

Ocean Buoy for Ocean Sensors

By

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Cal-Val activities at SAC/ISRO

- Ocean
- Land
- Atmosphere
- Vicarious calibration of sensors & validation of bio-geo-physical products using controlled and instrumented sites in India

Operational site

Kavaratti (Ocean)

Site under development

Krishna-Godavari, Kanyakumari,

Machilipatnam, Desalpar, SAC-Bopal,

Land validation sites, Leh (Inst. Calibration)

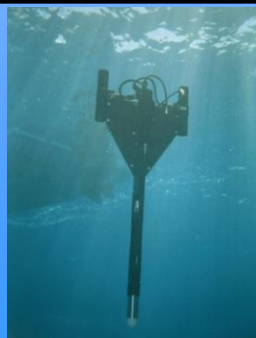
Cal-Val Site, Kavaratti

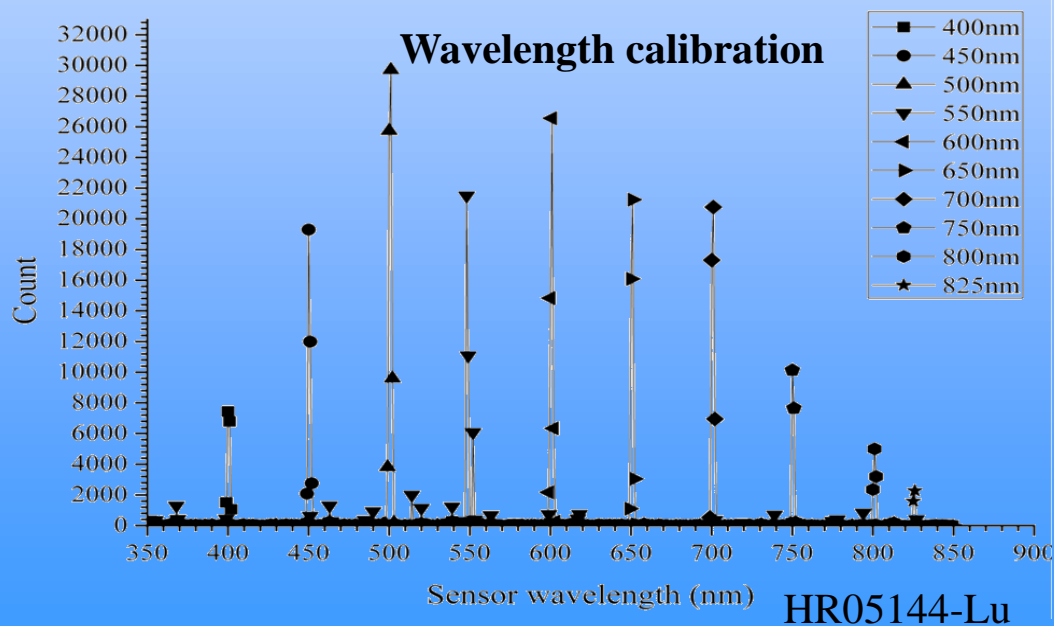
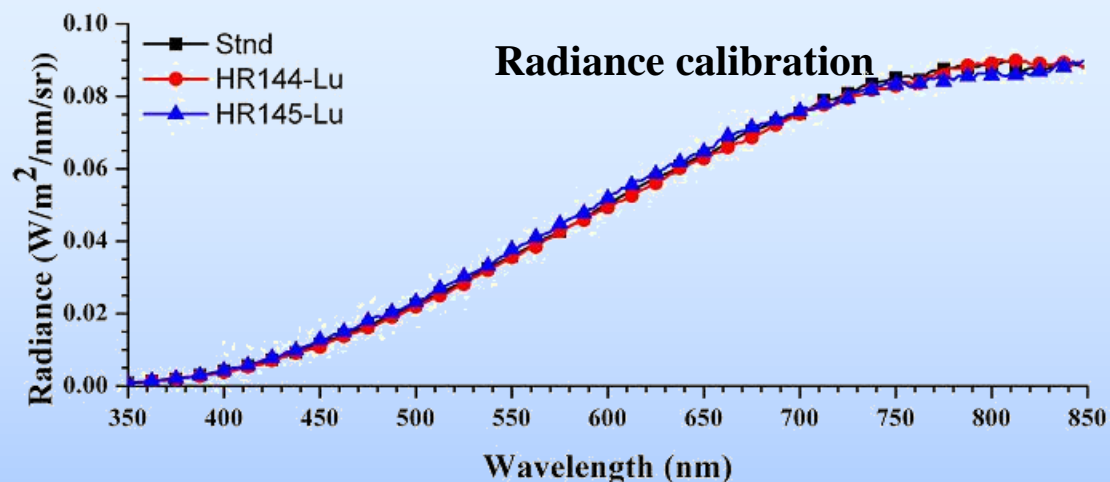
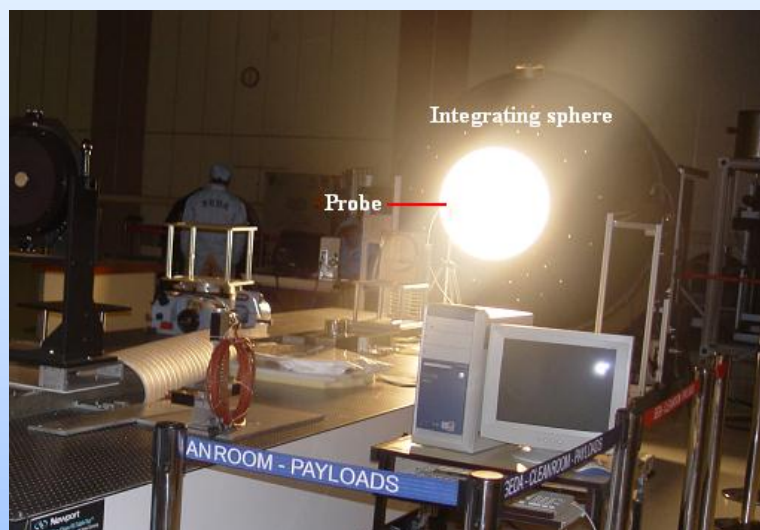
- Site established in 2008. Useful for Oceansat-2, Meghatriptiques & Saral/AltiKa
- Provides data on hyperspectral radiometric measurements (350-850nm) at hourly interval (7:30hrs-18:30hrs).
- CIMEL Sun/Sky radiance measurements
- Ancillary meteorological parameters at pre-defined interval
- Augmented with Micro Rain Radar, Disdrometer, Radio Sonde vertical profiling systems, Radar tide gauge, GPS reference station.
- This site will also have referenced Bottom Pressure Recorder and GPS buoy.



Sampling type and frequencies

Optical sensors		Other sensors	
Above water radiometry	Hourly observations	Micro Rain Radar	Continuous observations
In-water radiometry	Hourly observations	Disdrometer	Continuous observations
Bio-geo-chemical sampling	Ad hoc data collection	Radar tide gauge	Continuous observations
Sun-photometric observations	At most every 15 minutes	GPS reference station	Continuous observations
Fluorometric/turbidity measurements	Hourly observations	Radio sonde	Launching at pre-defined interval
Ancillary met observations	Pre-defined interval (mostly 3 hourly)	Profiling radiometer, MicroTopII systems	Campaign mode observations



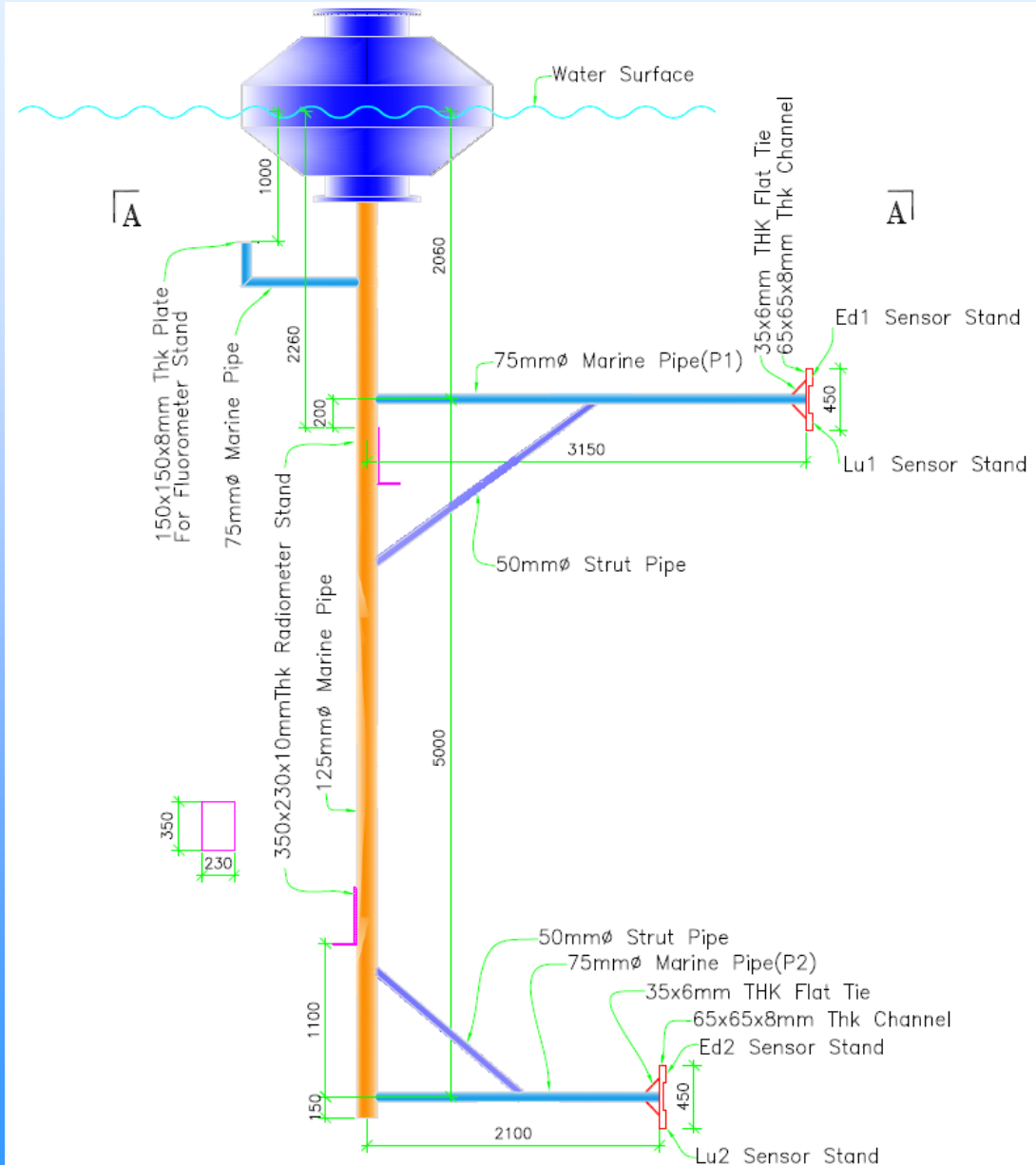


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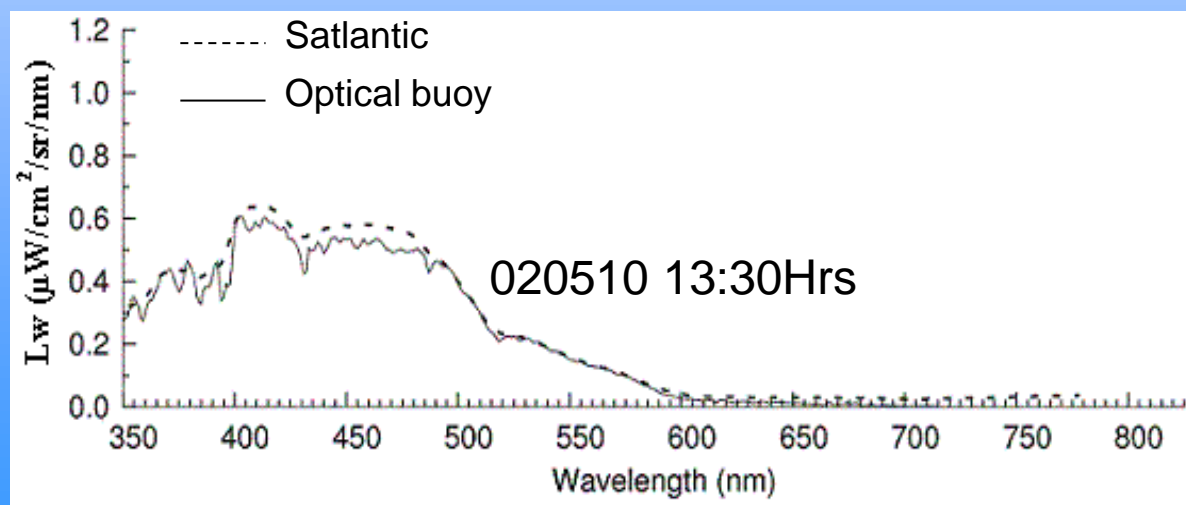
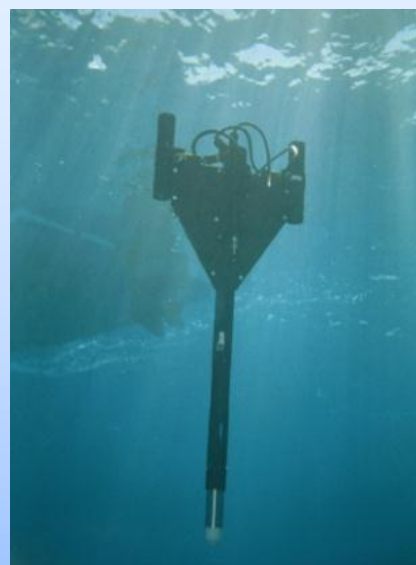
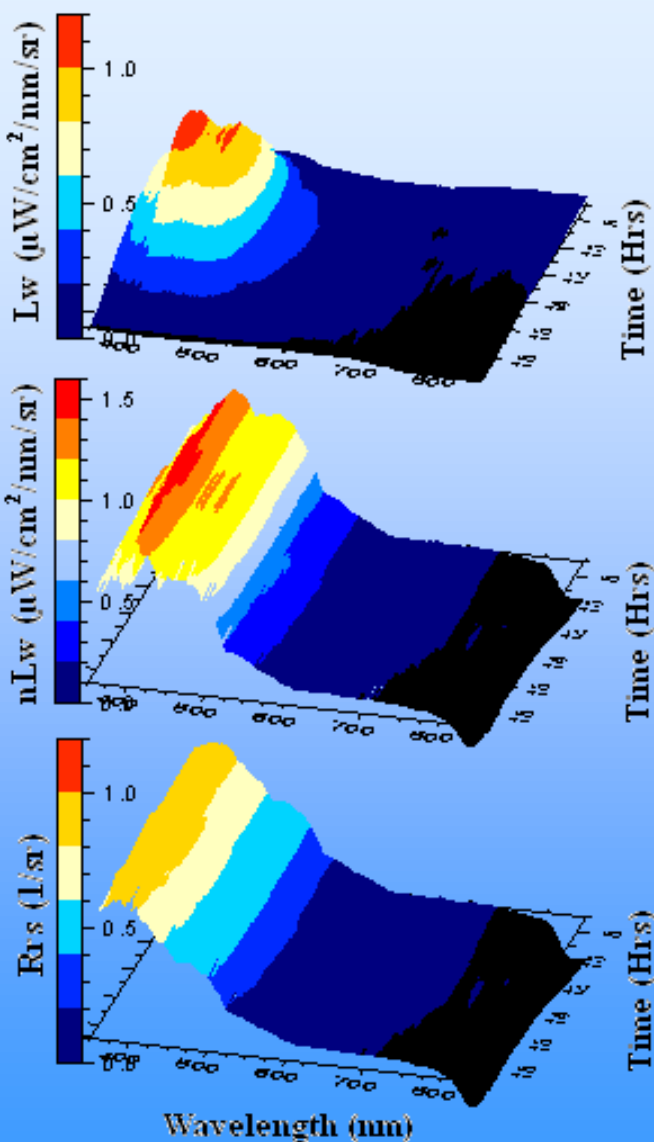
Kavaratti Optical buoy



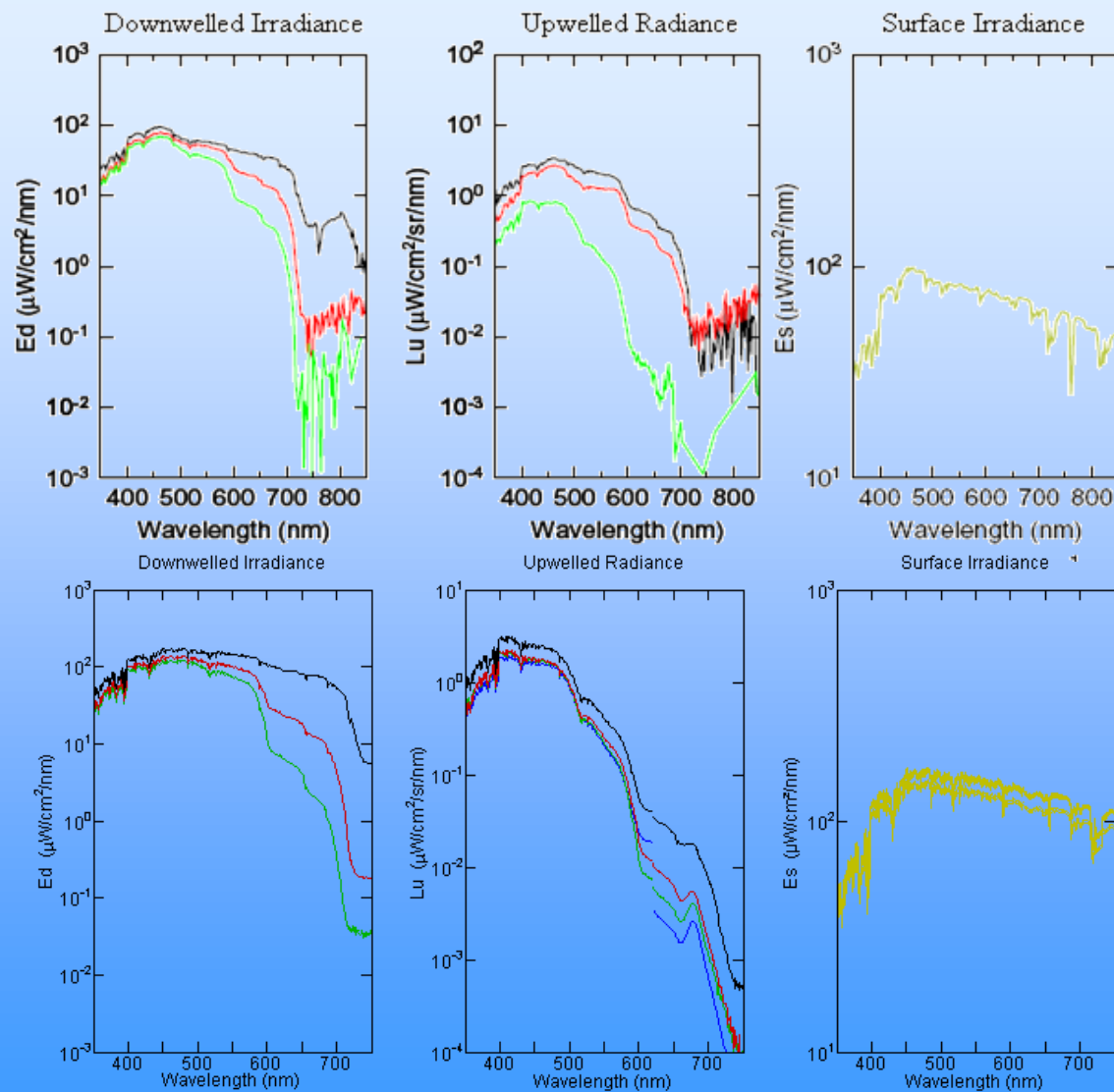
Seen by OCM2



Optical buoy observations

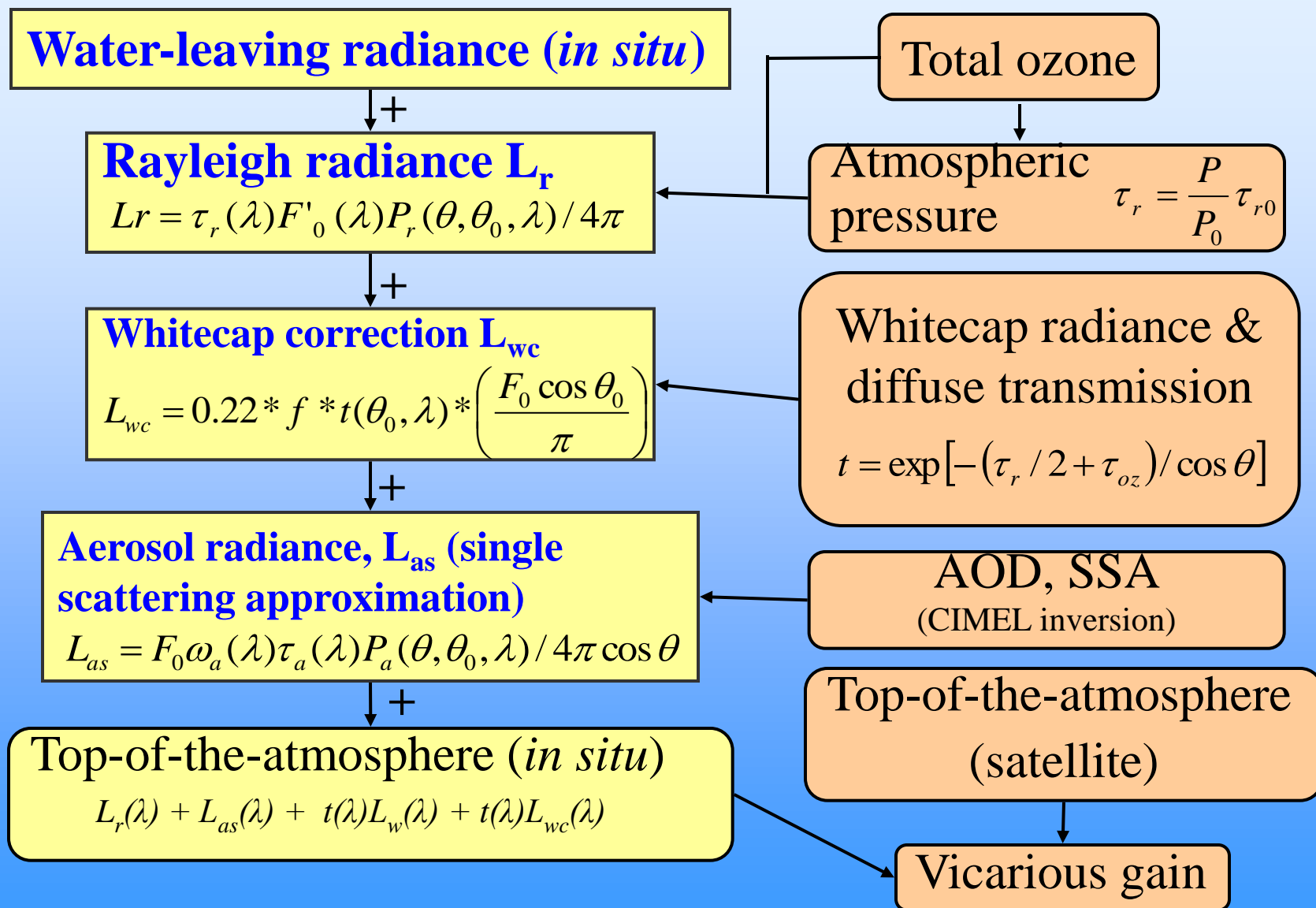


Comparison with MOBY

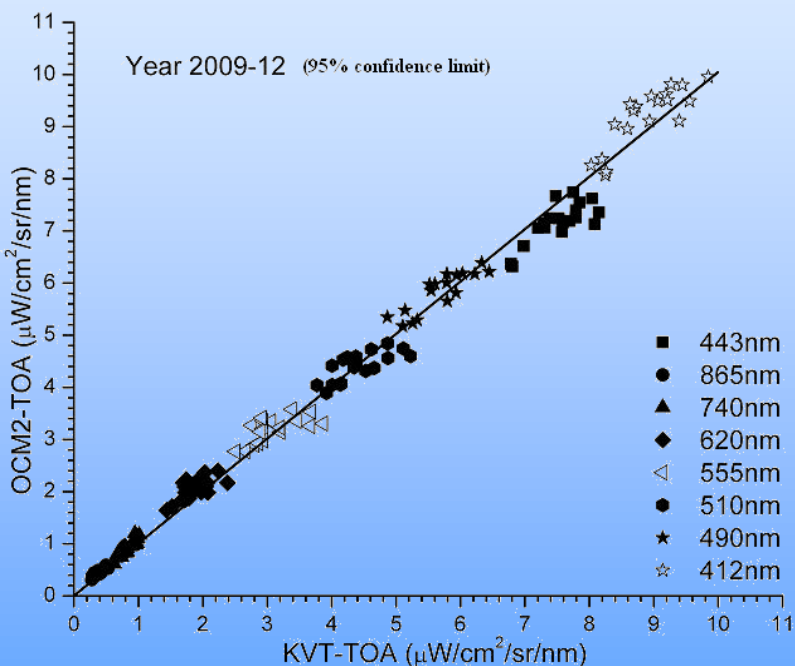


Optical buoy observation over Arabian Sea

MOBY observation over Lanai



TOA radiance with 95% confidence



Band No.	Total points	CC (R^2)	Mean TOA radiance ($\mu\text{W}/\text{cm}^2/\text{sr}/\text{nm}$)	
			KVT	OCM2
1	20	0.978	8.865	9.191
2	19	0.977	7.530	7.169
3	17	0.976	5.684	5.830
4	21	0.936	4.402	4.410
5	19	0.876	3.094	3.202
6	20	0.873	1.873	2.059
7	21	0.929	0.817	0.904
8	15	0.910	0.392	0.455

Kavaratti vicarious calibration gain coefficients

Band	Year 2009-10	Year 2011	Year 2012	Year 2010-12
	Gain \pm SD	Gain \pm SD	Gain \pm SD	Gain \pm SD
1	0.93 \pm 0.04	0.97 \pm 0.03	0.95 \pm 0.03	0.95 \pm 0.03
2	1.03 \pm 0.04	1.06 \pm 0.04	1.06 \pm 0.02	1.05 \pm 0.04
3	0.96 \pm 0.04	0.97 \pm 0.04	0.92 \pm 0.04	0.96 \pm 0.04
4	1.00 \pm 0.07	0.97 \pm 0.05	0.97 \pm 0.04	0.98 \pm 0.06
5	1.00 \pm 0.09	0.93 \pm 0.07	0.91 \pm 0.05	0.95 \pm 0.09
6	0.95 \pm 0.08	0.86 \pm 0.07	0.87 \pm 0.06	0.90 \pm 0.08
7	0.88 \pm 0.07	0.88 \pm 0.06	0.92 \pm 0.07	0.89 \pm 0.06
8	0.88 \pm 0.05	0.71 \pm 0.05	0.81 \pm 0.02	0.80 \pm 0.08

INSAT 3C

Data transmission and reception

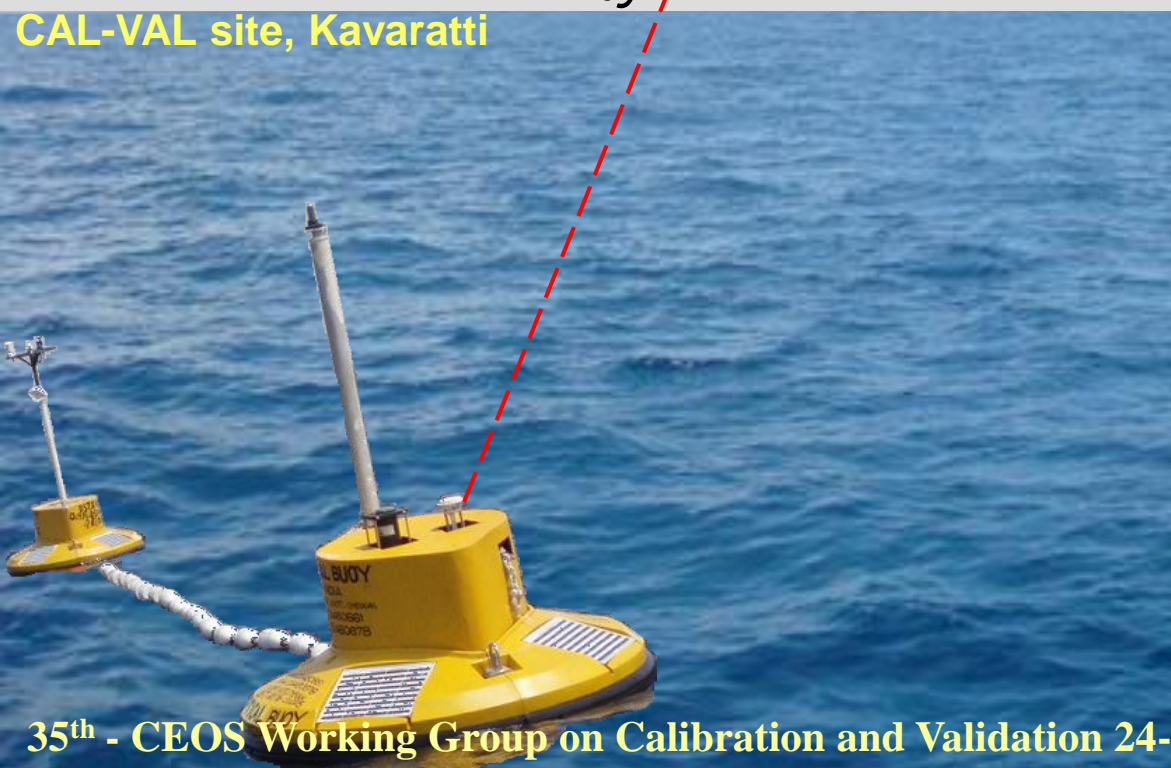
S-Band

S-Band

C-Band



CAL-VAL site, Kavaratti



Delhi Earth Station, New Delhi

Internet





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Calibration & Validation Program

ISRO has taken multi pronged initiatives for understanding key issues concerning global changes. This activity requires validation for all the products generated thereby.

A high-tech site is developed at Kavaratti with sensors installed in the ocean for measuring various parameters. Similarly, Principal Investigators and Collaborating Agencies also collect data at field level. Other sites and sub sites are being developed at Kolkata, Gadanki and so on for collecting in-situ data and supporting CALVAL activity for all ISRO Science Missions.


This web site facilitates the archival, visualisation and dissemination of the in-situ data for scientific interpretation and analysis of data from these and future missions.

OCEANSAT-2

INSAT-3D

MEGHA TROPIQUES

SARAL/ALTIKA



OCEANSAT-II is India's second satellite launched for the study of the oceans as well as the interaction of oceans and the atmosphere to facilitate climatic studies. It carries two major payloads viz. Scatterometer (Ku band) and ROSA (GPS receiver).

[View More..](#)

Sensors



Met & Optical buoys on CAL-VAL Site



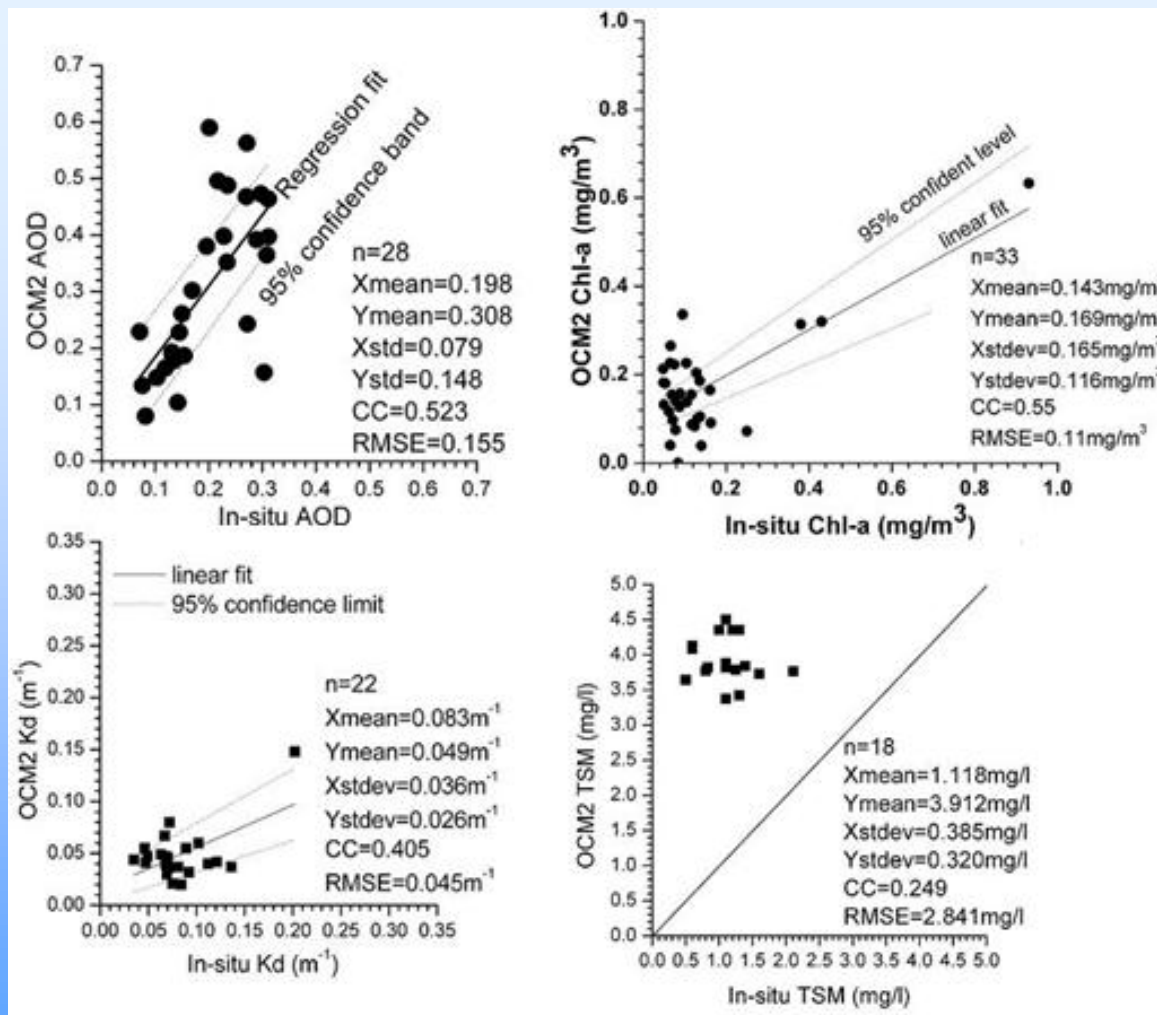
Sun/Sky Photometry on Island



Optical Disdrometer



THANK YOU



Validation of OCM2 derived Aerosol Optical Depth, chlorophyll-*a* concentration, Diffuse attenuation coefficient and total suspended sediment over Kavaratti calibration-validation site observations.