European Commission

JRC Agency Report:

1. Land Activities
2. Ocean Color Activities

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Joint Research Centre

LAND ACTIVITIES:

1. ***RAMI*** *(Radiative Transfer Model Intercomparison)*
2. ***QA4ECV*** *(Quality Assurance for Essential Climate Variables)*

Prepared by *Nadin Gobron* (May 2015)

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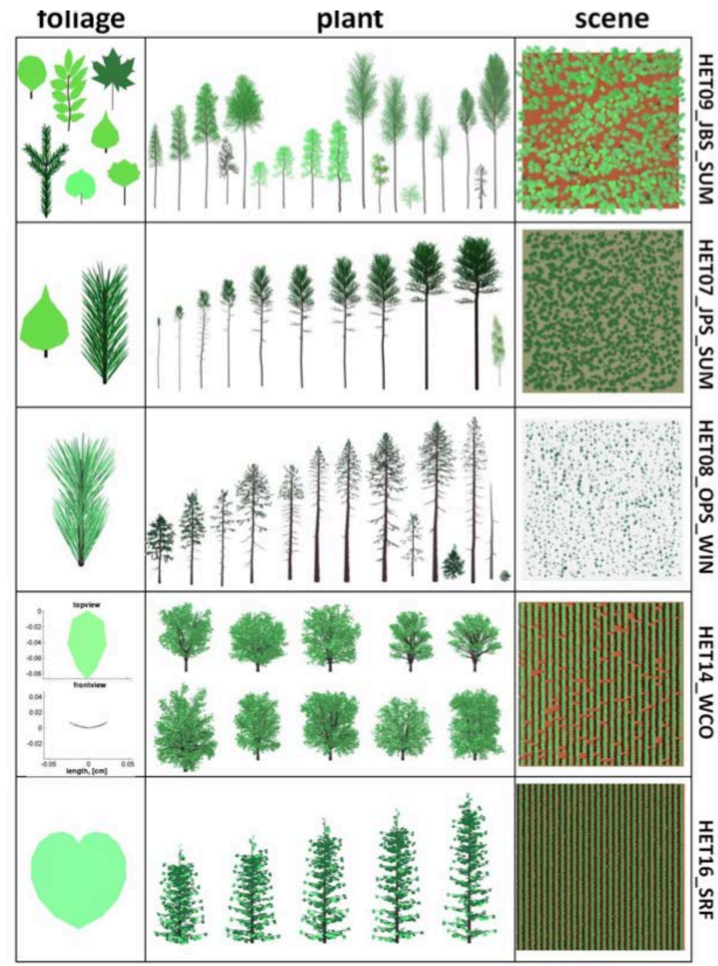
RAMI Corner

The fourth phase of the "*Radiative Transfer Model Intercomparison* (RAMI) exercise: Actual canopy scenarios and conformity testing" by Widlowski, et. al. has been submitted to Remote Sensing of Environment.

model name	model reference(s)	model operator	measurement types
ACTS	Ni-Meister et al., (2010) Yang et al., (2010)	W. Ni-Meister W. Yang	fluxes
CanSpart	Haverd et al., (2012) Lovell et al., (2012)	V. Haverd J. Lovell	fluxes
DART	Gastellu-Etchegorry et al., (1996, 2004, and 2015)	E. Grau J-P Gastellu	BRFs, fluxes
FLiES	Kobayashi and Iwabuchi, (2008)	H. Kobayashi	BRFs, fluxes, THP
FRT	Kuusk and Nilson (2000) Kuusk et al., (2008)	A. Kuusk	BRFs, fluxes
inform	Atzberger (2000) Schlerf and Atzberger (2006)	C. Atzberger M. Schlerf	BRFs
librat	Lewis (1999) Disney et al., (2009)	M. Disney P. Lewis	BRFs, THP
pbrt	Pharr and Humphreys (2010)	J. Stuckens	BRFs, fluxes
price	Esserey et al., (2008)	R. Esserey	THP
RGM	Liu et al. (2007) Huang et al. (2009)	H. Huang	BRFs, fluxes, THP
raytran rayspread	Govaerts (1995) Widlowski et al., (2006)	J-L Widlowski C. Mio	BRFs, fluxes, THP
row	Zhao et al., (2010)	F. Zhao	BRFs



RAMI Corner

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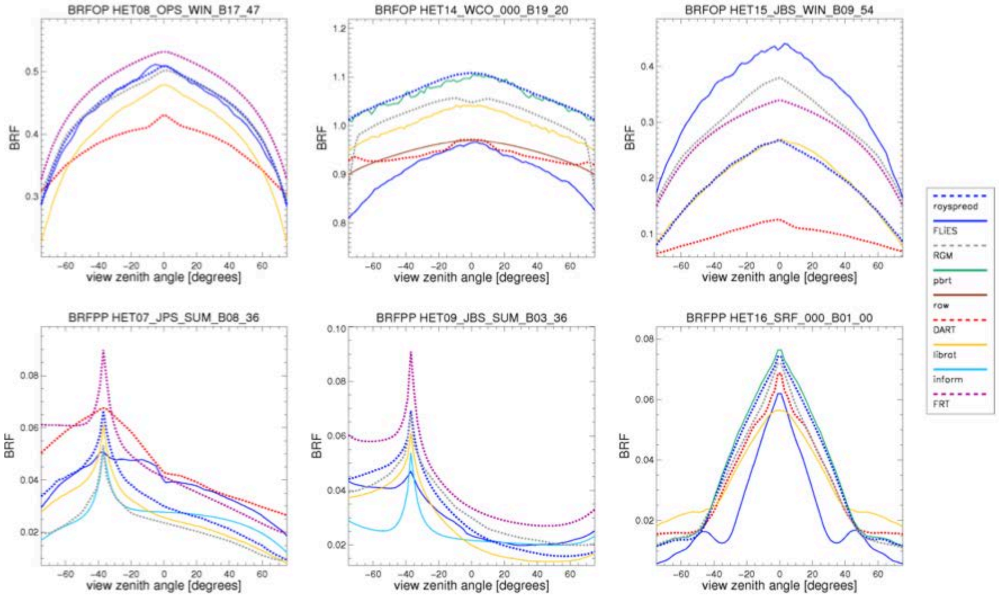


The dispersion of simulation results was found to be rather large both for flux simulations and for BRFs.

In addition, there were rarely any obvious clusters of simulation results that might help to guide the analysis.

Possible causes for the substantial dispersion among the simulation results could be:

1) operator choices when transferring the prescribed test site properties to the needs and *capabilities of a given RT model*,

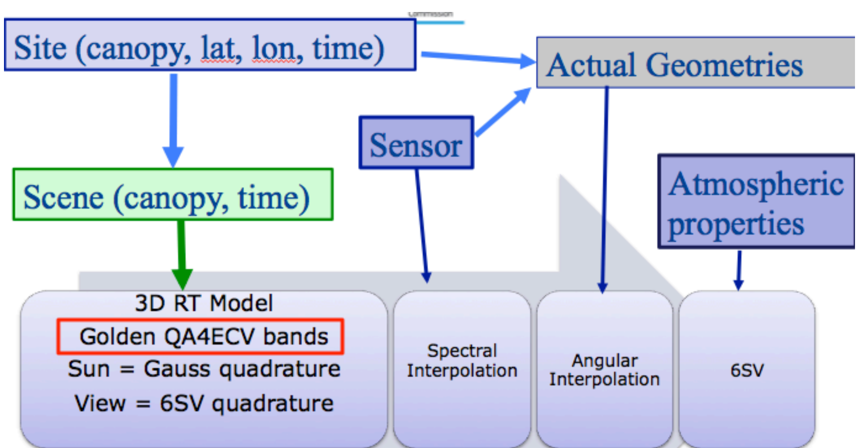
2) *operator errors* during this scene creation process, and/or during the setup of the actual model run, and/or any eventual post-processing steps, and

3) software “bugs” and *conceptual/theoretical errors in the RT formulation of the model*.

JRC QA4ECV Activities

A series of *'virtual' validation sites* are constructed using *specific scene* (spectral values of each elements, 3-D architecture etc …)

1-Simulate Top Of Atmosphere Bidirectional Factors for several sensor/satellite data
→ ***benchmark land variables retrieval algorithms.***



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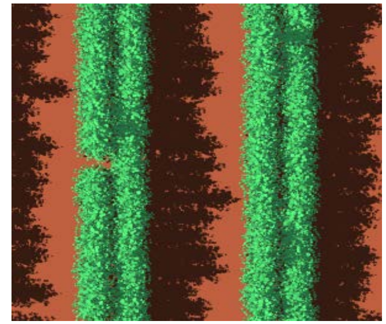

Zerbolo / Valencia

Tropical

Nghotto / Manaus

Mixed Forest Scene

Järvselja

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JRC QA4ECV Activities

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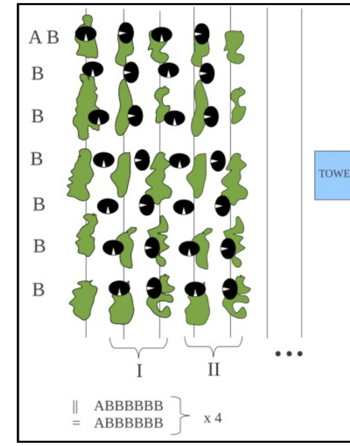
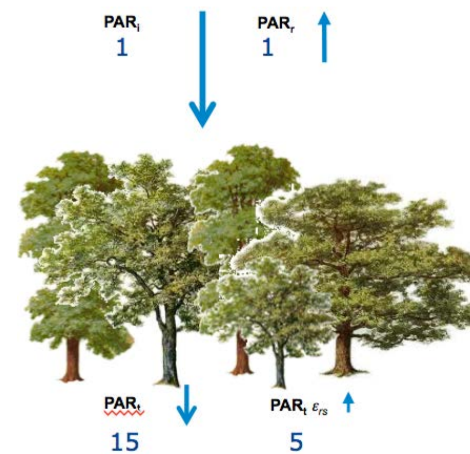


2-Reproduce various measuring protocols of in-situ measurements

→ ***Assess error budget of in-situ products***



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OCEAN COLOR ACTIVITIES:

1. JRC Field Measurement Programs
2. AERONET-Ocean Color
3. Recent Relevant Publications

Prepared by *Giuseppe Zibordi* (May 2015)

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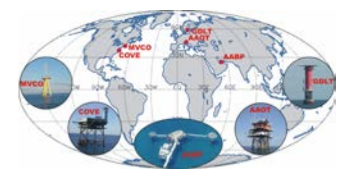
Ongoing JRC Ocean Color Field Programs

CoASTS: Coastal Atmosphere and Sea Time Series (1995-present)
(time-series data for regional OC applications)

BiOMaP: Bio-Optical Marine Properties (2000-present)
(spatially distributed data for continental OC applications)

AERONET-OC: AERONET- Ocean Color (2002-present)
(spatially distributed time-series data for global OC applications)



AERONET-OC

Primary objective of these JRC field programs is to support ocean color standardization and validation activities in view of the generation of **highly accurate satellite ocean color data products** for **Climate Data Records** applicable at regional, continental and global scale.

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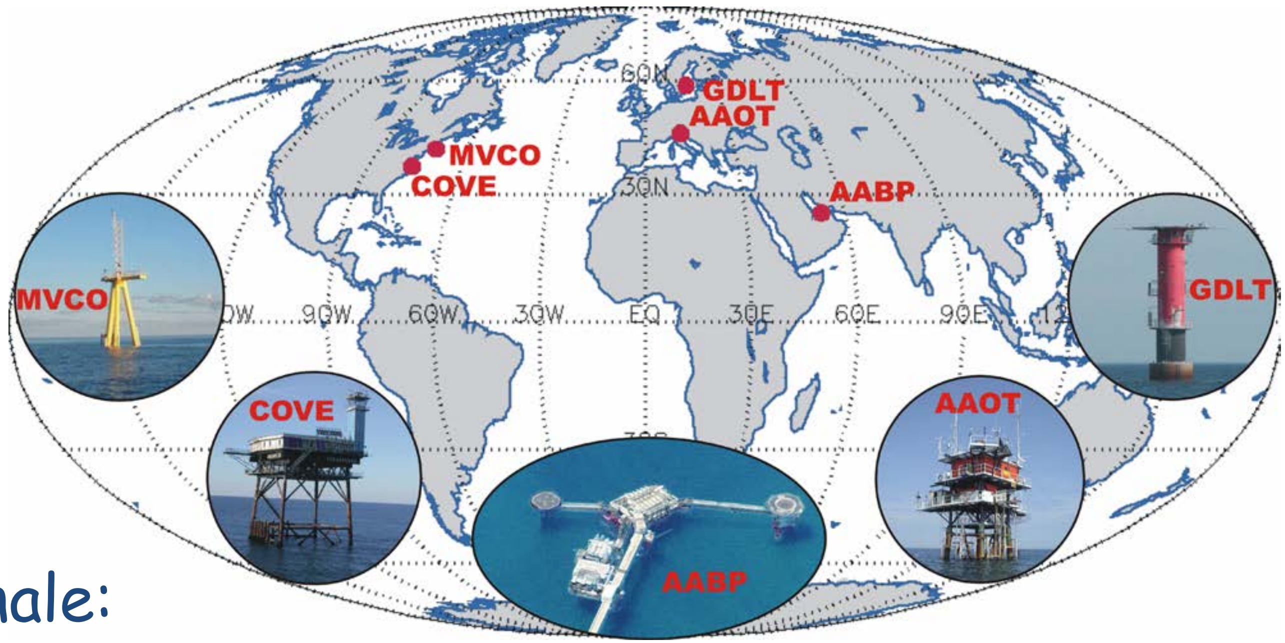
AERONET-OC

AERONET – Ocean Color is a sub-network of the Aerosol Robotic Network (AERONET), relying on modified sun-photometers to support ocean color validation activities with highly consistent time-series of $L_{WN}(\lambda)$ and $\tau_a(\lambda)$.



Rationale:

- Autonomous radiometers operated on fixed platforms in coastal regions;
- Identical measuring systems and protocols, sensor calibrated using a single reference source and method, and data processed with the same code;
- Standardized products of normalized water-leaving radiance and aerosol optical thickness.

G.Zibordi et al. A Network for Standardized Ocean Color Validation Measurements. Eos Transactions, 87: 293, 297, 2006.

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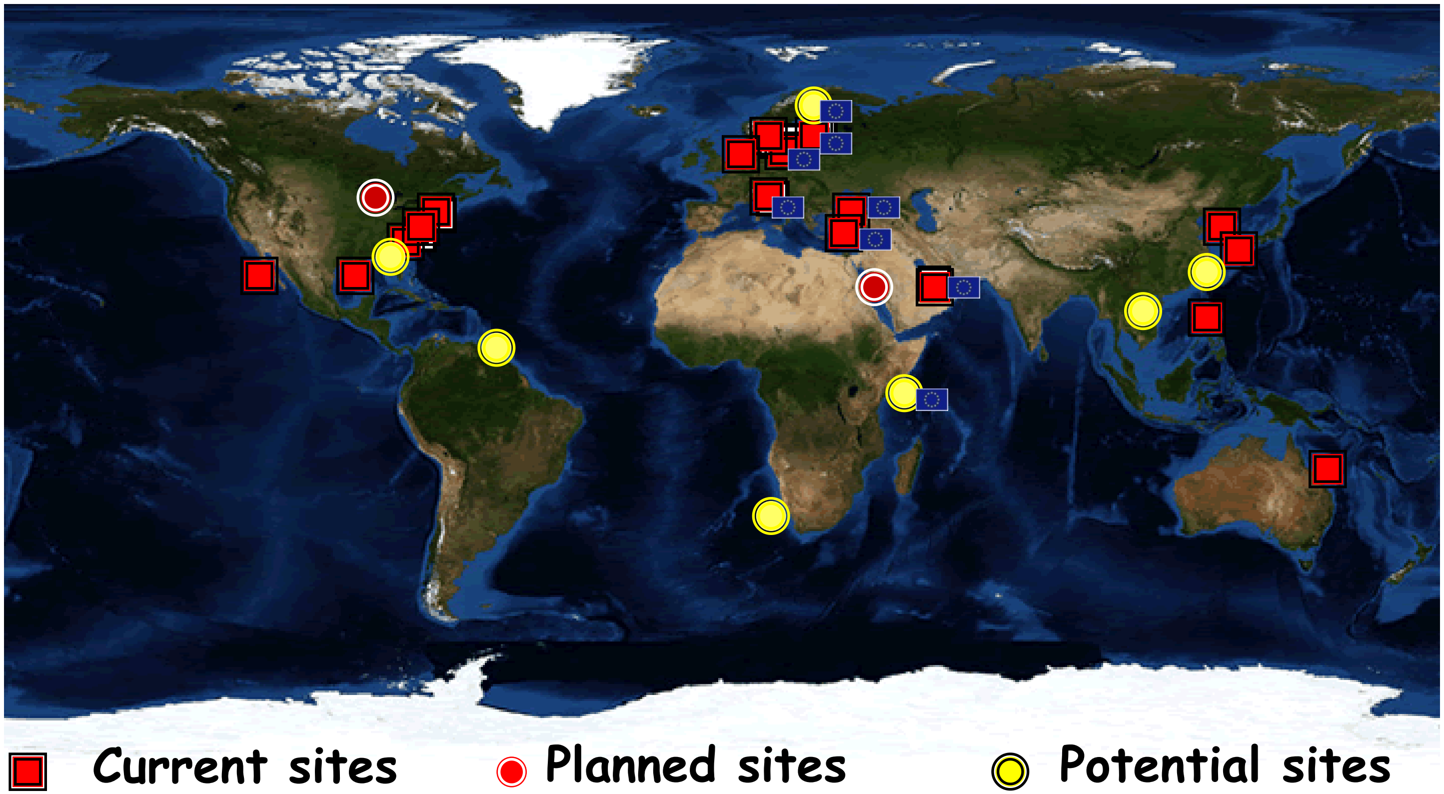
AERONET-OC sites

AERONET-OC generates globally distributed highly consistent time-series of standardized $L_{WN}(\lambda)$ and τ_a measurements.



- **NASA** manages the network infrastructure (i.e., handles the instruments calibration and, data collection, processing and distribution within AERONET).
- **JRC** has the scientific responsibility of the processing algorithms and performs the quality control of data products (in addition to the management of 5 out of 15 sites).
- **PIs** establish and maintain individual additional AERONET-OC sites.

G.Zibordi et al. A Network for Standardized Ocean Color Validation Measurements. Eos Transactions, 87: 293, 297, 2006.

AERONET-OC sites

Site	Region	Lat.	Lon.	Structure	Responsible Institution
AAOT (2002-ongoing)	Adriatic Sea	45.314°N	12.508°E	Oceanographic tower	Joint Research Centre (EU)
MVCO (2004-ongoing)	Mid-Atlantic Bight	41.325ºN	70.567ºW	Oceanographic tower	University of New Hampshire (US)
GDLT (2005-ongoing)	Baltic Proper	58.594°N	17.467°E	Lighthouse	Joint Research Centre (EU)
COVE (2005-ongoing)	Mid-Atlantic Bight	36.900°N	75.710°W	Lighthouse	NASA (USA)
HLT (2006-ongoing)	Gulf of Finland	59.949°N	24.926°E	Lighthouse	Joint Research Centre (EU)
AABP (2006-2008)	Persian Gulf	25.495°N	53.146°E	Oil platform	Joint Research Centre (EU)
Palgrunden (2008-ongoing)	Palgrunden Lake	58.753°N	13.158°E	Lighthouse	University of Stockholm (S)
LUCINDA (2009-ongoing)	Coral Sea	18.519°S	146.385° E	Jetty	*CSIRO* **(***AU***)**
LISCO (2009-ongoing)	Long Island Sound	40.955°N	73.342°W	Jetty	City College of New York (USA)
WaveCIS_Site_CSI_6 (2010-ongoing)	Gulf of Mexico	28.867°N	90.483°W	Oil platform	Louisiana State University (USA)
Gloria (2010-ongoing)	Black Sea	45.600° N	29.360° E	Gas platform	Joint Research Centre (EU)
'Gageocho_Station' (2011-ongoing)	Yellow Sea	33.942°N	124.593° E	Oceanographic tower	Korea Ocean Satellite Center (KR)
USC (2011-ongoing)	US Pacific Coast	33.564° N	118.118° W	Oil platform	University of Southern California (USA)
GOT (2012-ongoing)	Gulf of Thailand	9.286° N	101.412 °E	Oil platform	NASA (USA)
Galata (2013-ongoing)	Black Sea	43.045° N	28.193° E	Gas platform	Joint Research Centre (EU)
Ieodo Station (2013-ongoing)	Yellow Sea	32.123° N	125.182° E	Oceanographic tower	Korea Ocean Satellite Center (KR)
Zeebrugge (2014-2015)	North Sea	51.362° N	3.120° E	Coastal platform	Royal Belgian Institute of Natural Sciences (EU)

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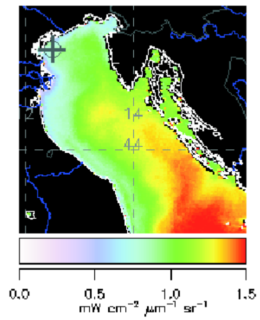
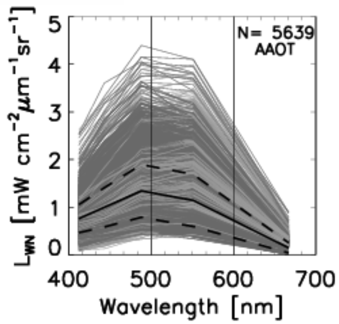
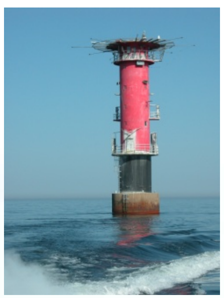
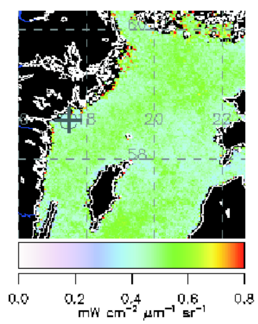
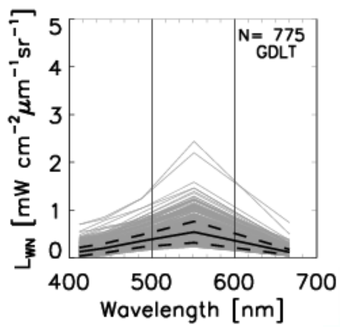
Examples of AERONET-OC Sites

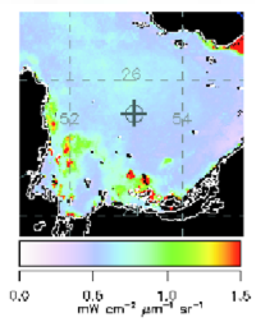


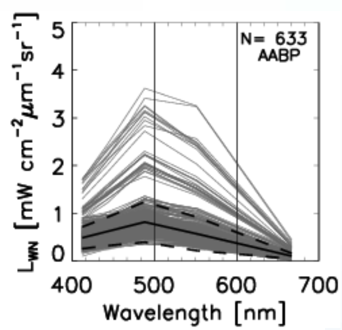
Site: AAOT
Location: Northern Adriatic Sea
Water type: Case-1/Case-2
Period: 2002-present



Site: GDLT
Location: Northern Baltic Proper
Water type: Case-2
Period: 2005-present (summer)



Site: AABP
Location: Persian Gulf
Water type: Case-1 (?)
Period: 2005-2008

G.Zibordi et al. 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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AERONET-OC: Legacy

- *AERONET-OC is a framework for the generation and distribution of standardized ocean color data products (relying on identical radiometers, calibration, measurement protocol, data reduction, quality assurance and quality control).*

- *AERONET-OC had long development and assessment phases:*
  - 4-year (1999-2002) development phase (for measurement protocol, QA/QC and data reduction) distinct from AERONET and without any specific funding;
  - 4-year (2003-2006) implementation and testing phase within AERONET without any specific funding;
  - 13-year (2002-2014) operational phase fully relying on the AERONET infrastructure (with incremental number of deployment sites and continuous revisions of code and hardware) with little funding from Space Agencies solely addressed to PIs.

In conclusion, any new development is constrained (but not prevented) by:

- network legacy (hardware & software, methods & protocols);
- the main network objective of ensuring continuity of data collection and consistency over time to the current quality of data products (i.e., new technology does not automatically mean higher data quality);
- the large resources and long time required to take into operation any new method/systems (and not simply the costs of new hardware).

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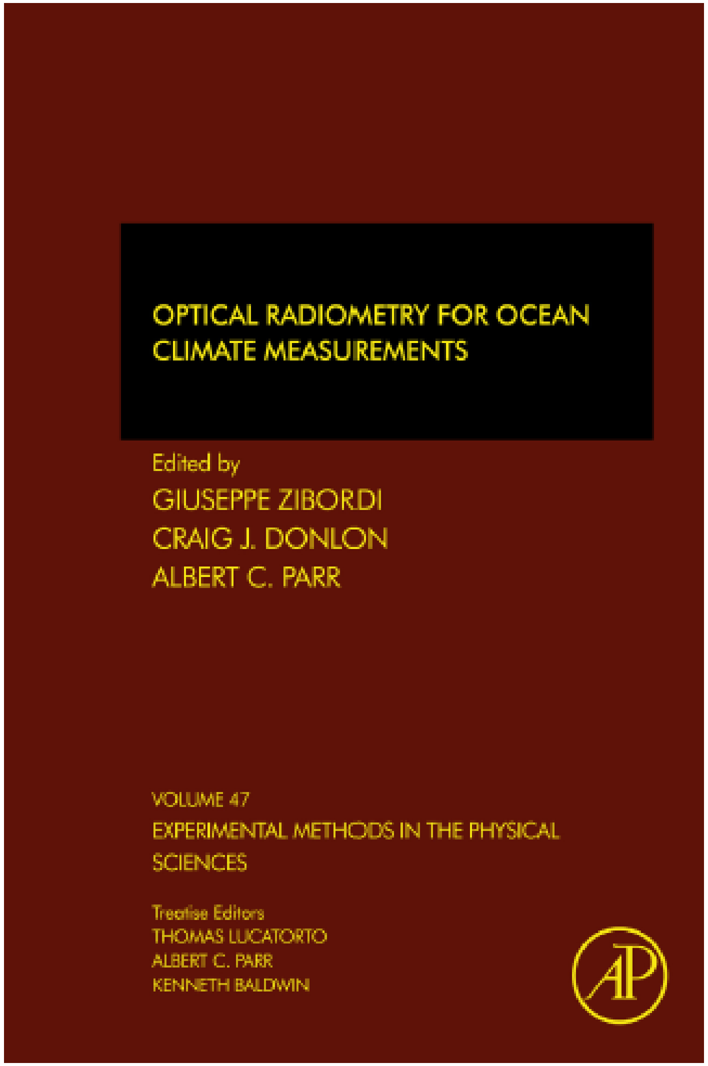
Optical Radiometry for Ocean Climate Measurements (an international effort)



The book presents the state-of-the-art of optical remote sensing applied for the generation of marine climate-quality data products.

The chapters embrace:

i. *requirements for the generation of climate data records* from satellite ocean measurements;

ii. *satellite visible and thermal infrared radiometry* embracing instrument design, characterization and, pre- and post-launch calibration;

iii. *in situ visible and thermal infrared radiometry* including overviews on basic principles, technology and measurements methods;

iv. *simulations* as fundamental tools to support interpretation and analysis of both *in situ* and satellite radiometric measurements;

v. *strategies for in situ radiometry* to satisfy mission requirements for the generation of climate data records; and

vi. *methods for the assessment of satellite data products.*

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System Vicarious Calibration: Requirements for In Situ Data

Remote Sensing of Environment 159 (2015) 361–369

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journal homepage: www.elsevier.com/locate/rse

System vicarious calibration for ocean color climate change applications: Requirements for in situ data

Giuseppe Zibordi [a,*], Frédéric Mélin [a], Kenneth J. Voss [b], B. Carol Johnson [c], Bryan A. Franz [d], Ewa Kwiatkowska [e], Jean-Paul Huot [f], Menghua Wang [g], David Antoine [h,i]

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The work indicates that the creation of ocean color CDRs should ideally rely on:
i. one main long-term in situ calibration system (site and radiometry);
ii. a *unique (i.e., standardized) atmospheric model and algorithms for atmospheric correction*.
Finally, *requirements and recommendations for system vicarious calibration sites* and field radiometric measurements, are streamlined.

Thank you!