National Aeronautics and Space Administration

AERONET

Aerosols and Earth's Climate

Inside

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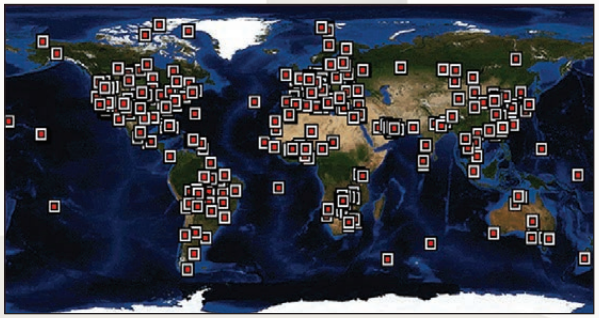
What is AERONET?

AErosol RObotic NETwork (AERONET) is a globally distributed network of identical robotically controlled ground-based sun/sky scanning radiometers. Each instrument measures the intensity of sun and sky light throughout daylight hours from the ultraviolet through the near-infrared. The program provides a long-term, continuous, and accessible public domain database of aerosol optical, microphysical, and radiative properties for aerosol research including, aerosol characterization, validation of satellite retrievals and model predictions, and synergism with other data bases.

The instrument above is pointing directly at the sun to determine spectral aerosol optical depth (AOD). The AERONET radiometer then scans the sky from which additional properties, such as size and absorption, may be determined. Photo credit: Itaru Sano.



International collaboration has fostered a multi-year global distribution of AERONET measurements on all continents and over many seas and oceans allowing assessment of all aerosol types under most conditions.

Cover photo credits (clockwise from top): Daniel Jamen Bryant, Sheng-Hsiang Wang, Daniel Yara, Dee Golden, (bottom) Rick Hoblitt/USGS; (left) Jayson Coil, Kenn W. Kiser, (center) Gian Gobbi

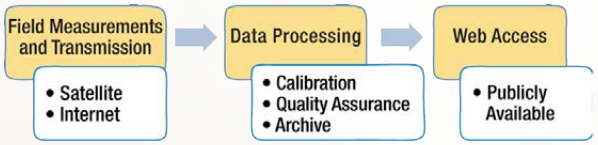
Aerosols are tiny solid and liquid particles suspended in the atmosphere from the surface to the stratosphere with typical lifetimes of days to weeks. Key aerosol groups include sulfates, organic carbon, black carbon, nitrates, mineral dust, and sea salt. Aerosols scatter sunlight to space and Earth's surface and absorb a small fraction of sunlight that is reemitted as thermal energy, which depends on the properties of aerosol types. Aerosols affect Earth's radiation balance, the biological environment, and human health. Photo credits (left to right): Rick Hoblitt/USGS, Daniel Jamen Bryant, Jayson Coil.

Calibration and Standardization

The AERONET calibration facilities impose standard procedures to ensure that all instruments quantify aerosol properties and concentrations to scientific accuracy requirements.

Field instruments placed in remote regions are calibrated annually to reference instruments at NASA's Goddard Space Flight Center in Greenbelt, Maryland; Carpentras, France; and Valillodolid, Spain. Photo credit: Wayne Newcomb

Data Processing and Availability



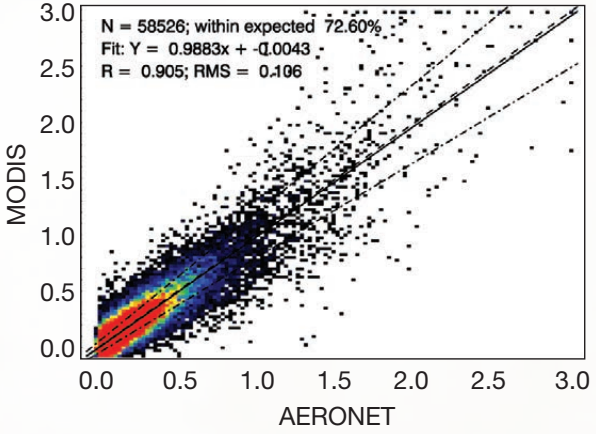
AERONET data transmitted via satellite or the Internet are processed, archived, and publicly accessed in near real time on the Web at:
aeronet.gsfc.nasa.gov

Data Quality

AERONET provides quality-assured datasets for scientific analysis at each site. Real-time data are not quality assured [levels *1* and *1.5* (cloud-screened)], yet provide significant information on the current aerosol environment. Quality-assured data (level *2*) are available after post field calibration and are strongly recommended for scientific analysis and publication.

MODIS/AERONET

AOD land: both 0.55µm, QA3



Satellite instrumentation utilizes AERONET to provide atmospheric correction and to provide validation of retrieved aerosol properties and concentrations. The frequency scatter plot above demonstrates a Moderate Resolution Imaging Spectroradiometer (MODIS) instrument algorithm validation exercise using thousands of coincident AERONET observations worldwide. Figure courtesy of Robert Levy.

Benefits to Science

- AERONET measurements are used to validate and advance algorithm development of satellite retrievals of aerosols
- Aerosol transport models use aerosol data from AERONET to validate and improve model algorithms
- Aerosol assimilation models as well as weather prediction models use real time AERONET data to improve predictions
- Long-term commitment to AERONET sites worldwide provides assessment of the regional climatological impact of aerosols (e.g., aerosol amount, size, and heating or cooling effects)
- Atmospheric correction of satellite imagery for improved biogenic process studies
- Remote sensing of ocean sediments and validation of satellite ocean color from selected AERONET-Ocean Color sites (See **aeronet.gsfc.nasa.gov/new_web/ocean_color.html**)
- Assessment of maritime aerosols from ships of opportunity from AERONET-Marine Aerosol Network (See **aeronet.gsfc.nasa.gov/new_web/maritime_aerosol_network.html**)
- Assessment and measurements of solar flux at AERONET locations from AERONET-Solar Radiation Network (See **solrad-net.gsfc.nasa.gov**)
- Synergism with multiple remote sensing and modeled aerosol and related databases at AERONET sites (See Synergy Tool: **aeronet.gsfc.nasa.gov/new_web/synergism.html**)
- Support field campaigns and foster synergism with multiple aerosol, chemistry, and remote sensing measurements to assess the dynamics of aerosol properties on local and regional scales (See AERONET campaigns: **aeronet.gsfc.nasa.gov/new_web/campaigns.html**)

NASA's P3-B collected airborne measurements in Maryland in 2012 while spiraling up and down over core ground sites. At the same time, AERONET instruments made measurements from the ground up. These synergistic measurements helped validate and determine aerosol during this Air Quality mission. Photo credit: Alex Tran

Contacts

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The AERONET team is comprised of scientists, engineers, and technicians (shown above) from NASA's Goddard Space Flight Center, University of Lille's LOA, University of Valladolid's GOA, AEMET's Izana Observatory, Environment Canada's AEROCAN, and the Institute of Remote Sensing Applications' MOSTap. Over 100 principal investigators in more than 80 countries and territories participate in the AERONET federation. We are indebted to all of the many individuals and funding agencies that allow AERONET to grow and contribute to science. Photo credit: Sandra Bussard

Other Web Links

Laboratoire d'Optique Atmosphérique (LOA)
www-loa.univ-lille1.fr

Grupo de Optica Atmosferica (GOA)
goa.uva.es

Agencia Estatal de Meteorología (AEMET)
www.aemet.es

AEROCAN Network
www.aerocanonline.com

Canada Centre for Remote Sensing (CCRS)
Natural Resources Canada
nrcan.gc.ca

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