Report from SARB Working Group

CERES STM (Huntsville, Alabama 20-22 Sept. 2000)

Thomas P. Charlock   Fred G. Rose   David Rutan

On-line CAVE www-cave.larc.nasa.gov/cave/

- ~40 station broadband mostly up to date
- Aerosol AOD on-line for some sites

TMI (Wentz) improves SST and PW

- CERES July 1998 clear-sky radiance (Edition 1)
- Computed broadand closer to CERES
  with TMI than with ECMWF
- TMI catches fast changes in SST, less moist
- Should be useful for Clouds and MOPITT
- TMI cloud study with Lin and Hoa later

Haeffelin improving broadband measurements
for ARM Central Facility and ULDB (balloon)

Fast Kato parameterization to calculate fluxes
for distribution of cloud optical depths

- Discussion for implemenation welcome

.

AGENDA

Surface and Atmospheric Radiation Budget (SARB) and Surface-only

Joint Meeting of Two CERES Working Groups

Bevill Conference Center, Huntsville, Alabama

Thursday, September 21, 2000

8:30 am Status of CAVE Online Validation Experiment
David Rutan (AS&M)

8:40 am Update on CMDL/BRSN Stations and Validation Activities
Ellsworth Dutton (NOAA CMDL)

8:50 am Calibration and thermal offset of pyranometers
Martial Haeffelin (VPI/NASA Langley)

9:05 am Relationships between PIR parameters and PSP thermal offset
Bernardo Carnicero-Dominguez (VPI at NASA Langley)
and Martial Haeffelin.

9:20 am Validation of the CERES) Surface Radiation Budget
("surface-only") Algorithms, Update
David P. Kratz (NASA Langley) Shashi K. Gupta, Cathy Nguyen,
and Anne C. Wilber

9:35 am Retrievals of Surface LW Using R4 SSF TOA - Differences
with ES8
Anand Inamdar (Scripps)

9:45 am Comparisons of CERES Observed and Fu-Liou Modeled
Longwave and Window Radiances using MOA/ECMWF and TMI
Precipitable Water and SST
Fred G. Rose (AS&M) and Thomas P. Charlock

10:00 am Outgoing Longwave Radiation and Cloud Radiative Forcing
of the Tibetan Plateau
Wenying Su (Hampton University/NASA Langley)

10:30 am Break (then either adjourn to attend other WGs or
reconvene to discuss planned CLAMS field campaign)

12:00 pm Lunch (followed by CERES Plenary)

Chesapeake Lighthouse and Aircraft Measurements for Satellites (CLAMS)

Summer 2001 field campaign at the CERES Ocean Validation Experiment (COVE) site

CERES, MISR, MODIS-Atmospheres, GACP

www-cave.larc.nasa.gov/cave/   click "CLAMS"

Cloud free conditions (clear skies)

Aerosols
    Remote sensing & radiative impact

SW broadand & spectral, up & down,
    Concentration on sea surface

Core period 10-23 July 2001
    Seek extension July to mid-August 2001
    MISR also wants Fall 2001

OV-10 & ER-2 coming
    CV-580 very likely
        French M-20 possible

Aqua validation later (2002)
    with OV-10, other LW (spectral and broadband) H2O(z)

CLAMS summer 2001 campaign at COVE

CERES, MISR, MODIS-Atmospheres, GACP

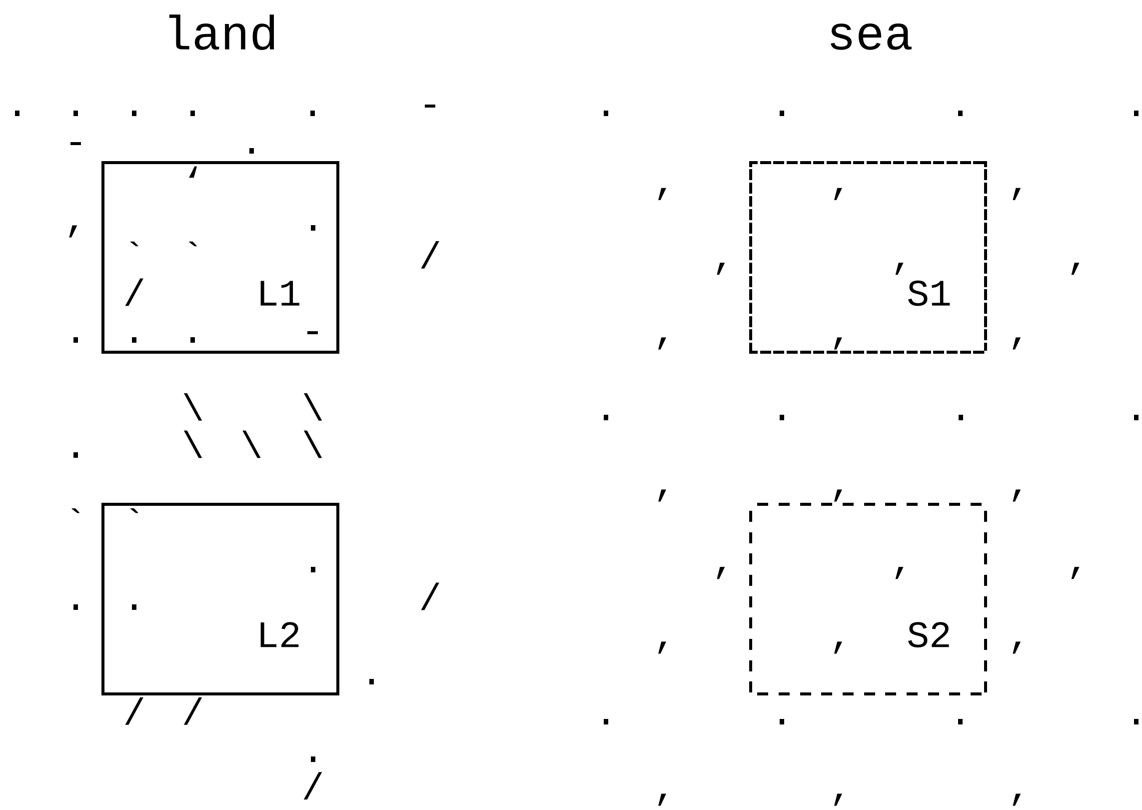
www-cave.larc.nasa.gov/cave/ click “CLAMS”

Bill Smith, Jr. will assume leadership of CLAMS, as well as the OV-10

Ken Rutledge is the site scientist for COVE

	Leaders	Representative
CERES	Wielicki/Barkstrom	Charlock
MISR	Diner/Kahn	Kahn
MODIS	Salmonson/King	Vanderlei Martins
GACP	Mischenko	Charlock

Consider observations of upwelling SW
at 4 surface sites (2 land and 2 sea)



Even if L1 and L2 are nearby, the long term time-mean upwelling radiation at L1 will differ from L2.

If S1 and S2 are nearby, the long term time-mean upwelling radiation at S1 and S2 will be equal.

Q: Why have COVE (long term sea platform) and CLAMS (short term aircraft campaign)?

A1: Point (i.e., COVE) sea observations permit time mean closure for both upwelling and net surface radiation over a large area (at least MODIS pixel, and perhaps CERES footprint).

The above is hardly ever true over land.

A2: Improved optical boundary conditions for remote sensing are needed for the most common surface (the sea) that is viewed from space.

Example: Direct radiative forcing of aerosols

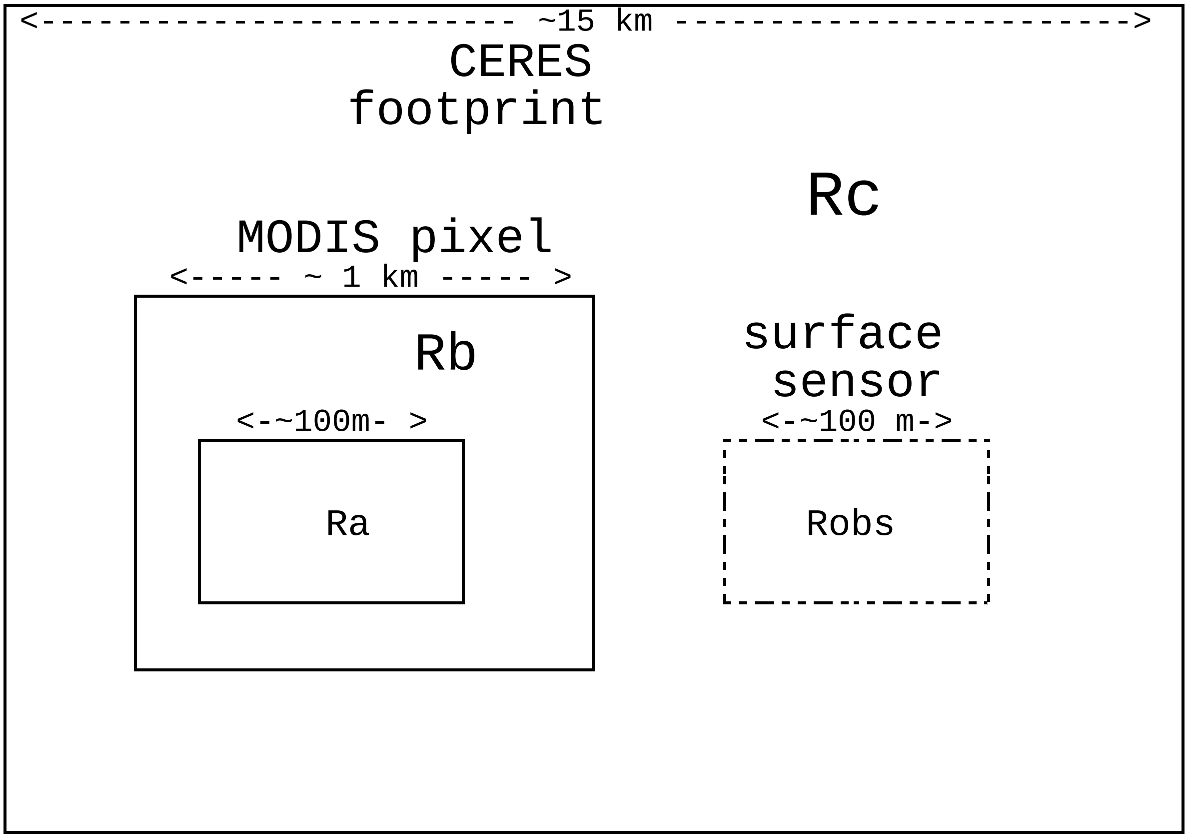
A2 surface optics	retrieve aerosols
A1 surface net flx	forcing to surface vs atmos.

Q: What's special about COVE?

A: It will permit us to measure the variation of ocean optics for a huge number of sun angles, aerosol and cloud conditions, wind speed, and sea state.

Q: What will the CLAMS campaign do for the long-term COVE?

A: CLAMS will determine how platform obstructions and local variations in sea optics must be accounted for in the interpretation of COVE data to the broader ocean.



FOVs in the above figure are not to scale.

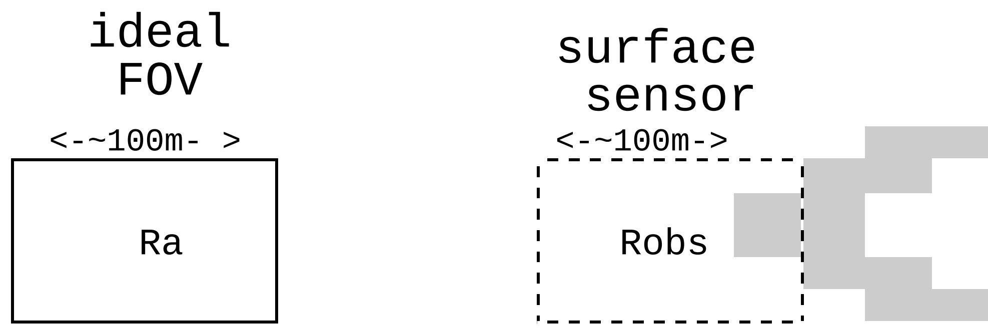
Robs (~100 m) of observed FOV at surface

Ra (~100 m) of ideal FOV at surface

Rb (~1 km) of MODIS FOV projected to surface

Rc (~15 km) of CERES FOV projected to surface

Problem: Desired FOV at surface obstructed by shadows of COVE tower legs, etc.



Robs (~100 m) of observed FOV at surface

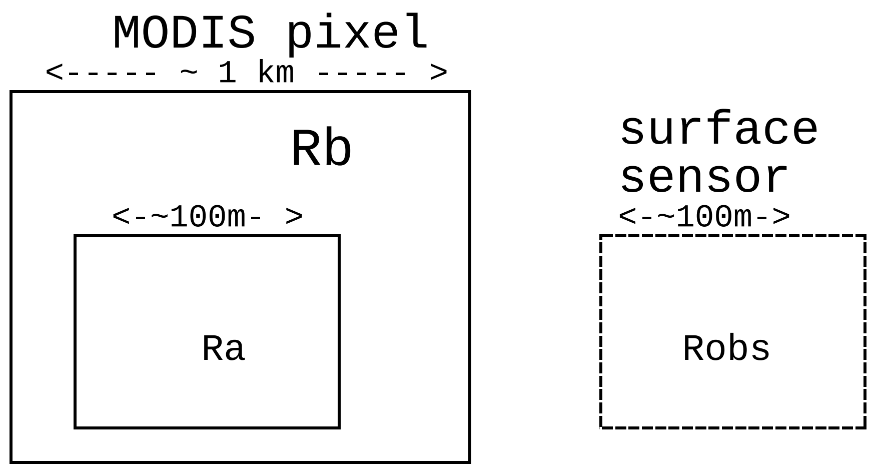
Ra (~100 m) of ideal FOV at surface

Solution: Fly OV-10 C-FAR at low altitude to observe adjacent, ideal FOV. Make appropriate adjustments to sensor record.

Robs (~100 m)   Ra (~100 m)

Problem: Does the sea bottom at COVE platform (~100m) represent an entire MODIS pixel?

Problem: Are there variations in sea turbidity on scales smaller than a MODIS pixel?

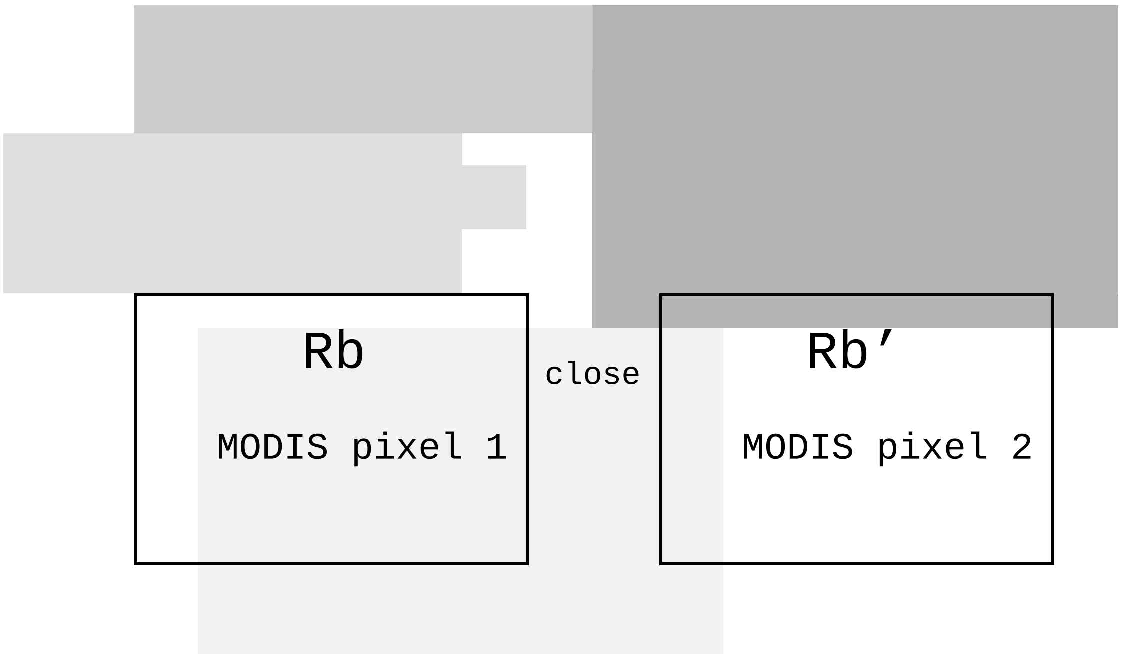


The FOVs in the above figure are not to scale.

Solution: Low altitude OV-10 aircraft observes the several Ra (~100m) that comprise the MODIS pixel Rb (~1 km).

Ra (~100m) Rb (~1 km)

Problem: Different TOA radiances from nearby MODIS pixels 1 and 2. How much due to sea optics versus aerosol optics?



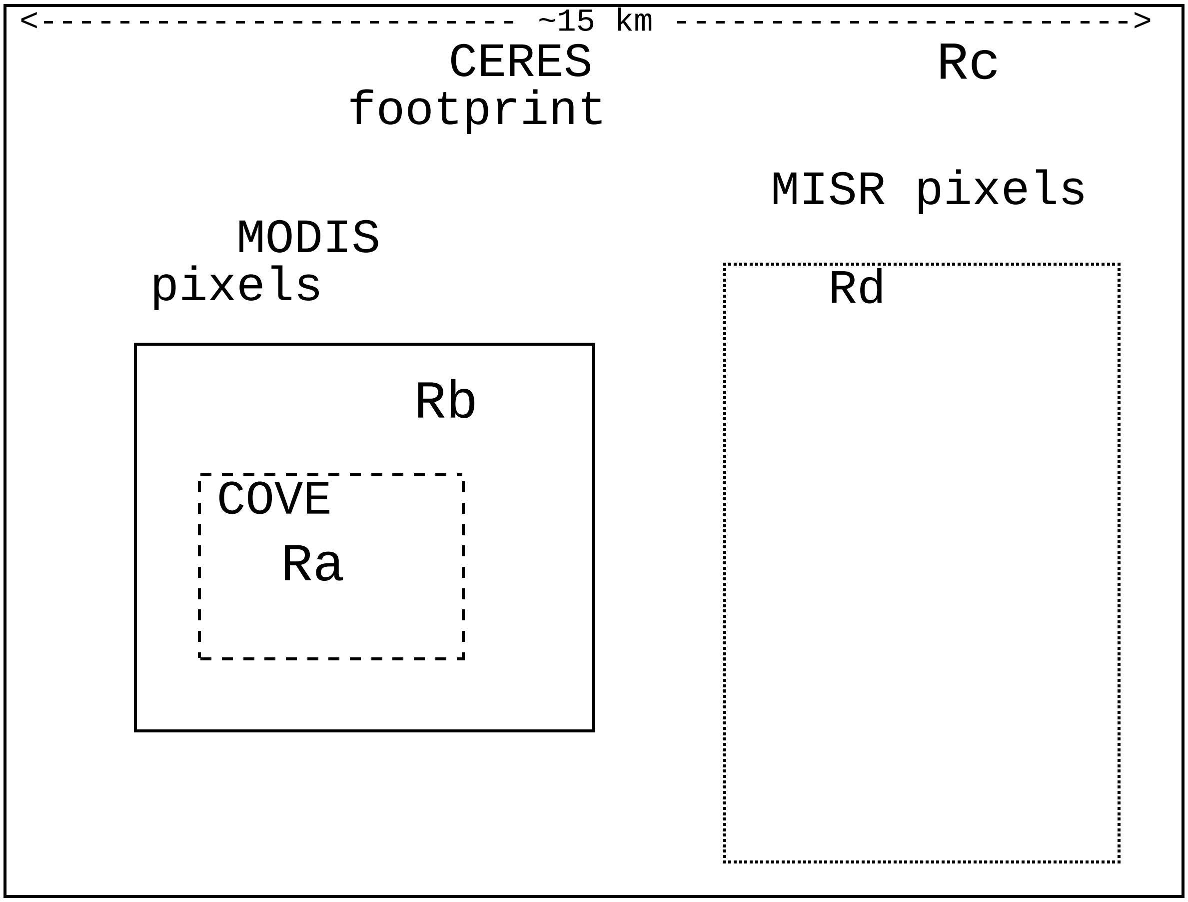
Solution A: OV-10 observes sea surface Rb and Rb’. Combine OV-10 and MODIS to estimate the aerosol difference in pixels 1 and pixel 2.

Solution B: See if the aerosol difference in pixels 1 and 2 (solution A) is consistent with the ER-2 Cloud Physics Lidar (CPL) aerosol, nearby COVE Angstrom coefficient.

Solution C: Same as B, but evaluate aerosol differences in pixels 1 and 2 with ER-2 AirMISR.

Rb(~1 km) Rb’(~1 km)

Problem: How to “scale up” CLAMS for best value of atmospheric absorption?

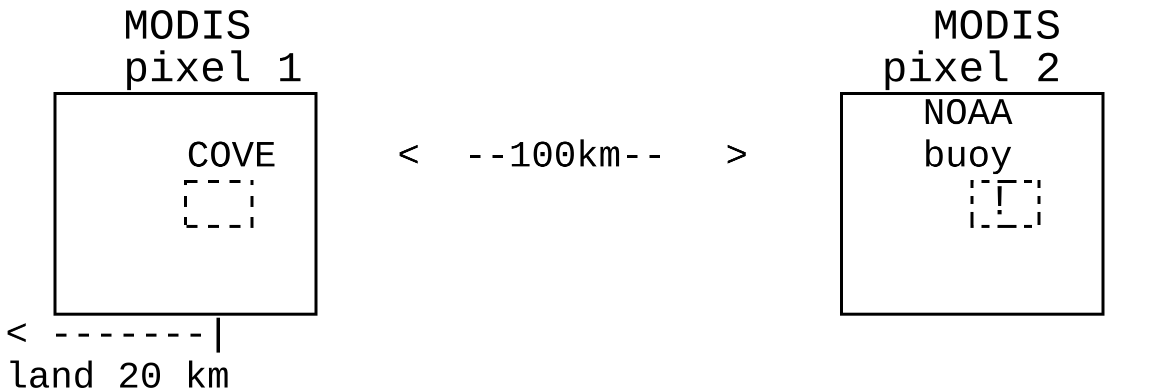


FOVs in the above figure are not to scale.

Surface fluxes: Scale up from COVE in situ (Ra) to MODIS (Rb) and up to CERES (Rc)

TOA fluxes: Check for consistency of observed MISR (spectral, multi-directional) with a model and then on to CERES ADM.

Problem: How well does surface optics within 1 km of COVE represent the sea in general?



Solution A: Nonsimultaneous (unfortunately) OV-10 measurements of both pixels, interpreted with CV-580 (CAR BRDF) and ER-2 CPL (aerosol) and other observations.

Rb (COVE~1 km) Rb (bouy~1 km)

ATTACHED Figure 1

Jose Vanderlei Martin has put together this summary of cloud information.

Pink Line - Totally Clear Conditions (right y-axis), from Hahn-Warren-London surface-based cloud climatology (1952-81).

Blue Line - AERONET Monthly mean aerosol optical thicknesses (AOT).

Yellow Line - Monthly mean cloud fraction, from Hahn-Warren-London surface-based cloud climatology (1952-81).

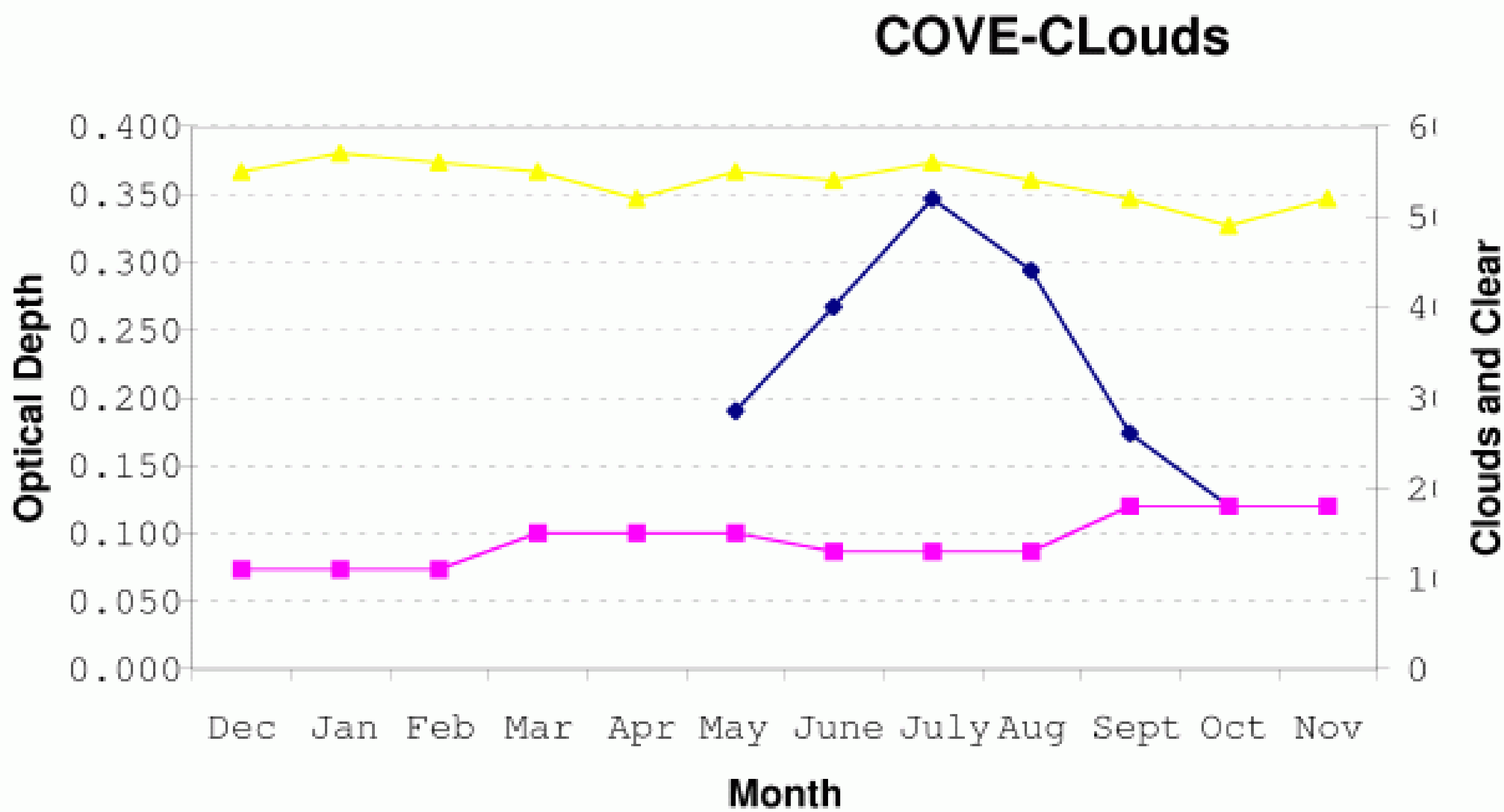
ATTACHED Figure 2

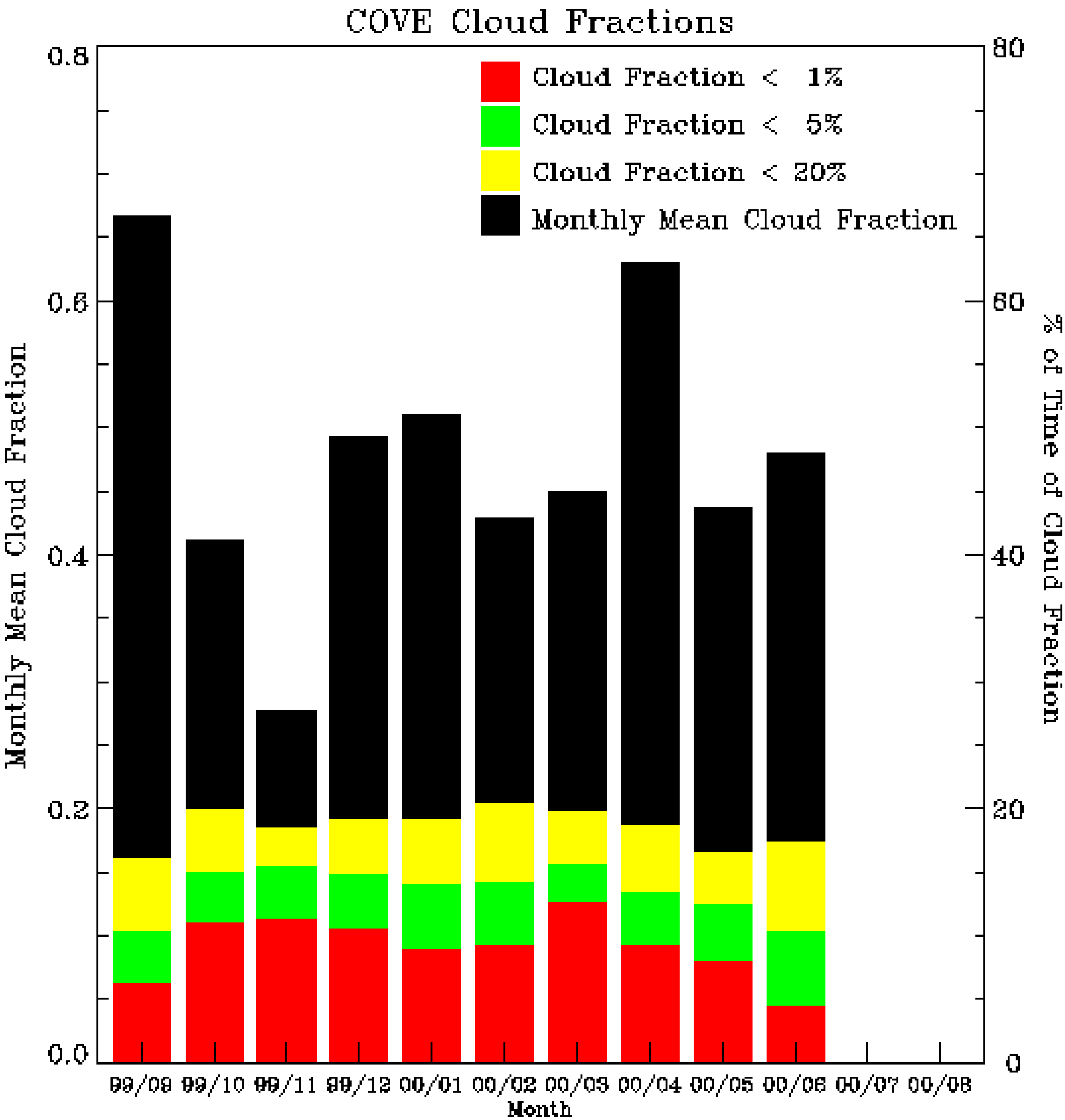
This graph shows cloud fractions based on the Long/Ackerman clear sky detection algorithm applied to the COVE uplooking SW radiometery. The red, green, & yellow colors give temporal cloud fractions and are appropriate to the right y-axis. The Black shows the monthly mean cloud fraction appropriate to the left y-axis.

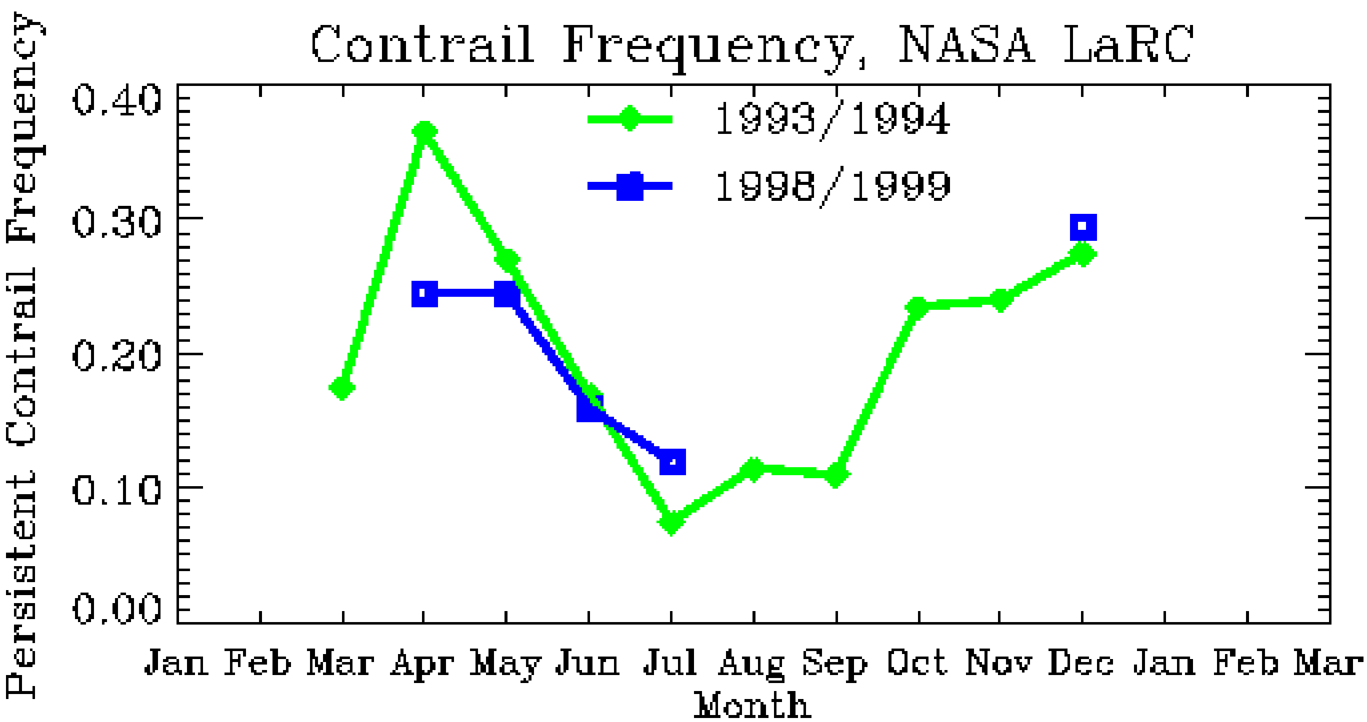
ATTACHED Figure 3

Pat Minnis supplies this picture of the frequency of contrails over the Hampton Roads area for 1993 & 1998. The data is based on observations from Langley Air Force Base, Hampton, VA.

	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**




COVE Cloud Fractions
Cloud Fraction < 1%
Cloud Fraction < 5%
Cloud Fraction < 20%
Monthly Mean Cloud Fraction
Monthly Mean Cloud Fraction
% of Time of Cloud Fraction
0.0
0.2
0.4
0.6
0.8
0
20
40
60
80
99/09 99/10 99/11 99/12 00/01 00/02 00/03 00/04 00/05 00/06 00/07 00/08
Month


Contrail Frequency, NASA LaRC
Persistent Contrail Frequency
0.40
0.30
0.20
0.10
0.00
1993/1994
1998/1999
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar
Month