Maritime Aerosol Network as a component of AERONET – dreams of the 1980s became realities of the 2020s

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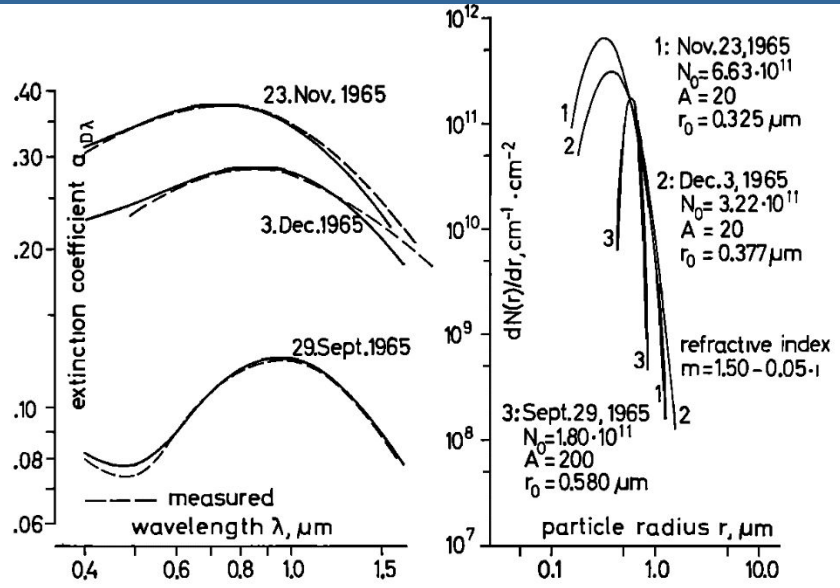

Fig. 7. *Left:* extinction coefficients of aerosol particles versus wavelength. *Right:* corresponding size distributions of aerosol particles versus particle radius. Results obtained on three different days.

JOURNAL OF GEOPHYSICAL RESEARCH VOL. 75, NO. 15, MAY 20, 1970

Determination of Size Distribution of Atmospheric Aerosol Particles from Spectral Solar Radiation Measurements

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The extinction coefficient in a vertical column of atmosphere was determined from spectral solar radiation measurements. The corresponding aerosol size distributions were derived by comparison with Mie calculations. Ground-level measurements over the tropical Atlantic Ocean show that a distribution having a maximum particle concentration near 0.4 μm radius is superimposed on the usual power-law distribution. This distribution can be described by a logarithmic Gaussian (log-normal) distribution.

Optical properties of the atmosphere: calculated variability and application to satellite remote sensing of phytoplankton

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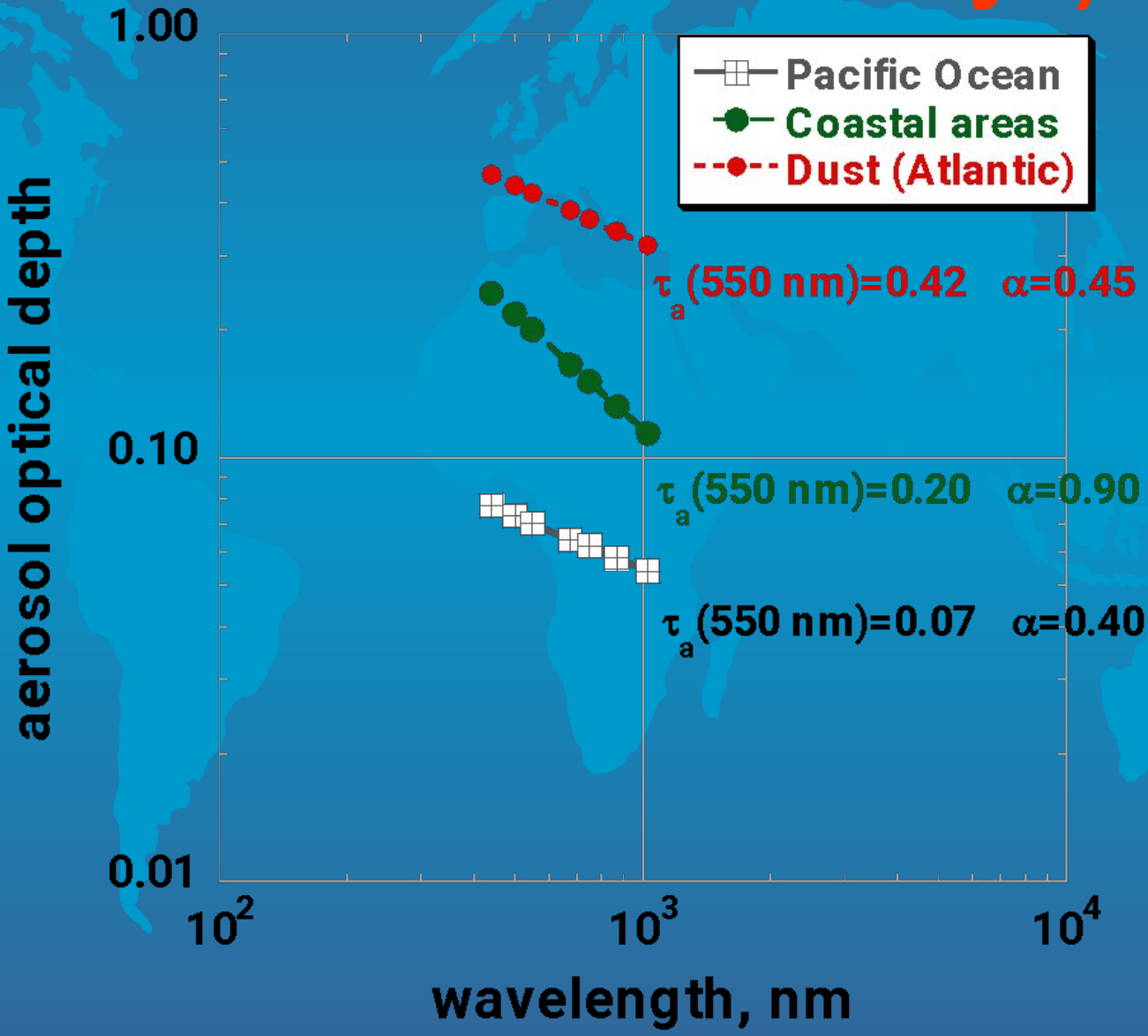
Received 12 June 1979.
0003-6935/80/081338-07$00.50/0.

From these statements we conclude that accurate channel-by-channel reduction of the spectral radiances at the satellite to the radiances just above the surface cannot be done without additional measurements of the atmospheric optical state. Consequently, for removal of the important atmospheric effect from the radiance at the satellite the development of an algorithm is needed, which requires the least possible knowledge about the atmospheric optical state.

Typical sea areas (as of 1988, 220 measurement days)



Optical Properties of Atmospheric Aerosol in Maritime Environments

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TABLE 1. Summary of aerosol optical depth measurements in maritime and coastal areas.

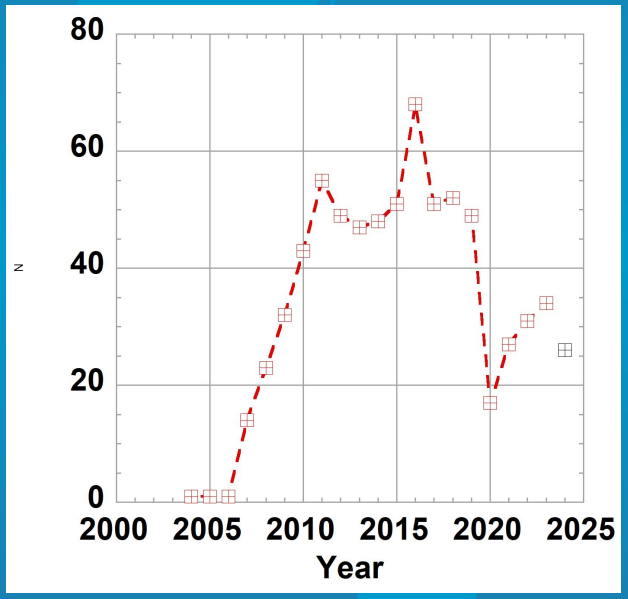
Reference	Area	τ_a[a]	D[b]	Spectral range (nm)	No. of filters
Fischer (1967)	South Ocean	0.09	—[c]	500	1
	South Pacific Ocean	0.12	—		
	New Zealand coast	0.16	—		
Guttman (1968)	Marshall Islands	0.11	1	$450 \leq \lambda \leq 710$	7
Guschin (1970)	Indian and Atlantic Oceans	0.23	20	$370 \leq \lambda \leq 530$	2
Quenzel (1970)	Tropical Atlantic	0.23	3	$400 \leq \lambda \leq 1600$	8
Volz (1970)	Tropical Atlantic	0.18	17	$440 \leq \lambda \leq 1630$	4
Sandomirskiy et al. (1971)	Black Sea coast	0.27	—	$480 \leq \lambda \leq 2240$	6
Kuznetsov and Izhovkina (1973)	North Atlantic	0.04	—	$410 \leq \lambda \leq 550$	
Barteneva et al. (1974)	Tropical Atlantic	0.22	34	$350 \leq \lambda \leq 1010$	10
Burmistrova and Shubova (1974)	Tropical Pacific and Atlantic	0.18	26	550	1
Shifrin et al. (1975)	Indian Ocean	0.11	21	$330 \leq \lambda \leq 690$	5
Fraser (1976)	Atlantic Ocean–dust	0.50	1	$500 \leq \lambda \leq 1070$	2
Karimova (1976)	North Atlantic	0.08	5	$340 \leq \lambda \leq 630$	6
Emelyanov et al. (1978)	Atlantic Ocean	0.25	20	$440 \leq \lambda \leq 710$	4
Jaenicke and Schutz (1978)	Island Sal	0.38	—	$380 \leq \lambda \leq 500$	2
Adnashkin et al. (1979)	Tropical Atlantic	0.19	—	$350 \leq \lambda \leq 1010$	10
Tavartkiladze (1979)	Black Sea coast	0.28	—	$370 \leq \lambda \leq 820$	13
Wilson (1979)	San Diego	0.20	1	$400 \leq \lambda \leq 750$	10
	Gulf of Mexico	0.24	7		

Distribution of island-based AERONET sites

Long-term island based comprehensive AOD measurements, which seemed to be a luxury for various applications in the 1980s, do not satisfy contemporary needs of remote sensing and modelling research. Establishment of Maritime Aerosol Network (MAN) as a component of AERONET allowed to improve our knowledge of aerosol optical properties over the oceans and fill existing data gaps in various oceanic areas.

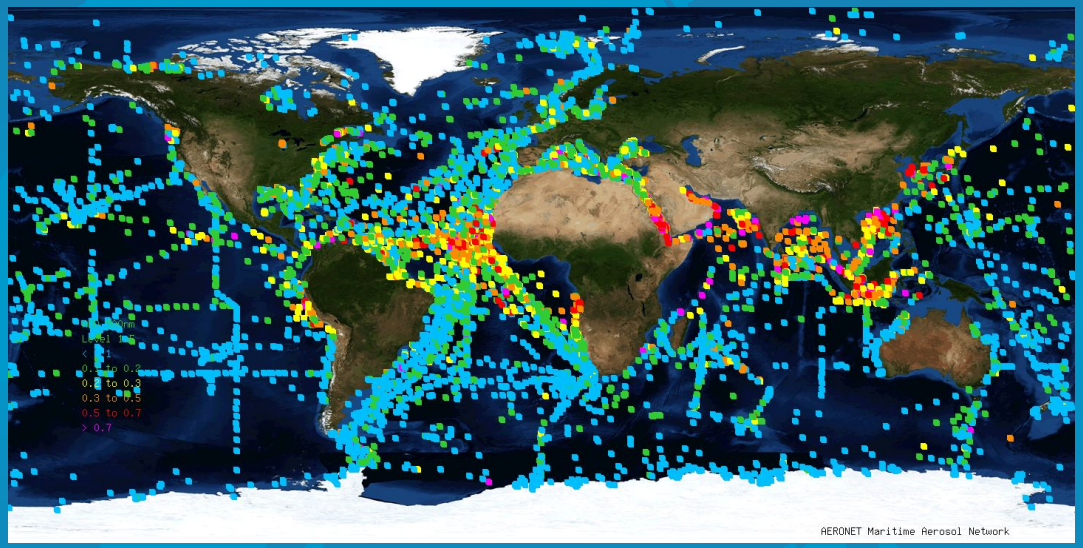
Maritime Aerosol Network as a Component of AERONET

- MAN represents an important strategic sampling initiative and ship-borne data acquisition complements island-based AERONET measurements



- Data acquired in more than 700 cruises are easily accessible in the web-based public data archive

Maritime Aerosol Network global coverage from October 2006 to September 2024



Cruise tracks and daily averages of aerosol optical depth at 500 nm (squares are colored with respect to AOD values, i.e. blue – AOD<0.10, green – 0.1≤AOD<0.2, yellow – 0.2≤AOD<0.3, orange – 0.3≤AOD<0.5, red – 0.5≤AOD<0.7, purple – AOD≥0.7).

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JOURNAL OF GEOPHYSICAL RESEARCH, VOL. 114, D06204, doi:10.1029/2008JD011257, 2009

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Maritime Aerosol Network as a component of Aerosol Robotic Network

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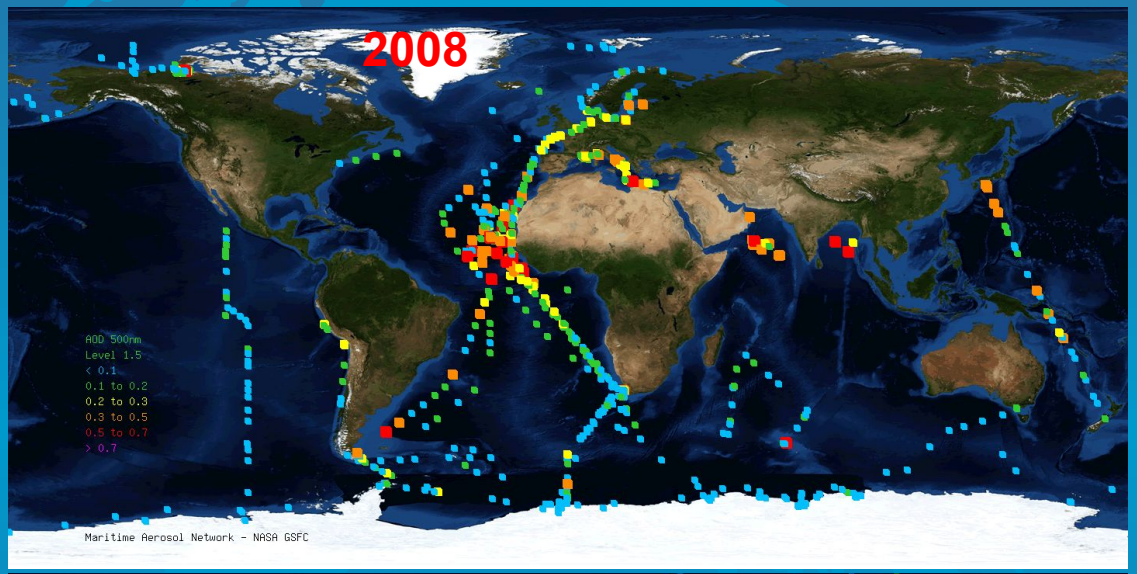
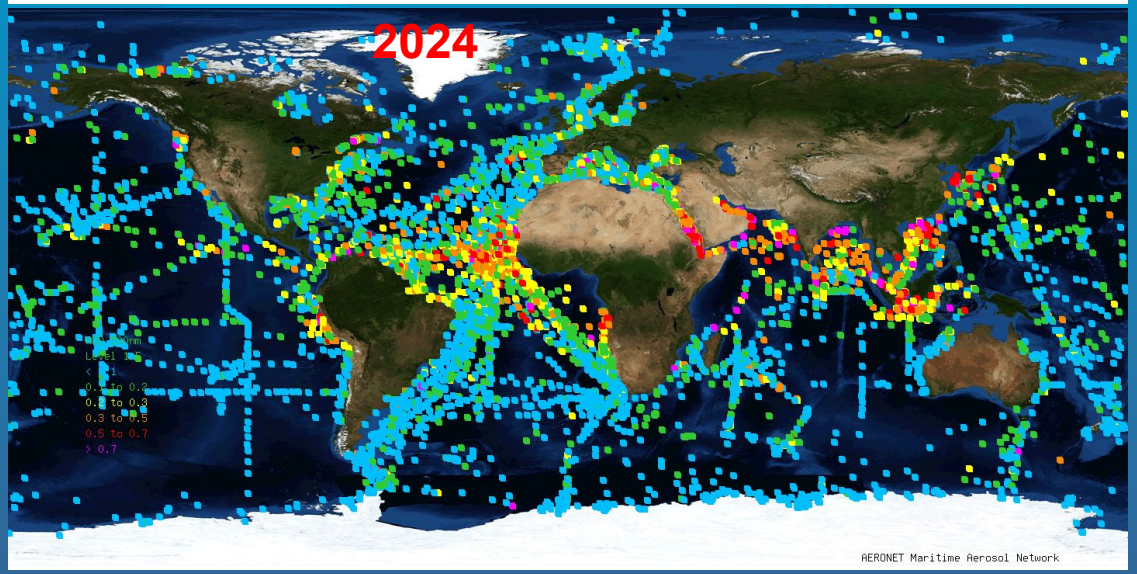
Received 7 October 2008; revised 12 January 2009; accepted 23 January 2009; published 21 March 2009.

[1] The paper presents the current status of the Maritime Aerosol Network (MAN), which has been developed as a component of the Aerosol Robotic Network (AERONET). MAN deploys Microtops handheld Sun photometers and utilizes the calibration procedure and data processing (Version 2) traceable to AERONET. A web site dedicated to the MAN activity is described. A brief historical perspective is given to aerosol optical depth (AOD) measurements over the oceans. A short summary of the existing data, collected on board ships of opportunity during the NASA Sensor Intercomparison and Merger for Biological and Interdisciplinary Oceanic Studies (SIMBIOS) Project is presented. Globally averaged oceanic aerosol optical depth (derived from island-based AERONET measurements) at 500 nm is ~0.11 and Angstrom parameter (computed within spectral range 440–870 nm) is calculated to be ~0.6. First results from the cruises contributing to the Maritime Aerosol Network are shown. MAN ship-based aerosol optical depth compares well to simultaneous island and near-coastal AERONET site AOD.

YEAR	Citations
2010	13
2011	22
2012	21
2013	30
2014	16
2015	22
2016	17
2017	19
2018	22
2019	29
2020	25
2021	17
2022	32
2023	20
2024	15

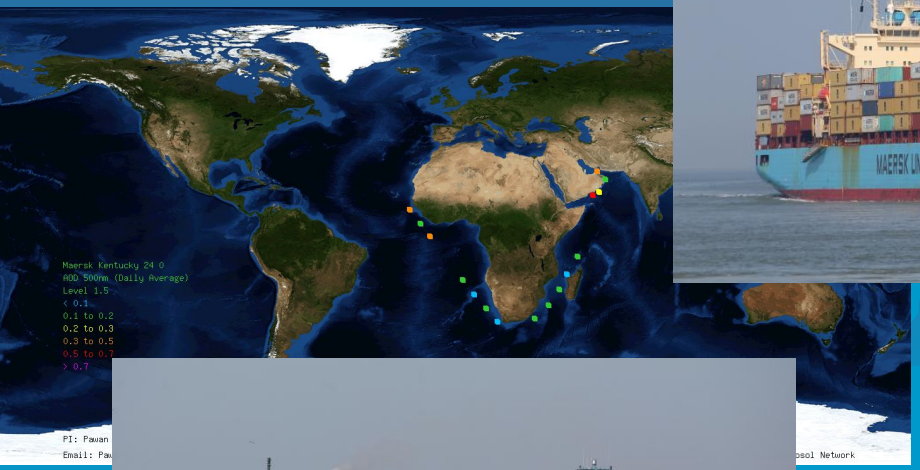
	2006	2010	2012	2014	2016	2018	2019	2023	2024
Cruises completed	2	76	147	268	356	510	579	675	723
Measurement days	63	1612	2950	4550	6040	7450	9260	9775	$>10^4$





MV Maersk Kentucky

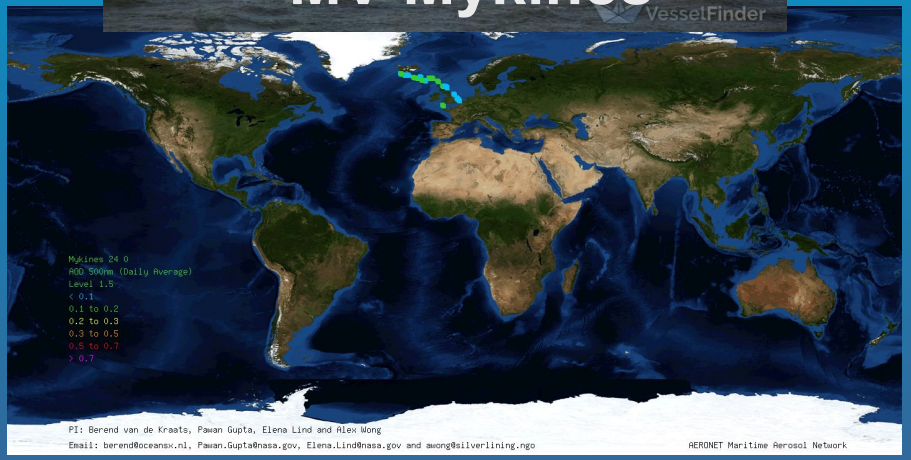
MV Maersk Kentucky

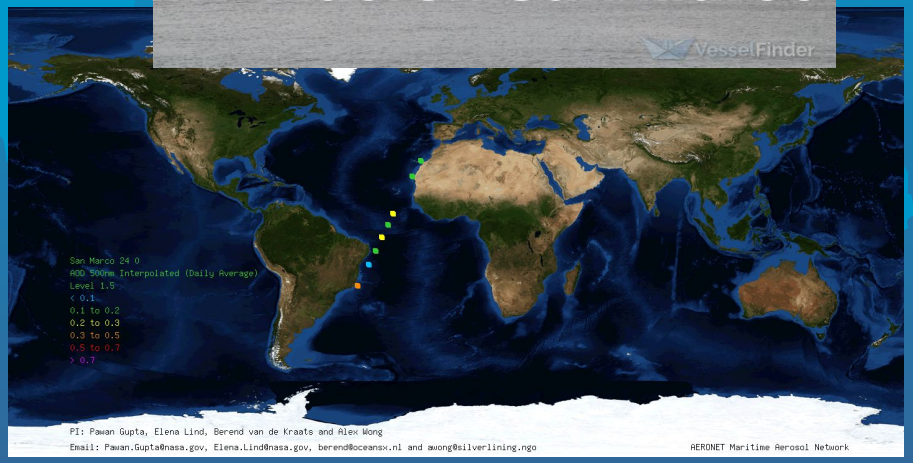


MV Mykines

2024

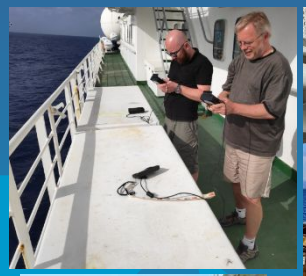
MV Maersk San Marco



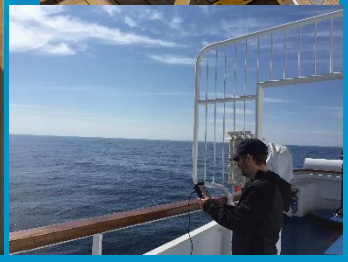


Maritime Aerosol Network as a Component of AERONET

International collaborative effort

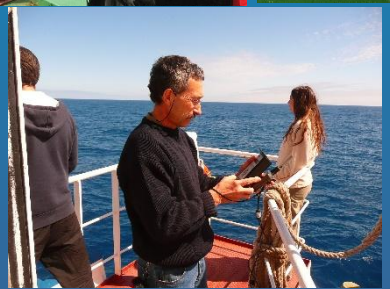










Acknowledgments

- We thank Dr. Steve Platnick from EOS Project Science Office and Dr.Hal Maring from NASA Headquarters for their support of AERONET