Status and Operations at the Chesapeake Light (CLH) BSRN Station

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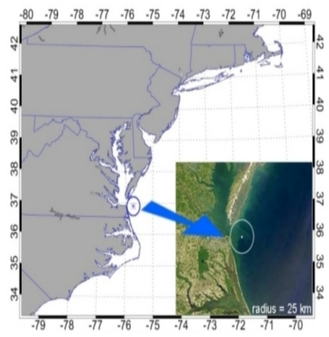
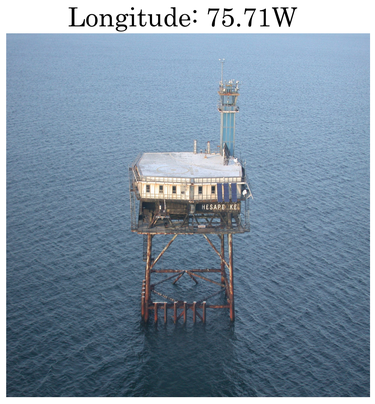
Clouds and the Earth's Radiant Energy System (CERES) Ocean Validation Experiment(COVE) at CLH website:

http://cove.larc.nasa.gov/



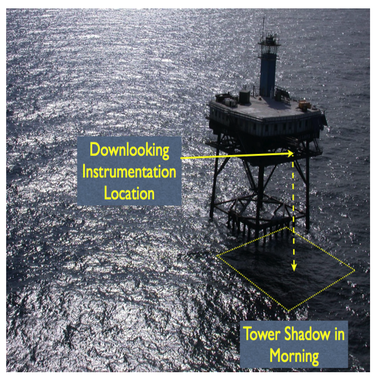
Latitude: 36.90N
Longitude: 75.71W



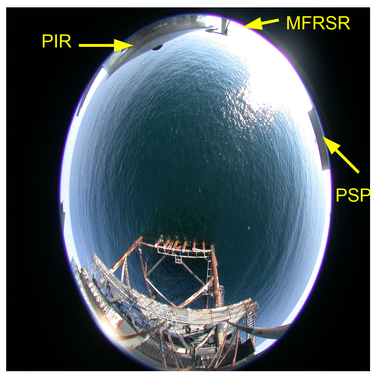
COVE-CLH is located approximately 25 km off the coast of Virginia Beach, Virginia.

Uplooking instruments on the tower top.
Elevation: ~36 meters.

Downlooking instruments: MFRSR, Eppley PIR and KippZonen PSP.
Elevation: ~21 meters.



Tower shading effect in the upwelling irradiance field of view.

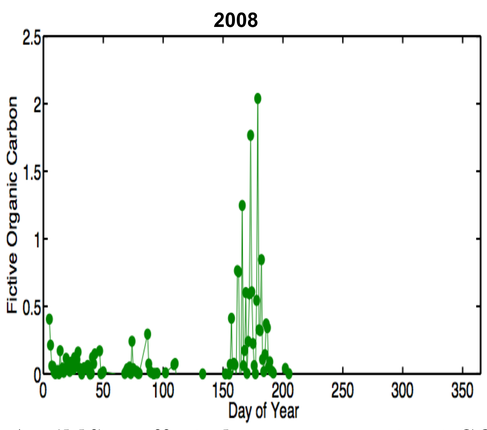


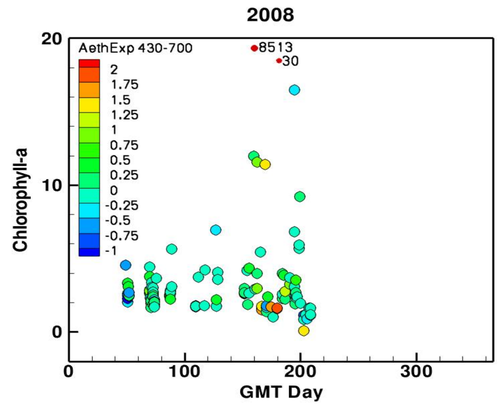
Fish-eyed lens view of downlooking instruments. Note the tower in the field of view of all 3 downlooking instruments (PIR, PSP and MFRSR).

Introduction:

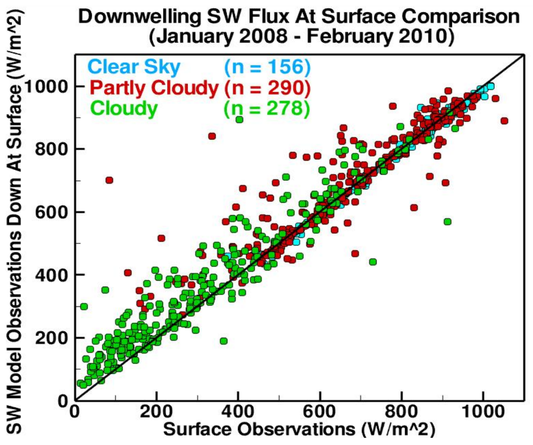
- COVE was established in 1999 as a surface validation site for CERES and other satellites.
- First data collection for BSRN began May 1, 2000 – Present.
- A table of current instruments and measurements is provided (right).
- Photos of COVE-CLH's location, instrumentation and the tower effect issue we have for our downlooking instruments are presented (left).
- Data analysis is shown for select measurements collected within the last 5 years.

Select Data Analysis at COVE-CLH:

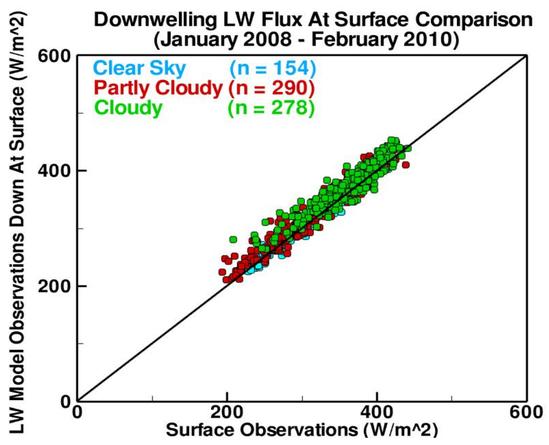




A wildfire affected measurements at COVE-CLH in June-July 2008. The above plots show 2 different measurements affected by the smoke from the wildfire. **LEFT:** Our 7 wavelength Aethalometer measures Black Carbon(BC) and is tuned for conventional pollution. Organic Carbon (OC) aerosols cause smoke to have greater absorption in the UV than conventional pollution. Therefore, Fictive OC = BC (370 nm) - BC(700 nm). Here, Fictive OC clearly indicates fires are present and makes a nice tracer. **RIGHT:** Chla-a (Chlorophyll-a) is measured with our Seaprism Cimel, part of AErosol RObotic NETwork (AERONET)-Ocean Color. The smoke caused anomalously high readings to be measured and may confound satellite retrievals of Chla-a as well.

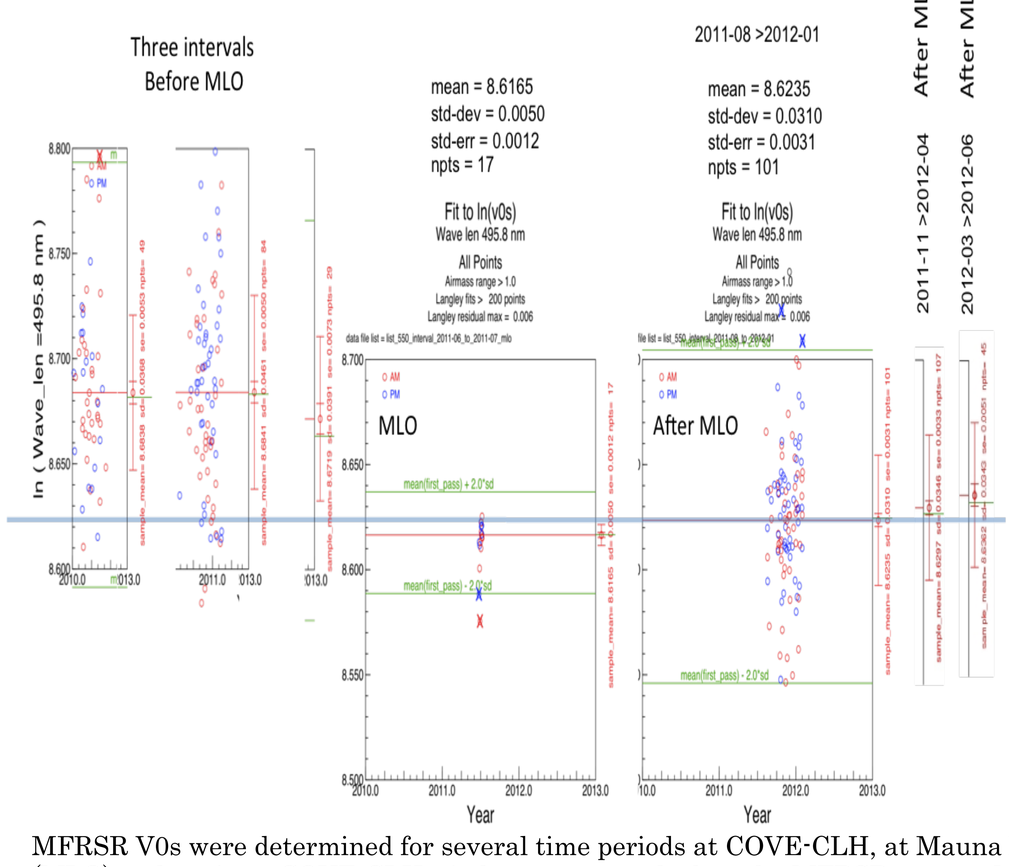


Sky Condition	Y = mx + b	R^2	Mean Bias	Standard Deviation
Clear	Y = 0.995x + 0.845	0.991	-3.1	15.9
Partly Cloudy	Y = 0.802x + 158.506	0.837	23.1	82.6
Cloudy	Y = 0.898x + 77.259	0.885	45.3	73.2



Sky Condition	Y = mx + b	R^2	Mean Bias	Standard Deviation
Clear	Y = 1.015x - 1.915	0.974	2.6	9.5
Partly Cloudy	Y = 0.975x + 19.944	0.951	11.8	13.5
Cloudy	Y = 0.859x + 63.565	0.876	12.8	15.6

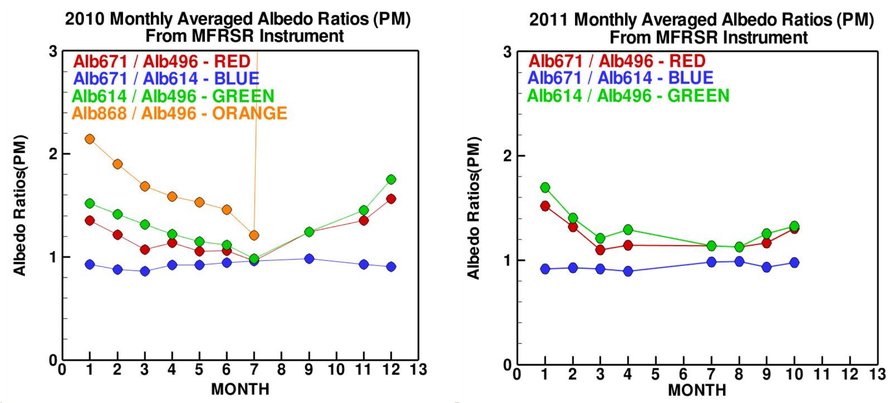
Statistics of coincident surface observations at COVE-CLH and CERES Cloud and Radiation Swath (CRS) Model-B retrievals from the Terra Satellite about the X=Y lines for total shortwave and longwave surface radiation, separated by sky condition. Model B was developed at NASA Langley Research Center and works under all sky conditions. Both the SW and LW comparisons have very good correlation. The distribution of statistics are best under clear skies.



MFRSR V0s were determined for several time periods at COVE-CLH, at Mauna Loa Observatory (MLO) and again at COVE-CLH. A change occurred when the MFRSR went to MLO. In place V0 determination at COVE-CLH takes longer (3-6 months) than MLO (10 days) but results show low standard errors can be obtained at COVE-CLH with a large number of V0s.

Measurement	Atmosphere (A) OR Ocean (O)	Units	Instrument	Wavelength (nm)	COVE-CLH Database?
Direct Shortwave Irradiance	A	W/m^2	Kipp and Zonen Pyrheliometer (CH1)	200-4000	Yes
Diffuse Shortwave Irradiance	A	W/m^2	Kipp and Zonen Pyranometer (PSP)	200-4000	Yes
Global Shortwave Irradiance	A and O	W/m^2	Kipp and Zonen Pyranometer (PSP)	200-4000	Yes
Longwave Irradiance	A and O	W/m^2	Eppley Pyrgeometer (PIR)	5000-50000	Yes
PAR Irradiance	A	mV	Li-Cor PAR	400-700	Yes
Global and Diffuse Narrowband Irradiance	A and O	W/m^2	Yankee Multi-Filter Rotating Shadowband Radiometer (MFRSR)	415, 496, 614, 671, 868 and 939	Yes
Direct and Diffuse Narrowband Radiance	A		AERONET sunphotometer	412, 443, 490, 532, 551, 667, 870 and 1020	No (AERONET Database)
Normalized Water Leaving Radiance	O	mW/ (cm2 sr um)	AERONET sunphotometer	413, 441, 489, 530, 551, 668, 869 and 1020	No (AERONET Database)
Aerosol and Cloud Vertical Structure	A		Micro-Pulse Lidar (MPL)	523	No (MPL Network)
Total Column Precipitable Water Vapor	A	cm	Global Positioning System (GPS) Meteorology		No (NOAA's GPS-MET Network)
Black Carbon	A	µg/m^3	Magee Scientific Aethalometer	370, 430, 470, 520, 565, 700 and 950	Yes
Light Scattering Extinction Coefficient	A	1/m	Radiance Research Nephelometer	530	Yes
Sky Temperature	A	Kelvin	Heitronics Infrared Thermometer	9600-11500	Yes
Sea Surface Temperature	O	Kelvin	Heitronics Infrared Thermometer	9600-11500	Yes
Air Temperature	A	°C	Rotronic Temperature Sensor		Yes
Relative Humidity	A	Percent	Rotronic Relative Humidity Sensor		Yes
Barometric Pressure	A	millibar	Vaisala Pressure Sensor		Yes
Wind Speed and Wind Direction	A	m/s and 0-360°	Young Wind Speed and Direction Sensor		Yes
Rain Sensor	A		SKYE rain sensor		Yes

Current measurement collection at COVE-CLH. This table also displays type of measurement (atmospheric or ocean), units, instrument used for collection, wavelength and what database or network one can find the data. Finally, most of these instruments have a backup collecting at the same time in case one fails.



MFRSR Albedo plots for the afternoon for years 2010-2011. Afternoon data was used due to the tower shading effect we have in the morning at COVE-CLH. Albedo868/Albedo496 show the highest ratio. 868nm channel malfunction after July 2011 explains why there isn't any data. Albedo614/Albedo496 is higher than the other ratios for both years excluding when the 868nm channel was working.

Moving Forward:

- CLH is in the process of being transferred to the U.S. Department of Energy (DOE) from the U.S. Coast Guard. How this will affect BSRN measurements, other measurements and our presence at CLH is indeterminate at this time.

References:

- We thank AERONET and Brent Holben for their effort in establishing and maintaining their instrument at COVE-CLH.
- The Downwelling SW and LW data were obtained from the NASA Langley Research Center Atmospheric Science Data Center.