AEROSOL NETWORK NEWS

Issue 1, Jan. 2012

Welcome!

We thought we'd try sending out a short, somewhat (ir)regular newsletter about the NOAA collaborative aerosol network. There are several goals we hope to achieve with this newsletter:

- Let you (our collaborators) 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.

We're thinking about sending something out 2-4 times/year.

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? Graduated? Got an idea you would like to share with everyone? PLEASE LET US KNOW!! (email: betsy.andrews@noaa.gov)

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

Storm Peak Laboratory (SPL)

In January 2011, Storm Peak Laboratory in Steamboat Springs, CO became our first Colorado-based partner. The instruments at SPL are on long-term loan from the US Department of Energy, Pacific Northwest National Laboratory. SPL is operated by Nevada's Desert Research Institute.

The deployment coincided with the Stormvex field campaign and offered us the first opportunity to compare extinction calculated from nephelometer and PSAP measurements to that measured by the Aerodyne CAPS extinction instrument. In addition to hosting frequent field campaigns, SPL has a long history of aerosol measurements, primarily focused on aerosol physical properties (number and size distribution).

You can find more information about SPL at: http://stormpeak.dri.edu/
More information about STORMVEX is here: http://www.arm.gov/sites/amf/sbs/

ARM Mobile Facility (AMF)

In June 2011, the ARM Mobile Facility began its multi-month deployment in Nainital, India. The aerosol rack is part of a much larger suite of instruments. The installation is part of the GVAX campaign that is designed to study the interactions of aerosol particles, clouds and precipitation with hopes of better understanding cloud formation and the monsoon in the region.

You can find more information about this latest AMF deployment at: http://www.arm.gov/sites/amf/pgh/

Gosan Observatory (GSN)

In October 2011, the Gosan observatory on Jeju Island, South Korea joined the network and began utilizing NOAA software to collect aerosol optical data. The Gosan deployment is a collaboration with scientists at Seoul National University. The Gosan site is an ABC supersite and a major participant in various field campaigns including ABC-Asia. We're excited to be back at the Gosan observatory – we made almost a year of measurements there, starting during the ACE-Asia campaign in 2002.

More about ACE-Asia is here: http://saga.pmel.noaa.gov/Field/aceasia.

More about ABC-Asia is here: http://www-abc-asia.ucsd.edu/

Summit, Greenland (SUM)

In spring 2011, NOAA and Georgia Tech University began a collaborative measurement at Summit Camp in Greenland. Professor Mike Bergin at Georgia Tech is funded by NSF to make the aerosol measurements. Mike was a member of the NOAA aerosol group Boulder before leaving for flatter, more humid Atlanta. You can learn more about Mike in the 'Meet the Partners' section below.

For more information about the Summit site: http://www.summitcamp.org/

For more information about the Bergin research group: http://people.ce.gatech.edu/~mhbergin/

What's happening around the network - New Instrument Deployments

Continuous Light Absorption Photometer (CLAP)

The CLAP is a NOAA designed and built instrument to measure aerosol light absorption. The CLAP is similar to the Radiance Research Particle Soot/Absorption Photometer (PSAP) in that it is a filter-based measurement. It differs from the PSAP in that it utilizes solenoid valves to cycle through 8 sample filter spots and 2 reference filter spots, enabling the instrument to run at ideal conditions (filter transmittance, Tr, greater than 0.7) eight times as long as the single sample filter spot PSAP. There are also significant upgrades in the optical system, electronics, and internal signal processing.

CLAPs were deployed at quite a few sites in 2011, including: AMF, AMY, BND, BRW, CPT, ETL, GSN, LLN, MLO, SGP, SPL, SUM and THD.

CLAP deployments will continue in 2012 including at APP, ARN, BEO, CPR and EGB.

Constant RH Humidograph

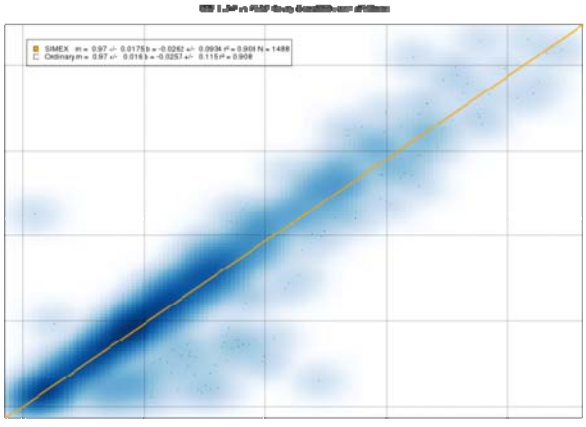
In April, a simple humidograph system was deployed at Cape San Juan (CPR) Puerto Rico, similar to that deployed at APP in 2010. The humidograph measurement provides an indication of aerosol hygroscopicity – the amount of water that particles will pick up in humid air.

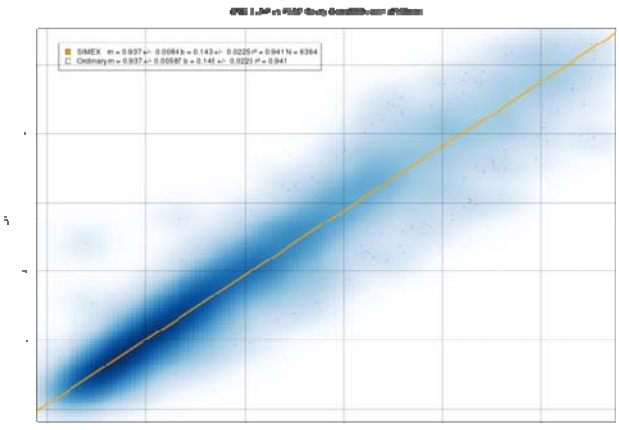
The constant RH humidograph system consists of three main parts: (1) a TSI nephelometer measuring aerosol scattering at low relative humidity (2) a humidifier which increases the humidity of the sample air RH to 85% and (3) a second Radiance Research nephelometer (1 wavelength, no backscatter measurement) which measures the aerosol scattering in the humidified air stream. The hygroscopic growth parameter (f(RH)) is the ratio of wet (RH=85%) to dry (RH<40%) scattering. The value of f(RH) is higher for more hygroscopic particles such as sea salt and lower for less hygroscopic particles (e.g., fresh smoke or dust).

What's happening around the network - Projects

CLAP/PSAP comparison

CLAPs have been deployed in tandem with PSAPs at several sites for multiple months. We've begun to evaluate how well the aerosol absorption values from the two instruments compare. Here we present comparison plots from the AMF and BND sites. The plots are based on hourly-averaged, edited data. The PSAP data are on the x-axis and the CLAP data are on the y-axis. These are population density plots, so the darkest blue indicates higher concentrations of data points. The two instruments appear to be highly correlated with slopes of 0.97 (AMF) and 0.94 (BND) and R^2 values > 0.9.





Aethalometer/PSAP comparison

Graduate student Ji-Hyoung Kim at Seoul National University will be utilizing Aethalometer and PSAP data from some of the Network sites where both of these instruments are located. The goal of his project is to evaluate different correction schemes for calculating light absorption coefficient from the aethalometer. The European aerosol community (http://www.actris.net/) is pursuing a similar investigation, although they are comparing the MAAP with the aethalometer.

GAW Climatology Papers

There are a couple of data analysis projects in the works that could make use of long-term aerosol scattering and absorption data from as many stations as possible. Both need to be submitted for publication before the IPCC AR5 deadline of July, 2012.

The first project focuses on means and variability of single-scattering albedo (SSA), backscattering fraction (BFR), and radiative forcing efficiency (RFE). In addition to reporting the data, the individual contribution of variability of SSA and BFR to variability of RFE will be evaluated, i.e., how important is it to be measuring backscatter fraction? The role of the co-variance of SSA and BFR to the average RFE will also be investigated. In other words, what is the difference between RFE calculated from the average SSA and BFR, vs. the average of RFE calculated from the "instantaneous" SSA and BFR. (i.e., is the average of the means very different from the mean of the averages?).

The second project will involve using data from as many stations contributing to the WMO World Data Center for Aerosols as possible. Under the leadership of the WMO Science Advisory Group for Aerosols, we want to compare long-term trends of aerosol optical properties from as many GAW stations as possible.

What else?? Please let us know what you are up to with aerosol data!
email: betsy.andrews@noaa.gov

End of Year Data Processing and Submission to GAW

Once you finish editing a full year of data, it should be submitted to WDCA. The procedure is documented in the FAQ titled "How do I submit my data to the World Data Center for Aerosols?" at http://www.esrl.noaa.gov/gmd/aero/software/aerosols/dbfaq.html.
Please read this FAQ entry before proceeding further.
After you have read the FAQ and are ready to proceed, the first thing that you should do is sync your AER_VM system.

Derek has entered metadata for all stations into the configuration files mentioned in the FAQ, so you shouldn't have to do that part of the procedure described in the FAQ. Before submitting data, however, you should verify that the metadata are complete and correct - particularly the part about instrument model and serial numbers. You should check all the files in /aer/db/etc/xxx/ebas and /aer/db/etc/xxx/ames. For example, to view and edit the global configuration file in 'ames' you can use the command

```
gedit /aer/db/etc/xxx/ames/global.xxx.conf
```

Replace xxx with your three letter station i.d. in lower case letters.

Any time that you begin sampling with and/or swap out an instrument, you need to inform the database of the new instrument serial number. The procedure is described in the FAQ titled "How do I update instrument metadata? (manufacturer, model, or serial number)?" at http://www.esrl.noaa.gov/gmd/aero/software/aerosols/dbfaq.html.

→ Please email any changes that you make in these configuration files to your contact at NOAA, so that we can update the master versions here.

To check the data files, you run `data.aggregate.ebas` as described in the FAQ, and then use a text editor to view the files. For example, to check the 2010 data files, use these commands:

```
cd /aer/xxx/work/tmp
data.aggregate.ebas xxx neph_L2_cut 2010 2011
gedit *scattering*
data.aggregate.ebas xxx psap_L2_cut 2010 2011
gedit *absorption*
data.aggregate.ebas xxx cpc_L2 2010 2011
gedit *number*
```

Detailed information on the format of these files is on the WDCA website http://www.gaw-wdca.org.

When you are convinced that the metadata are correct and complete, you submit the data from previous years with these commands:

```
data.aggregate.upload wdca_manual xxx YYYY
```
where YYYY is the year of the data being submitted.

I realize that it sounds complicated, but in practice it's fairly simple. The first submission is the hardest because you have to verify the metadata and catch up on documenting changes in instrument serial numbers since start of measurements. In the future, as long as the metadata are correct and you have recorded all instrument changes in cpx2, you submit the clean data with a single command, i.e.,

```
data.aggregate.upload wdca_manual xxx YYYY
```

In the future, we may enable automatic uploading of data as soon as a full calendar year of data have been passed.

The advice columns

Dear Derek:
How do I extract 30 min averages of edited neph and PSAP data to a file?

(1) Determine the variable names for the neph and PSAP for your specific station. The neph is likely to be S11 while the PSAP could be A11 or A12 or A13 or A14 etc depending how many absorption instruments you have at the station.

(2) Use '`data.avg`' to do the extraction and averaging and pipe the output from that to '`data.export`' to get the data in the format you want:

```
data.avg --interval=1800s --
source=edited thd A11a,S11a 2011:335
2011:336 | data.export --mode=excel
>thd_30min_avg
```

Dear Instrument Guru:
My CLAP keeps reporting temperature errors in the daily reports:
'Status for A11 at 2011-10-18T06:03:00Z 2011-10-19T12:03:03Z:
Case temperature unstable for 26.7 % of data'.
What should I do?

The case temperature setpoint is typically ~39±1 ºC. The case temperature is controlled by the CLAP. There are two scenarios that can set the temp flag: (1) case temperature above setpoint and (2) case temperature below setpoint.

If the case temperature is warmer than the setpoint, which is due to self heating from the electronics (the solenoids get rather warm) then to clear the flag we need to either raise the setpoint, expand the acceptable temperature deviation for "good" temperatures. The CLAP temperature being above the setpoint is not a problem unless the CLAP gets really really hot. The easy way to fix the CLAP temperature being warmer than the setpoint is to remove any thermal protection that was put around the CLAP (i.e., if the CLAP is in a box) or allow for convective cooling.

If the case temperature is cooler than the setpoint temperature then we need to minimize convective cooling on the outside of the CLAP. Tests have shown that something as simple as a cardboard box placed over the instrument has a significant impact in this situation.

Note: it is not good if the case temperature is below the setpoint because it increases the likelihood of humidity changes within the instrument and thus artifacts that affect the CLAP measurement of absorption.

"40th Anniversary ESRL Global Monitoring Annual Conference"

NOAA's Earth System Research Laboratory (ESRL), Global Monitoring Division will hold the next ESRL Global Monitoring Annual Conference on Tuesday, May 15 and Wednesday, May 16, 2012, at the David Skaggs Research Center, 325 Broadway, Boulder, Colorado.

http://www.esrl.noaa.gov/gmd/annualconference/

Meet the Partners

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

Professor Michael Bergin, Georgia Tech

Michael Bergin is our partner in the new aerosol measurements being made at Summit Camp in Greenland. Mike did his PhD work at Carnegie Mellon University in Pittsburgh with Cliff Davidson.

His PhD thesis project was 'Measurement and Modeling of the Fluxes of Chemical Species to the Greenland Ice Sheet' so it's not the first time he's braved the cold and high altitude to study the atmosphere.

After finishing his degree he worked for several years with NOAA Aerosol group in Boulder on a joint research project with the Department of Energy's Brookhaven National Laboratory.

Georgia Tech beckoned though, and he took the opportunity to begin his own aerosol research group where he's been involved in aerosol measurements around the world from close to home in Atlanta to Europe, Asia and Antarctica.

More about Mike and his research can be found at: http://people.ce.gatech.edu/~mhbergin/

Publications (in 2011)

Andrews, E., Sheridan, P.J., Ogren, J.A., "Seasonal Differences in the Vertical Profiles of Aerosol Optical Properties over Rural Oklahoma," *Atmos. Chem. Phys.,* 11, 10661–10676, 2011.

Andrews, E., Ogren, J.A., Bonasoni, P., Marinoni, A., Cuevas, E., Rodriguez, S., Sun, J.Y., Jaffe, D.A., Fischer, E.V., Baltensperger, U., Weingartner, E., Collaud Coen, M., Sharma, S., Macdonald, A.M., Leaitch, W.R., Lin, N.-H., Laj, P., Arsov, T., Kalapov, I., Jefferson, A., Sheridan, P.J., "Climatology of aerosol radiative properties in the free troposphere", *Atmospheric Research*, 102, 365-393, 2011.

Brock, C. A., Cozic, J., Bahreini, R., Froyd, K. D., Middlebrook, A. M., McComiskey, A., Brioude, J., Cooper, O. R., Stohl, A., Aikin, K. C., de Gouw, J. A., Fahey, D. W., Ferrare, R. A., Gao, R.-S., Gore, W., Holloway, J. S., Hübler, G., Jefferson, A., Lack, D. A., Lance, S., Moore, R. H., Murphy, D. M., Nenes, A., Novelli, P. C., Nowak, J. B., Ogren, J. A., Peischl, J., Pierce, R. B., Pilewskie, P., Quinn, P. K., Ryerson, T. B., Schmidt, K. S., Schwarz, J. P., Sodemann, H., Spackman, J. R., Stark, H., Thomson, D. S., Thornberry, T., Veres, P., Watts, L. A., Warneke, C., and Wollny, A. G.: Characteristics, sources, and transport of aerosols measured in spring 2008 during the aerosol, radiation, and cloud processes affecting Arctic Climate (ARCPAC) Project, *Atmos. Chem. Phys.,* 11, 2423-2453, doi:10.5194/acp-11-2423-2011, 2011.

Esteve, A.R,. Ogren, J.A., Sheridan, P.J., Andrews, E., Holben, B.N., and Utrillas, M.P., "Statistical evaluation of aerosol retrievals from AERONET using in-situ aircraft measurements," *Atmos. Chem. Phys. Disc.*, 11, 29003-29054, 2011.

Gallagher, John P., Ian G. McKendry, Anne Marie Macdonald, W. Richard Leaitch, "Seasonal and Diurnal Variations in Aerosol Concentration on Whistler Mountain: Boundary Layer Influence and Synoptic-Scale Controls." *J. Appl. Meteor. Climatol.,* 50, 2210–2222, 2011.

Garrett, T. J., S. Brattstrom, S. Sharma, D. E. J. Worthy, and P. Novelli "The role of scavenging in the seasonal transport of black carbon and sulfate to the Arctic," *Geophys. Res. Lett.*, 38, L16805, doi:10.1029/2011GL048221, 2011.

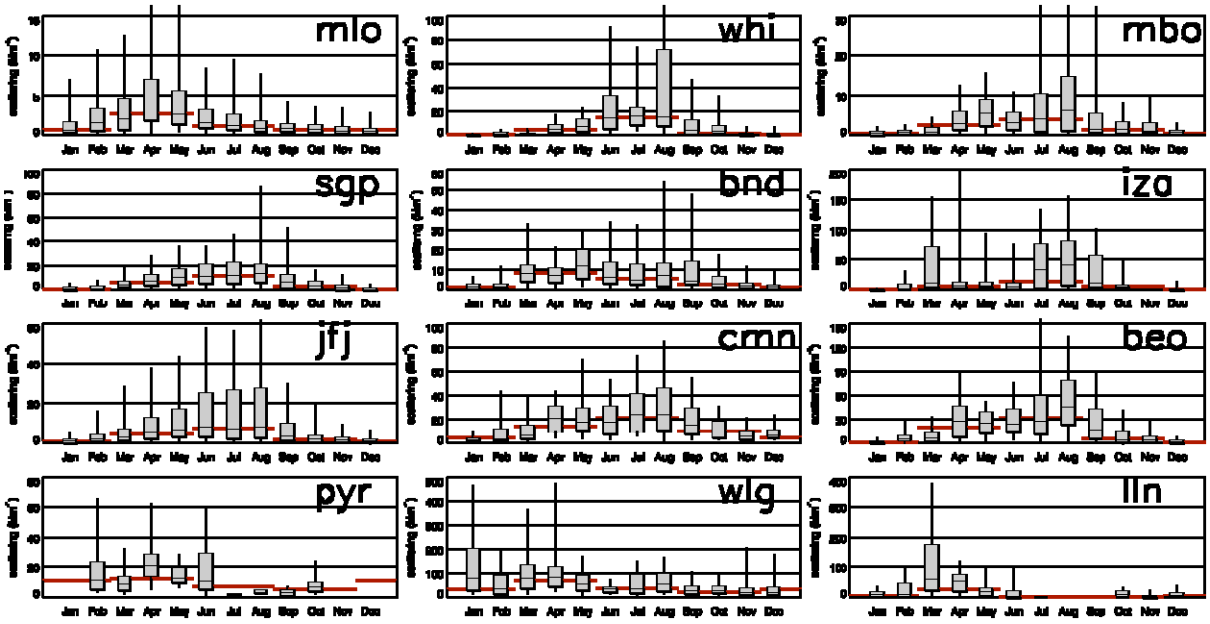
Gilardoni, S., Vignati, E., and Wilson, J.: Using measurements for evaluation of black carbon modeling, *Atmos. Chem. Phys*., 11, 439-455, doi:10.5194/acp-11-439-2011, 2011.

McKendry, I., Strawbridge, K., Karumudi, M. L., O'Neill, N., Macdonald, A. M., Leaitch, R., Jaffe, D., Cottle, P., Sharma, S., Sheridan, P., and Ogren, J.: Californian forest fire plumes over Southwestern British Columbia: lidar, sunphotometry, and mountaintop chemistry observations, *Atmos. Chem. Phys*., 11, 465-477, doi:10.5194/acp-11-465-2011.

Skeie, R. B., Berntsen, T., Myhre, G., Pedersen, C. A., Ström, J., Gerland, S., and Ogren, J. A.: Black carbon in the atmosphere and snow, from pre-industrial times until present, *Atmos. Chem. Phys*., 11, 6809-6836, doi:10.5194/acp-11-6809-2011, 2011.

Paper Highlight

One of the advantages of long term measurements over shorter term field campaigns is that they enable us to identify temporal patterns in aerosol properties while, in contrast, a field intensive might make measurements during a time period that is not representative of the typical site conditions. The plot below (from Andrews et al., 2011) shows monthly climatologies of free troposphere aerosol light scattering at 12 high altitude sites. The black, horizontal line is the median (50th percentile), edges of box are 25th and 75th percentiles, whiskers are 5th and 95th percentiles. The red line indicates seasonal medians. Data are reported at 550 nm, except at CMN where light scattering is at 520 nm and MBO where light scattering is at 530 nm.



Please let us know of any recent publications or presentations utilizing the aerosol data so we can include them in the next newsletter. Email your info to: betsy.andrews@noaa.gov

Current station map

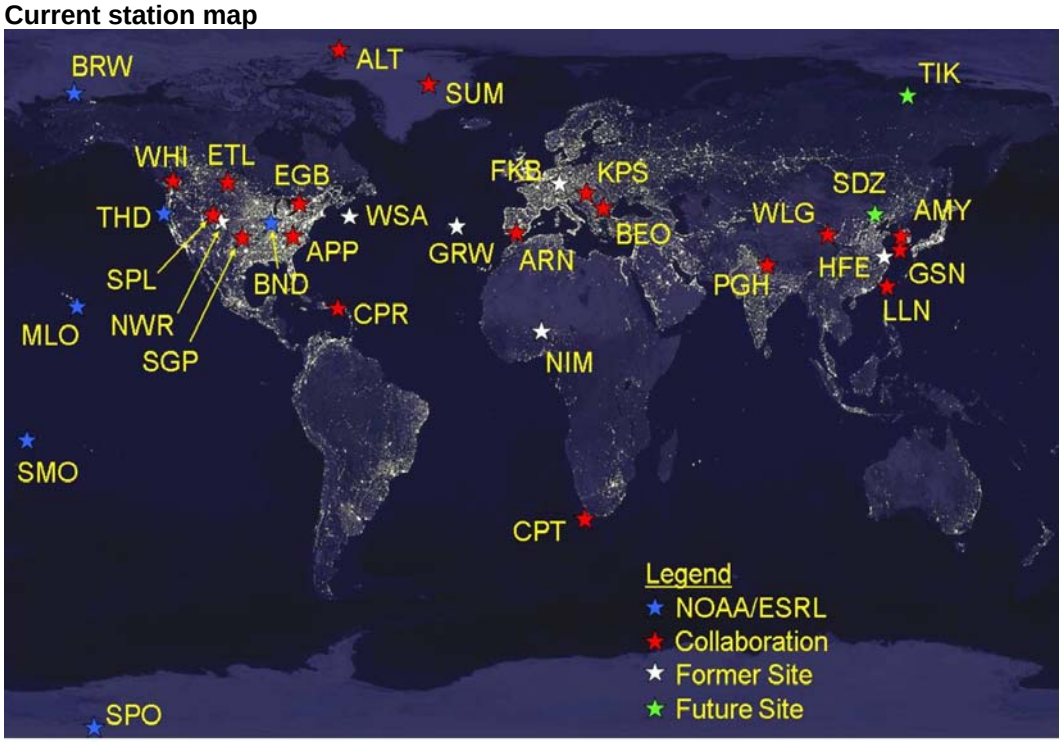


Table of instruments at each active site (connected to aerosol rack/NOAA software)

	TSI neph	PSAP	CLAP	CPC	Other[1]
ALT	X	X		TSI#3010	Aeth, OPC
AMF (PGH)	X	X	X	TSI#3010	CCN, Hum
AMY	X	X	X	TSI#3760	
APP	X	X		TSI#3760	Hum, Aeth
ARN	X	-	-	-	
BEO	X	-	-	-	
BND	X	X	X	TSI#3760	Filters
BRW	X	X	X	TSI#3010	CCN, Hum, filters
CPR	X	X		TSI#3022	Hum, Aeth
CPT	X	X	X	TSI#3781	
EGB	X	X		TSI#3775	
ETL	X	X	X	TSI#3775	
GSN	X	-	X	TSI#3776	
KPS	X	-	-	-	
LLN	X	X	X	TSI#3760	Aeth
MLO	X	X	X	TSI#3760	
SGP	X	X	X	TSI#3010	Hum, CCN
SMO	-	-	-	TSI#3010	
SPL	X	X	X	TSI#3010	
SPO	X	-	-	TSI#3781	
SUM	X	X	X	-	
THD	X	X	X	TSI#3760	
WHI	X	X	-	TSI#3775	
WLG	X	X	-	TSI#3010	

[1]Hum=humidograph system, Aeth=aethalometer, CCN=DMT single column CCN, filters=inorganic ions (PMEL analyzes)