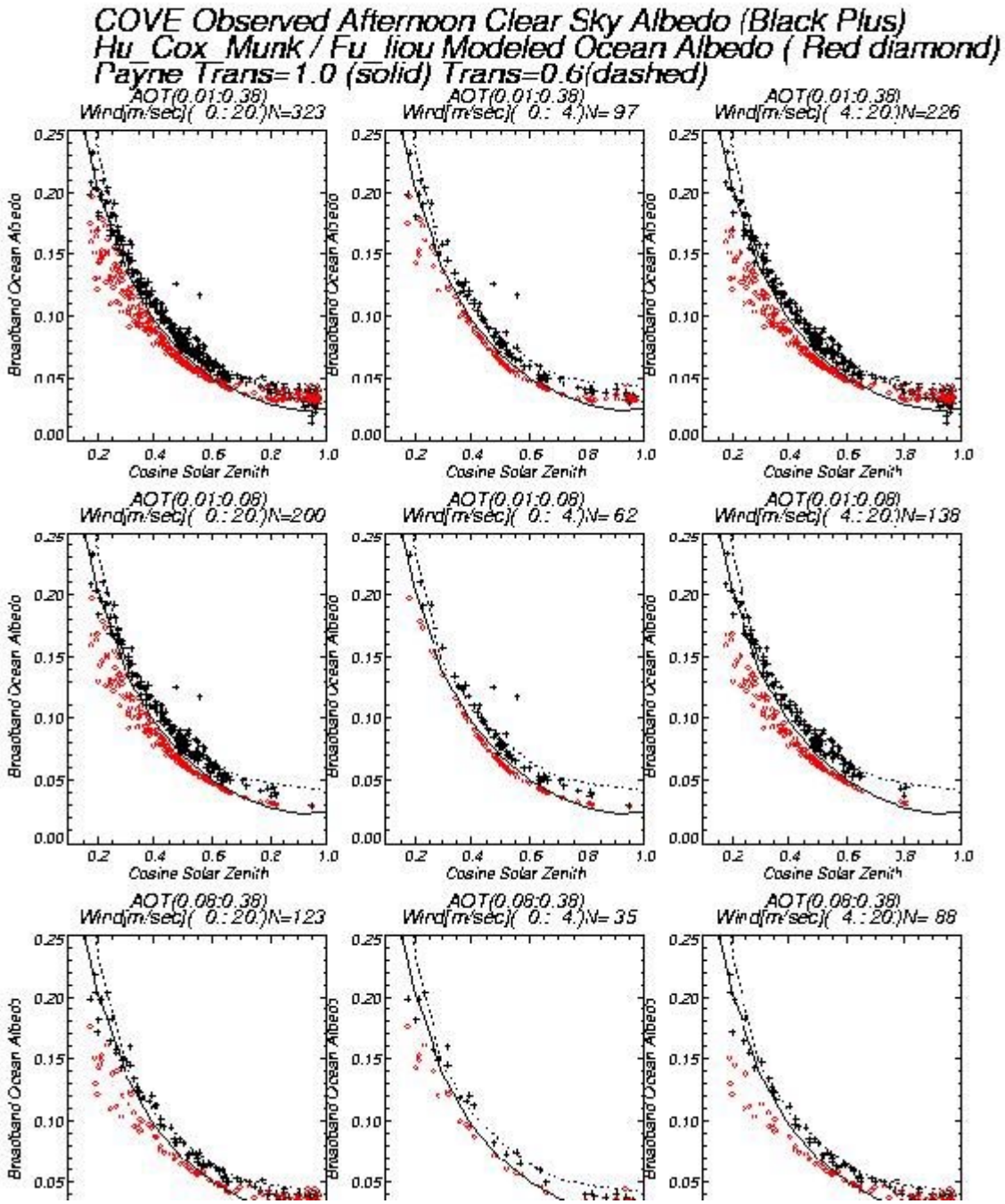


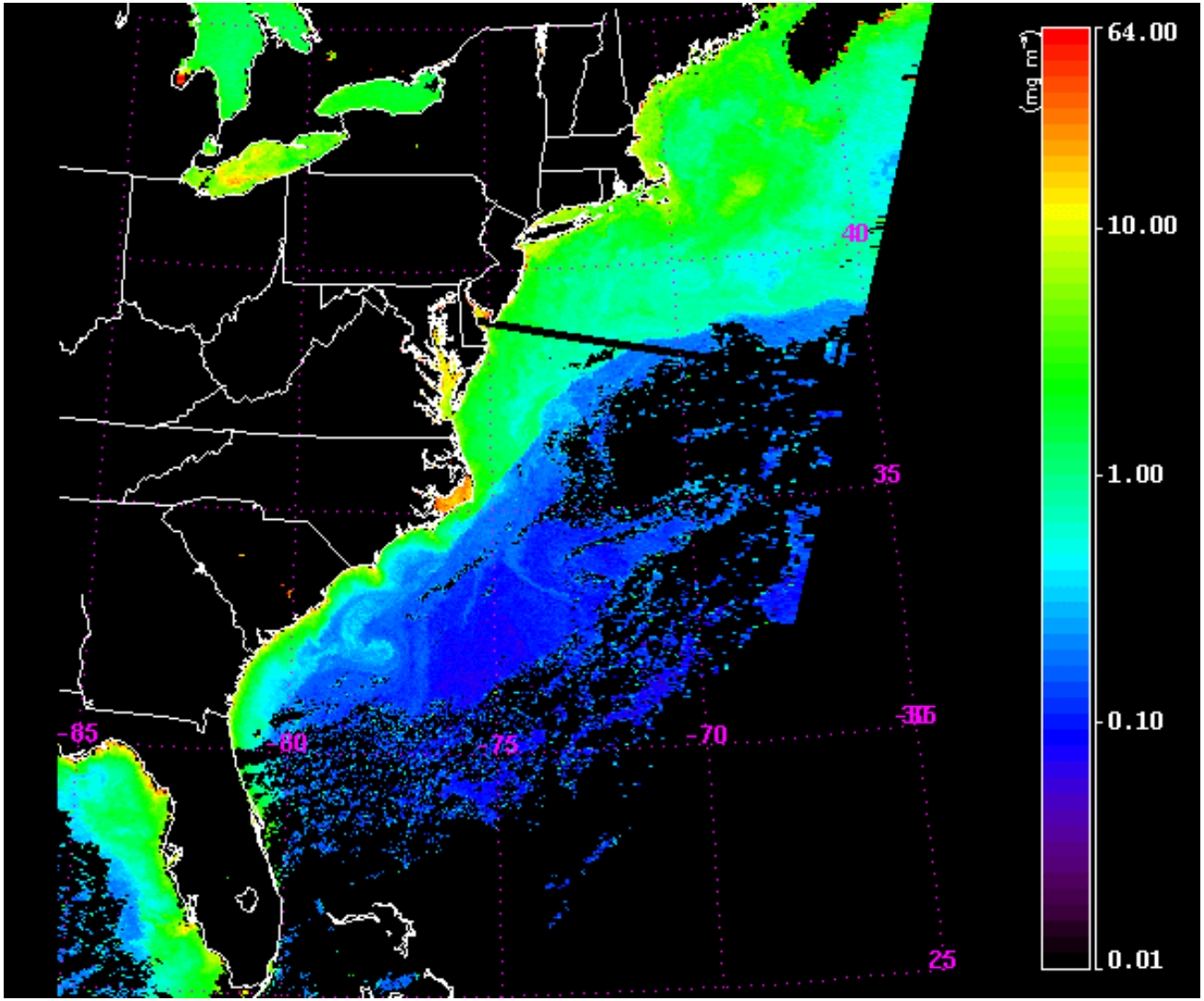
CERES Ocean Validation Experiment "COVE"

Provides continuous long term radiation measurements at a stable sea platform

- Up, down broadband fluxes, spectral, directional radiances
- Broadband (BSRN), MFRSR, Cimel (AERONET), SP1A (GACP), Waves and Meteorology (NOAA)

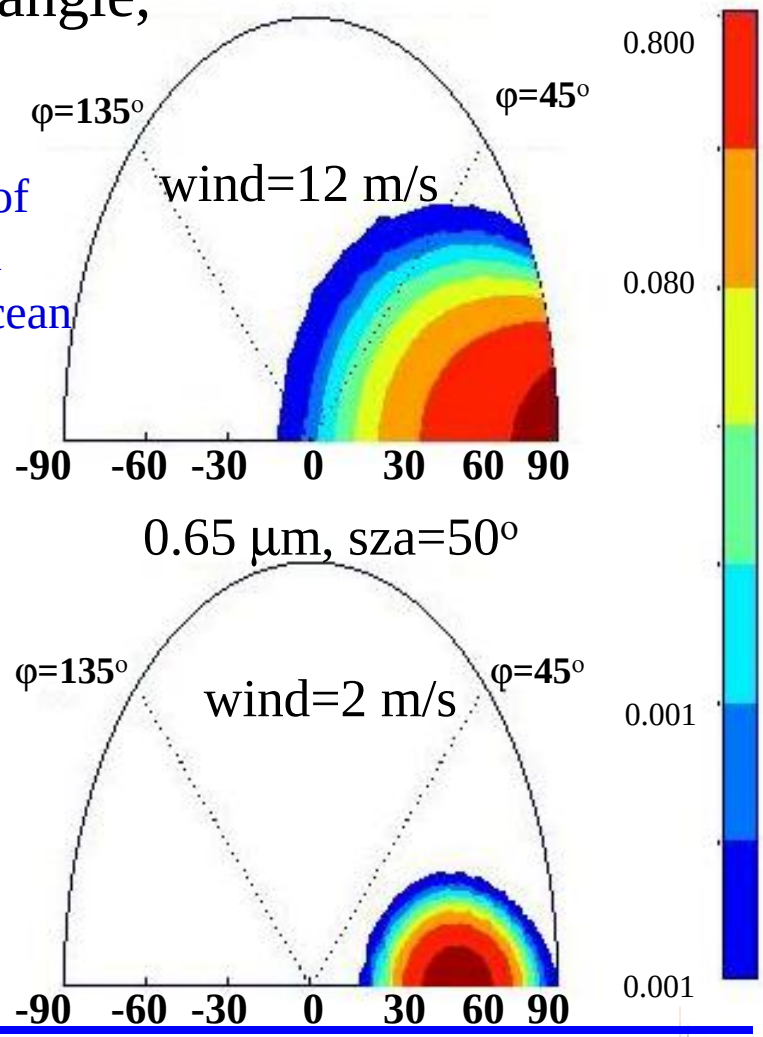



COVE Observed Afternoon Clear Sky Albedo (Black Plus)
Hu_Cox_Munk / Fu_Iiou Modeled Ocean Albedo (Red diamond)
Payne Trans=1.0 (solid) Trans=0.6(dashed)
AOT(0.01:0.38) Wind[m/sec](0.: 20.)N=323
AOT(0.01:0.38) Wind[m/sec](0.: 4.)N= 97
AOT(0.01:0.38) Wind[m/sec](4.: 20.)N=226
AOT(0.01:0.08) Wind[m/sec](0.: 20.)N=200
AOT(0.01:0.08) Wind[m/sec](0.: 4.)N= 62
AOT(0.01:0.08) Wind[m/sec](4.: 20.)N=138
AOT(0.08:0.38) Wind[m/sec](0.: 20.)N=123
AOT(0.08:0.38) Wind[m/sec](0.: 4.)N= 35
AOT(0.08:0.38) Wind[m/sec](4.: 20.)N= 88
Broadband Ocean Albedo
Cosine Solar Zenith
0.00
0.05
0.10
0.15
0.20
0.25
0.2
0.4
0.6
0.8
1.0


64.00
10.00
1.00
0.10
0.01
40
35
25
-85
-80
-75
-70
-65

CLAMS seeks improved characterization of ocean optics, including BRDF, as a function of sun angle, aerosol loading and sea state

Y. Hu model of BRDF using a Cox-Munk Ocean



Clams Objectives

1. *Fill gaps in SARB validation using COVE*

   - Determine how platform obstructions affect upwelling broadband measurements at COVE and determine corrections
   - Extend COVE measurements to broader ocean

Clams Objectives Cont'd

2. Validation of satellite-retrieved aerosol properties

- Assess the impact of scene variability on measurement uncertainty, on 10 m to 10 km scales
- Test the impact of improved boundary conditions arrived at with CLAMS data
- Comparisons with in-situ measurements, surface-based measurements and sensor intercomparisons
- Improve retrievals in sun-glint conditions, in partly cloudy conditions and over coast

Strategy

Conduct an intense measurement campaign from Wallops Flight Facility targeting COVE and nearby deep ocean targets in primarily clear conditions over a 3 week period in July.

Deploy from Wallops

- ER-2 with TERRA airborne counterparts and a Lidar to sense and map the horizontal and vertical distribution of aerosols
- UW CV-580 for in-situ aerosol sampling, flux profiling and ocean surface BRDF

Deploy from LaRC

- OV-10 to survey broadband and spectral upwelling and downwelling fluxes

ER-2 Payload (32 hours)

- MAS *(MODIS Airborne Simulator)*
  50 band multispectral scanner; 50 m res
- AirMISR - *Multi-angle Imaging Spectroradiometer*
  4 color (446, 558, 672, 867 nm) pushbroom imager; 20m res
- CPL - *Cloud Physics Lidar*
- AVIRIS – *Advanced Visible and Infrared Imaging Spectrometer*
  224 band (400-2500nm) scanner; 20 m res

University of Washington Convair 580

In-situ aerosol profiler (AOT, g, ω_0)

- aerosol size spectrum (DMPS, PCASP-100X)
- scattering coefs (various nepholometers)
- humidification factor (Scanning humidograph)

University of Washington Convair 580

Radiation

- BRDF (NASA GSFC Cloud Abs. Radiometer)
- Sunphotometry (NASA AMES AATS-14)
- Broadband LW & SW
- Skin Temperature
- Spectral Flux (SSFR ; 350-2500nm) ??

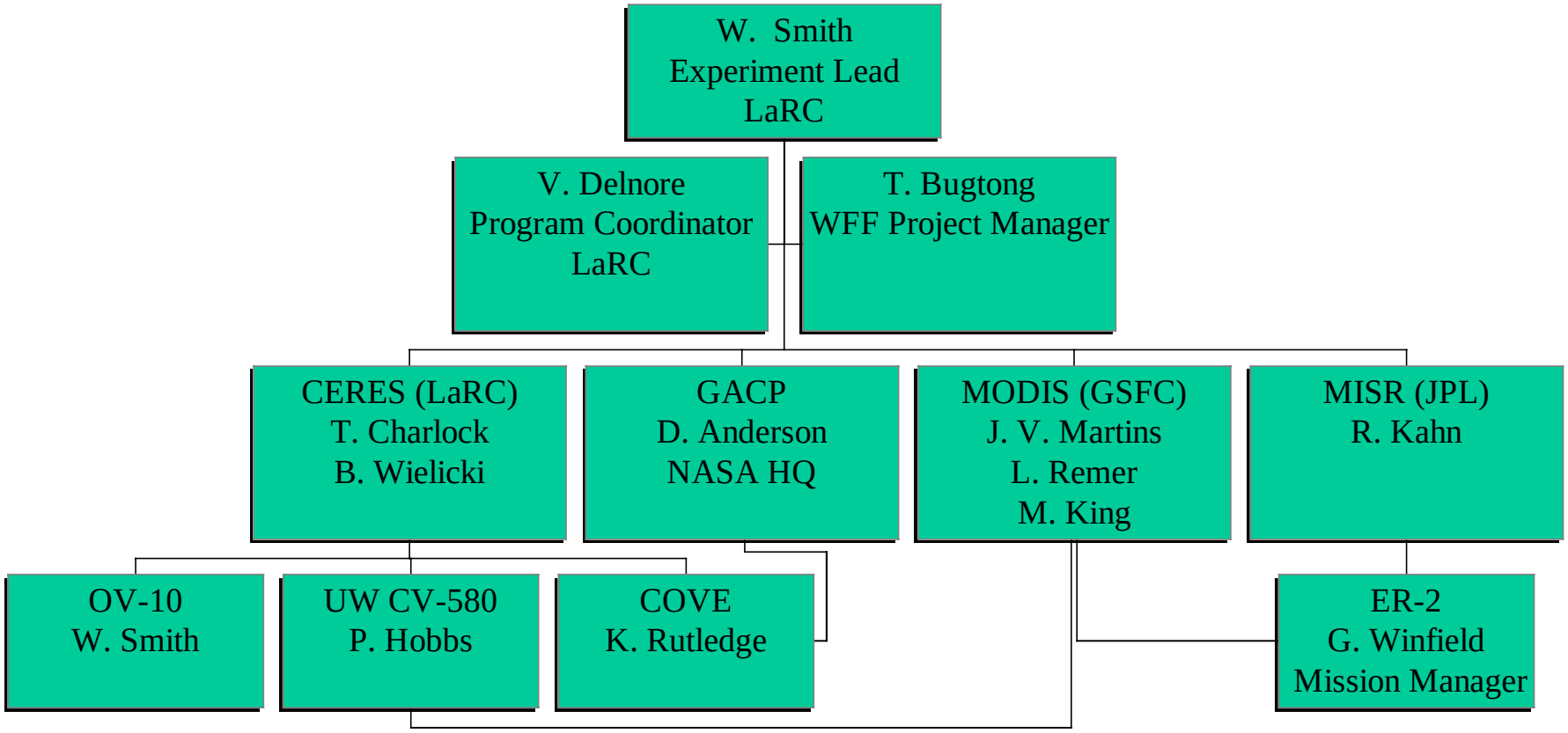
NASA Langley OV-10

Up and Downlooking Radiometers

- ASD Fieldspec (350-2200 nm) spectral flux
- Eppley broadband LW & SW fluxes

In-situ temperature, humidity, pressure

CLAMS ORGANIZATION



Other Participants

ER-2

- CPL (J. Spinhirne)

CV-580

- AATS-14 (P. Russell)
- SSFR (P. Pilewskie)
- CAR (J. Li)

OV-10

- All (V.E. Roback)

SURFACE

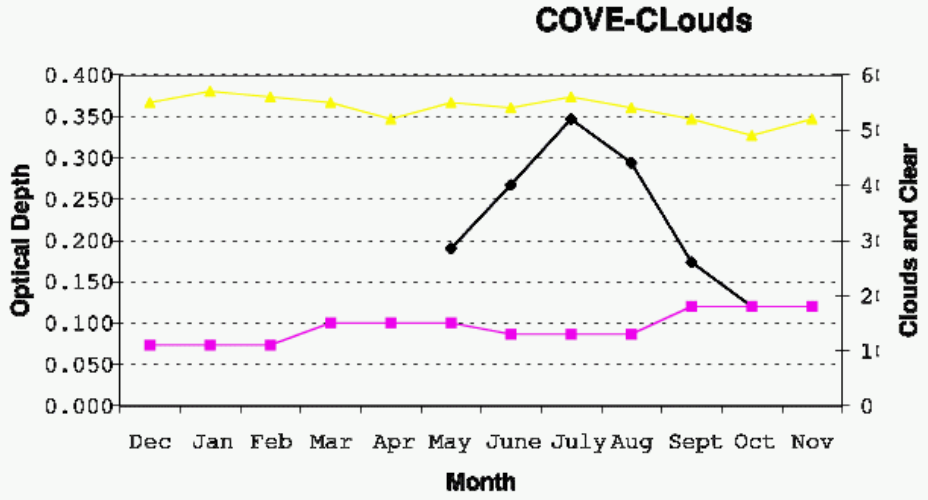
- SMART (S. Tsay)
- COVE Oceanography (G. Cota)
- MPLnet at COVE (Rutledge)

OTHER

- Satellite coordinator (L. Nguyen)
- Mission Forecaster (F. Rose)
- Web Curator (D. Rutan)

Surface-based Cloud and Aerosol Climatology

	AOT 1997	AOT 1998	AOT 1999	AOT AVG	Totally clear conditions (%)
Dec					11
Jan					11
Feb					11
Mar					15
Apr					15
May	0.14	0.27	0.16	0.190	15
June	0.3	0.26	0.24	0.267	13
July	0.29	0.36	0.39	0.347	13
Aug	0.28	0.27	0.33	0.293	13
Sept	0.11	0.27	0.14	0.173	18
Oct	0.17	0.08	0.11	0.120	18
Nov					18



GOES "quicklook" Climatology Over COVE (20x30 mile region)

Jul 12-Aug 1 (21 days)	1997	1998	1999	2000
TOTALLY CLEAR	4	4	3	3
CLEAR AM OR PM	2	2	5	2
THIN CIRRUS	2	1	3	1
P. CLOUDY <30%	1	1	-	-

CLAMS Planning Workshop
Feb. 21-22, 2001
NASA LaRC

Primary purpose to review and modify strawman operations plan

CLAMS Webpage: http://www-cave.larc.nasa.gov/cave