DOE ARM Aerosol Working Group Minutes Dec 8-10 2004

Ferrare: Introduction

Ogren/Michalsky Remarks from Meeting Hosts/logistics

Intro, snack contribution $4, group dinner menu…

Ferrare Update on Aerosol IOP results, paper status, submission, archival,

IOP data archive link:
http://www.db.arm.gov/cgi-bin/IOP/selectAftIOP.pl@iopName=sgp2003aerosol
Table with submitted data. Updates should be sent to the above link.
Tsay, SMART data left of list…

Ferrare Aerosol IOP papers lead authors short presentations

List of papers for special issue of JGR.
Schwartz: Add this list to IOP Webpage… notify him when complete so he can forward
JGR Special Issue: Deadline has been extended, most important is acceptance deadline July 2005 (submit by March 2005) ~12-15 papers critical mass
http://jgr-atmospheres-submit.agu.org
select DOE ARM Aerosol IOP special section
Colin O'Dowd is editor
Send copy of paper to Wanda, Tom, Rich
Also executive summary of key findings, metrics, graphics.
Include contact info!

IOP Paper Short Presentations:

Ferrare & Turner: RL

CARL data proc.

Post 2001, CARL degraded
Poorer data quality, modified algorithms to accommodate poorer SNR
RL repaired in 2004!
Much improved SNR.
More work again required on algorithms, nearly done though.

H_2O vap comparison

High dynamic range in H_2O, ext, part size throughout the campaign
Tried to assess RL H_2O and ext retrievals,
Compared rh to aircraft AATS, chilled mirror, CARL <3km daytime
RL scaled to MWR column (as are radiosondes)
MWR-scaled instruments wet compared with other sensors.
Model for MWR had been tweaked for arctic, introduced wet bias 3%
Sidebar: IAP may be overall dry, especially for low ambient RH
Summary: 3-7% differences remain, on border of allowable

> Steve: Is there a water vapor paper?
> Rich: part of his paper, part of Beat's paper, no obvious H_2O grouping…
> Steve: What about an overview paper, campaign results. Highlight big-picture
> stuff. Or provide chronology, narrative… Fog incident, etc.

Aerosol extinction comparison:

CARL, AATS, neph+PSAP

Larger discrepancies, lidar is higher

In terms of bias, lidar seems to do better with higher ext values.

Temperature dependence of Raman scattering is an issue., ~10% for small ext.

Smoke observation, infer SSA

Use method of Ferrare et al (98) Redemann (2000)

Mie calcs of angstrom and lidar ratio for variety of size dist from PCASP adjusted to ambient RH using CAPS sizes.

Smoke parameters consistent with obs in Japan, Germany

SSA = .98

RL Mods:

Yay! Much better, Dave T will elaborate. Order of magnitude improvement.

Strawa: Cadenza: cavity ring-down on Twin-Otter

Cadenza: Measures ext, uses reciprocal neph to measure scat, then (hopefully) retrieve abs from difference.

Data versions:

Original: smoothed, mission time

Oct. 2004: not smoothed, Jd synce dot neph for ext and sca compares

Dec. 2004: correct only scat portionof ext for f(rh) and correct temperature for certain flights.

Updated results: ext, ssa, leg comparisons, IAP comparisons

Also ext. comp to TSI Neph Scat and PSAP abs (courtesy of Covert, U.Wash)

Leg average comparisons: slope 1.014, r-factor 0.998

> Ogren: truncation corrections?

> Strawa: yes, two different methods

Scattering comparions:

Overall: 0.971 slope

Leg avg: 0.984 slope, r = 0.998

Good agreement in extinction and scattering, nevertheless absorption (difference) agrees less well.

>Some mention of instrument issues involving the addition of a low pass filter (to the PA?), but I didn't capture the timeline.

Last three days have most confidence.

Cadenza appears to agree with PSAP much better than the PA, but there is no definitive source for abs so what is really truth?

Reno mini-IOP. PSA was within a few % of reference. The PA was also within 2%.

Meanwhile PA (from ground test with another PA and wavelength (Sheridan) showed ~.6 slope.

> Arnott: possible error in aerosol delivery, but thought checked carefully…

> Arnott: how were the legs of the last three flights determined?

> Strawa: pressure stability

> Strawa: all abs measured cabin temperature, implies dry measurements

> Ferrare: implication for SSA?
> Arnott: pressure drop may explain some bias
> Strawa: let's get together…

f(RH) results: 85/40 for all flights from humid. Radiance Research Nephs

Typical 1.25-1.75

Some events ~3

IAP compare: Ratio of Cessna to Neph Green Scat.

Impactor introduced May 25.

Discrepancies in angstrom exp between IAP and Cadenza explained well by impactor and aerosol size/type

> Ferrare: how well can IAP be used for radiative forcing?
> Ogren/Michalsky: Answered in Joe's paper

Red scattering comparison: Twin-Otter to Cessna

Cessna values are lower due 1 micron cutoff

IAP Abs. comparisons

Cessna measuring about ½ of twin otter: ouch

> Feingold: Try a least absolute deviation filter?

Conclusion:

Cadenza worked well overall.

Abs needs work.

Arnott:

Comparisons of instruments at GIF:

Abs:

Some differences day 135 136

Better agreement till 140

Good agreement on 143

Differences on 144

PSAP/Aeth comparisons, factor of 10 conversion for units?

Aerosol Carbon

Aeth at 521 nm

Kirchstetter BC 880 nm

Fairly good agreement

K also did ratio of BC/TC, fair variability, points to aerosol size and src

Arnott sidebar reference to Urban Las Vegas 2003: Particle size dependence on neph values comparing Radiance and DRI.

Neph comparison:

Overall good, DRI agrees more closely with NOAA Neph 450 then 550

Good correlation, but slope is 0.77. Both neph with truncation corrections applied.

DRI neph v. DRI cavity ringdown: some excursions, but otherwise good

Looking at DRI and NOAA vs angstrom to assess impact of part. Size shows no significant bias.

But Climet shows structure in this comparison.

During RAOS: 532nm DRI, and TSI differences as a fnt of ang exp.

DRI and TSI Neph correlate well but differ in magnitude. DRI is higher

In GIF trailer, different rh in DRI and NOAA neph. DRI is at higher RH than NOAA. SSA for DRI typically higher as well. Reasonable. Fair tracking with some extreme diffs.

Asymmetry parameter:

Using same Wiscombe parameterization

At times, counter-intuitive correclaton between asym and part size

PSAP and PA absorption comparions:

Sometimes good agreement, other times whoa.

Known issues with PSAP during rapid flight level/RH changes. PA affected by turbulence at low levels.

Work in progress…

Schmid: How well can we measure vert. prof of aero extinction?

Important: emphasis on measuring ambient extinction.

Measurement methods:

Airborne:

Nephelometer + PSAP

Cavity Ring-down

Photometry: AATS-14

Remote sensing:

RL

MPL-Net

MPL-ARM

Ext = abs + scat

Abs via PSAP

Low RH, downstream of Neph

Not Bond corrections, Virkkula better for this re-worked system.

Scattering contribution

Loading correction

Ambient P, T

Scat:

Nephelometers

TSI lamba: 450 550 700

Also Low RH (aircraft was hot)

Cavity Ring-down

Alternate between filtered and non-filtered air.

Incidental heating resulted in dry extinction

Photometry: AATS-14

Aerosol optical depth and extinction (and water vap in suitable channels)

Ground based:

CARL – Turner helped "improve" the data

MPLnet – tied to AEROnet optical depths, assumed constant ext/bscat ratio

MPLARM – tied to nimfr, assumed constant ext-bscat ratio

AATS photometry measured at 14 channels, differentiation of splined smoothed vertical aod.

Extinction comparisons relative to AATS:

RL high
Neph + psap, bit low at all wavelength
MPLnet, high
MPLARM, higher,
Cadenza, lower
Cimel a bit lower.
Nimfr, dead on

> Arnott: try looking only at dry cases to look for rh bias (known to be an issue)

Summary: RL, MPLARM, and IAP need validation:
Schmid: recommendation: AATS-14 on J-31

Andrews: Comparison of calc. asym parameter g during IOP

What is observed range, biases, uncertainty.
No commercial instrument
Wide variety of approaches to estimate

- Identify available methods
- Select appropriate IOP instruments
- Use measures scattering vs calc
- Calc g
- Look at results

Assessed:

- Henyey-Greenstein inversion
- Fiebig inversion (NOAA Post doc)
- King inversion
- Dubovik inversion (AERONET product)

General observations:

- In situ correlated well. Ambient larger than dry.
- Neph derived (Henyey-G) lower than others
- Remote sensing tends to be higher than ambient
- Dry: median g .6 (0.35 to 0.72)
- Ambient: median g 0.65 (0.51 to 0.8)

NOAA is focused on Neph measurements, so focus of comparison centers on Henyey Greenstein / Wiscombe backscatter fraction parameterization. Compared to MIE derived g, the neph-based Wiscombe parameterization tends to overpredict at low backscat frac but is okay for more typical conditions for b seen at SGP.

Q: Is g_sfc representative of g_col?
A: Mild agreement, slope ~.6?

Q: Effect of g on forcing?

A: 10% g change translates to 15% TOA, less SFC

Asym depends on size dist (as expected) but also some unusual groupings results, based on shape of size dist. Composition less important as determined by TDMA comparison. Median value and range depend very little on index of refraction specifics.

Representativeness of conditions observed during IOP:

No: abs, scat, f(rh), g(Andrews)
Yes: g, ang exp, ssa, g(aeronet)

Derived range of g: from .6 for dry to .65 for ambient
Surface and column not correlated
Significant effect on forcing, g(.65->.6) : -15%TOA, -10%SFC
Size dist was important
Composition unimportant.

Richiazzi: Radiation closure experiment;

retrieval of phase function based on Cimel radiation data. Use method of Wang and Gordon. Struggling with using IAP for radiation closure.
Have phase function and SSA from Cimel.
Next step compare to IAP data.

Feingold: Indirect Effects during IOP:

f(rh): lidar,nephelometer, in-situ
- Neph rh range: 40-85%
- Lidar rh range: 85-96%
- Look for capping cloud, 100% RH
- Calculate backscatter profile beta(z)
- With mixed conditions, calculate rh profile rh(z)
- Combine to get beta(rh)
- Lots of variability at higher f(rh)
- Improved correlation between lidar and neph f(rh) as lidar rh range is expanded

Drop-size retrievals and remote measurement of the first indirect effect
Constraining component mixtures to yield same modeled … (Fast slide!)
Further constrained with soluble mass-fraction.
Not much sensitivity to assumed soluble inorganic mass-fraction.
Some weak correlation with angstrom exponent
Weak confidence in SSA relationship due to lack of data points

Drop-size retr and first indirect effect:
- Radar + MWR for profiles of r_eff.
- Use lidar for aerosol size dist.
- One day SSRF, MODIS (700km) and MFRSR, twin-otter penetration 20km away.

Have five different r_eff measures.
MODIS, SSFR top-down
MFRSR-MMCR bottom-up
Twin otter, *in situ*
    Twin-Otter 5-6 um
    MFRSR and MMCR fair agreement with above until cloud thinning
    SSFR also in good agreement
    MODIS: 6.5 um
Derived weighted best-estimate of r_eff from these.

Estimates of 1st indirect effect:
IE = - d(ln(r_eff))/d(ln alpha); theoretical 0<IE<0.33

Various CCN proxies (for alpha):
    Lidar extinction
    Neph scattering
    PCASP

Derived IE for lidar:
    May 8 .01, .09, .06 for LWP from 50-169 g/m2
    May 13, Ie too high except for high LWP
    May 17, IE .22, .33, .19 for same LWP ranges

For MFRSR, data sparse so used campaign avg, not too good
For MMCR + Lidar, maybe okay.
For MMCR + neph, wild divergent
For MMCR + Na, again non-physical results

Summary:
    f(rh): some consistency between lidar and neph
    Comparison of 5 different r_eff: all fairly good agreement
    Devised best-estimate methodology
    Calc indirect effect in terms of different r_eff and different CCN proxies
    Even though r_eff estimates are similar estimates of IE vary widely
    Flags CNN proxies as problematic

Thursday Morning:
Open Discussion on IOP papers, unresolved issues, etc.

1. Send titles and lists of authors for proposed journal articles to Rich and Connor (all)
2. Send any articles already submitted to Tom Ackerman (all)
3. Update data availability page on Aerosol IOP web site
4. Compare Twin Otter neph vs. IAP neph (Ogren, Covert)
    1. Resolve comparisons in hangar (positive vs. negative pressure)
    2. Determine impact of 1 micron cut on IAP measurements

> I Missed this discussion while computer was starting…

5. How well do IAP measurements, with corrections for supermicron scattering and application of surface based f(RH), represent profiles at ambient conditions? (Ogren, Covert, Ferrare)

Answer: IAP slightly (~10%) high

6. Why such a large difference between PSAP measurements on Twin Otter and Cessna? Supermicron particles? (Ogren, Covert, Sheridan)

Arnott: still need to check level-legs, pressure corrections…

John will work with Pat to work with UW PSAP data to assess concerns comparisons.

Pat Sheridan, comment: during IOP had difficulty getting sufficient access to PI instruments to assess agreement with portable ground-based suite of Neph and PSAP. Inlet issues could be serious, this was not checked for the abs meas well enough.

7. Does single scattering albedo derived from Twin Otter neph+PSAP also show same decrease with altitude as indicated by IAP data? (Covert, Ogren) How big a pertubation in sfc flux does observed (consensus) SSA yield?

Ricchiazzi agreed to look at.

> Strawa: looked at IAP and did not see decreased SSA in IAP data.

> Ogren/Sheridan: It's a statistical decrease, need larger data set to check. Suggest comparison of monthly averaged IAP /IOP SSA in-situ profiles.

> Sheridan: SSA decrease approx .01 .02 at altitude.

> Ogren: not a noise floor issue. Winter abs is much lower than summer values (at altitude), measured with no problem.

8. How well do Cimel retrievals of asymmetry factor and single scatter albedo compare with IAP and Twin Otter measurements? (Ogren, Redemann, Ferrare) –

Answer: AOT was too low for usual almucantar retrievals, principal plane measurements used instead. SSA>0.95, generally higher than in situ measurements. Need to review results with Dubovik, Assigned to whom?

9. How do the comparisons of absorption (PSAP, PA, CRD ext-scat) and extinction (neph+PSAP, CRD) relate to the Reno results? (Strawa, Arnott, Sheridan, Covert)

Still an open question.

10. Resolve issue of high temperatures in AOS trailer causing problems with f(RH) measurements (Ogren)

Mods made to AOS to terminate this problem, can't address effect on existing data.

11. Add links to IOP data archive page to other locations of relevant data (Flynn) IOP Archive in XDC hands.

Preliminary (non-trivial passwd) site should no longer be used. Contact Alice Ciala is public archive contact point.

12. Determine relevant level leg periods to use for comparisons of Twin Otter and IAP data (Ogren, Covert, Strawa, Arnott)

Strawa to add table of level legs to web site.

> Strawa: analysis is complicated by time sync issues, link was non-functional.

13. Determine golden days/times for profiles (Schmid)

Done. Schmid to supply in separate table?

14. Determine golden days for comparisons among sensors (several)
15. Send APS calibrations to J Wang (Jonsson) Aerdynamic Particle Size – unknown status
16. Compute f(RH) for scattering from TDMA and compare to nephs (Gasparini) Collins, J, paper,
Done..
17. Resolve wet DMA flow zero drift during flights (Wang)
Assuming that Jay has taken care of this.
18. Summarize relationship between aerosol composition with trajectories – DRUM (Cahill) (sent in summary on Jan. 6, waiting receipt of digital data for aerosol size/composition)
Ferrare will put this in separate directory. Will go in overview if overview happens…
19. Complete Raman lidar retrievals and add data quality flags (Ferrare, Turner)
Done. Revised and QC'ed data submitted to archive on Jan. 21, 2004
20. Develop MPL aerosol extinction and backscatter retrievals and compare to MPLNET retrievals (Flynn, Welton)
Ongoing. Beat has been seminal.
21. Compute SSA, net fluxes, absorption, heating rates, IR also (Start with smoke cases) (Bucholtz, Pilewskie, Strawa, Turner)
Ferrare: IR-folks should really carry this. Bucholtz and Pilewskie have apparently opted out of an aerosol analysis for now.
22. Compute net flux divergence profiles in aerosols (Pilewskie, Bucholtz)
Gently lean on Pilewskie after his first paper is finished. (Who to do this leaning?)
23. Complete CCN closure study using data from flight CCNC3, flight DMA, ground PILS (Rissman)
Need to check with Rissman.
24. Evaluate impacts of organics on CCN measurements (Rissman)
25. Compare CCN measurements (Rissman, Hudson)
Comparison not moving.
26. Resolve issue of correlation (or lack thereof) between aerosol extinction and CCN concentration (Ghan, Ferrare, Turner, Feingold) better correlation between in situ aerosol extinction and CCN than with lidar, changes in size and composition reduce correlation.
Ghan still working on finishing a paper, Dec or Jan.
27. Determine utility of surface CCN measurements for retrieving CCN aloft (Ghan) – paper to be submitted, some limited success.
Part of Ghan study.
28. Evaluate presence of new particle formation? From enhanced low level aerosol from farm fertilizer? (Ogren, Wang, Gasparini, Tsay)
Nucleation event observed, check with Gasparini? Chemistry guys see it? Lack of notice suggests not observed.
29. Compare of cloud microphysical retrievals with in situ data (Pilewskie, Feingold, Min, Turner, Schwartz)
(No discussion? If there was, I didn't capture it.)

30. Evaluate diffuse flux closure (Turner, Mlawer, Halthore, Michalsky, Trishchenko, Barnard)

Paul Ricciazi to look at.

31. Determine impact of absorbing aerosols on clouds, and cloud liquid water (Iziomon)

No recent communication.

32. Update access restricted web page/ ftp site (deprecated)
33. Evaluate satellite aerosol retrievals (Li, Ferrare)

Not very promising. No good MISR overpass. MODIS aot comparision not really new.

34. Are there indications of low single scattering albedo? (Covert, Arnott, Ogren, Strawa)

Already discussed this. Seems like no.

In a discussion of "major findings" the credibility of SSA numbers (stemming largely from PSAP uncertainties) flowed back and forth. Some felt the IOP makes a discouraging statement about capability to measure SSA, others (Arnott) felt it only that it reflected the complexities of field measurements vs lab. One question: Do we need more of an ongoing comparison between PSAP measurements beyond multi-wavelength?)

Snippet:

- Arnott: many variables, loading, sometimes good agreement…
- Schwarz: back to original motivation. Are underlying measurements of SSA (PSAP, Neph) in disagreement to the extent that SSA closure is prohibited?
- Arnott: Jury is still out whether we can or cannot explain observed
- Schmid or Strawa: Abs uncertainties ~40% imply large uncertainties in SSA, this is of particular relevance
- Arnott: Possible errors need close attention before we claim unresolvable discrepancies.

Sheridan - RAOS? Aerosol Science Presentation

6th paper regarding RAOS accepted.

> Ferrare: Can we have a summary of key findings from RAOS first authors?

Motivation for RAOS: Highly absorbing aerosols required for flux closure are inconsistent with observed SSA in cases of low aot. Main uncertainties seen as abs measurement, ie PSAP.

9 measurements conducted:

2 PA
2 PSAP
2 Aetha
1 MAAP
2 Ext minus Scattering

Experimental target matrix with ammonium sulfate, soots, graphite, filtered air, polystyrene latex 0.5 um diam.

PSAP < 25 1/ Mm, slope 1.02 R-squared 0.97
PSAP detection limit 0.5 1/Mm
Conclusion: PSAP with within +10% of others. Not missing abs with PSAP.
With lab conditions: PSAP agrees with reference well enough to be useful for answering diffuse discrepancy.
Future: extend RAOS, RH-dependence, other matrix samples, sfc meas
Participants: Sheridan, Arnott, Ogren, Moosmuller, Covert, Bond, etc?

Myeong-Jae Jeong: "MJ" (assoc. Zhanqing Li) Cloud contamination vs aerosol humidification effects in Aeronet AOT

Modis optical thickness and cloud fraction as motivator. Can we see this from ground-based?
Looked at TSI cloud fraction product, observed similar relationship to MODIS aot vs cloud fraction.
Eliminate potential that observation is artifact of TSI due to observed dependence of AOT on circumsolar cloud-fraction bands.
Distinct correlation between PWV and AOT, but is it due to cloud contamination of both quantities or is it due to humidification of aerosols? Currently in the midst of analysis, now need to look at vertical structure.

Mikail Alexandrov

Automated retrievals from MFRSR
First cloud screen with automated epsilon-prime algorithm
Retrieval:

- fine mode aot and R_eff
- Coarse mode aot (fixed R_eff=1.5 um)
- Ozone
- NO
- What? Sulphate maybe? Too fast.

If unable to distinguish modes, retrieve using monomode.
Comparison to Aeronet 870 nm shows fair total agreement, little high fine, low coarse
From Pinatubo analysis: fine mode shows no interannual corr, coarse does.
Implies Pinatubo is bi-modal.
Spatial variations observed in fine r_eff seasonal dependence from EF study.
Looked at NO3 and SO4 concentrations, also PM2.5/PM10 ratio across SGP ACRF.
> Ogren: treat nitrate measurements with suspicion due to volatility of nitrate over 12 hours.
> Ferrare: compare to IOP effective radius
> Wagener: might consider PI product or VAP as alternative data entry points.

Michalsky: Radiation closure for clear-sky conditions during Aerosol IOP

All treatments used same SSA, g, aod (NIMFR), spectra sfc alb, ET spectrum, O3, H2O, sfc press in all model runs.

Ground-based ssa, (neph and psap)
Asymmetry parameter g, from arm AOS (neph)
NIMFR for aod
Cavity or NIP for direct. Diffuse is avg of CM22 corrected for offset and 8-48 (B&W)
TOMS/Dobson
Local sfc met
Models:

- SBDART 2.4 (Uses disort)
- SMARTS 29.4 (paramterized)
- RAPRAD (two-stream, Kato)
- MODTRAN (no results yet)

Variety of solar elevation (90-zenith angle)
SSA notable in that it is non-exceptional
g (stp) is a bit lower than in past.

Model – Measurement: 2% on direct, few % in diffuse
Very acceptable closure results.
Bottom line: lower g seems to help the closure without constraining SSA to unobserved low values.

As sensitivity study, Barnard conducted three semi-independent SBDART runs with slight variations of aot. The 2% direct, few % diffuse flux uncertainty in this treatment correspond to an aot of ~0.01. This is very small and is about the best we can hope to measure aot with sun photometry.

Ogren: SGP AOS, IAP, NSA AOS, differences, status, and upgrades

Differences between SGP AOS, IAP, and NSA AOS:
IAP: no size-cut, single rh, single abs wavelength
Only SGP AOS measures size distribution
CO_2 used for neph cals and long time series performance measure, but no means for similar cal for abs.
Seasonal variation in scattering at 3 km, not at ground level. Indicative of fines?
AOS upgrades:

- Move pumps to outside shelter (less noise, heat, more space)
- TDMA to be added
- 3 wavelength PSAP: Instead of upgrade, now recommend purchasing a new instrument to provide a minimum 3 month overlap
- Mentor edits now incorporated in AOS Corr.

IAP upgrades:

- Eliminate HD, boot to liveCD, data to memory stick.
- Upgrade PSAP
- Plan for larger aircraft: Cessna 206
    - CO2 needs more capacity
    - NOAA is building IAP-like aircraft, share engineering costs
    - Complete instrument package to be decided...

Optical partical counter reliability a problem, Recommended soln:

1. Use TDMA for low-end of OPC size range
2. Replace OPC with Aerodynamic Particle Spectrometer for high-end

Ozone monitor reliability, Manufacturer out of business

Soln: replace with new one, or discontinue

Consensus: discontinue

No gui for AOS data system.

Turner: Upgraded CARL

Replaced all the cheap parts first. Filter replacement, Mirror refurbishment, Wow!

Upgrade detection electronics with LICOR. Double-wow!

Improved SNR on the order of a factor of 10, depending on the particular quantity.

Flynn: MPL Extinction Profiles status:

Retrievals comparable (or a bit weaker) than MPLnet retrievals, according to comparisons during IOP. Some improvements in the retrieval still in the works.

1. Improve lidar profiles
2. Improve cloud-screening
3. Mesh downward and upward retrievals
4. Automate

Liljegren:AMF: capabilities, limitations, schedule

Jan. 2005: beta test at PNNL

Feb. 3 Ship to Pt. Reyes, CA, marine stratus

March 10-Sept 12, Pt. Reyes campaign

Jan 2006 Niger, Africa

7'x7'x15' shelters located some distance from the rad stand and met station.

Diesel generator for emergency power.

Data system: remote instrument access

SBIR funding, let's get some…

Turner: BBHRP

ARM has chosen an "Accomplishment Target" to run BBHRP for an entire year at each site.

ACRF	CompletionDate	Status
SGP	2004	re-entrenchment
NSA	2005	
TWP	2005	

Unresolvable (so far) discrepancy, currently indicating problems with the NIP(s) have limited BBHRP ability to move forward at SGP.

Turner ABE Version 1:

1. Use minimal set of datastreams
2. Augment with conditional ds
3. Use MFRSR / RL / sfc obs for tau
4. asymmetry parameter considered constant with height

Previous mixing height approach often generated statistical outliers for tau. New approach involving an empiracle regression generates many fewer outliers in absence of actual measurements.
Shooting for a new re-run with BBHRP by STM.

Extend to NSA, TWP:
More limited instrument options.
MPL is critical.
Recommendation for validation for MPLext , RL, aircraft/AATS
Ferrare: suggests adding modeled results to the mix in lieu of reliable measurements

Flynn, AWG VAP Recommendations and Data Needs:

Each of the VAPs below are strong recommendations by the AWG.

- Aerosol Best Estimate VAP for BBHRP input Level 2
    - Pull in profiles of extinction retrievals, f(rh)
    - Mesh RL, MPL_ext, IAP
    - "Improve" SSA and g range dependence
    - Finish level 1 by STM?
    - Start level 2, requires MPL-ext

  The BBHRP has been chosen by ACRF as an "Accomplishment Target".
  The Aerosol Best Estimate feeds into BBHRP, so it is a high AWG priority
- MPL Aerosol Extinction Retrieval
    - Improve lidar profiles
    - Improve cloud/aerosol discrimination
    - Automate
    - High recommendation

  The MPL extinction VAP feeds into ABE, so it is a high AWG priority.
- MFRSR:
    - Add automated cloud screen

      This is a high priority because MPL_ext (and thereby ABE and BBHRP) require cloud screened AOT.
    - Deliver atmos trans as side product for BSRN

      This is a fairly easy and would benefit the broader community.
- Aerosol Intensive Properties (AOS), extend to NSA, IAP
    - Relatively small effort.
    - Needed for ABE and MPL-ext at remote sites
    - Good bang for buck ratio.
- RL reprocessing of 2002-2004
    - High recommendation, critical datastream for AWG Science Team members.
    - Likely to take ~1 year

- AWG also expressed a request to the CPWG for r_eff products, optimally multiple algorithms. Valid r_eff measures are critical inputs to studies of the aerosol indirect effect.

Ken Kehoe:

DQ Office, data browser, NCVweb

Dick Eagan:

Engineering group charged with supporting science via the infrastructure.
Review of EWO/ECR/ECO/RRR/BCR process

Rick Wagener:

Low recommendation from AWG for Cimel XDC ingest
High recommendation for TOMS reprocess

Steve Schwartz:

Atmospheric Science Program is itself not new, but has new focus.
Focus has shifted over the years from transport (fallout removal), acid deposition, and now focusing on aerosol. Proposal for reconfig went through VERAC (sp?) in 03, in May of 04 was decided. Some 450 proposals submitted, something like 33 accepted. Jan 25-27 ASP first science team meeting.

Approach of ASP is campaign mode in contrast to ARM. Focusing on properties and processes of aerosols during campaign. Tpically have one 4-week project a year. Cooperative, collaborative proposals are encouraged.

3 proposed ASP campaigns:

- Pt Reyes study, 2005, marine stratus, ARM AMF
- Mexico city 2006, characterizing black carbon, NSF Mirage campaign proposed
- Houston 2006, urban plume coupled with power plants, interaction of plumes…

ASP central goal: studying radiative forcing. Without ARM-level detail to radiation,.
ARM central question: given some aerosol, (possibly with chemical, physical, optical characterization specified from ASP) how well can we account for radiative forcing?
ASP central question: What are processes that control the amount, distribution, formation, evolution, etc. of this aerosol population?

- Feingold: what program might fund aerosol indirect effect, ARM or ASP?
- Schwartz: could be supported by either program, depends on phrasing of the science question.

- Michalsky: What is the ASP interest in the Pt. Reyes campaign?
- What effects do aerosol have on marine status formation and properties…

Metrics…

Very unfocussed discussion, no clear consensus. Here are some ideas that were raised:

- Flynn/Turner: BBHRP, reduce ice-cloud uncertainties by X%.
- Flynn: Reduce bias and uncertainty in MPL extinction retrievals by half.
- Arnott/Sheridan: Reduce uncertainty in airborne abs measurement from +/- 40% to 20%.
- Flynn/Schmid: Quantified level of uncertainties in current capability extinction profiles. Now reduce them by Y%.

The Future: Aerosol IOPs, experiments, key aerosol science research areas, recommendations to ARM

IOP/Experiments:

- Mini-IOP deployment of Cadenza (cavity ring down) for in situ aerosol extinction/scattering absorption measurements at SGP for months.
- Validation campaign for CARL and MPL with AATS.
- Jan 2006 Niger, Africa
- SGP Cloud IOP 2007 in March, pretty low loading, but indirect effect might benefit.
- 2008, Indirect study in Arctic in springtime

- Ogren: Should we try to state an assessment of forcing uncertainties?

Friday Morning

Key aerosol science research areas:

- Evaluation of aerosol models
  - Additional measurements of aero comp as fnt of size
  - Understand aerosol sources
  - Evaluate representation in phys trans models
  - Evaluate accuracy of models for properties as fnt of altitude
- Quantify sensitivity of aerosol direct effect
  - Single-scatter albedo
  - Asymmetry parameter
  - Sfc albedo
  - Aerosol optical thickness
  - Meteorology
  - Cloud liquid water, depth, morph
  - Aerosol size, comp, trace gas effects on drop size
  - Isolate aerosol effects from met.

> Schwartz: how well do we need to do this in order to look at anthrop and climate
> sensitivity, the uncertainty in the radiative forcing ~0.5 W/m^2 or less. In the context

> of 60W/m2 per OD, then the 0.01 OD measurement floor is on that level.
> Ogren:We can cast that in terms of uncertainty in SSA and g.
> Schwartz: or we can play sensitivity games as in Joe's SW closure analysis.
> Schmid: Doesn't the profile matter?
> Schwartz: in first order, column goes into forcing.
> Ricchiazzi concurs, to first order.

>Schwartz: Some sensitivity analysis done by Graham already, but more could/should be
> done, esp in bullet 3.
> Feingold: Some work on cld liq water (Turner) really needs to be done. Should we
> continue looking at first indirect effect or should we look at cloud life-cycles, precip
> effect, etc.? (No definite group response.)
> Turner: Lagrangian study for second indirect effect?
> Graham: Modeling is more likely, but still tough. No observational methodology has
> been identified.
> Ferrare: second direct effect seems to involve other WG (CPWG). So far, not much
> evoked interest yet, perhaps IOP 2007 could be a vehicle.
> Graham: "Seeing" the first indirect effect isn't the issue, several investigators claim
> "seeing the first indirect effect". The question is whether we can quantify it, or explain
> observations. For example, a recent paper summarized drop number concentration
> versus aerosol number function as a set of widely divergent slopes. Why is this slope
> so varied?

> Graham: Incremental step to get sfc CCN with composition would enable continuous
> closure experiments. From size and composition, try to predict CCN actually observed
> from sfc measurements.
> Schwartz: this is along lines of ASP goals but not in mode of continuous operation.
> ASP is campaign-focused.
> Tracy and Seinfeld have CCN closure report.
> Ogren: since ASP has funded PIs for CCN closure work, perhaps we should leave it to
> them and possibly invite them to an IOP.
> Back and forth discussions regarding composition and CCN measurements. Some
> discussion about airborne. Diurnal cycle also an issue.

AWG recommendations to ARM …

VAPs: Although discussed on Friday morning, I've moved the content and recommendations to the VAP section above.

IAP Program:

Group recommends continue for > 2 years for f(rh) statistics.
Maintain current cut-off configuration
Addition meas. Composition,size
Ogren, should IAP scope include regular cloud work? IFR clearance issues.
Homogeneous cloud cover typically important, Marshak looking at broken skies.
Ogren: should I do some more research to put a proposal forward to extend IAP operation in cloud?

Yes, John, do it.
Sfc_albedo measurements with MFR.
Are there measurements for the indirect effect that we could add to the IAP?
Or additions to the IAP for other aerosol topics, transport models, what not? Size and composition? No clear recommendation from the group.

Composition measurements at SGP and NSA (Trish Quinn)

Currently unfunded by NOAA/PMEL.
Allison, Mikail are using this data set.
Group recommends continuation at SGP and NSA
Liljegren: At cloud parameterization meeting, some interest in speciation. Do the composition measurements approach this need?
Ferrare: This composition work doesn't really meet this. "IMPROVE" site about 30 km away, only a few years old data base though.

Steve Schwartz / Allison have volunteered to put together a sensitivity report relating to radiative forcing and input parameters (SSA, g).

Mini-IOP (1-2 mths) combining Cadenza, PA, with RAOS2.

Ogren: Update on CCN counter options

Cost is $50-55K
5 Supersats in 30 minutes. 2-3 minutes to stabilize.
Supersaturation range 0.1 – 1%
Ready for ground deployment. Out of six weeks, 20 days of data. Pretty good for a first deployment.

AWG STM Monday or Thursday afternoon, half-day meeting

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