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

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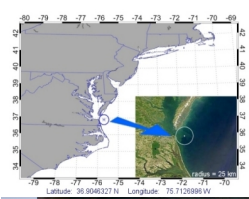
Clouds and the Earth's Radiant Energy System (CERES) Ocean Validation Experiment (COVE) at CLH website: http://cove.larc.nasa.gov

Introduction:

- BSRN data has been collected at CLH for 15 years and continues today.
- Pictures of COVE-CLH, COVE-CLH's power system and a new calibration site are shown.
- A table of current measurements and instrumentation is displayed.
- Data Analysis of satellite derived versus surface observed measurements are presented.
- The Department of Energy (D.O.E.) gained ownership of CLH on October 1, 2012 for wind monitoring purposes.



- *COVE-CLH is approximately 25 km off the coast of Southeast Virginia.*
- *Latitude: 36.90 N, Longitude: 75.71 W.*
- *Downwelling instrument elevation: Approximately 37 meters.*
- *Upwelling instrument elevation: Approximately 21 meters.*
- *Note the upwelling instrumentation is installed at the end of an 8 meter extension from the structure on the west side.*

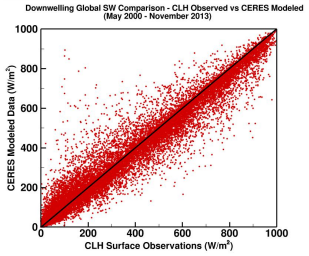
Power at COVE-CLH is self sufficient (off the grid). Some details (top to bottom) – solar panels (~4.5 Kw of solar panels) around COVE-CLH, a 7.5kW diesel generator, and a bank of six 900 amp hour, 12 volt batteries wired in parallel.

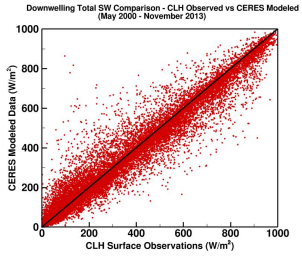
Calibration site at NASA Langley. Having a land location calibration site allows for greater opportunities to collect data on clear sky days. Compare to the multi-day lead time and logistics of a COVE-CLH trip, which requires a helicopter ride and predicting the weather a few days in advance. Pyranometers and pyrheliometers with their associated Campbell Scientific dataloggers are calibrated here as a set and then taken to COVE-CLH. This set is directly traceable to the World Radiation Group in Davos, Switzerland.

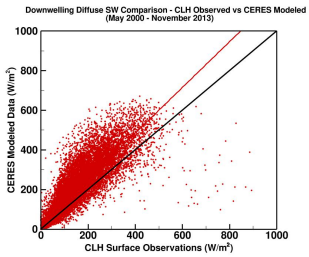
Locations where newly calibrated instruments are installed at COVE-CLH. Global pyranometer position (left). Diffuse pyranometer and direct pyrheliometer on solar tracker (right).

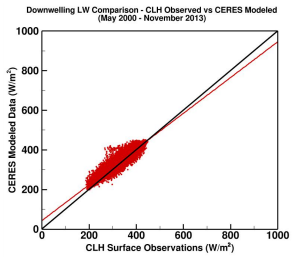
List of Measurements

Measurement	Instrument (Model)	Units	Wavelength in nm	Remarks
Direct Shortwave Irradiance	Kipp and Zonen Pyrheliometer (CH1)	W/m^2	200-4000	Since May 2000
Diffuse Shortwave Irradiance	Kipp and Zonen Pyranometer (CM31)	W/m^2	200-4000	Since May 2000
Global Shortwave Irradiance	Kipp and Zonen Pyranometer (CM22)	W/m^2	200-4000	Since May 2000
Longwave Irradiance	Eppley Pyrgeometer (PIR)	W/m^2	5000-50000	Since May 2000
Global and Diffuse Narrowband Irradiance	Yankee Environmental Systems MFRSR (MFR-7)		415, 496, 614, 671, 671, 868 and 939	Since 2000. Aerosol Optical Depth derived from MFRSR
Direct and Diffuse Narrowband Radiance	Cimel Electronique SeaPRISM Sunphotometer (CE 318N SP9 Ver. 5)		412, 443, 490, 532, 551, 667, 870 and 1020	Part of AERONET Network since October 1999
Normalized Water Leaving Radiance	Cimel Electronique SeaPRISM Sunphotometer (CE 318N SP9 Ver.5)	mW/cm^2 sr µm	413, 441, 489, 530, 551, 668, 869 and 1020	Part of AERONET-OC since November 2005
Aerosol and Cloud Vertical Structure	Science and Engineering Services Micro-Pulse Lidar (Type 3)		523	Part of MPL-NET since May 2004
Integrated Precipitable Water Vapor	Trimble Global Navigation Satellite System (NetR9)	cm		Part of NOAA's GPS-MET network since July 2001
Black Carbon	Magee Scientific Aethalometer (AE-42-7-HS-AW)	µg/m^3	370, 430, 470, 520, 565, 700 and 950	Since March 2006
Light Scattering Extinction Coefficient	Radiance Research Nephelometer (M903)	1/m	530	Since March 2006
Sky Temperature	Heitronics Infrared Thermometer (KT 19.85)	Kelvin	9600-11500	Since December 2005
Sea Surface Temperature	Heitronics Infrared Thermometer (KT 19.85)	Kelvin	9600-11500	Since 2001
Air Temperature	Rotronic (Hygroclip-S3)	°C		Since May 2000
Relative Humidity	Rotronic (Hygroclip-S3)	Percent		Since May 2000
Barometric Pressure	Vaisala (PTB101B)	mb		Since May 2000
Wind Speed and Wind Direction	R. M. Young (05103)	m/s and 0-360°		Since May 2000
Photosynthetically Active Radiation (PAR)	LI-COR (LI-190SB)	mV	400-700	Since 2001. Calibrations are inconsistent
Surface Wetness Sensor (Rain Sensor)	Skye (SKLW 1900)	mV		Since October 2006
Ultrasonic Echolocation Calls	Anabat			Since April 2012









Downwelling Parameter Comparison	n	Y=mx+b	R^2	Mean Bias	Standard Deviation
SW-Global	22883	Y = 0.931x + 13.975	0.951	7.057	61.825
SW-Total	21730	Y = 0.938x + 14.094	0.952	4.415	60.928
SW-Diffuse	21802	Y = 1.154x + 23.137	0.791	-40.922	65.374
LW	37507	Y = 0.903x + 43.638	0.908	-10.810	16.938

Statistics of coincident surface observations at COVE-CLH and satellite derived CERES SYN1deg-3hour Edition 3A, about the X=Y line (black) for downwelling SW and LW radiation. CERES SYN1deg-3hour Edition 3A was developed by the CERES Science team. The linear fit line is in red. Correlations are good and mean bias is small for all except downwelling SW-Diffuse. Downwelling LW has the best overall statistics with datapoints tightly clustered on the X=Y line.

CLH's Future:

- CLH's future with the D.O.E. is constantly changing. The latest news is the D.O.E. is investigating an "Option B" for CLH (with full renovation for CLH being "Option A"). Option B is using the tower "as is" which includes a data campaign for at least two full calendar years. The primary instrument would be a "WINDCUBE" LiDAR system in place of a tall meteorology tower. Some other sensors may also be included. We have a good relationship with the D.O.E. and our research will not be affected during this time.

References:

- We thank the D.O.E. for allowing continued use of CLH for atmospheric and oceanic research.
- We thank NASA Langley's Chemistry and Physics Atmospheric Boundary Layer Experiment (CAPABLE) for allowing us to establish a land calibration site for our instrumentation. http://capable.larc.nasa.gov/
- Surface versus satellite data supplied by the CERES/ARM (Atmospheric Radiation Measurement) Validation site at http://www-cave.larc.nasa.gov