

IMPROVE Steering Committee Meeting
October 15-16, 2014
Cape Romain NWR, SC

Major discussion topics:

- Network Review
- Laboratory Review and Methods Development
- Data Processing, Distribution and Quality
- Data Analysis
- Budget
- Steering Committee Business

Network Review

- Optical, Scene, Night Sky
 - Cost savings using nephelometers for trends, scattering equation
 - 12 in operation, all LED-based, but 20+ years old, so parts an issue
 - Night Sky is a NPS initiative using high resolution spectral camera to look at degradation due to city lights
 - Problem: only 1 image/night
 - Testing other camera at Bryce Canyon, getting hourly night shots
- QA
 - 32 audits in 2013, most by 6 states, 4 flowrates over 10% limit
 - 13 audits so far in 2014, with 2 flow failures
 - EPA starting to hold auditor trainings
- Aerosol Network Status
 - Lake Tahoe Community College site added in 2014
 - Data available through 2013
 - XRF analyses now being done within 1-month of receipt
 - 2005-2013 data being corrected and need a data advisory sheet created:
 - TOR artifact corrections using field blanks
 - Filter light absorption by new calibration algorithm
 - Corrected temperature equation
 - Corrected flow rates for some low concentration samples
 - New formulas for uncertainty and MDL
 - 2005-2009 regional haze metrics to be re-calculated
 - Overall, 9% lost samples due to equipment and power failures, lightning, missed samples, incorrect filter installation
 - 5 sites failed to meet completeness in 2013, so far none in 2014
 - Quarterly site status emailed to operators and discussions with operators where seeing problems
 - Sampler re-design as electronics now 15+ years old
 - Module hardware not being changed
 - Replacing analog sensors with digital
 - New pressure sensor that is more accurate
 - Adding satellite modems

- New electronics boxes being tested
 - Testing 2 different controller boxes
 - Testing fixed critical orifice for PM10 to replace needle valve
 - Full new design to be tested in spring 2015, deployment to follow
- Lab management system being developed to replace FoxPro system
- Ticketing software implemented to keep track of problems better
- QAPP revised in 2014
- New lab equipment to be deployed in 2015 for carbon analysis

Laboratory Review and Methods Development

- Improve Carbon Analysis
 - Received over 1700 samples so far
 - Working on improving standards and laser system
- Equivalence in OC and EC Between Single and Multi-Wavelength Systems
 - New model in 2015 using diode laser to replace 2001 system
 - Smaller, lower cost and more efficient...uses off-the-shelf components
 - Multi-wavelength (7 from 405-980 nm) instead of single at 633 nm
 - Comparison so far looks good
 - Will retrofit 2001 units with 2015 light source and intercompare
- Optical Characteristics of Multi-Wavelength Carbon analyzer
 - Single wavelength only used to adjust for pyrolysis (reflectance & transmittance)
 - Multi-wavelength can get better info on black vs. brown carbon to better quantify anthropogenic dust vs. biomass burning and to separate adsorbed vs. aerosol organic vapor
- Ion analysis
 - RTI analyzing nylon filters for anions to support UC Davis
 - RTI evaluating new IC systems
 - RTI vs. NAREL lab intercomparison looking good
- Lab Intercomparisons and Issues
 - NAREL using Met-One SuperSASS to create PT samples
 - More variation on 25mm vs. 47mm filters
 - Gravimetric intercomparison looks good
 - IC intercomparison of 5 labs to NAREL for CSN method looked good for high level, okay for low level
 - TOA looked good for EC for 5 labs to NAREL, but more variability with OC
 - XRF for 6 labs to NAREL looked okay for some elements, but not others
- Teflon Filter Orientation and Multi-Element Reference Materials
 - Used multi-element XRF reference filters to quickly evaluate instrument performance and address interference issues, but they are not readily available
 - Use potassium as a reference to ratio as easy to measure
 - 8 labs for intercomparison
 - Some elements looked good, some not
 - ICP/MS provides ug/filter whereas XRF gives ug/cm²
 - With ICP/MS need to use a consistent deposit area for calculation
 - UC Davis uses 11.34 cm² for Pall, EPA uses 11.86 cm² for MTL

- Filter orientation needs more evaluation to see if makes a difference as can get tenting toward support screen
- Multiwavelength HIPS (“BITS”)
 - New system for OC/EC being tested that uses broadband light source, 190-1700 nm and optical integrating sphere
 - Filter handling system is in development
- Predicting TOR OC and EC with FTIR
 - Current IMPROVE method uses destructive TOR on quartz filters
 - Can non-destructive FTIR method on Teflon filters be used?
 - Compared 7 sites that have X-modules that use Teflon filters
 - For OC, get as bias at high concentrations and ammonium is an interferent, but overall can predict within 10% error
 - For EC, get more variability, but precision is better for FTIR
 - Next step is to look at additional years and sites and to look at impact of variability in Teflon filter uniformity
- Identifying Smoke in IMPROVE Samples
 - With FTIR, can get OM/OC
 - Developed a detection algorithm using FTIR spectra and fire assessment data
 - Very evident spectral signature for fire days vs. no fire impacts
 - Proof of concept appears to work, but need to develop further

Data Processing, Distribution and Quality

- Data Analysis and Uncertainty
 - New data advisories are available to cover:
 - Vandalism
 - Cr and Ni contamination in a new sampler shed
 - Contamination due to caulking
 - Revised optical absorption measurements since 2003
 - White Sands blowing dust plumes
 - Seeing an increase in sulfur in the spring nationwide versus summer
- IMPROVE and FED Websites
 - IMPROVE website originally for data and products as well as education and feedback, but now includes data advisories as well
 - Website getting old and tools are outdated
 - Needs updating and a new graphical interface
 - Need \$ and a committee to define purpose and content
 - FED database and website might be a model to follow as uses open standards and supports multiple organizations and data systems
 - Use FED tools to leverage new IMPROVE website?
 - Look at WRAP Technical Support System as another possibility or for ideas

Data Analysis

- Use of Webcam Images – Image Contrast as a Measure of Visual Air Quality
 - Historically 3 measures of visual AQ:
 - Transmissometer or nephelometer
 - Direct IMPROVE samples

- Cameras
 - Images can capture the effects of haze and meteorological conditions
 - Need to ensure camera settings are fixed as filters or auto adjustments will affect the result
 - B_{ext} can be calculated from the sky/ground contrast, but met conditions can affect
 - Need to work to see if we can quantify visibility from cameras
 - Need to look at different metrics (i.e. avg. contrast and equiv. contrast)
 - Need other instruments (i.e. nephelometer) to develop relationships for cameras
- Trends in Haze Constituents (1990- 2013)
 - 2003-2005 vs. 2011-2013 shows a significant improvement in the eastern US, but central/western US shows no real improvement (note: west is cleaner to start)
 - Regulated emissions have declined, but unregulated (i.e. smoke) has increased
 - Sulfate is dropping, so nitrate is becoming a more significant factor, which may lead to a revision in the IMPROVE equation being needed in the future

Budget

- Budget Analysis
 - Funding:
 - EPA Interagency = \$5,210,831 (Apr. 2014 – Mar. 2015)
 - EPA mods (FTIR work) = \$202,875
 - USFS = \$144,000
 - NPS = \$144,000
 - TOTAL = \$5,701,706
 - (+ EPA in-kind, NPS additional, operator in-kind, etc. = \$2,441,140)
 - Expenses
 - UC Davis = \$3,095,984
 - DRI = \$1,030,562
 - RTI = \$414,600
 - CIRA, overhead, other = \$1,134,868
 - TOTAL = \$5,676,014
 - Projected for 2015-2016
 - Income = \$5,473,000 (assuming flat funding)
 - Expenses = \$5,592,500
 - Shortfall = \$119,500
 - 6 IMPROVE sites shutting down (not PROTOCOL)
 - Shut down network for 2 weeks
 - One-time shift in contractor pay timing
 - IMPROVE sites cost about \$28,000/year each to operate
 - PROTOCOL sites pay \$36,000/year
- CSN Network Assessment
 - Presentation from EPA on CSN assessment to shut down sites
 - Currently 189 CSN sites
 - Need to reduce expenses to meet budget
 - Want to cut expenses 30% from \$6.6 million to \$4.7 million and reinvest 10%
 - Need to maintain core objectives
 - Created a scoring matrix

- After full evaluation:
 - 42 sites being defunded effective 1/1/2015
 - CSN mass eliminated 10/1/2014
 - 3 sites to reduce frequency from 1/3 to 1/6 on 1/1/2015
 - Reduce carbon blanks and shipping ice packs on 1/1/2015
 - Overall \$325,000 available for reinvestment
- Budget Process Summary
 - Site analysis done in 2006
 - Hard to be purely objective in decisions
 - Budget discussions and analysis performed in 2012/2013 and a series of cost saving measures implemented, but no sites cut
 - Looked at again in 2013/2014
 - Final call in Jan 2014 was split on removing sites vs. cutting sample frequency
 - Now in Oct 2014, need to look at cuts again with projected deficit
- Budget Discussion and Planning
 - Can each agency come up with another \$50,000 to cover projected deficit?
 - 6 sites still have backup filters on C-module that are not used and can be cut for \$15,000 savings
 - Need to develop a plan to reduce number of sites for next 5 years, commencing with 6 sites in Apr 2015
 - Keep the option of cutting frequency in hip pocket
 - Recommendation to eliminate Christmas week samples was not implemented, but would save \$40,000/year
 - Look at not analyzing samples from a site for days where there was at least 1 bad filter/module instead of looking at alternatives for data substitution
 - UC Davis will do an assessment, but estimate about 2% of samples
 - Letter will be developed on budget issues to send to agencies on sites to be cut

Steering Committee Business

- Scott Copeland the chair for next year
- Getting 3-4 requests per year for archived filters, so really need a good protocol on how to handle and approve/deny
- No \$ for a calendar this next year, but operators like to have one
- Site relocations to occur:
 - Sycamore Canyon, AZ – move approx. 2 miles
 - Tuxedni, AK – looking at alternate sites on west side of island