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Measurement protocol and uncertainties

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AERONET-OC Workshop, Greenbelt, 23-24/02/2011

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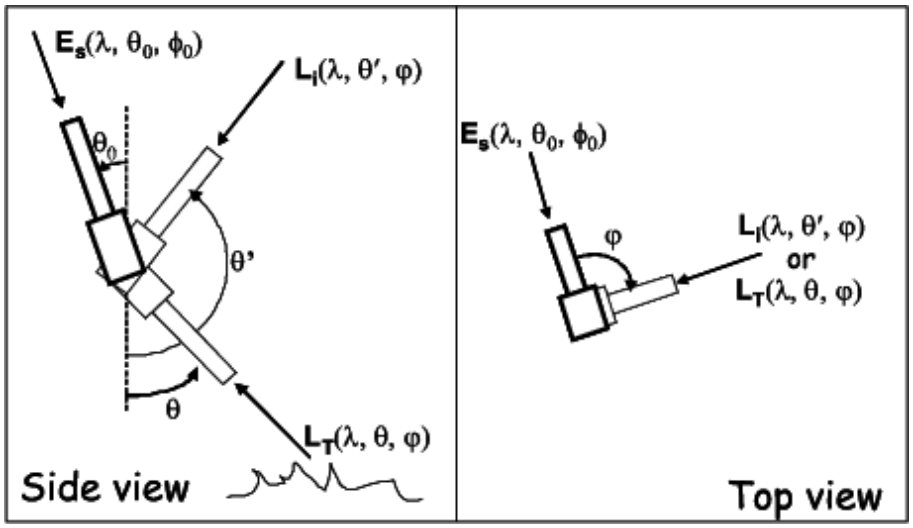
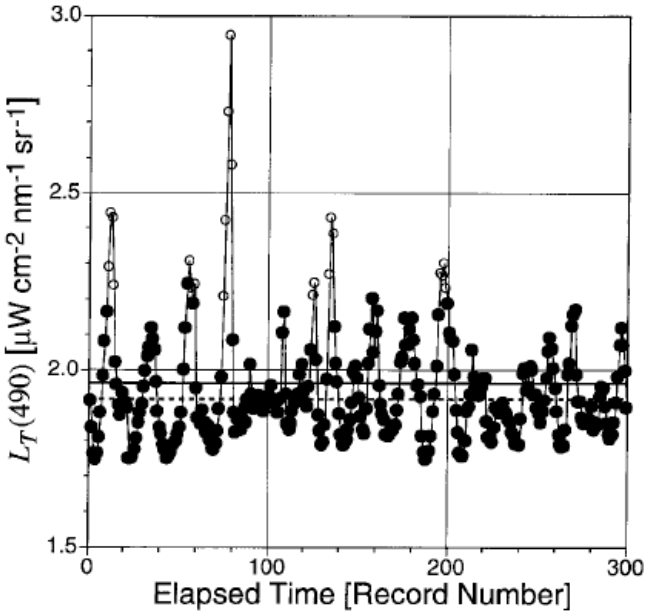
The Measurement Protocol





E_s: Direct solar irradiance

L_T: Total radiance from the sea

L_i: Sky-radiance

Quantified accounting for wind speed

Average of measured L_i

$$L_W(\phi,\theta,\lambda) = L_T(\phi,\theta,\lambda) - \rho(\phi,\theta,\theta_0,W)L_i(\phi,180^\circ-\theta,\lambda)$$

Average of relative minima of measured L_T

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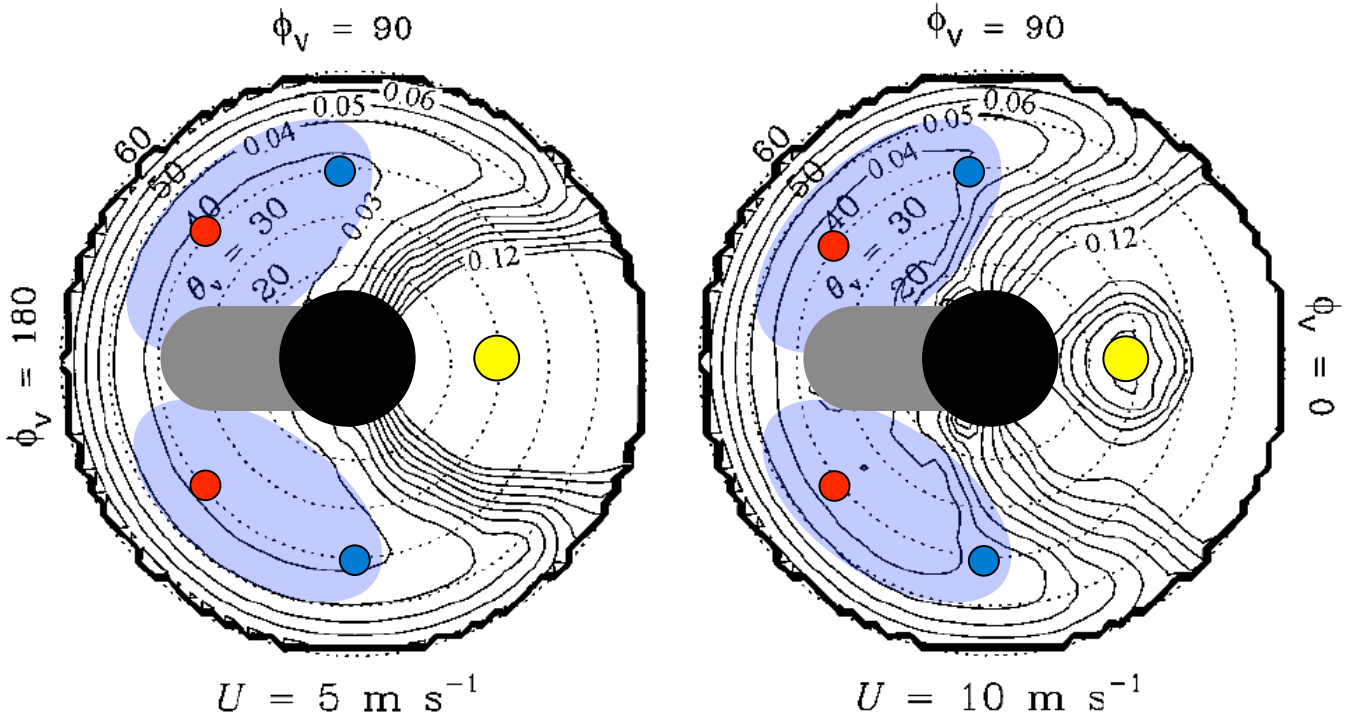
The viewing geometry



Sea-surface reflectance

C.Mobley, Estimation of remote-sensing reflectance from above surface measurements. *Applied Optics*, 38: 7442-7455,1999.

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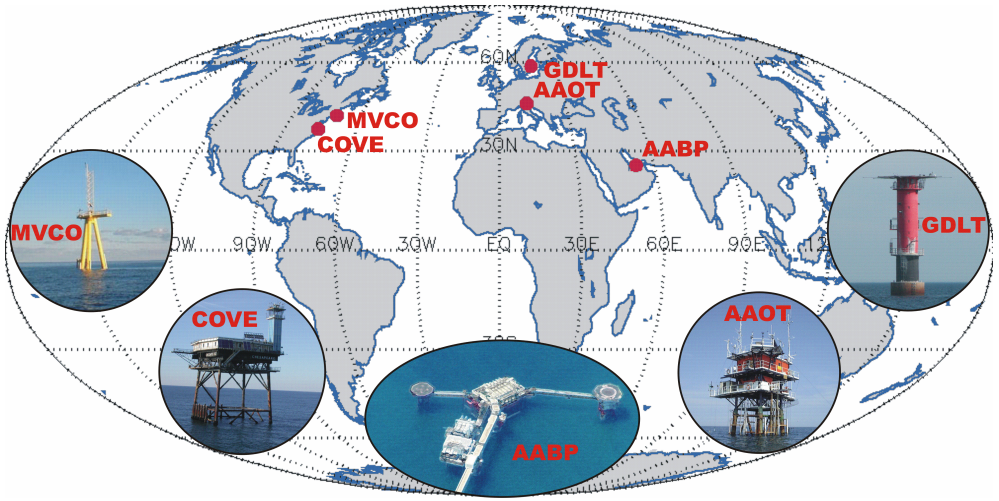
Deployment Requirements

a. Fixed deployment platforms to allow for accurate pointing

b. Relatively deep waters to minimize bottom perturbations

c. Selected deployment configurations to minimize superstructure perturbation

d. Away from land to minimize adjacency effects in remote sensing data



G.Zibordi, B.Holben, I.Slutsker, D.Giles, D.D'Alimonte, F.Mélin, J.-F. Berthon, D. Vandemark, H.Feng, G.Schuster, B.Fabbri, S.Kaitala, J.Seppälä. AERONET-OC: a network for the validation of Ocean Color primary radiometric products. *Journal of Atmospheric and Oceanic Technology, 26, 1634-1651*, 2009.

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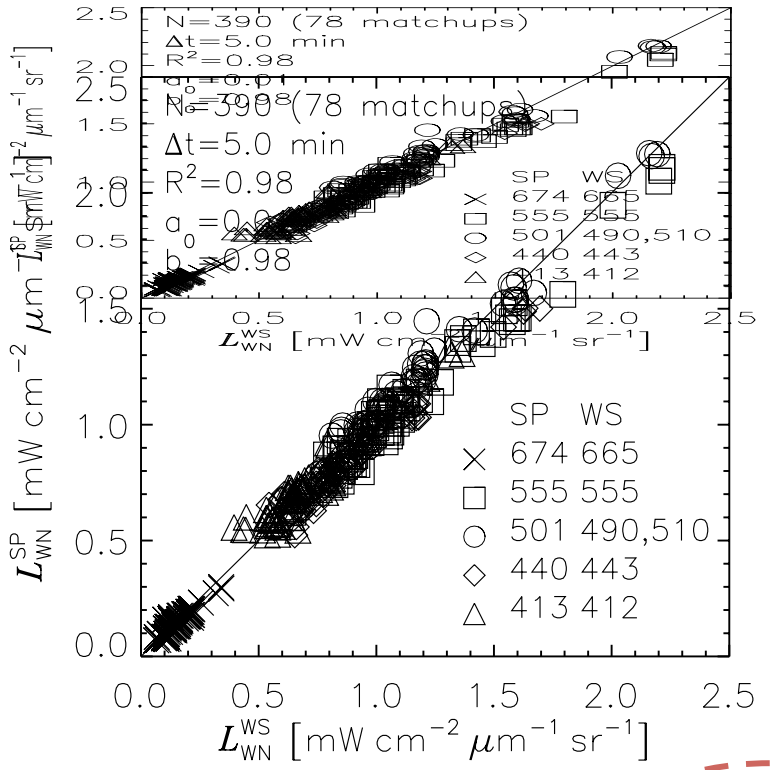
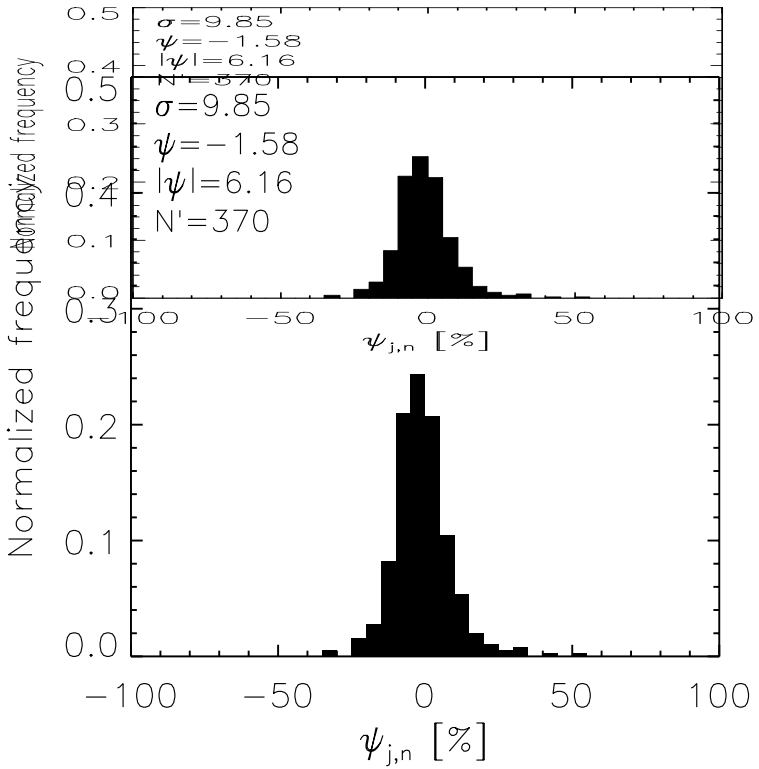
Consistency of L_{WN}





AERONET-OC (SeaPRISM)

$$L_{WN}^{SP}(\lambda) = L_{W}^{SP}(\lambda)\left(D^2 t_d(\lambda)\cos\theta_0\right)^{-1} C_{f/Q}(\lambda,\theta_0,\tau_A,IOP)$$

CoASTS (WiSPER)

$$L_{WN}^{WS}(\lambda) = L_{W}^{WS}(\lambda)\frac{E_0(\lambda)}{E_d(0^+,\lambda)} C_{f/Q}(\lambda,\theta_0,\tau_A,IOP)$$

Correction for non isotropy of the in water light field (relying on a Case-1 water scheme and *Chla* estimate).

G.Zibordi, F. Mélin, S. B. Hooker, D. D'Alimonte and B. Holben. An autonomous above-water system for the validation of ocean color radiance data. *IEEE Transactions in Geoscience and Remote Sensing*, 42:401-415, 2004.

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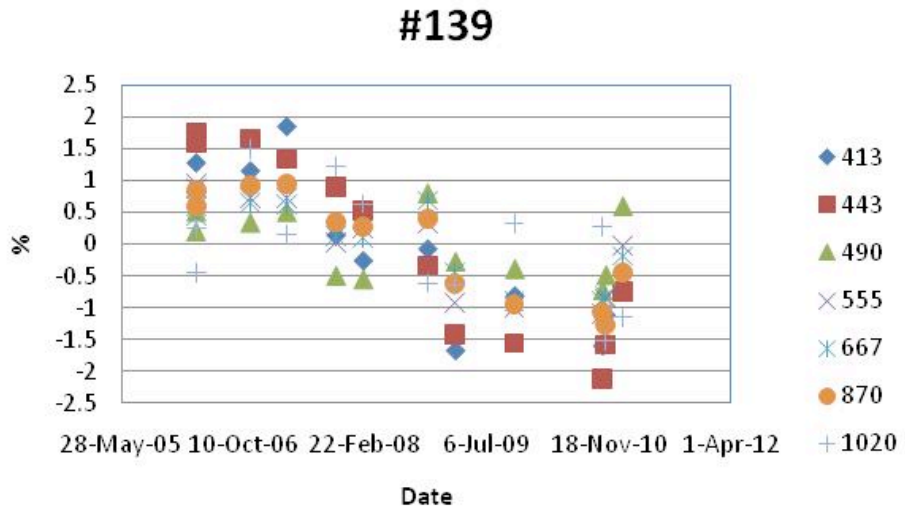
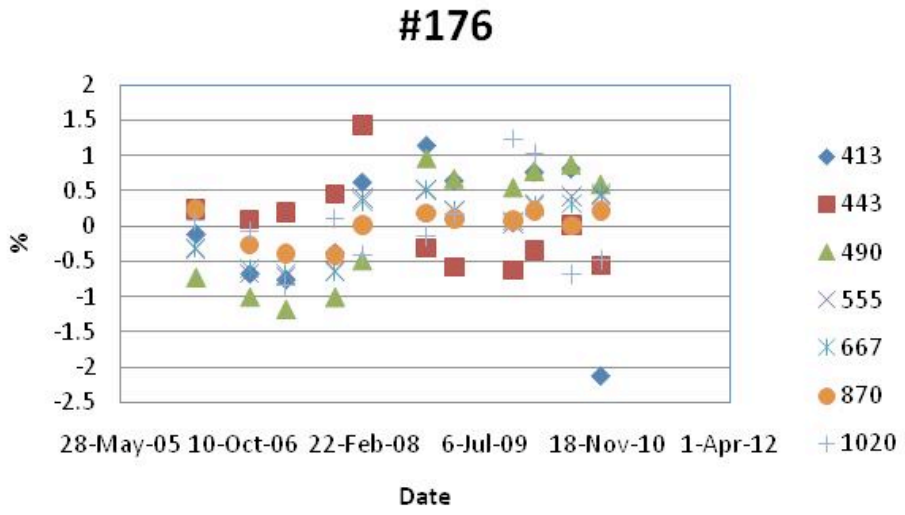
System Stability





Calibration/Instrument stability over time indicate average absolute changes within ±1% (avg std 0.5%) over 5 years.

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Uncertainties

Source	L_{WN}				
	412	**443**	**488**	**551**	**667**
Absolute calibration	2.7	2.7	2.7	2.7	2.7
Sensitivity change	0.4	0.2	0.2	0.2	0.2
Correction	1.6	2.0	2.8	2.9	1.9
t_d	1.5	1.5	1.5	1.5	1.5
ω_0	1.8	1.3	0.7	0.6	2.5
W	1.1	0.8	0.4	0.4	0.4
Environmental effects	3.1	2.1	2.1	2.1	6.4
Quadrature sum	**5.1**	**4.5**	**4.7**	**4.7**	**7.8**

ω_0 5% (400-600 nm)

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