

15-Year Climatology of BSRN Measurements at Chesapeake Light Station (CLH)



- 25km East of Virginia Beach, Virginia, USA
- Water Depth is shallow: 10m
- Coordinates: 36.90 N, 75.71 W

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Introduction:

- Why was CLH established?
- CLH instrumentation used in Climatology's
- Climatology's of Downwell LW, Downwell SW Global
- Climatology's of Upwell SW and LW
- Tower effect Issue for Upwelling Instruments
- Summary and Acknowledgements

Why was CLH established?

- Validating measurements from CERES and other satellites was the primary motivation to establish CLH (also known as CERES Ocean Validation Experiment (COVE)).
- CLH has 2 advantages when viewed from a satellite

CLH is in a dark, more homogeneous background



CLH does not have an island effect

Island Effect

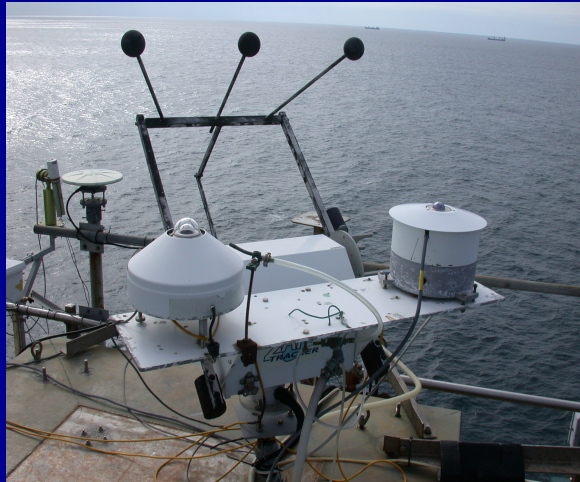


Guadalupe, Mexico:
1.3 km maximum altitude
25 km long
260 km west of Baja California

MISR image; June 11, 2000
earthobservatory.nasa.gov

Downwelling Instrumentation

Height Above Sea Level: ~37m

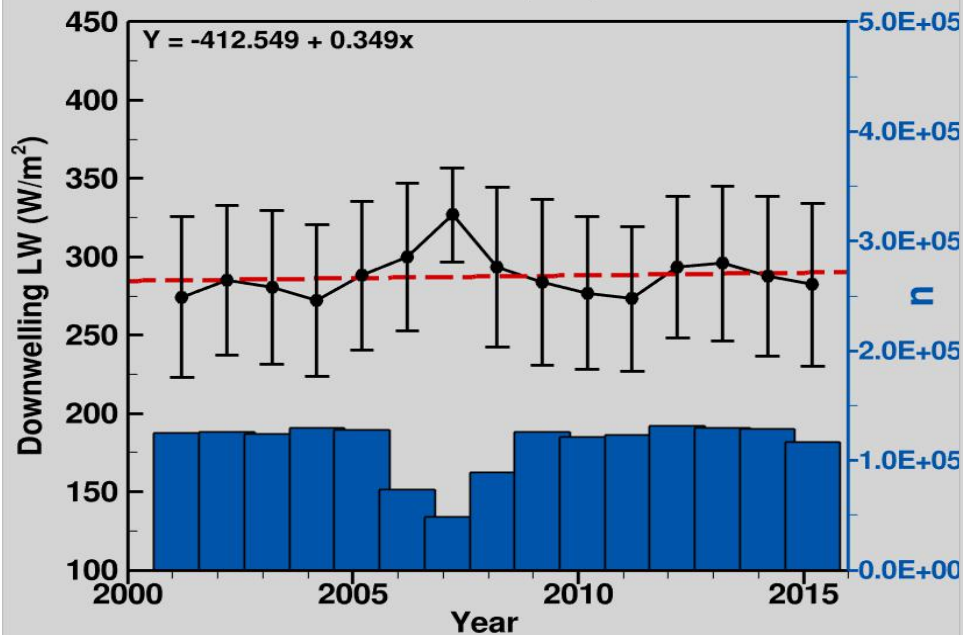


Upwelling Instrumentation

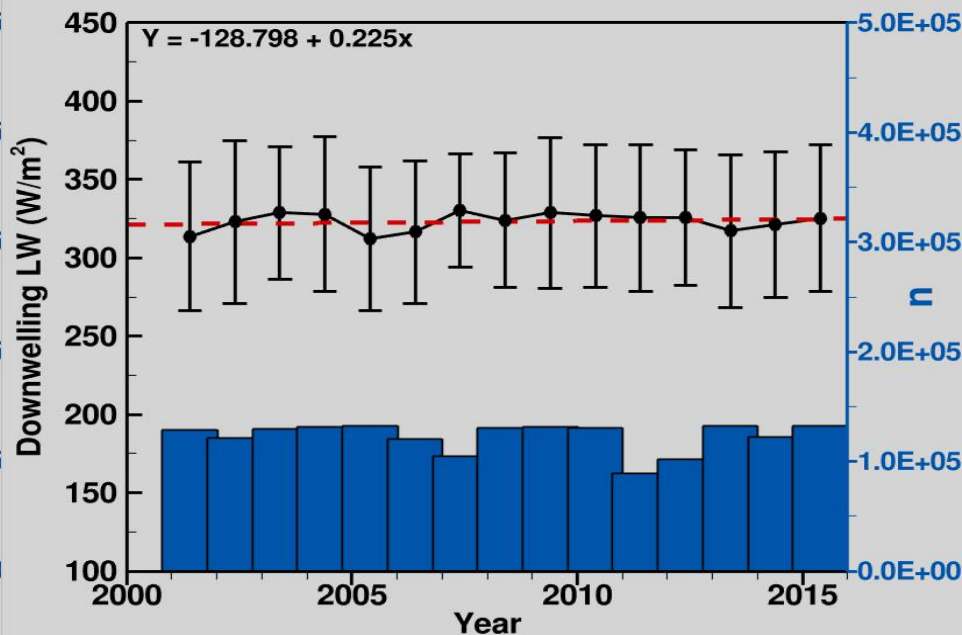
Height Above Sea Level: ~21m



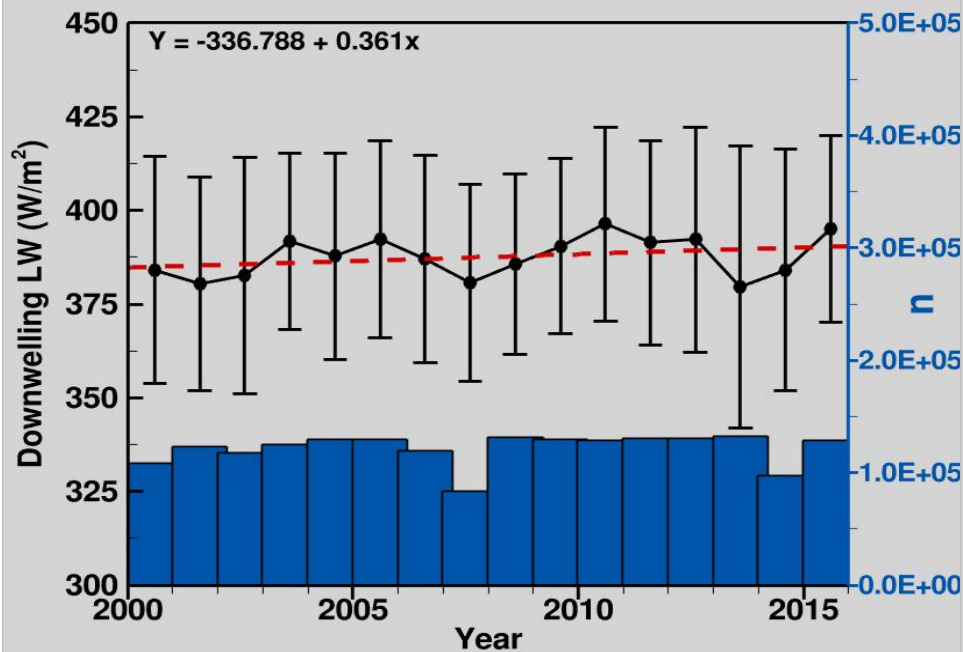
2001-2015 Winter (DJF) Means



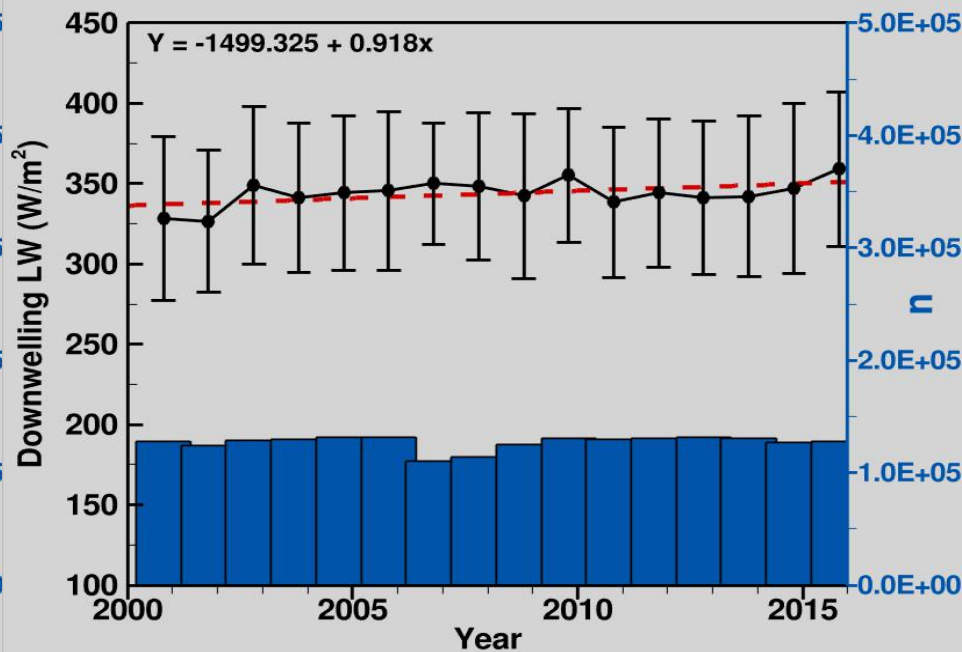
2001-2015 Spring (MAM) Means



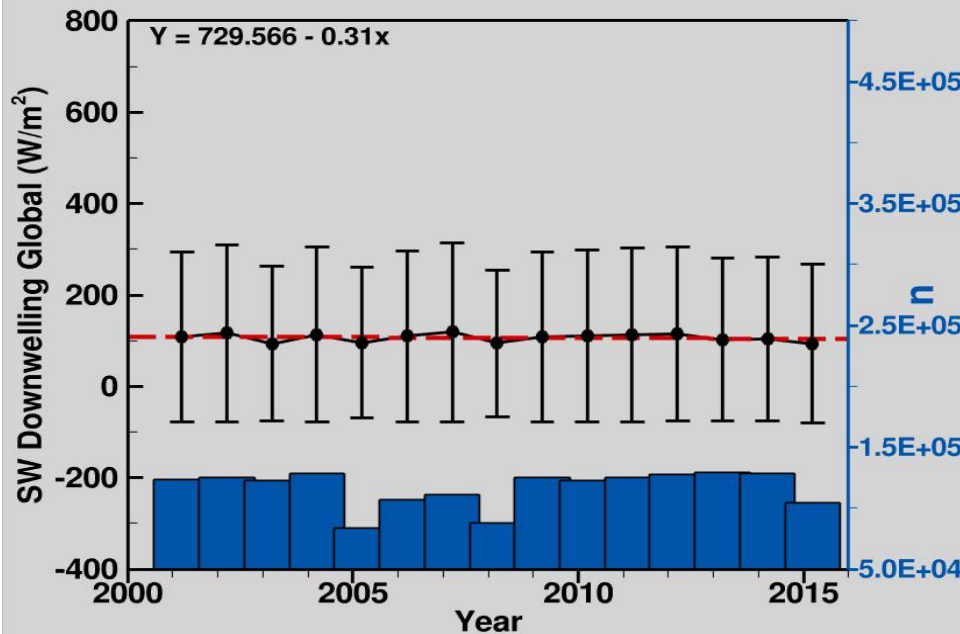
2000-2015 Summer (JJA) Means



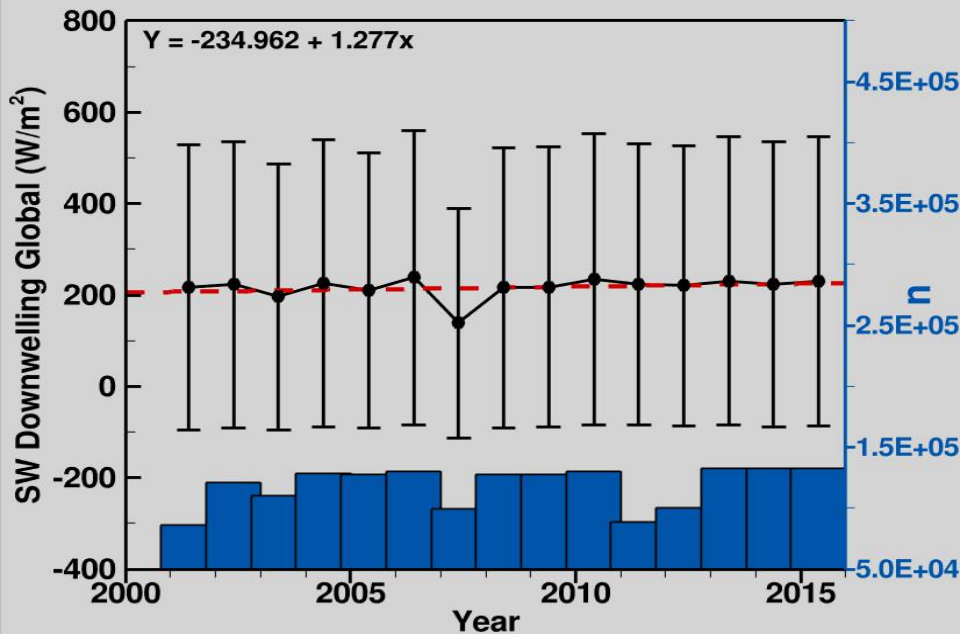
2000-2015 Autumn (SON) Means



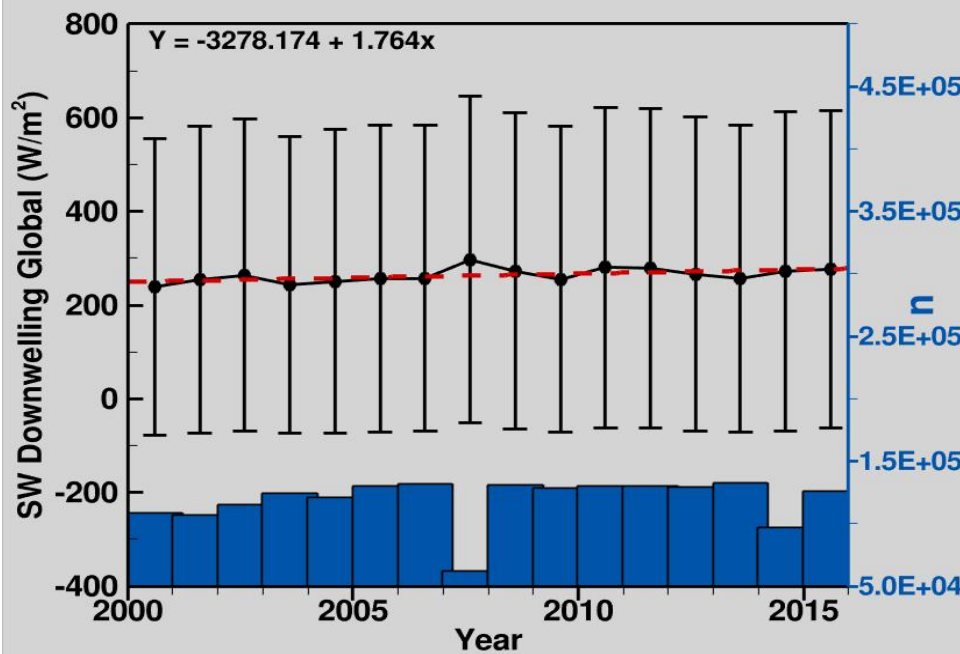
2001-2015 Winter (DJF) Means



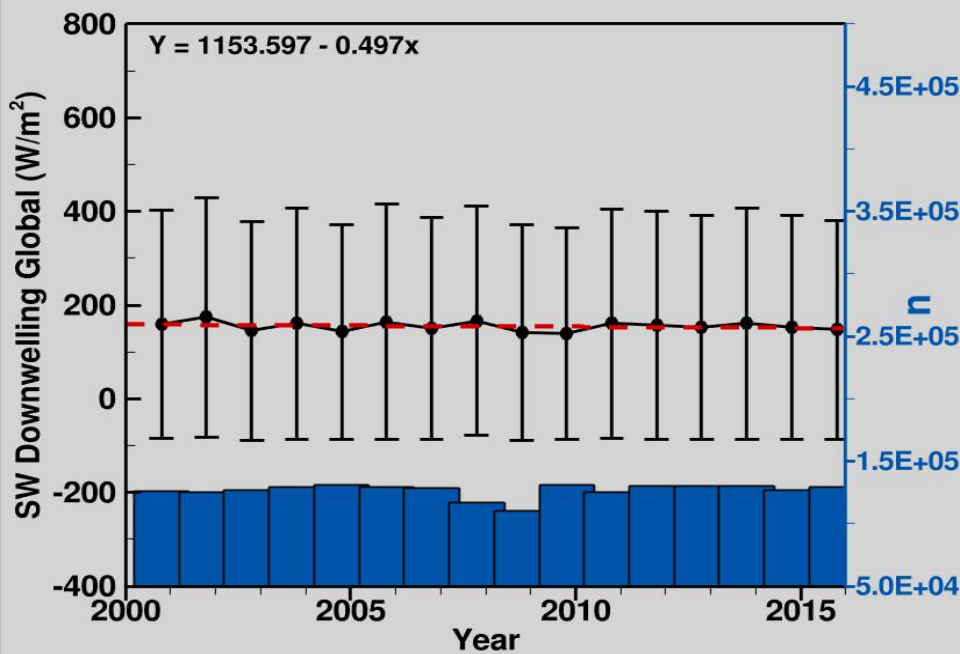
2001-2015 Spring (MAM) Means



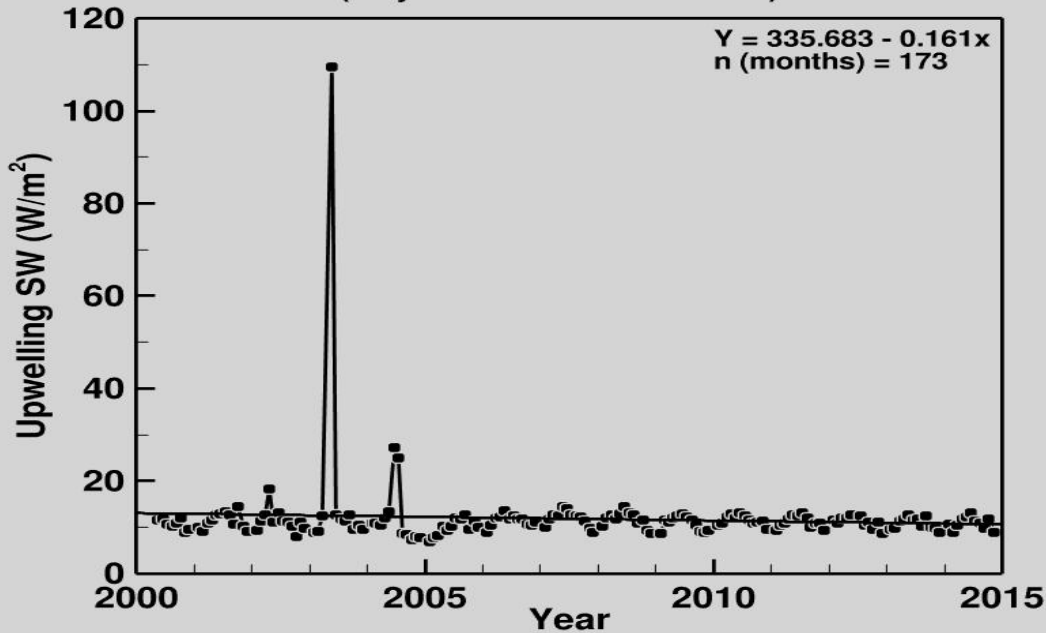
2000-2015 Summer (JJA) Means



2000-2015 Autumn (SON) Means



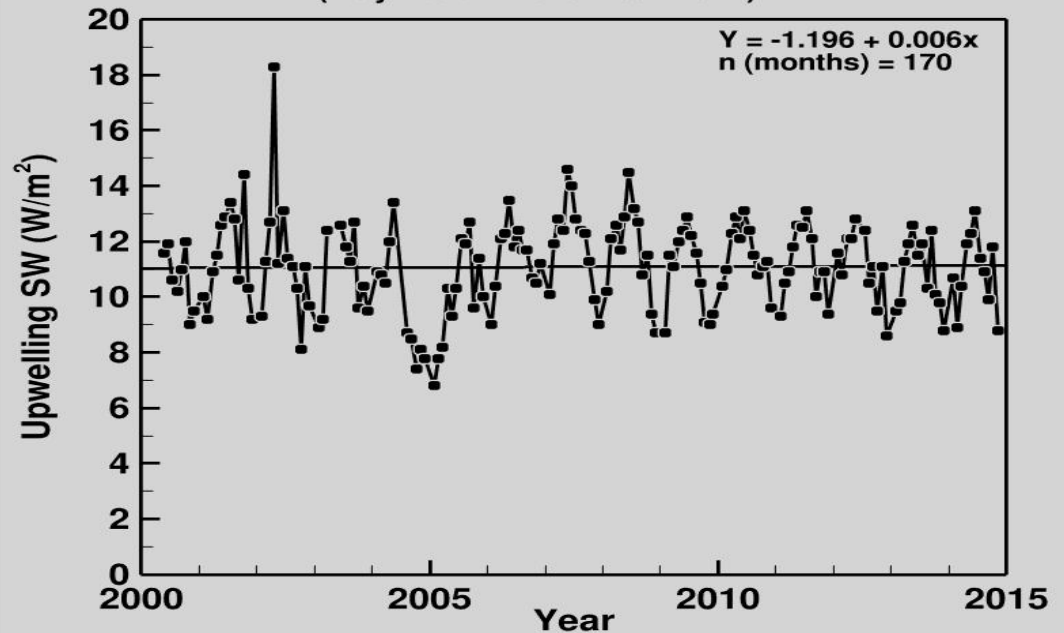
Upwelling SW Climatology of Monthly Means
(May 2000 - November 2014)



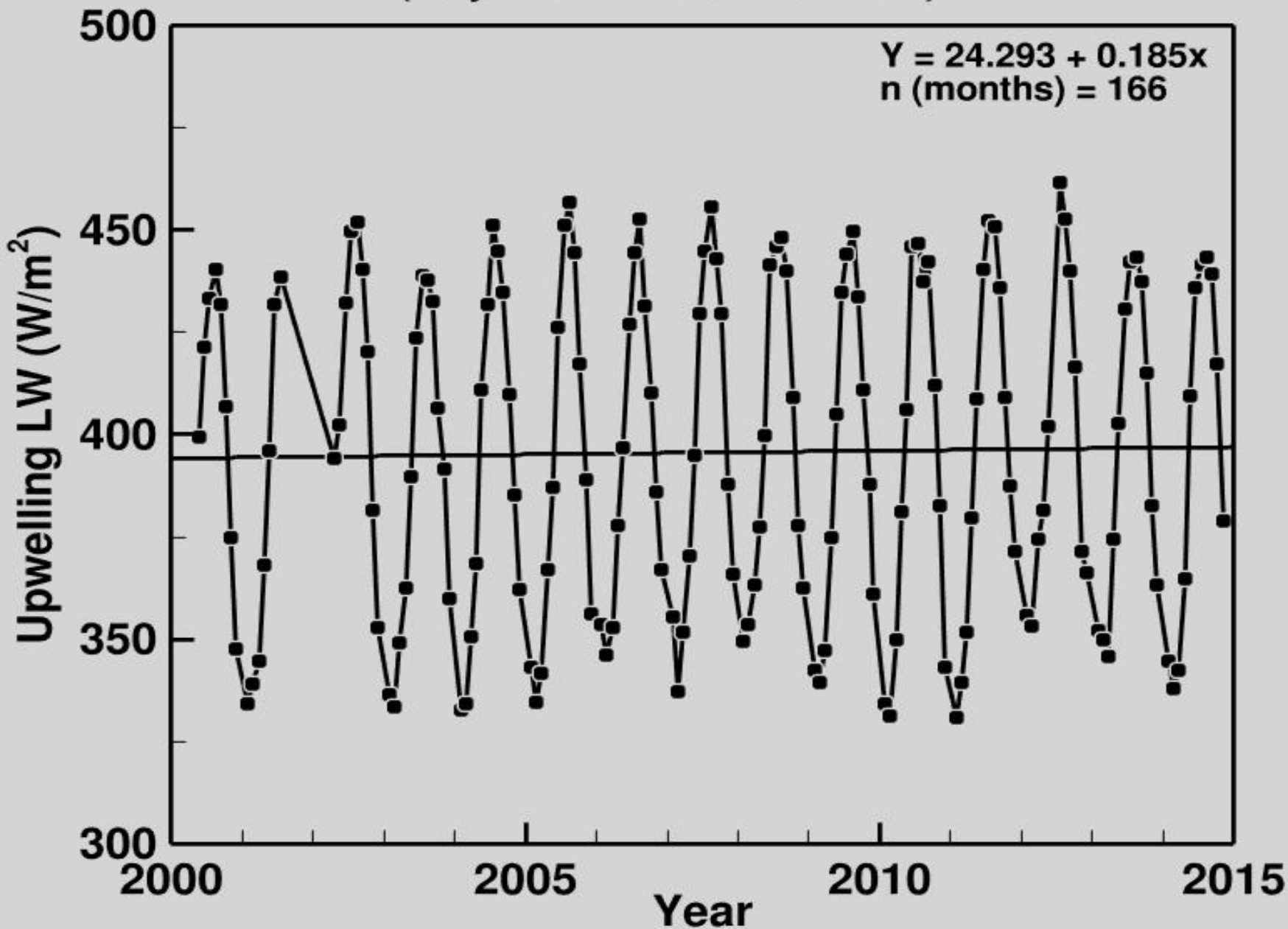
Upwelling SW. All points.
A few anomalous means.

Upwelling SW. Removed
the anomalous means.

Upwelling SW Climatology of Monthly Means
(May 2000 - November 2014)



Upwelling LW Climatology of Monthly Means (May 2000 - November 2014)



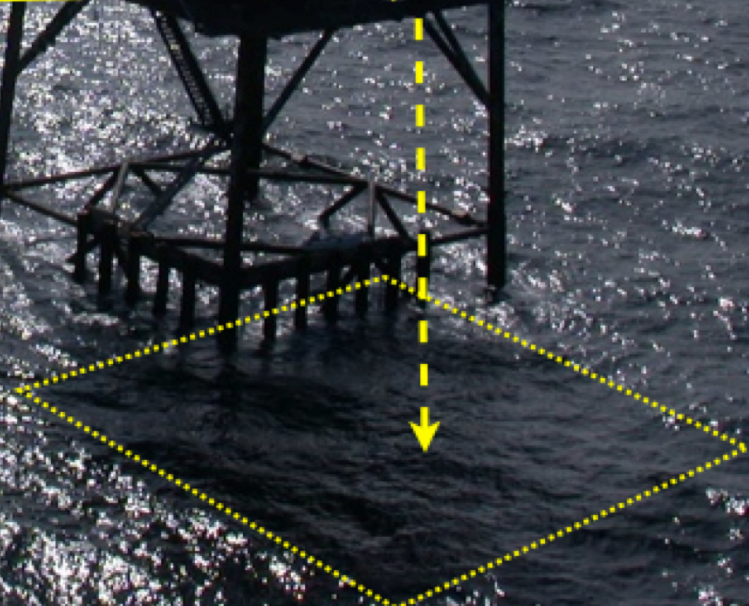
Tower Effect at CLH

Downlooking
Instrumentation
Location

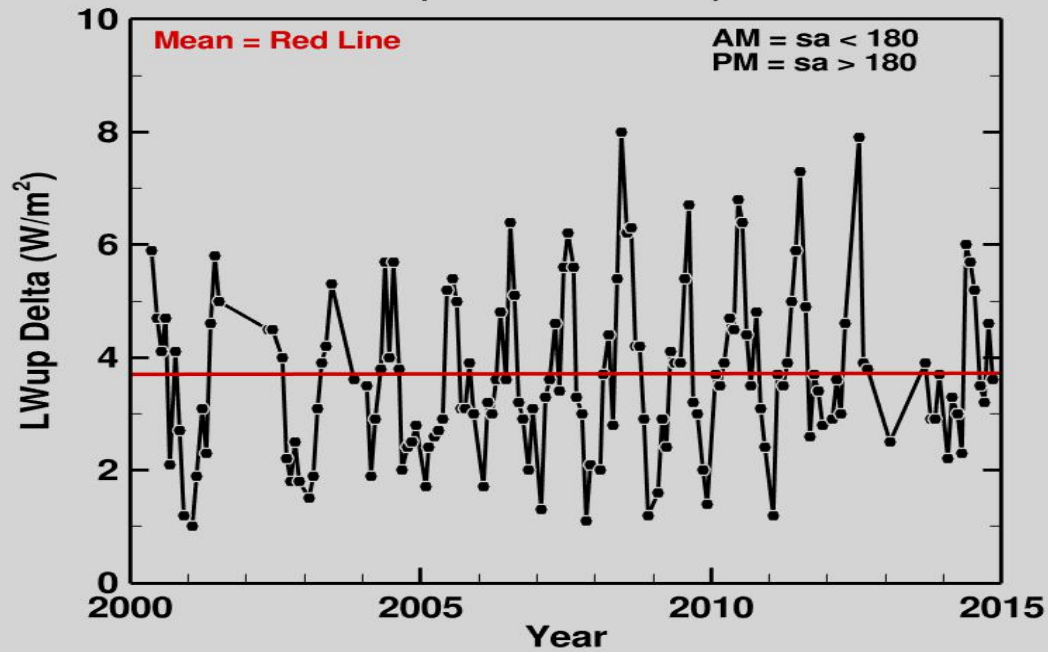
Fish eye
lens view



Tower Shadow in
Morning



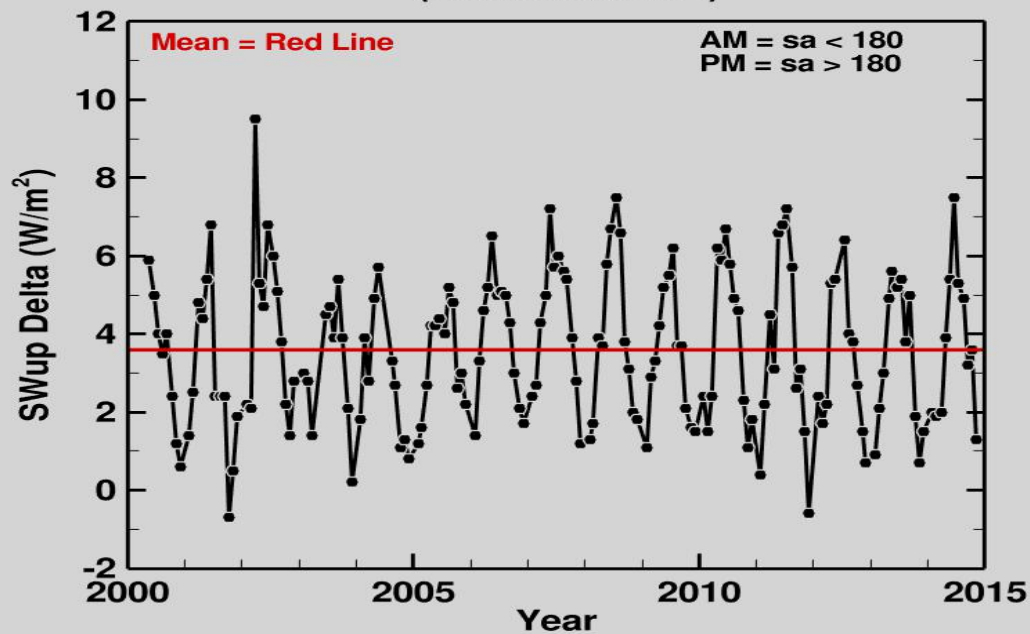
LWup (PM) - (AM) Monthly Statistics
(Years 2000-2014)



Monthly Upwelling
LW Deltas (PM - AM)



SWup (PM) - SWup (AM) Monthly Statistics
(Years 2000-2014)



Monthly Upwelling
SW Deltas (PM - AM)

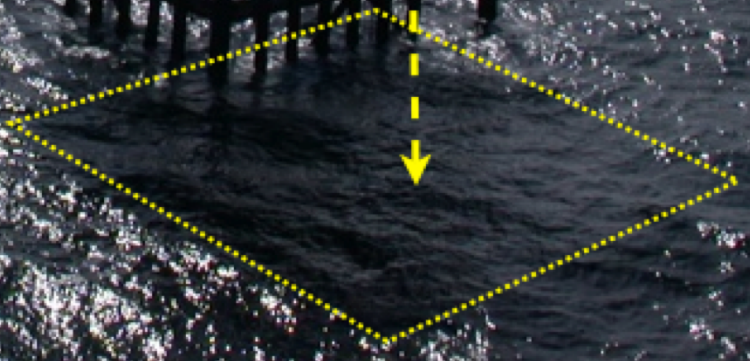
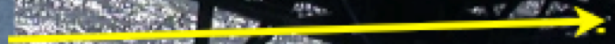


Tower Effect at CLH

NFOV SST



Downlooking
Instrumentation
Location

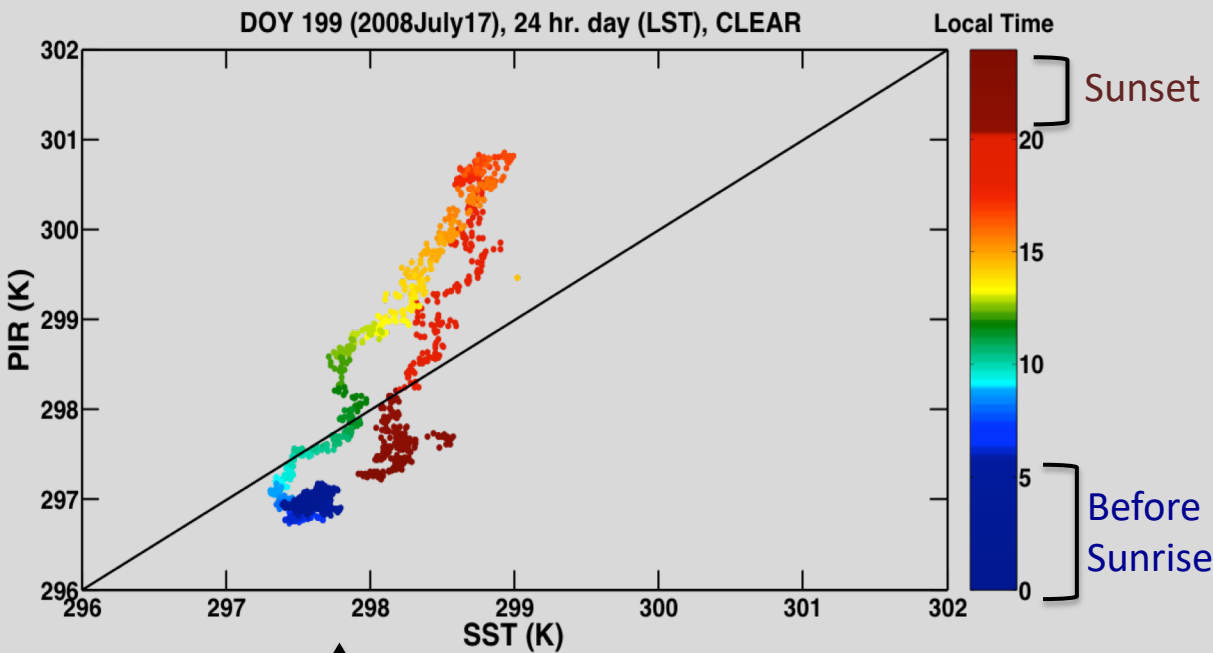
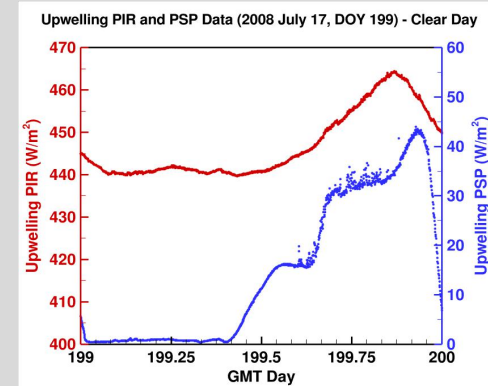


Tower Shadow in
Morning

Fish eye
lens view

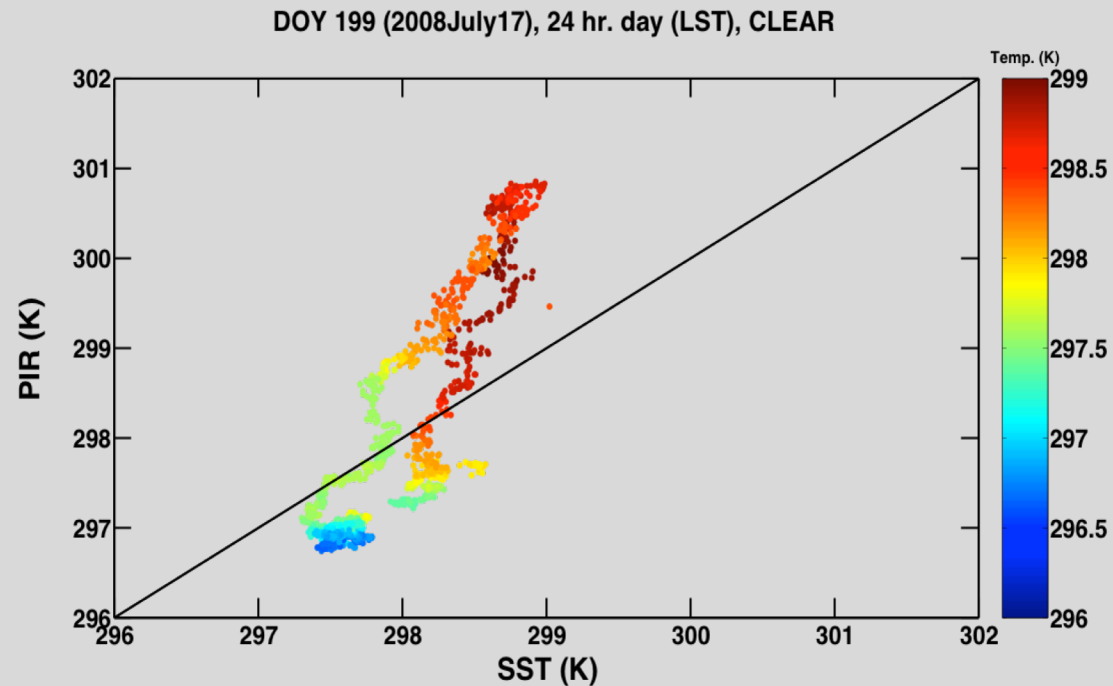


Tower Effect On Clear Summer Day

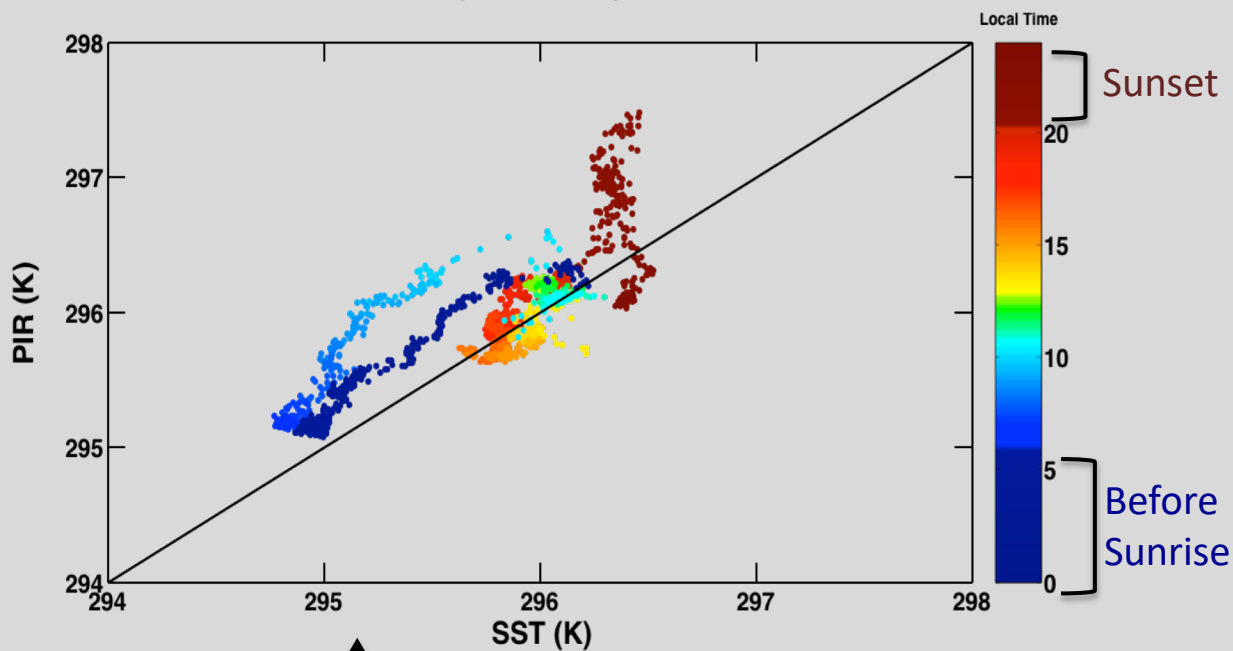


Upwell PIR (K) vs SST (K)
Contoured by Local Time

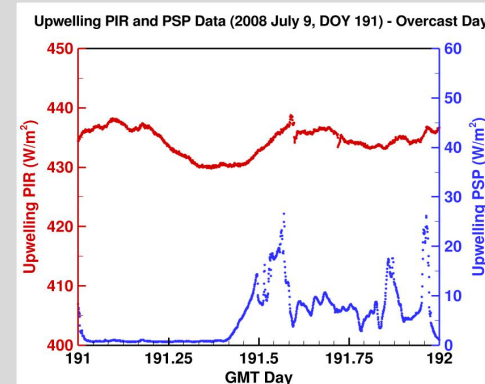
Upwell PIR (K) vs SST (K)
Contoured by Ambient
Temperature (K)



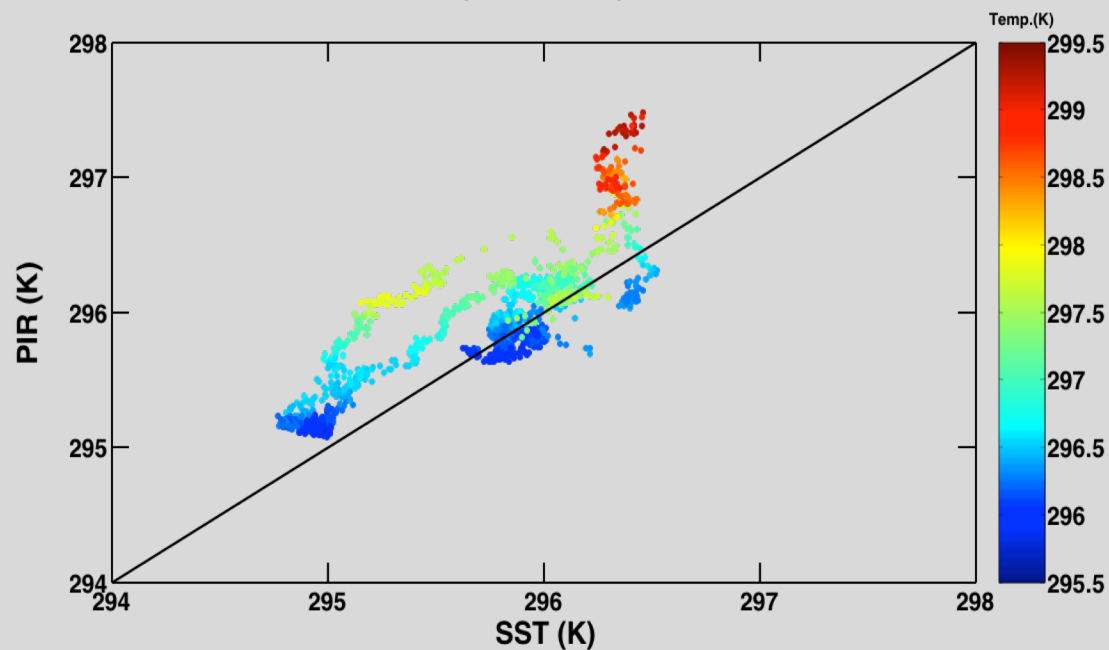
DOY 191 (2008July9), 24 hr. day (LST), OVERCAST



Tower Effect on Overcast Summer Day



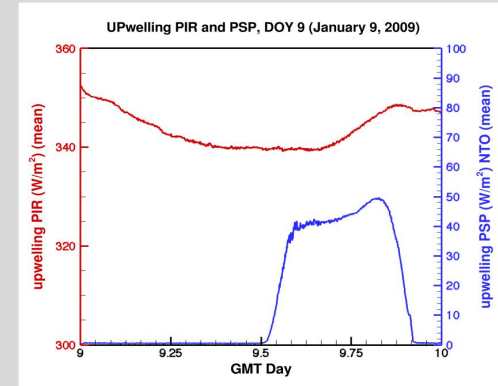
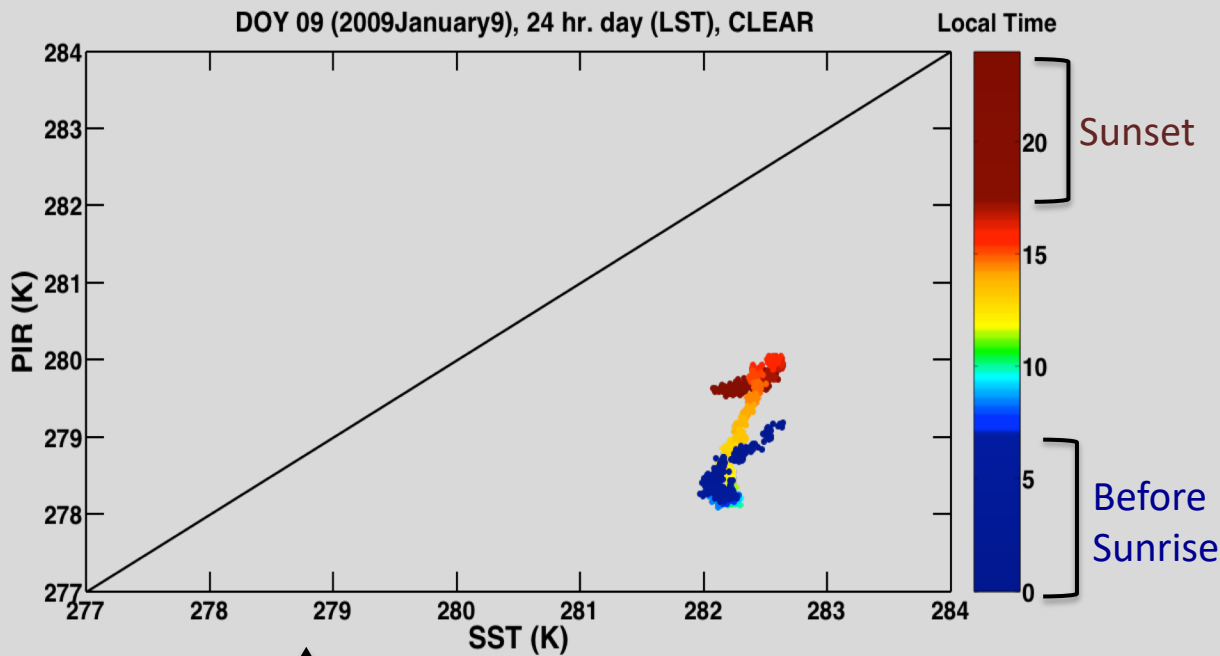
DOY 191 (2008July9), 24 hr. day (LST), OVERCAST



Upwell PIR (K) vs SST (K)
Contoured by Local Time

Upwell PIR (K) vs SST (K)
Contoured by Ambient
Temperature (K)

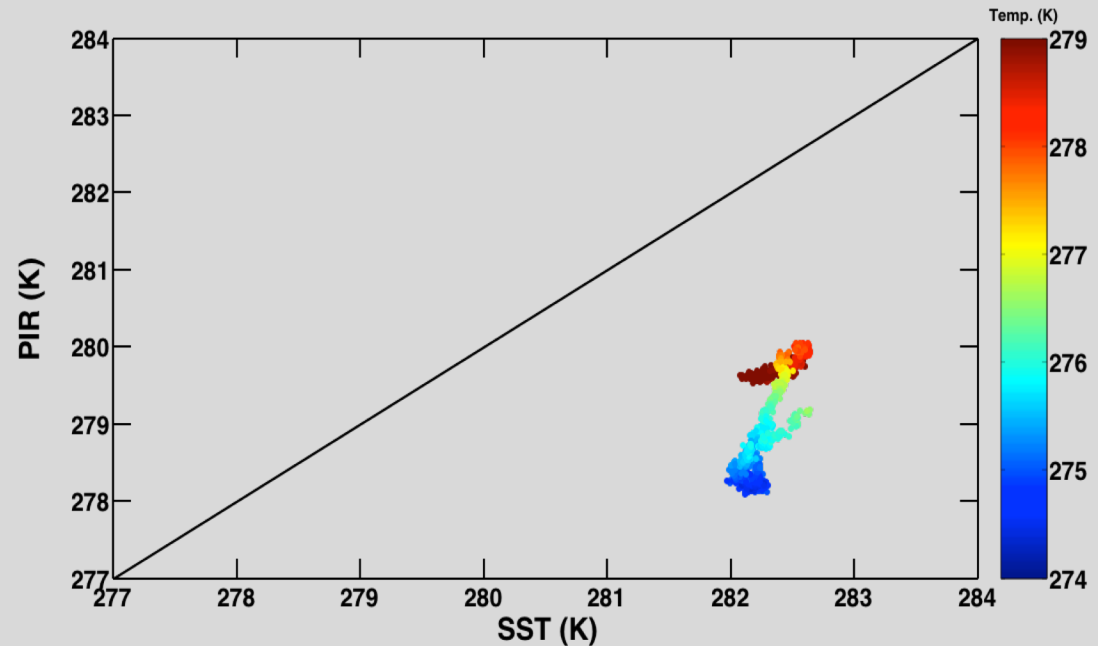
Tower Effect On Clear Winter Day



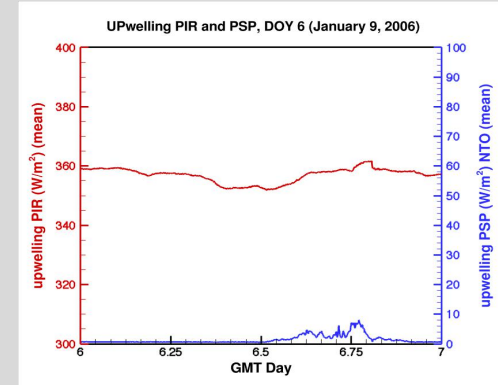
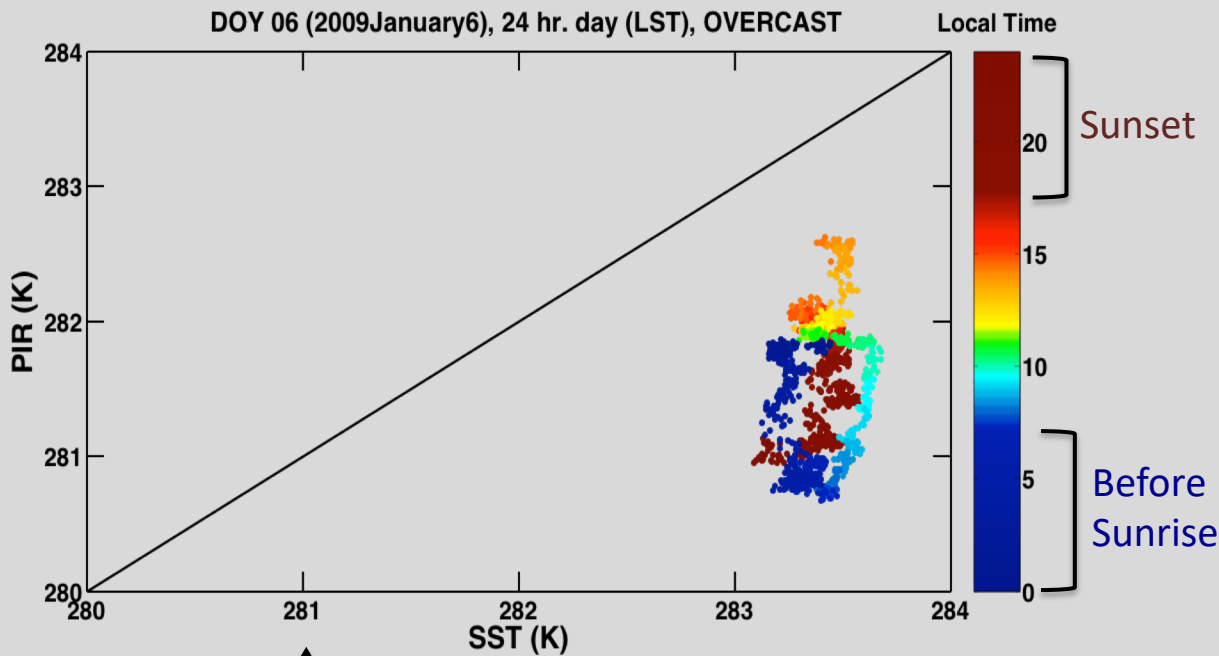
Upwell PIR (K) vs SST (K)
Contoured by Local Time

Upwell PIR (K) vs SST (K)
Contoured by Ambient
Temperature (K)

DOY 09 (2009January9), 24 hr. day (LST), CLEAR



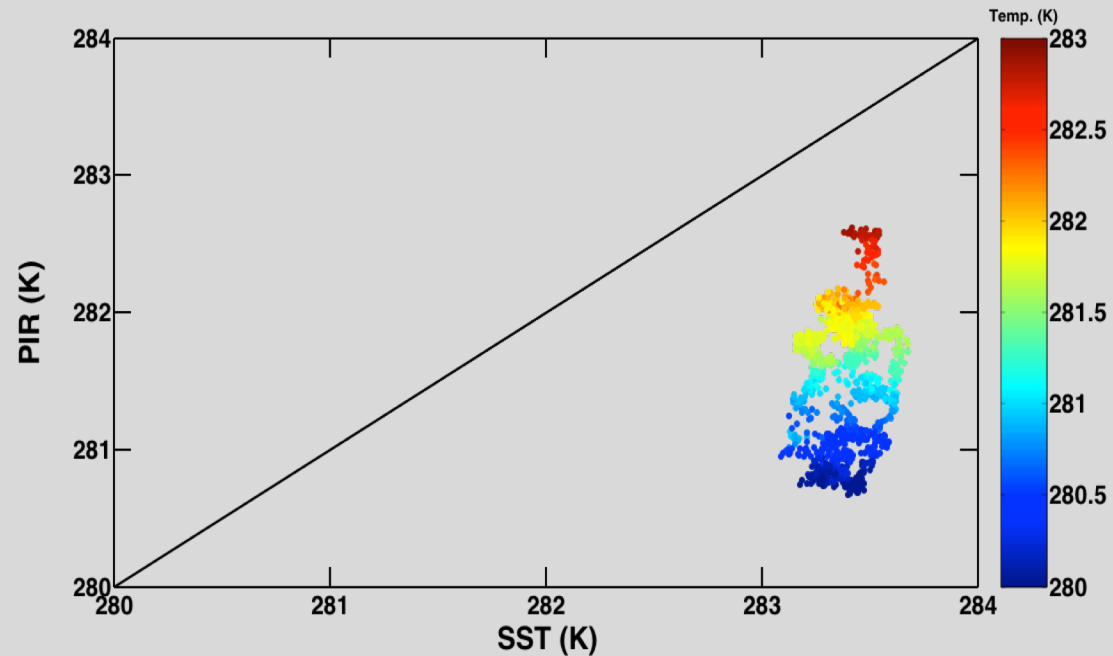
Tower Effect on Overcast Winter Day



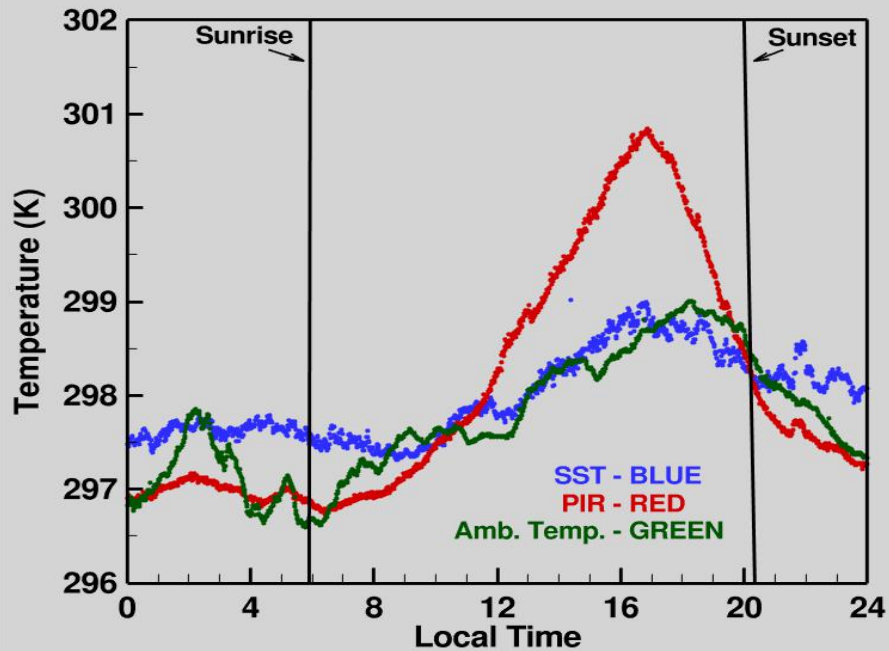
Upwell PIR (K) vs SST (K)
Contoured by Local Time

Upwell PIR (K) vs SST (K)
Contoured by Ambient
Temperature (K)

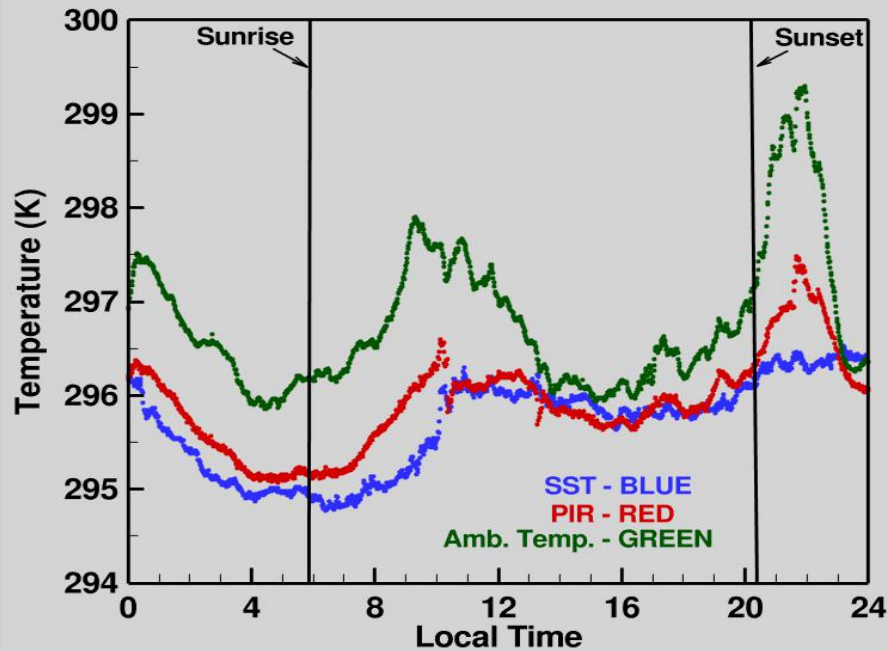
DOY 06 (2009January6), 24 hr. day (LST), OVERCAST



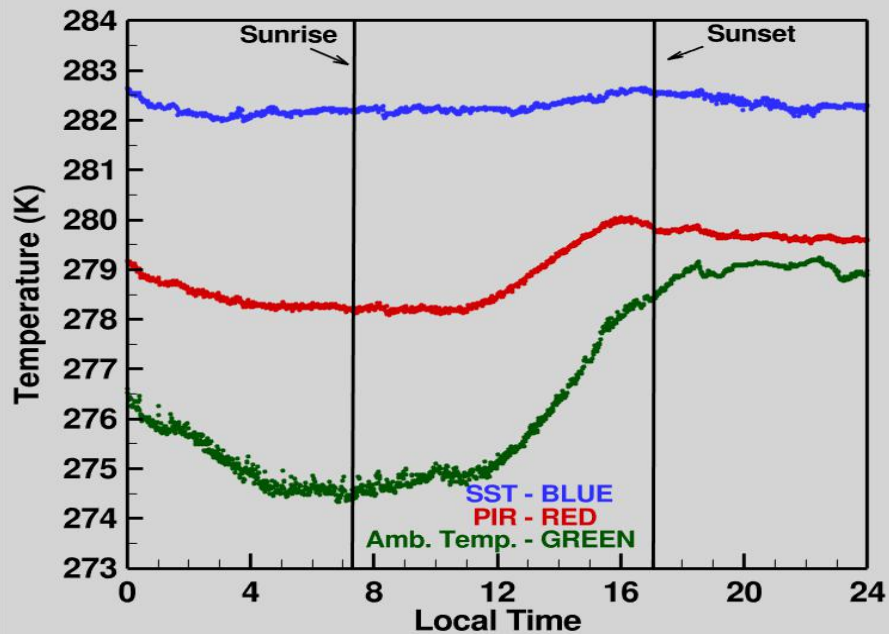
2008 July 17 (DOY 199) Temperature Profile (Clear Day)



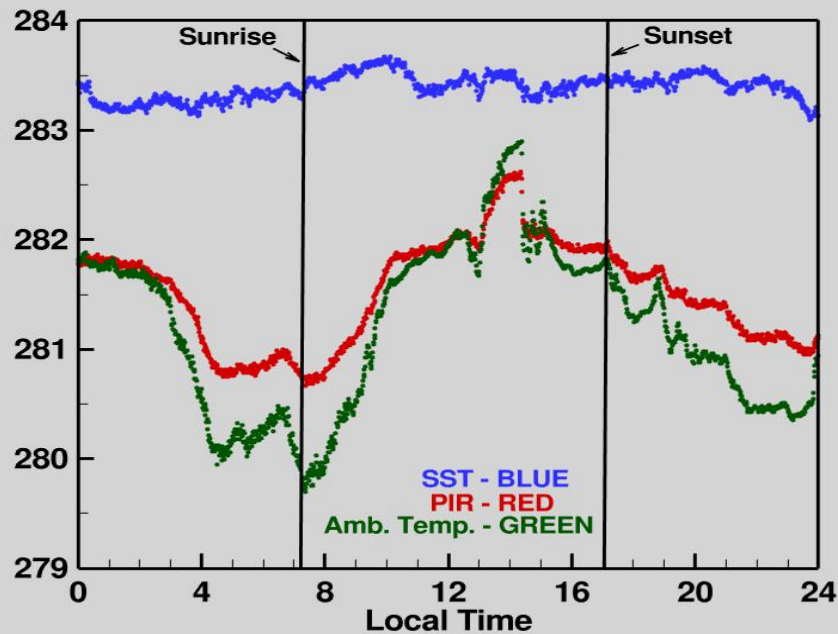
2008 July 9 (DOY 191) Temperature Profile (Overcast Day)



2009 January 9 (DOY 9) Temperature Profile (Clear Day)



2009 January 6 (DOY 6) Temperature Profile (Overcast Day)



Summary:

- CLH was initially established as a satellite validation site, but also became a BSRN site shortly thereafter
- CLH has been operating for over 15 years
- Climatology's for Upwelling and Downwelling data show mixed trends
- Trend lines are not always reliable if anomalous data points occur
- The Tower Effect is twofold: Upwell instruments are shaded by the tower's shadow in the morning and CLH is in the Field of View
- The Tower Effect can be seen in the Upwelling PIR dataset, especially noticeable on a clear day

Thank you!

Questions or Comments?



Acknowledgements:
Department of Energy
United States Coast Guard