



AEROSOL NETWORK NEWS

Issue 4, October 2019

Welcome!

Yet another edition of our very (ir)regular newsletter about the NOAA Federated Aerosol Network (NFAN), which is managed by scientists the Global Monitoring Division (GMD) in Boulder. As always, there are several goals we hope to achieve with this newsletter:

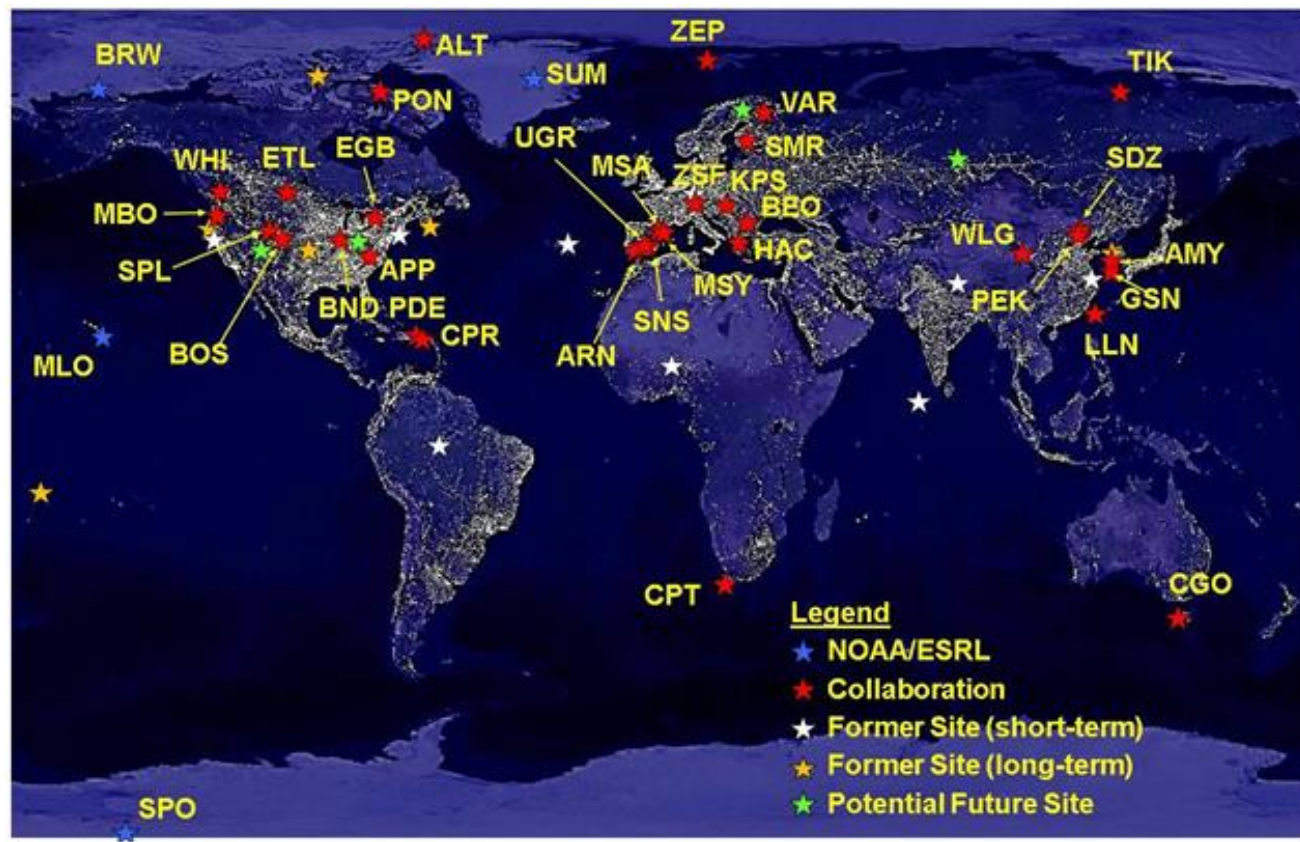
- Let you (our collaborators and colleagues) know about updates to the Network (including new sites, instrument additions, software changes, etc.).
- Describe research projects utilizing data from one or more sites within the network.
- Keep you informed about publications and presentations based on network data.
- Foster collaboration among network partners.

YOU can help us by keeping us up-to-date on what is happening at your site(s). For example, have you... Deployed a new instrument? Presented at a conference? Published a research paper? Graduated? Got an idea you would like to share with everyone? PLEASE LET US KNOW!

(email: betsy.andrews@noaa.gov).

Please feel free to share this newsletter with colleagues that might be interested.

Latest Network Map (September 2019)



What's happening around the network: New Sites!!

New stations since last newsletter

2016: SNS

2017: CGO, MSA, MSY

2018: HAC, MBO, PON, SMR, VAR, ZEP

2019: BOS

Future and potential future sites:

NMT, PDE, TOF, SLC, WPB

Closed aerosol stations since last newsletter

RSL (2016), SGP (2017), SMO (2017), THD (2017)

Table Mountain, Colorado (BOS)

This is our newest site, which became operational Sept 6, 2019. BOS is located at the NOAA Table Mountain Test Facility, about 10 km north of Boulder, Colorado, and at an elevation of ~1689 m asl. It is co-located with a full SURFRAD instrument suite (<https://www.esrl.noaa.gov/gmd/grad/surfrad/>) as well as surface ozone measurements from GMD's Ozone and Water Vapor (OZWV) group (the aerosol software is used to log, process, view, edit and archive the ozone data).



The establishment of a surface aerosol monitoring station at Table Mountain was made possible through a grant from the NOAA Office of Weather and Air Quality (OWAQ). The primary objective of the project is to conduct surface and boundary layer aerosol studies in support of weather forecast model development. The measurements made at this site will, of course, also be useful for climate studies.

Mt. Helmos, Greece (HAC)

Mt. Helmos station located on the Helmos Mountain at an elevation of ~2314 m asl.



HAC is operated by Dr. Kostas Eleftheriadis at the Institute of Nuclear and Radiological Science & Technology, Energy & Safety in Greece. HAC joined the NFAN in July 2018 by using the NOAA software and starting light absorption measurements with the NOAA Continuous Light Absorption Photometer (CLAP) instrument, although other aerosol measurements have been made there since 2016). It is in an excellent location to measure urban pollution, biomass burning aerosols and Saharan dust outbreaks.

Mount Bachelor, Oregon (MBO)

The Mt. Bachelor Observatory (MBO) is located on the summit of Mt. Bachelor at ~2743 m asl and is run by Professor Dan Jaffe of the University of Washington with the cooperation of the Mt. Bachelor Ski Area.



While MBO has made aerosol and other atmospheric measurements for many years, they joined the NFAN in April 2018 to take advantage of the support for both instruments and data processing. MBO is in a great location to study regional atmospheric chemistry and long-range transport events such as air pollutants and dust from Asia and wildfire smoke aerosols in the western United States.

What's happening around the network: Ecotech neph update

We've developed a new module for the NOAA aerosol software to enable the Ecotech nephelometer to operate more like a TSI nephelometer – specifically with respect to the zero calculations. To set this up on your Ecotech nephelometer requires a firmware upgrade to the

instrument and updating to the new Ecotech configuration on the data acquisition computer. We very much appreciate the Ecotech engineers working with us to develop the new firmware! Please contact us if you have any questions.

What's happening around the network: Projects

IPCC-related projects

In the lead up to the next IPCC report the WMO/GAW community is putting in significant effort to ensure that the report authors have access to information about the extent of the surface in-situ aerosol network measurements and about long-term trends in aerosol properties. This effort is currently operating under the unwieldy acronym 'SARGAN' which stands for 'in-Situ AeRosol GAW observing Network'. There are two prongs to SARGAN.

The first goal of SARGAN is submission of multiple papers describing various aspects of GAW network aerosol measurements: (a) an overview of the aerosol measurements led by Dr. Paolo Laj, chair of GAW's Scientific Advisory Group on Aerosols, which will summarize progress in aerosol observations over the last several decades. This paper will include plots of 2017 aerosol data that have been submitted to the EBAS archive (data submitters will be offered co-authorship); (b) a few separate manuscripts on trends in aerosol properties including aerosol optical properties, aerosol size distributions and OC/EC. Dr. Martine Collaud Coen, researcher at MeteoSwiss, is leading the effort describing aerosol optical property trends – she has probably already contacted you about your station measurements! Again – for data used in the trend analysis, data submitters will be offered co-authorship; and (c) Prof. Ali Wiedensohler, head of the World Calibration Center for Aerosol Physics, will write about standard measurement and operating procedures.

The second prong of the SARGAN effort is to suggest a list of essential climate variables (ECVs) related to aerosol properties to be included in the next revision of the Global Climate Observing System (GCOS) assessment. GCOS is a UN framework which assesses the status of climate relevant observations and makes suggestions for improving and sustaining observations.

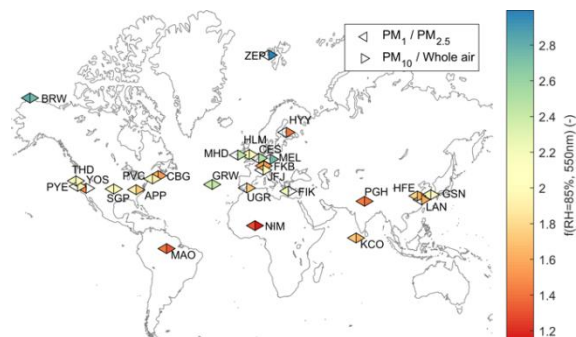
Estimating CCN from aerosol optical properties

One of the key elements of uncertainty in estimating climate forcing is the influence of clouds. Dr. Aki Virkkula, an NFAN collaborator, and his group at Finnish Meteorological Institute are using aerosol optical properties from SMR and several DOE/ARM Mobile Facility sites that operated as part of the NFAN to parameterize the number of Cloud Condensation Nuclei (CCN). Determining potential CCN concentrations is a first step in understanding cloud properties. The method may also provide useful insights for scientists attempting to retrieve CCN concentrations from satellite data as a function of aerosol optical depth.

Model evaluation using NFAN measurements

One of the advantages of a global network of consistent measurements (e.g., the NFAN) is that they can be used to evaluate model simulations. There is currently a lot of effort being put into using surface aerosol optical measurements to evaluate global climate models.

Post-doc Maria Burgos at Stockholm University has developed a benchmark dataset of aerosol hygroscopicity from tandem nephelometer measurements at 26 stations including several NFAN stations (see map below) and is currently using this dataset to explore differences in aerosol water amongst 8 global climate models. The interaction of aerosol particles with water affects their radiative forcing and also their ability to act as CCN.



Dr. Michael Schulz at the Norwegian Meteorological Institute is leading the AeroCom effort to use long-term in-situ aerosol measurements to assess how well models simulate trends in aerosol optical properties. His group has developed an interactive website in the process with the ultimate goal of including both measurement and model data; the link is:

<https://aerocom-trends.met.no>

Still in progress (but Betsy never has any time to work on it!) is the goal of using dry aerosol optical properties (scattering and absorption) from the NFAN and other GAW aerosol sites to evaluate climate models. Most previous aerosol optical property

model evaluations have focused on using AOD which is an ambient column measurement. Three limitations of using AOD are that (1) the models must get the aerosol water right (2) the vertical location of the aerosol is not well-constrained and (3) it is difficult to get information about aerosol absorption except in conditions of very high loading. Surface in-situ measurements have none of these limitations (although there are, of course, other issues).

What else?? Please let us know what you are up to with aerosol measurements and data!

Email: betsy.andrews@noaa.gov

What's happening around the network: GMD Network Support

As you all know, operating a monitoring station and producing quality data is a lot of work. We want to reinforce that we at NOAA are here to help you to the extent possible. We started NOAA Baseline Observatory aerosol measurements in the 1970's and have picked up a lot of valuable knowledge along the way! If you have questions about station operation, best practices, standard operating procedures, etc., please do not hesitate to contact us.

We are also happy to assist on any questions or problems about software and/or instruments and we encourage partners to contact us with questions. Derek Hageman at NOAA/GMD created the custom NFAN network software package (CPD3). He is currently working to complete and improve the software documentation. If you have questions about the software or how to best use it, a good place to start would be looking at the link:

<https://www.esrl.noaa.gov/gmd/aero/sw.html> and choosing 'Online documentation for data processing software (CPD3)'. There are also other links on this page that describe how to install the software on your computer, a data editing instruction manual, the graphical user interface (CPX3 GUI) for data visualization and editing, instructions and examples on how to perform basic data extraction and manipulation tasks (e.g., https://www.esrl.noaa.gov/gmd/webdata/aero/net/cpd3/doc/gui/export_examples.html), FAQ's, etc.

Regarding instruments, we can assist on some instrument troubleshooting, repairs, comparisons and calibrations. We have extensive experience in the repair of TSI nephelometers and some TSI particle counters. We can often perform successful repairs

on some of these instruments that have gone out of production, although our time is very limited and the repair may take some time.

We developed the Continuous Light Absorption Photometer (CLAP) instrument at NOAA which is used at many of our NFAN partner stations, and we are willing to repair this instrument for our partners when it is necessary free of charge. When an instrument comes back to us for repairs we also typically perform a calibration or calibration check when that is possible, or we compare the partner's instrument to our NOAA laboratory reference instruments. This is one way we try to keep the instruments in the NFAN operating as similarly as possible.

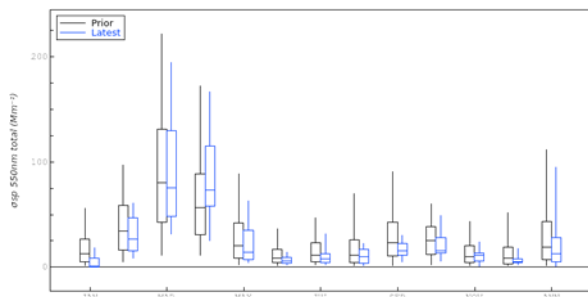


To summarize, if you have a question... ask! If you have a problem, let us know about it and we will do what we can to help.

What's happening around the network: Webpage updates!

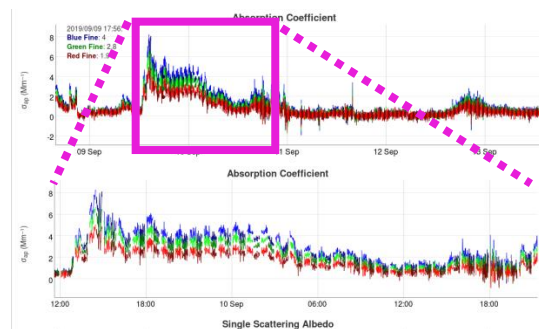
The NFAN station webpages hosted at NOAA are a great way to get some quick looks at your station data – both for near real time to assess station operations and for a historical/statistical perspective. These pages are found under the link: <https://www.esrl.noaa.gov/gmd/aero/net/> and then by clicking on an individual station in the station table.

Below the site description on each station's webpage is a link to that station's statistical summary plots, which provide a quick look at the multi-year records of aerosol properties measured that site. These plots show time series data and annual cycles (by month) over the entire record of measurements. One type of plot provided shows how the most recent data from each month compared with the entire record. This is useful in evaluating whether something has changed recently at a given site, whether that change is atmospheric or related to the sampling/measurement system. Below is an example of this type of plot for aerosol light scattering at Mount Lulin in Taiwan, with blue representing the most recent conditions and black representing the long-term record.



In addition to the historical plots, the Atmospheric Properties plot table at the bottom of each station's pages contains links to near real time data plots

(updated several times/day). We've updated these plots to be interactive, with zooming and panning enabled to get better looks at portions of the displayed time series (see plot below).



The table provides links to two types of plots: (i) short-term status plots (last five days of 1-minute resolution data) and (ii) long-term status plot (last 30 days of hourly average data). The 'Overview' plot shows measured extensive and calculated intensive atmospheric properties while other plots show measurements and status parameters related to individual instruments.

We encourage our collaborators to take a look at these plots, not only for their own stations but also for those of other NFAN stations. This could be useful, for example, to an NFAN collaborator studying smoke aerosols in the western US to see if an aerosol event was observed at other North American stations. These tools were made not only to make data viewing quicker and easier from virtually anywhere with internet access but also to foster and facilitate collaboration across NFAN stations. Please let us know if you have any suggestions to improve these pages/plots.

48th Global Monitoring Annual Conference (GMAC)

NOAA's Earth System Research Laboratory (ESRL), Global Monitoring Division will hold the next ESRL Global Monitoring Annual Conference in May of 2020 (final dates have not been set yet) at the David Skaggs Research Center, 325 Broadway, Boulder, Colorado 80305. As always we invite all of our NFAN partners and scientific collaborators to attend and present your research. If you require an official letter of invitation, we will provide that for you. The link is: <http://www.esrl.noaa.gov/gmd/annualconference/>

Also during the week of the GMAC we typically run workshops for our NFAN partners on using the aerosol software package, on data editing strategies, and on instrument maintenance and repairs. The GMAC is an excellent opportunity to interface with other researchers in the NFAN, at NOAA, and in the local atmospheric science community (University of Colorado, Colorado State University, National Center for Atmospheric Research, etc.).

Meet the Partners

In this section we put faces to the names of our partners. You might be next!

Professor Konstantinos (Kostas) Eleftheriadis



Kostas has worked in the atmospheric aerosol field for over 25 years, with activities related to aerosol physicochemical characterization, application of nuclear techniques to environmental studies and radioactivity including development of novel sampling and measurement techniques. He has established and is responsible for two sites in the Global Atmosphere Watch network the Demokritos Regional Research Aerosol station (DEM), operating since 2007 and Helmos Mountain station (HAC) since 2016, which is now a participant in the NOAA Federated Aerosol Network.

In addition to his field and laboratory activities Kostas has been actively involved in European initiatives for the development of standardized methods, through EUSAAR (European Supersites for Atmospheric Aerosol Research) and ACTRIS (Aerosols, Clouds, and Trace gases Research InfraStructure network) activities

Publications

We keep an updated link of aerosol publications at:

<ftp://aftp.cmdl.noaa.gov/aerosol/doc/newsletter/publications.html>

→Please let us know of any recent publications or projects utilizing NFAN aerosol data so we can include them (Email to: betsy.andrews@noaa.gov). Here are some highlights from recent papers:

NFAN overview paper (Andrews et al., 2019)

<https://journals.ametsoc.org/doi/pdf/10.1175/BAMS-D-17-0175.1>

We finally(!!!) published a general paper describing the NOAA Federated Aerosol Network. The paper includes information about the sampling methods and software as well as an overview of aerosol optical properties across the network and some of the interesting science being done with the NFAN data.

Hygroscopicity dataset (Burgos et al., 2019)

<https://www.nature.com/articles/s41597-019-0158-7>

This paper describes the development of a benchmark dataset of aerosol hygroscopicity based on tandem nephelometer measurements at 26 sites. The primary finding is that, while there is no clear segregation of sites by hygroscopicity, the general trend is that hygroscopicity decreases as one moves from Arctic to marine to rural and urban sites. This dataset is currently being used to evaluate global model simulations of aerosol hygroscopicity.

CLAP publication (Ogren et al., 2017)

<https://www.atmos-meas-tech.net/10/4805/2017/>

This paper has been out for a few years now, but we wanted to make sure you all were aware of it as you begin to utilize CLAP data in publications. It discusses uncertainties in the CLAP absorption measurements and highlights the intercomparability of the PSAP and CLAP. It is also where the current correction scheme for using Azumi filters in the CLAP is documented.