Report on the First ACE-Asia Data Workshop

California Institute of Technology, Pasadena, CA

29 October – 1 November, 2001

The workshop was hosted by John Seinfeld at California Institute of Technology. The facilities and arrangements were perfect for the meeting (if you don't count one brief unexpected shower). The community owes a great thanks to John, his efficient colleague Ann Hilgenfeldt, and Brian Jackson of UCAR/JOSS for the administration of the workshop. The facilities and surroundings made it possible to be very productive in our 3 1/2 days.

The majority of this report is contained in Appendices, to make it a bit easier to navigate. Plenary Session Summaries and Breakout Session Reports are numbered below so that readers can find the similarly numbered Report on that Session in the Appendices.

The workshop consisted of three elements: plenary sessions, breakout meetings, and posters. Most mornings and afternoons began with a plenary session, the substance of which are outlined below. The breakout sessions that followed allowed smaller groups of participants to discuss common issues and arrange for standardized approaches for each type of activity. Finally, each attending group brought a poster or two describing their results, which were mounted in an open courtyard for the duration of the workshop. These stimulated a tremendous amount of interaction and discussion between groups.

ACE-Asia Data Policy

Of course, this interaction depends on sharing data from multiple groups, which makes many observers uncomfortable since they fear loss of control over their data. For this reason, we began the Data Workshop with a reminder about the ACE-Asia data policy:

> **"It is the intent of the ACE science team that all data will be considered public domain at the end of the ACE-Asia field experiment and that any use of the data will include either acknowledgment or co-authorship at the discretion of the investigator who collected the data."**

Using someone's data, even after it becomes public, requires that this person be informed and given a chance to participate in its publication. Failure to comply with the above data policy can have many negative consequences, including:

* Undermining ACE-Asia's spirit of cooperation and collaboration;
* The misuse of data;
* Career impairment for the data producers (who worked hard to produce high-quality data but who miss out on co-authorships needed to demonstrate to their program managers the value of their work); and
* Reduced effort to produce the highest-quality data.

By rigorously following the ACE-Asia Data Policy, we can avoid having any of these negative consequences. In summary, **you *cannot* publish or present someone's data without offering them participation in the publication.** Thanks to everyone for your cooperation! It really is to all our benefit to share our data freely.

I. Plenary Sessions

Breakout Sessions Reports were presented in Plenary, so that all participants were informed about discussions in which they were unable to participate. All other plenary talks are listed below. A summary of each can be found in Appendix V.C. [Approximate page # below for 8 1/2 x 11 paper.] The exception is the concluding session discussion (where do we stand and where do we go from here?), which is included in the body of this report.

II. Breakout Sessions

The breakout sessions were of two types. Some were relatively technical sessions, which dealt with issues like corrections for RH in scattering measurements, platform-specific issues, or data quality. Other sessions were of a more general nature, pulling together related measurements to begin creating integrated products. Many groups tried to develop a tentative list of manuscripts and authors. All the Sessions are listed below. Reports from the Breakout Sessions can be found in Appendix V.D.

III. Posters

The poster session was extremely productive. Having the posters up throughout the meeting meant that most people had time to view most posters. The list of poster titles and authors that is appended below was derived from preregistration forms, so it is almost certainly shorter than the number that were actually presented. *[If you would like to correct your title, fill in the remaining authors, or add a poster that didn't get listed her, please send that information to me (huebert@soest.hawaii.edu) quickly. I'll make just one or two sets of changes to the report after it is posted on the web site, so if you send me corrections soon your poster will be properly recorded in the web Workshop Report.]*

IV. Closing Plenary Session

IV.A. What is the status of ACE-Asia data analysis?

Closing Plenary Discussion – Barry Huebert, 1 Nov 2001

What metric should one use, six months after our intensive observation period, to determine whether The ACE-Asia project is meeting its goals? We're still at the point of looking at some of our data for the first time; many of us have looked in detail at only our own data. Most groups have, however, produced enticing summaries of their data and glimpses of detailed data during particular events. Yet it is far too early to have any assessment of the bottom line: the radiative impact of Asian aerosols on climate, as determined by updated and thoroughly-tested models that have benefitted from ACE-Asia data.

Our formal objectives are one way to gauge our progress: Have we characterized the Asian aerosol well? Did we measure its impact on radiation accurately enough to make models of direct forcing by aerosols into more useful predictive tools? Can our insights be used to improve process descriptions in aerosol/climate models? While we may not have the final answers yet, I think we can see very clearly that we have put together the tools and coordinated observations for generating very positive answers. There are good reasons for the excitement and enthusiasm of the people at this workshop.

First of all, nature cooperated. How many projects have we done in which the required conditions failed to materialize? We find droughts when trying to study rainfall, and clouds when working on clear-sky photochemistry. It's almost axiomatic that field programs won't find what they're looking for, but we did. Our goal was to study the unique Asian multi-component aerosol, which includes mineral dust, soot, inorganic ions, condensed organics, and sea salt, and that is what we found. We could not have asked for more ideal conditions. The spring of 2001 was a high-dust year, with several intense dust storms and ample pollution plumes during the time of our most concentrated observations. Some of the breakout session reports below identify the “golden days” or “nuggets” from the standpoints of those groups.

One of these episodes has been labeled “The Perfect Dust Storm,” both because its structure and history were classical (a cold front played a large role in its formation and transport) and because its intensity was so great. It was also an excellent example of long-range (intercontinental) transport, having been tracked by satellite well across North America and across the Atlantic Ocean. The effects of this storm include “nightly-national-news” levels of visibility reduction in Colorado, as well as a significant jump in surface-water iron concentrations in the iron-starved central North Pacific Ocean. We have an incredible suite of observations of this storm, from its genesis in the Gobi Desert to surface sites in China, Korea, Japan, and offshore at Kosan to the R/V Ron Brown to three C-130 and two Twin Otter flights. After crossing the Pacific it was sampled off the coast of Washington by the PHOBEA aircraft and above Colorado by a NOAA lidar and aircraft. We could not have asked for a more ideal case study, and we were able to mobilize our resources to study it intensively.

To understand these great aerosol outbreaks, we used an integrated suite of models, remote sensing, and in situ observations very effectively. Both the NRC Panel on Radiative Forcing and Climate Change (96) and a recent paper by Charlson (2001) argue that to characterize the impact of aerosols on climate, “simultaneous and coordinated use of all three approaches [models, remote sensing, and in situ observations] is required…” (Charlson 2001). We had three very effective chemical transport models running in a forecast mode every day to predict the locations and composition of aerosol plumes. Each model had a representative on site, who could create new products and visualizations (such as concentration slices for dust or EC along potential flight tracks) so that decisions about where to sample were strongly influenced by the model output. Flight plans were equally influenced by the locations of satellite scenes, in which we did numerous profiles. The vast majority of our flights involved profiles coordinated with TERRA scenes, in addition to SeaWiFS, GMS, and AVHRR. The integration of models, satellites, and in situ observations was achieved beyond anyone’s expectations.

We also went to the field with comprehensive suites of instruments, so that several platforms could measure most of the relevant parameters simultaneously. Size dependent chemistry, which is fundamental to calculating indices of refraction, was measured in many locations (including both US aircraft). Physical size distributions were measured by optical, electrical, and aerodynamic particle sizers and mass spectrometers, usually with a variety of approaches on the same platform to allow for comparisons of their results. For example, particle size is a surprisingly difficult thing to define: how can one define the “size” of a nonspherical clay particle, composed of a jumble of flat plates stuck together? Microscopic and aerodynamic measurements give totally different conclusions. For this reason the use of multiple techniques is not redundant; each supplies complementary information.

These related measurements are of tremendous value: the size and composition measurements allow us to compute optical properties, which can now be compared with the simultaneous measurements of aerosol scattering and absorption. These in situ measurements will be constrained by inlet-less sun photometric measurements of solar extinction, so that we have an independent check on the quality of our optical property data. Using these integrated suites of instruments allows local closure in many places for many properties (mass, scattering, absorption, etc.), as well as column radiative closure in our satellite scenes. Single-particle analysis by SEM, TEM, and single particle mass spectrometers permits us to assess the impact of mixing state and particle morphology in situations where closure has not been achieved. The use of both time-series and airborne sampling permitted us to examining variations of aerosol properties with time and space. Amazingly, the vast majority of this instrumentation worked well throughout the ACE-Asia intensive experiment, with very limited down time. In short, we had the right tools for the job and they worked beautifully.

Our optimism about achieving our objectives also relies on the fact that the ACE-Asia observations were strategically well coordinated for answering relevant questions. For example, there are MISR local-mode "golden days" (profiles in clear air with working instruments) for 4 Twin Otter flights and a similar number of C-130 flights. In fact, the majority of flights on both aircraft included well-designed profiles in some satellite scene: the planes were at the surface when the satellite's shutter clicked, then they rapidly ascended to identify layers of extinction, ending with a more leisurely probing of the most interesting layers for in situ analyses. Similar profiles were flown near lidars at Kosan, on the Ron Brown, and in the Tokyo region. The airborne radiometric and in situ extinction measurements (including direct measurements of the lidar ratio from the C-130) offer a powerful constraint and calibration tool for making sense of lidar profiles. These flights should increase the worth of retrievals from the CALIPSO lidar-in-space. One strategy for model testing was to make observations over many model cells, to test the ability of the models to position plumes properly and to describe spatial variability. We did this both through surface network measurements (which recorded the arrival times of dust, for instance) and with long-distance flights. One C-130 flight each was devoted to a circuit of Japan, of Korea, and of the East China Sea downwind of Shanghai. We even had minimal sets of measurements near the dust sources in China, even though we had fewer instruments and couldn't use aircraft as we did offshore.

The integration of models and observations in ACE-Asia has really been impressive. True, this isn't the first time forecast models have been used to direct platforms: in 1995 we used forecast trajectories to choose starting locations for the ACE-1 Lagrangian experiments. But the coupling in ACE-Asia has already gone both ways, including the use of observations to significantly improve the models. The most dramatic example so far is the "surprise dust storm." For April 24 all 3 CTMs forecast modest dust levels over the Yellow Sea: tens of $\mu g/m^3$, peaking at about 3-4 km altitude. However, the C-130 encountered extremely heavy dust (500-1000 $\mu g/m^3$!) right near the surface. Why had the models been so far off, when they usually forecast at least the broad outlines of plumes correctly? They missed a source: a former lake northeast of Beijing that has been dried up by pumping of water from its aquifer. When this anthropogenic dust source is included in the models, they properly "forecast" the event we encountered. This dry lakebed may be a fairly minor dust source relative to the big deserts (Irina Sokolik estimates it produces 1-2% of China's total dust emissions), but its proximity to Beijing and the Yellow Sea allows it to have a disproportionate impact on populated areas. In view of the frequent debate over how much dust is natural vs man-made (is it a "climate forcing?"), getting the human-caused dust sources right is very important. This is a tough question, on which ACE-Asia's observations have already made notable progress. The close integration of modelers and measurers in the ACE-Asia Science Team is the reason we made that leap so quickly.

Another reason for the excitement here is the high quality of the data. Much of the effort during this workshop has been spent working on issues of data quality. Wherever possible, the measurements on various platforms have been intercalibrated. Round robin unknowns have been sent out to participating labs to analyze for inorganic anions and cations and OC/EC. The organics/elemental carbon comparison was a real triumph: by using Sunset labs analyzers in an agreed-upon way, eight labs got results that agreed within the stated uncertainty of the instrument, generally 10-20%. This comparability of OC and EC measurements between groups and platforms is unprecedented. The growth of particles with RH changes is another example, where redundancy and related measurements are being used. On the Ron Brown, for instance, there were five separate measurements of hygroscopic growth or scattering f(RH). Sorting out the conditions under which they agree and disagree tells us not only about the aerosol, but also about the proper use of these methods. Users of this data will know how much faith to put into various parameterizations of humidity effects.

Sampling biases due to inlets and plumbing are always an issue in aerosol experiments, but even more so when the study aerosol (dust) is largely in the coarse mode. While inlet artifacts are most pronounced in aircraft, they can also be significant for surface samplers. Here, too, the ACE-Asia Science Team has worked hard to design good inlets and then to characterize what has been used. The C-130's LTIs were an exciting advance, since they permitted dust collection at altitude. It is not a trivial matter to model the likely enhancement of 5-10 µm particles by an LTI, but it is a well-posed fluid mechanics problem. Likewise the loss of particles in transfer tubing has to be quantified in the lab before the relationship between measured and ambient aerosol parameters can be established. These are big tasks, but it is exciting to realize that we finally have our hands on the problem of studying large particles from aircraft. Again, the use of sun photometry to constrain the possible biases in these inlet-dependent measurements is critical: a preliminary analysis of Twin Otter data has shown better agreement between extinction estimates above the boundary layer than in the presence of sticky (easily-lost in tubing) sea salt particles.

The issue of data quality and comparability is central to a large field program. Intercomparison flight legs were used to ensure that side-by-side data is available for each pair of platforms. For example, the C-130 flew in formation 3 times over and near the Ron Brown, twice with the Twin Otter, 7 times alongside Kosan, twice with the NASA P-3, once with the ARA Kingair, and once each near Hachijo and Amami Ojima. All this intercomparison data will be used in our "harmony" effort, similar to that in INDOEX. The harmony working group will search out all the resources it can find to interpret the agreements and disagreements between similar quantities measured on different platforms. The result will be an understanding of just how comparable these platforms really were.

But in addition to all these positive things, there is another, very fundamental reason for the optimism and excitement that has been evident this week: the ACE-Asia Science Team is cooperating in a manner unheard of in most international programs. Very few groups are hoarding data, but are instead openly sharing it to see what can be learned by combining data sets. One excellent example is a poster that was up this week comparing extinction from lidar and airborne in situ data. Toshi Murayama is the first author on this poster, which includes authors (and data) from eight different groups, in the US and Japan. The lidar-derived extinction compares very favorably to similar data derived from nephelometers and a sun photometer. I find it really exciting that so soon after the field program, multiple groups are already pooling their data to generate insights than no one group could achieve alone. It is efforts like this that make large field programs worthwhile. I really believe that the spirit of openness and data sharing in this group is beyond what I have witnessed in any earlier field program, and that the scientific productivity will be higher as a result.

Our challenge now is to maintain this momentum and excitement into the analysis and paper-writing phase of ACE-Asia. Many manuscripts are being planned, and our mailing lists for Breakout Groups are facilitating discussions about various types of data. Hopefully every group involved in ACE-Asia will lead-author at least one paper.

In summary, I think we're right where we need to be:

Great Data, Great Synergy, *Great Colleagues*!

IV.B. Where do we go from here?

Special JGR Issue: We will have a special issue of JGR for ACE-Asia papers. The proposed submission date is Oct 31, 2002. AGU's new JGR publication mechanism is ideal for special issues, because no one's paper gets held up waiting for anyone else: authors can submit manuscripts at any time. As soon as they are in final form, JGR publishes them to the web, which is the official "publication date." After a reasonable time for the bulk of papers to be reviewed and revised, all the completed papers identified as ACE-Asia manuscripts will then be bound together into a hard-copy issue of JGR. This binding (the real deadline for getting your manuscript printed alongside the others) will probably be about 1 May, 2003. All ACE-Asia papers ready by then will make the special issue, regardless of their submission date. It is less likely, of course, that papers submitted after 31 Oct 2002 will be able to make the printing deadline.

Submission Instructions: http://www.agu.org/journals/jd/

Note that there is no prohibition to prevent anyone from publishing in a different journal at a time of their choosing, as long as they adhere to the ACE-Asia Data Policy when using data from other groups.

Overview publication: Before the spring of 2002, we will prepare a manuscript for BAMS that basically outlines what ACE-Asia has done, with little or no science. This publication will list the measurements made, the platforms and sites, and the names of groups that participated. It will plot the flight and ship tracks, describe our experimental strategy, and briefly outline the conditions we encountered. The idea is to get something in the literature that says the experiment happened and here are the kinds of data analyses that will be undertaken. It will also provide a reference –able outline of ACE-Asia activities.

Presentations at Conferences: ACE_Asia sessions have been arranged at two upcoming meetings, and a third will be organized.

1. The ***International Aerosol Conference in Chinese Taipei, 8-13 Sept 2002***. Please submit your abstracts to the Organizers: Prof. Barry Huebert (Univ. of Hawaii) (huebert@soest.hawaii.edu), Prof. Xiaoyan Tang (Peking Univ.), Prof. Yasunobu Iwasaka (Nagoya Univ.), **or** Prof. Shaw Liu (Academia Sinica), and a copy to the IAC web site at **http://caart.org.tw/**. Instructions for preparation and submission of abstracts can be found at the IAC web site.

2. ***CACGP/IGAC Open Science Conference in Crete, 19-25 September, 2002***. http://atlas.chemistry.uch.gr/IGAC2002/ for meeting details and abstract submission instructions. Please note abstracts are due 31 March 2002.

3. We will have an ACE-Asia session at the ***Fall 2002 AGU Meeting in San Francisco***, perhaps jointly with TRACE-P. Details will be forthcoming.

Future Workshops: There is considerable sentiment that additional workshop time is needed to resolve some issues prior to the JGR manuscript submission date. However, there is not yet a consensus about whether this needs to be a large meeting or a series of smaller ones. Mitsu Uematsu is trying to arrange a workshop in ***Beijing around 4-6 April 2002*** that will be most accessible for Asian scientists. Nothing is final on that yet. ***The week of May 20-24, 2002*** (the week before Spring AGU) has been suggested for working groups to meet in the US, perhaps in Boulder. Nothing is finalized yet, but if you can hold that week free it would be a good idea.

V. Appendices

V.A. List of Participants

	PARTICIPANT	P.I.	PARTICIPANT INSTITUTION
1	James Allan	Choularton	UMIST
2	Donald E. Anderson		NASA HQ
3	James R. Anderson	Anderson	Arizona State University
4	Tad Anderson	Covert	University of Washington
5	Richard Arimoto	Arimoto	New Mexico State University
6	Roya Bahreini	Seinfeld	California Institute of Technology
7	David E. Bates	Welton	University of Miami
8	Tim Bates	Bates	NOAA/PMEL
9	Michael H. Bergin	Bergin	Georgia Institute of Technology
10	Robert W. Bergstrom	P. Russell / Pilewskie	Bay Area Environmental Research Institute
11	Byron Blomquist	Bandy	Drexel University / University of Hawaii
12	Tami C. Bond	Bates/Quinn	NOAA/PMEL
13	Keith N. Bower	UMIST	UMIST
14	Michael A. Box	Phil Russell	University of New South Wales
15	Fred J. Brechtel	Brechtel/Imre	Brookhaven National Laboratory
16	Anthony Bucholtz	Westphal	Naval Research Lab
17	Brett C. Bush	Valero	Scripps Institution of Oceanography, UCSD

18	Gintautas Buzorius	Brechtel/Imre	Brookhaven National Laboratory
19	Thomas A. Cahill	Tom Cahill	University of California, Davis
20	Teresa L. Campos	Campos	NCAR
21	Gregory R. Carmichael	Carmichael	University of Iowa
22	Christian M. Carrico	Rood	Georgia Institute of Technology
23	Ta-Yih Chen	Chen	Academia Sinica
24	Mian Chin	Chin	Georgia Tech/ NASA Goddard SFC
25	Byoung-Cheol Choi	Choi	Meteorological Research Institute
26	Shun-Ying Chou	Chen	Academia Sinica
27	Patrick Y. Chuang	Schauer	University of California, Santa Cruz
28	Steven S. Cliff	Cahill/Cliff	University of California, Davis
29	Hugh Coe	Choularton	UMIST
30	Don R. Collins	Seinfeld	Texas A&M University
31	William D. Collins	Collins/Rasch	NCAR
32	David S. Covert	Covert	University of Washington
33	Richard A. Dirks	Sawyer	UCAR/JOSS
34	Philip A. Durkee	Durkee	Naval Postgraduate School
35	Sylvia A. Edgerton		National Science Foundation
36	Ian C. Faloona	Campos - RAF/Chemistry	NCAR
37	Richard C. Flagan	Seinfeld/Flagan	California Institute of Technology
38	Hans R. Friedli	Friedli	NCAR
39	Hajime Fukushima	Nakajima	Tokai University
40	Sergio A. Guazzotti	Prather	University of California, San Diego
41	Ann Hilgenfeldt	Seinfeld	California Institute of Technology
42	Brent N. Holben	Holben	NASA Goddard Space Flight Center
43	Steven G. Howell	Clarke/Howell	University of Hawaii at Manoa
44	N. Christina Hsu	Tsay/Hsu	UMBC NASA Goddard Space Flight Center
45	Barry J. Huebert	Huebert	University of Hawaii at Manoa
46	Brian Jackson	Sawyer	UCAR/JOSS
47	Daniel J. Jacob	Guest	Harvard University
48	Dan Jaffe	Jaffe	University of Washington
49	Anne Jefferson	Ogren	NOAA/CMDL
50	Qiang "Jack" Ji	Tsay	SSAI NASA Goddard Space Flight Center
51	Jose L. Jimenez	Seinfeld/Flagan	California Institute of Technology
52	Haflidi H. Jonsson	Jonsson	Naval Postgraduate School
53	Ralph A. Kahn	Kahn	Jet Propulsion Laboratory/Cal Tech
54	Fuu-Ming KAI	Chen	Academia Sinica
55	Mikio Kasahara	Kasahara	Kyoto University
56	Kimitaka Kawamura	Kawamura, Hokkaido Univ.	Hokkaido University
57	Jiyoung Kim	Kim, J-Y	Meteorological Research Institute
58	Sangwoo Kim	Yoon/SNU	Seoul National University
59	Young J. Kim	Kim, Y-J	K-JIST
60	Makoto Koike	Koike	University of Tokyo
61	Yin-Nan Lee	Yin-Nan Lee/Rodney Weber	Brookhaven National Laboratory
62	Joel M. Levy		NOAA Office of Global Programs
63	Ho-Jin Lim	Turpin	Rutgers University
64	Catherine J. Liousse		Laboratoire d'Aérologie
65	John M. Livingston	Russell, P.	SRI International NASA Ames Research Center
66	Brian T. Mader	Seinfeld	California Institute of Technology

67	Céline Mari		Laboratoire d'Aérologie - OMP
68	Steven F. Maria	Russell, L.	Princeton University
69	Sarah J. Masonis	Covert	University of Washington
70	Kari L. Maxwell	Weber	Georgia Institute of Technology
71	Gordon B. McFiggans	Choularton	UMIST
72	Cameron S. McNaughton	Clarke/Howell	University of Hawaii at Manoa
73	John T. Merrill	Merrill	University of Rhode Island
74	Christelle Michel		Laboratoire d'Aérologie
75	Michihiro Mochida	Kawamura, Hokkaido Univ.	Hokkaido University
76	K.C. (Kil-Choo) Moon	KIST and NOAA	KIST
77	Toshiyuki Murayama	Murayama	Tokyo University of Mercantile Marine
78	Sung-Nam Oh	Oh	KMA/Meteorological Research Institute
79	David D. Parrish		NOAA Aeronomy Laboratory
80	John C. Pommier	Pilewskie	NASA Ames Research Center
81	Shelly K. Pope	Valero	Scripps Institution of Oceanography, UCSD
82	Kimberly A. Prather	Prather	University of California, San Diego
83	Heather U. Price	Jaffe	University of Washington
84	Joseph M. Prospero		University of Miami
85	Patricia K. Quinn	Quinn	NOAA/PMEL
86	Phil Rasch	Collins/Rasch	NCAR
87	Jens Redemann	Russell, P.	BAERI NASA Ames Research Center
88	R. Michael Reynolds	Reynolds	Brookhaven National Laboratory
89	Monica D. Rivera	Russell, L.	Princeton University
90	David C. Rogers	NCAR/RAF	NCAR
91	Mark J. Rood	Rood	University of Illinois
92	Lynn M. Russell	Russell, L.	Princeton University
93	Philip B. Russell	Russell, P.	NASA Ames Research Center
94	James J. Schauer	Schauer	University of Wisconsin-Madison
95	Beat Schmid	Russell, P.	NASA Ames Research Center
96	Anne-Marie Schmoltner		National Science Foundation
97	John H. Seinfeld	Seinfeld	California Institute of Technology
98	Steven T. Siems	Siems/Jensen/Gras/Hacker	Monash University
99	David A. Sodeman	Prather	University of California, San Diego
100	Irina N. Sokolik	Sokolik	University of Colorado at Boulder
101	Hilton B. Swan	Swan	AGAL
102	Si-Chee Tsay	Tsay	NASA Goddard Space Flight Center
103	Mitsuo Uematsu	Uematsu	Ocean Reseach Institute University of Tokyo
104	Itsushi Uno	Carmichael	Kyushu University
105	Andrew M. Vogelmann	Vogelmann	Scripps Institution of Oceanography, UCSD
106	Jian Wang	Seinfeld	California Institute of Technology
107	Rodney J. Weber	Weber	Georgia Institute of Technology
108	Steven F. Williams	Sawyer	UCAR/JOSS
109	Jae-Gwang Won	Yoon/SNU	Seoul National University
110	Chou-Lin Yeh	Chen	Academia Sinica
111	Soonchang Yoon	S. Yoon, SNU	Seoul National University
112	Wlodek Zahorowski	Radon	ANSTO (Australian Nuclear Sci. & Tech. Org.)

V.B. Poster Titles

Anderson, J.	Anderson, J.	Individual-particle results from NCAR C-130, R/V Ronald Brown, and Cheju Island
Bandy	Blomquist	SO2 on the C-130
Bates, T.	Bates, T.	ACE-Asia measurements aboard Ronald H. Brown, an Overview
Bergin	Bergin	Aerosol radiative properties in Yulin, China during ACE-Asia
Brechtel/Imre	Brechtel	Aerosol Size Distribution, Chemical Composition and Hygroscopic Properties at Cheju Island During ACE Asia
Cahill	Cahill	Highly Size/Time/Compositionally Resolved Aerosols at 14 Surface Sites
Campos	Campos	C-130 In Situ Trace Gas Measurements
Campos	Faloona	Ozone and its Deposition to the Sea Surface Observed During ACE-Asia
Carmichael	Carmichael	Regional scale modeling in support of Ace-Asia
Carmichael	Uno	CFORS - Regional Chemical and Weather Forecast System post-analysis during ACE-Asia observation period
Chen	Chen	Observations of Hydrocarbons and Halocarbons during ACE-Asia
Chin	Chin	Sources, transport, and properties of aerosols over the Asian-Pacific region: Results from a 3-D model
Choi	Choi	The Aerosol Number Size Distribution Measured by Optical Particle Counter at Kosan, Korea during ACE-Asia
Choularton	Bower	Aerosol and Cloud Measuremements on Cheju Island
Choularton	Coe	Aerosol Composition Measurements at Cheju Do with an Aerosol Mass Spectrometer
Clarke/Howell	McNaughton	Aerosol Microphysics and Optics during ACE-Asia and TRACE-P Intercomparison Flights
Collins/Rasch	Collins	Characterization of aerosols in the ACE region using the NCAR MATCH CTM
Covert	Anderson, T.	Airborne aerosol optical properties on the C-130
Covert	Anderson, T.	Airborne in situ aerosol optics
Covert	Covert	Aerosol Number-size Distributions and Hygroscopic Growth in the Marine Boundary Layer during ACE-Asia
Deschamps	Deschamps	SIMBADA measurements of aerosol optical thickness and ocean color
Durkee	Durkee	Satellite Analysis of Aerosol Properties during ACE-Asia
Friedli	Friedli	Gaseous Mercury Measured From The C-130 Aircraft
Frouin	Robert Frouin	Simbad measurements of aerosol optical thickness and water-leaving radiance during ACE-Asia
Holben	Holben	Optical Properties from AERONET during Ace-Asia
Huebert	Huebert	OC, EC, and Size-dependent Ions from the C-130
Jaffe	Jaffe	Ground and Airborne Observations during PHOEBA 2001 in the Northeastern Pacific
Jaffe	Price	Airborne measurements of NMHCs, O3, CO and aerosol scatter in the Northeast Pacific during PHOBEA II
Kahn	Kahn	First Steps in Validating Satellite Aerosol Retrievals from MISR
Kasahara	Kasahara	Observation of aerosols and radiation at rural site in Japan
Kawamura	Kawamura	Distributions of water-soluble organic acids in the aerosols and stable carbon isotopic composition of the NMHCs collected during C-130 flights
Kawamura	Mochida	Distributions of gaseous and particulate dicarboxylic acids over the Northwestern Pacific: Results from NOAA R/V Ronald H. Brown
Kim, J-Y	Kim	Ground-based Sunphotometer and Skyradiometer Measurements at Kosan, Korea during ACE-Asia
Kim, J-Y	Kim	Meteorological and Air Mass Source Region Characteristics for the Kosan Supersite during ACE-Asia
KIST and NOAA	Moon	Particle Characterization
Koike	Koike	Reactive Nitrogen and Other Species Measured on board the NASA P-3 Aircraft during TRACE-P
Merrill	Merrill	Underlying Meteorological Phenomena
Murayama	Murayama	Lidar observations of aerosols over Tokyo during ACE-Asia IOP

Nakajima	Fukushima	Asian aerosols observed through SeaWiFS: Preliminary comparisons with TOMS aerosol index and aerosol particle transport simulation result
NCAR/RAF	Rogers	In-Situ Aerosol Particle Measurements on the NCAR C-130
Ogren	Jefferson	Measurements of aerosol optical properties from Kosan
Oh	Oh	Data of Aerosol Optical Properties at Kosan, Cheju during ACE-Asia Campaign
Prather	Guazzotti	Size and chemical characteristics of aerosol particles sampled on board NOAA R/V Ronald H. Brown
Quinn	Quinn	Ronald H. Brown Aerosol Chemical and Optical Measurements
Radon	Zahorowski	Air mass characterization using radon-222 at Kosan and Hok Tsui
Reynolds	Reynolds	Radiation and Aerosol Measurements from the BNL Portable Radiation Package
Rood	Carrico	Controlled Relative Humidity Light Scattering Measured Onboard the R/V Ron Brown during ACE-Asia
Russell, L.	Maria	Submicron Organic Functional Groups and Elemental Composition Measured Aboard the C-130 Aircraft
Russell, L.	Rivera	Organic functional groups and elemental composition of shipboard particle samples aboard the R/V R.H. Brown
Russell, L.	Russell, L.	FTIR and XRF Detection Methods of Functional Groups and Elements aboard the NCAR C130 and R/V Ron Brown
Russell, P.	Redemann	Airborne sunphotometer and in situ aerosol measurements aboard the NCAR C-130 and their combination with satellite data
Russell, P.	Schmid	Ames airborne sunphotometer measurements of aerosol optical depth and water vapor
S. Yoon, SNU	Kim	Lidar monitoring of aerosols during Ace-Asia IOP
Sawyer	Williams	ACE-Asia Data Management
Schauer	Schauer	Measurement of Organic, Inorganic and Isotope Tracers for Source Apportionment of Aerosols During ACE-Asia
Seinfeld	Collins	Measurements of aerosol hygroscopicity during ACE-Asia
Seinfeld	Wang	In situ aerosol size distributions and hygroscopic properties during ACE-Asia
Seinfeld/Flagan	Jimenez	Aerosol Size and Chemical Composition Measurements in the Twin Otter Using an Aerodyne Aerosol Mass Spectrometer
Siems/Jensen/ Gras/Hacker	Jensen	Aerosol Observations made from the ARA King Air
Sokolik	Sokolik	Characterization of Asian Dust and its radiative impacts
Swan	Swan	DMS and CS2 surface measurements at Kosan, ACE-Asia IOP.
Taiwan ACE-Asia Ground Station	Liu	The major source of anthropogenic aerosols during Asian dust storms over Taiwan
Tsay	Ji	SMART Ground-based Measurement at Dunhuang during ACE-Asia
Tsay/Hsu	Hsu	Satellite characterization of aerosols by SeaWiFS and TOMS
Turpin	Lim	Semi-continuous particulate OC and EC concentrations over the Northwest Pacific Ocean: fate and resisdence time of particulate carbon
Uematsu	Uematsu	Preliminary Results from the VMAP Ground Network in Japan
Valero	Valero	Radiative Forcing by Aerosols
Vogelmann	Vogelmann	Aerosol Spectral Radiative Forcing Observed During the NOAA Ship R. H. Brown Cruise
Weber	Maxwell	Airborne Measurements of Fine Soluble Aerosols
Westphal	Westphal	Aerosol Modeling During ACE-Asia by NAAPS (NRL Aerosol Analysis and Prediction System)
Yoon/SNU	Kim	Lidar monitoring of aerosols at Kosan during ACE-Asia IOP

V.C. Plenary Session Summaries

V.C.1.a. Introduction and Objectives of Data Workshop – Barry Huebert

[The opening session laid out a variety of questions for the participants to consider in their discussions. A Powerpoint file of Barry Huebert's introductory presentation (HuebertDataWkshpIntro29Oct01.ppt) can be downloaded from the password-protected portion of the ACE-Asia web site. Participants are free to make use of these slides, on the condition that they credit the source of the various images and data plots.]

Why did so many scientists expend so many resources on studying Asian aerosols simultaneously? What was the point of conducting a large experiment like ACE-Asia, rather than smaller independent ones? The answer is that the sum of our simultaneous observations is vastly larger than the parts. The benefits derive from being able to compare (for instance) simultaneous radiation and aerosol measurements. From having vertical profiles of composition and optical properties over surface observation sites. From having forecast models of aerosols to compare with immediate observations. From having simultaneous observations at many surface sites that can show patterns of aerosol transport, processing, and removal. However, none of these benefits can be achieved unless the ACE-Asia participants discuss their data with one another and share that data freely, knowing that the group that generated the data will be properly credited for their work.

The overriding purpose of the Data Workshop, therefore, was to arrange for collaborations among the many participants in ACE-Asia. The plenaries, breakouts, and posters were all designed to encourage interaction between groups and data sharing. The many questions below are directed at stimulating discussion around themes where joint activities are likely to be fruitful.

SeaWiFS, AVHRR, and other satellites clearly show Asian dust and pollution plumes over the Pacific. How accurate are the retrievals of climate-relevant parameters like aerosol optical depth from this data? How can we use our data to improve these retrievals? In what ways can we use these remotely-sensed data to extend our in situ observations? The colored dust plumes in SeaWiFS images emphasize the wavelength-dependence of many aerosol radiative impacts. How well can we quantify the hue which aerosols impart to observations?

The IPCC's Third Assessment once again assigns aerosol effects the dubious honor of causing the largest uncertainties in the radiative forcing of climate. Have we managed to reduce any of those error-bars? Most of our efforts were focused on the direct forcing question, although the collaborating APEX program addressed aerosol-induced changes in cloud properties. Fortunately, any improvements we make in models of aerosol concentrations and distributions will ultimately be useful for quantifying both types of forcing.

One of the meeting goals was to assess what progress we made on the program's three objectives: characterization, radiation, and processes. We directed most of our attention at the first two, although some process information will come from our analyses. It is obvious, however, that we tightly coupled aerosol and radiation observations so that the relationships will be constrained far better thanks to ACE-Asia.

The network sites gathered time-series data on aerosol properties and effects for much of the spring of 2001. Some are still in operation, looking at annual cycles. The mobile platforms, however, could only be deployed for a few weeks or months. To maximize the benefits of these transient platforms, three forecast chemical transport models (CTMs: CFORS, MATCH, and GOCART) were used to guide the planning of each days operations. How well can we expect those models to do with the complexity of layering and sources in this region? In one C-130 vertical profile over the Yellow Sea, at least 13 distinct layers of clean air, dust, or pollution were identified, which is a serious challenge for most models. The tight coupling of models and observations will also make the improvement of models far easier than in many programs.

The valid interpretation of data from multiple platforms requires that their measurements are either unbiased or at least share similar biases. This comparability was tested repeatedly using intercomparison experiments. The aircraft flew coordinated legs near surface sites such as Kosan and the lidar network, near each other, and by the R/V Ron Brown, which itself worked alongside island sites. A P-3 from the NASA TRACE-P program and the Australian ARA Kingair both conducted joint flights with the US ACE-Asia aircraft. How comparable are these data? Can spatial or temporal separations be overcome to gain confidence that the various data sets are really comparable? The harmony effort will be directed at quantifying this comparability, so that users of the ACE-Asia data will know how much to interpret differences between them.

The NSF/NCAR C-130 and the CIRPAS Twin Otter each flew 19 research flights from Iwakuni, Japan. Some of their preliminary observations illustrate the kinds of questions we need to address in the workshop. One of these concerns the accuracy of the CTMs. On 24 April the C-130 encountered more than 1000 µg/m3 of dust over the Yellow Sea, where the models had forecast less than 50 µg/m3. This “surprise” dust event is a good test of the models, and has in fact already been used to improve their dust source code.

A major challenge for ACE-Asia’s observationalists is to understand how their measurements have been biased by unavoidable artifacts like inlet and transport losses. Large aerosols such as mineral particles are notoriously hard to sample without artifact. Ironically, while most inlets and plumbing will remove particles above a certain size, the new low-turbulence inlets (LTI) used on the C-130 actually enhances concentrations of the largest particles by a (calculable) factor that can be as large as five. A variety of reference measurements and models will be used to quantify the relationship between measurements and the actual ambient concentrations. Identifying strategies for quantifying these artifacts (and correcting them when possible) was a major activity of the workshop.

One of the most exciting aspects of ACE-Asia was that several groups were studying dust near its source in central China while others were looking at it farther downwind. Surprising measurements at the Zhenbeitai site found that sulfate and nitrate concentrations were already many tens of µg/m3 near the source area. Does that imply that some of these ions are primary salts, rather than the result of gas-to-particle conversion?

These observations were at the start of what some dust experts have called “The Perfect Dust Storm,” an episode that was sampled at its source around 5-6 April, off the coast of China 11-13 April, and observed by satellite and in situ devices as it crossed North America and the Atlantic Ocean. This storm was an excellent example of the long range transport of aerosols, which provided an test of both in situ and remote sensing tools. It was brought offshore behind a cold front, a common transport mechanism for heavy dust.

Several characteristics of this dust are interesting. Aerodynamic particle sizers found the volume peak to be larger than 5 µm in aerodynamic diameter. Will inlet or plumbing corrections change this conclusion? Those large particles have far less wavelength dependence of scattering than do smaller pollution aerosols, a fact repeatedly confirmed by airborne sun photometry. Most of the scattering was from big particles, but the absorption was submicron. Surprisingly, even in the presence of heavy dust most of the sulfate was on small particles, externally mixed with mineral particles. Nitrate, however, often had an identical size distribution to that of soluble calcium, suggesting that much of it may not be from gas-to-particle conversion. Soot coated many mineral particles, but the vast majority of soot (and the resulting absorption) was submicron.

It was a real challenge to sample particles in heavy dust. For example, impactors built up material under jets, potentially changing their cutoff sizes. The large scattering introduced extra uncertainty into absorption measurements. Do any of our observations need to be qualified due to these difficult conditions?

Carbonaceous particles have been poorly characterized in many experiments, so we tried to improve on that in ACE-Asia. In many environments there was as much organic carbon and sulfate, which means we have to assess its radiative impact. Above the directly polluted boundary layer, there was not an obvious gradient in elemental carbon, with values generally ranging from 1-2 µg/m3. Does that agree with absorption measurements (which were much more frequent)? The variety of OC sampling methods all used the same analytical method, which will allow us to study the potential for positive and negative OC sampling artifacts.

The coupling of radiation and in situ aerosol optical property measurements in satellite scenes is one of the most exciting parts of the ACE-Asia data set. It allows investigators to use methods (such as sun photometry) that do not depend on inlets to constrain the optical property measurements. How often was column closure achieved? The large number of radiation profiles flown just at the time of satellite scenes also will be of tremendous use for calibrating and validating those satellite products.

Clearly, we have gathered an extremely valuable set of observations under many types of aerosol loadings. How can the workshop help to make these into scientific advances and papers? The desired products from the Workshop include 1) arranged collaborations, 2) manuscript plans, awareness of and access to other groups' data, 3) awareness of interesting issues and events so we can look more fuitfully at our own data, and 4) the motivation to complete analyses.

V.C.1.b. TRACE-P Overview - Daniel Jacob

The NASA TRACE-P experiment overlapped by a few days with the ACE-Asia aircraft, so that we were able to conduct two joint fight operations. Daniel Jacob discussed the TRACE-P objectives (understanding photochemistry and aerosol formation in Asian outflow) and flight operations. The two programs can benefit from our interactions in two primary ways: during the joint flight operations, the more extensive photochemical measurements on the P-3 complement the more aerosol and radiation-oriented measurements on the C-130 and Twin Otter. Additionally, however, our side-by-side flights allowed us to intercompare a significant number of common measurements (SO_2, CO, CO_2, ozone, NMHCs, CFCs, CN, aerosol chemistry, size distributions, scattering, etc. As a result of this intercalibration the two program's data sets can be combined to provide a much longer time-series of concentrations for testing the temporal variation as described in models. The TRACE-P Science Team has already created an ACE-Asia/TRACE-P working group (mostly of PIs who had instruments on both programs) to organize papers making use of both data sets.

V.C.1.c. Summary of Meteorological Plenary presentation and discussion. John Merrill

An overview of the meteorological situation as it varied from day to day through the period of the field program was presented. The outline of the talk was driven by the aircraft flights conducted from the base at Iwakuni, but the focus of the presentation was the relationship between the large-scale, upper and middle tropospheric circulation over Asia and the western Pacific and the development, movement and impacts of (primarily lower-level) weather systems through the region. The illustrations used were isobaric meteorological charts at 500 and 200 hPa and the composite, subjective analyses which were prepared during the field program. (The charts presented are a subset of the archive of maps available on the project Web site maintained by JOSS.)

In the presentation a characterization and illustrations were presented for sixteen dates from March 31 to May 1, on 13 of which both the C-130 and Twin Otter flew and on 3 of which only the C-130 flew. The following outline indicates these dates, the Research Flight numbers and operational areas, and the critical meteorological features which were summarized.

March 31, RF01/RF01. Flights in Sea of Japan - Strong westerly flow aloft.
April 2, RF02/RF02. Flights in Sea of Japan - Warm sector of Low in NE China.
April 4, RF03/RF03. Flights in Sea of Japan - In broad anticyclonic area.
April 6, RF04/RF04. Flights to Kosan, Yellow Sea and Sea of Japan - Warm sector of weak Low.
April 8, RF05/RF05. Flights in Sea of Japan - South of weak trough line. Massive dust storm in central Asia.
April 11, RF06/. Flights in Yellow Sea - behind cold front.
April 12, RF07/RF07. Flights in Yellow Sea, east of Kosan - Broad anticylonic area, well behind front, south of weak surface trough.
April 13, RF08/RF08. Flights in Sea of Japan to Amami, Miazaki - north of weak ridge line.
April 17, RF09/RF11. Flights N. and S. of Japan/S. of Cheju -Across a surface ridge. Trough aloft over Shanghai.
April 20, RF11/RF13. Flights around Honshu/to 32N, 132E. Frontal band along Honshu. Southern area in warm sector of weak Low.
April 23, RF12/RF14. Flights in Sea of Japan/East to 33N, 134E. Broad anticyclonic area.
April 24, RF13. Flight in Yellow Sea/ - Unexpected dust. Well behind cold front.
April 25, RF14/RF15. Flights in Yellow Sea/east of Kyushu. Anticylonic area, west of weak surface Low.
April 27, RF15/RF17. Flight across Korea/34N, 130E. Anticyclonic area, weak ridge aloft.

April 30, RF16/. Flight in Shanghai plume, to 24.5N, 124.5E. Across weak near-surface trough.
May 1, RF17/RF19. Flights in Sea of Japan to 41N, 140E/N. of Oki. Broad anticyclonic area. Significant ridge aloft.

The following summary of the points which were brought out in the discussion includes things left open during the Plenary but settled upon later in the Workshop; the synthesis aspect relates primarily to the two major matters noted below.

Analysis of dust events - will the characteristics of dust events be analyzed and will interannual variability be documented as part of this? Yes.

What about the broad seasonal changes, particularly the onset of the monsoonal, onshore flow into Asia? Was the development in 2001 typical or anomalous? Yes, the flow was generally similar to climatology. A retrospective analysis using observed dynamical fields will be part of the overall meteorological characterization prepared for the Overview. (Also, it was learned later that at least one modeling group is working on simulations for years prior to 2001, explicitly studying interannual variability.)

Trajectory Analyses - Availability and Use. Lots of people are using trajectory calculations; how can this be coordinated? Will someone calculate thousands of "trajectories to order" at the request of other investigators? Merrill agreed to participate in a cooperative effort to share trajectory analysis results among ACE-Asia investigators, using the JOSS-supported data archive. The compilation would include descriptions or references to descriptions of the technique used, indications of the parent meteorological data set employed, contact information for the cognizant investigator and other particulars. Among the calculations already begun or in hand which were mentioned during the Plenary are these: The CFORS group has calculated back trajectories based on their 80 km resolution simulations; the CMDL trajectory model has been used to calculate trajectories for Kosan and other surface-sampling sites; trajectories calculated with the NOAA/ARL READY system are available in the project archive.

Meteorological Characterization - cooperative effort needed. This topic was introduced with a polite remark that Merrill's presentation was based on "Too many categories." It gradually became apparent that a number of needs could be met by a coordinated effort to prepare an overall Meteorological Characterization for each sampling period, covering all of the platforms and the entire field phase. In the emerging doctrine of Harmony the degrees of separation in sampling comparisons are Direct, Air Mass and Regional, in decreasing order of proximity. The Characterization now being planned would be more detailed than needed for placement in this scheme, and in particular would involve circulation and transport phenomena as well as thermodynamic (stratified vs. well-mixed) and aerosol distribution information. During informal conversations with Tim Bates and Barry Huebert, John Merrill agreed to lead the development of the Meteorological Characterization. Cooperative efforts will be sought from other meteorologists and from an investigator for each platform or site.

V.C.1.d. Harmony Plenary Summary

We have multiple measurements of some parameters on individual platforms and multiple measurements of most parameters from many platforms. To accomplish our ACE-Asia goals we must assess whether these measurements are comparable within the measurement uncertainties.

The presentations and discussions during the Harmony Plenary Session focused on two issues:

Issue 1: How can we show that our data are directly comparable among platforms? (or if not, why not?)

Issue 2: If the data do not agree, is there a consensus opinion of the best estimates of the aerosol properties for certain times or air masses?

Sarah Masonis (UW) presented a plan for comparing the in-situ aerosol measurements when platforms were sampling near each other. Piotr Flatau (SIO) led a discussion on comparisons of optical depth and radiative fluxes. There was agreement among the ACE-Asia science team that "harmony" (at least issue 1 above) was necessary. Opinions varied however on how far harmony should go. Should we compare only measurements or measurements with modeled products?

Harmony was addressed again in the meeting summary. The science team agreed on the following plan:

1. Sarah Masonis (UW) will lead an effort to compare in-situ aerosol chemical, physical and optical measurements. The work will start with the measurement periods when platforms were "side-by-side". If we find that our data are not comparable within measurement uncertainties we will need to take the harmony process further to assess why not. This may require local closure calculations to assess the internal consistency of the various measurements.
2. Mark Miller (BNL) will lead an effort to compare optical depth measurements on the RH Brown. Jens Redemann and Beat Schmid (NASA-AMES) will take this to the next step by comparing optical depth measurements between platforms.
3. No one was identified at the summary session to lead an effort to compare radiative fluxes.

V.C.1.e. PHOBEA - Dan Jaffe

During the ACE-Asia intensive period, observations were also made along the west coast of the U.S. as part of the PHOBEA program, including both ground and airborne observations. The ground station is located on the western edge of Washington state at Cheeka Peak. Measurements at the ground site included CO, O3, NMHCs, PM10 and PM2.5 (mass and chemistry). In addition, a Beechcraft Duchess aircraft was used to obtain vertical profiles to 6 km for O3, aerosol scatter, CO and NMHCs. 12 flights were made between March 29th and May 6th, 2001. All profiles were made in the northeast Pacific, very close to Washington state.

One of the most outstanding features of these observations is the extremely high aerosol scattering observed on the April 14^{th} flight. The elevated aerosol scatter was mainly confined to the region above 4 km and resulted from outflow of Asian dust. Associated with the high aerosol scattering values were enhanced values of CO and NMHCs. Based on back-trajectory analysis and the NMHC composition, it appears that the airmass observed near Washington state on April 14th, is very similar to the one observed by the ACE-Asia C-130 observations on April 8th. Analysis of the PHOBEA data continues and we expect to include one or more papers on this work with the ACE-Asia collection.

For further information about the PHOBEA project or to request PHOBEA data, please send an email to the P.I., Dr. Dan Jaffe at: djaffe@u.washington.edu

V.C.1.f. APEX - Fukushima

An overview of Asian Atmospheric Particle Environment Change Studies (APEX)
Presented by Hajime Fukushima

APEX, headed by Prof. Teruyuki Nakajima at University of Tokyo, is a 5-year Japanese project starting from 1999. The objectives of the project are:
(1) to understand the aerosol indirect effect,
(2) to model the cloud-aerosol interaction process, and
(3) to evaluate the indirect effect of man-made aerosols.
Thus, the project stresses on the effect of anthropogenic aerosols.

So far the science team had conducted two intensive field observation experiments, one in December 13-25, 2000, and the other in April 1-30, 2001. The second experiment was planned and conducted in coordination with the ACE-Asia experiment, with the central ground observation site at Amami-Ohshima Island, which locates 550 km away south of Cheju Island.

Fukushima presented some of the preliminary results being obtained. The total nephelometer measurements and the chemical analysis (by Ohta) of the particles sampled at Amami-Ohshima during the KOSA event on April 11-16 revealed that the airmass also included small absorptive particles, likely carbonaceous ones, which is consistent with the species-wise aerosol optical depth predicted by CFORS particle transport simulation conducted by Uno. Early results of the routine LIDAR observations in Beijing, Nagasaki, and Tsukuba (by Sugimoto) throughout April 2001 as well as the effort in evaluating downward solar flux based on the ground observation at Amami-Ohshima (Lead: Takamura) were presented. In terms of satellite observation, SeaWiFS, MODIS, and TRMM data were used to depict the spatial/temporal distribution of aerosol particles of different species (by Higurashi and T. Nakajima) as well as to study aerosol-cloud interaction processes (by T. Y. Nakajima and Masunaga). A preliminary result from the simultaneous observations of LIDAR and a newly-developed Cloud Profiling RADAR was also presented.

More information will be obtained at the APEX Project home page at http://duckbill.ccsr.u-tokyo.ac.jp/APEX-E2/apex_amami.php. Most of the ground-level optical observation data (preliminary version) is available at http://atmos.cr.chiba-u.ac.jp/~aerosol/amami2001/index.html.

V.C.1.g. 1.g. Modeling overview - Greg Carmichael & Itsushi Uno

The modeling plenary talk covered three areas: (1) an overview of trace gas a meteorological features during the measurement period; (2) post analysis modeling efforts; and (3) a summary of the results from the modeling breakout session held the day before. The overview of the measurement period consisted of a series of animations that showed general flow conditions, along with 3-distributions of dust, black carbon, and clouds. The animations covered the entire Ace-Asia intensive period (end of March to early May) and provided a visual context of the individual flights relative to the synoptic scale variability.

Most of the time was spent summarizing the post analysis efforts of the CFORS, GO_CART, and the MATCH groups. These groups have begun extensive comparisons of model results with measurements. Presented were results of comparisons at various surface sites in Japan and with lidar measurements in Beijing, Nagasaki, and Tsukuba The calculated ground level sulfate, nitrate, dust, black carbon, ozone and sulfur dioxide values are in good agreement with the surface station data, and capture many of the important features in the measurements than span latitudes from ~25N to 45N. The calculated vertical distribution of extinction and aerosol type (e.g., dust, BC, sulfate, etc.) are being compared to lidar information. The observations and modeling results show that the vertical structure is complicated. In Beijing there is frequently found elevated dust layer and heavy boundary layer sulfate pollution, with carbonaceous aerosol usually found in the boundary layer. Over Japan, dust concentration are decreased, but can be found in the boundary layer along with sulfate pollution. Carbonaceous aerosols are usually found both in the boundary layer and free atmosphere, and the pollution structure is much more complicated than over Beijing. Comparison with aircraft data had just begun. Preliminary analysis is finding that the modeled meteorology compares well with the aircraft values. One interesting observation is that the vertical distribution of calculated BC is similar to that observed, the calculated values are biased low. This is interesting as the values measured at surface sites are well captured by the model. More work is needed to understand whether this is an emission, model resolution or measurement issue.

The issue of how well the models are able to model the dust emission source term was discussed. Often during the experiment the models were in general agreement with the occurrence and transport patterns of the dust outbreaks. However all of the above models missed a large outbreak around April 24. Subsequent analysis strongly suggests that this was related to the land cover data set used by the models. There appears to have been the rapid production of new semi-arid regions in Shenyang (located east, northeast of Beijing) associated with land and water use issues. When an updated land cover distribution is used that includes exposed soils in this region, the models are able to reproduce this event. Model results were also presented comparing aerosol optical depths with those measured at AERONET surface sites and on the Ron Brown. Preliminary calculations of the aerosol forcing due the East Asia aerosol were also presented, and the results suggest that the forcings are large. This aspect of the analysis will be a focus area. The plenary concluded with a discussion of the results from the modeling breakout session. The major questions addressed and discussed were:

1) What has your group done since the field experiment? What are opportunities for improvement?

2) How do we construct a database that facilitates intercomparsion of models and observations?
3) What quantities are most easily compared to other models that reveal commonality or differences?
4) What quantities are most easily compared to measurements that reveal commonality or differences?
5) How should we stratify results for intercomparison? For example, in-cloud vs out-of-cloud/vertical profile vs horizontal legs/scatter/absorption ratios/big vs small particles/natural vs anthropogenic?
6) What specific episodes should be a focus of analysis attention? For example, Golden Days/High altitude/Surface Outflow/ Pre and Postfrontal states.

V.C.1.h. Data Archive - Steve Williams

The ACE-Asia Data Management WWW page is located at:
http://www.joss.ucar.edu/ace-asia/dm/
and contains information (and links) for all aspects of international ACE-Asia data activities:

- the Data Policy and Data Collection Platforms. Contains a summary of the ACE-Asia data policy and links to the individual platform and facility WWW pages.
- links to the ACE-Asia Data Management Working Group (DMWG) WWW pages. The DMWG was formed to facilitate international data exchange and access. Currently each member represents national or regional data holdings.
- data questionnaire/responses. In June 2000, a data questionnaire was sent out to the ACE-Asia community to help define the data ingest and archive requirements. Individual responses are also available on-line.
- documentation (e.g. Data Management Plan). The Data Management Plan contains detailed information on the ACE-Asia data policy and functional strategy.
- data submission guidelines and instructions. These links provide guidelines of both data and metadata content/organization as well as submission instructions (e.g. FTP, mailing, etc.).
- links to collaborating project data bases (e.g. TRACE-P and APEX).

In addition, this WWW page provides easy access to all operational and research data/products collected during the project. The ACE-Asia long-term distributed data archive is coordinated through a number of designated national and regional archive centers that participated in the project. Access to ACE-Asia data are provided through direct links directly to these centers, or through a Master List of all International ACE-Asia Data Sets which is located directly at: http://www.joss.ucar.edu/ace-asia/dm/data_access_frame.html).
This Master list table is frequently updated and includes direct links to the individual data sets (including dates when posted) as well as metadata or documentation. Over several hundred ACE-Asia data sets are expected to be compiled and published. In addition, the on-line field catalog which contains over 50,000 files of products, reports, mission summaries, and browse imagery that were collected in the field is available at:
http://www.joss.ucar.edu/ace-asia/catalog/ .
JOSS plans to leave this catalog on-line, although many of the products contained in the catalog will also be available as compiled data sets.

V.D. Breakout Session Reports

V.D.2.a. C-130 Breakout Session Report – Barry Huebert

The session began with a brief review of our accomplishments and the types of flights, to set up a discussion of what kinds of papers we can produce.

The first major issue we need to resolve is quantifying the size-dependent LTI enhancement and transfer tubing losses so that we can relate our on-board observations to ambient values. DU is apparently doing the enhancement modeling, although there is some concern about their having adequate resources to complete the job. The lab measurements of plumbing losses in the right-side plumbing will be done at UH (using uranine-tagged monodisperse particles from a VOAG), again if resources can be found to pay for the time this will take. Our goal is to have these corrections available to users by spring 2002, so that people can figure out how to correct their data before preparing publications based on it. It will be a real challenge to correct "bulk" measurements like scattering and absorption. We will need to use size-dependent measurements (like those from an APS) and Mie calculations to identify times when the inlet/plumbing modifications may have caused significant errors in bulk values. Of particular concern is the enhancement of large dust particles in the nephs.

A few of the C-130 data sets are already submitted, and many more are nearly ready to be submitted to the JOSS archive. Only a few of the more complex data sets (like DMA scans) need a fair amount of work before they can be submitted. Many PIs are conducting consistency checks vs other data to assess potential problems before making their data public. Byron Blomquist has merged the RAF data with some datasets, and will add completed sets from time to time as we await a formal merge by JOSS. PIs who want their data in his merge can get his time-stamp as a starting point. Dave Rodgers and Cameron McNaughton will prepare a consensus cloud flag based on several instruments.

The highlights of the C-130 data are many. They include intense dust flights RF06 and RF13, the heavy pollution in RF15, the contrast between very clean and polluted air in RF16, the overflights of the Ron Brown in RF03 and RF05, a profile at the TUMM lidar in RF12, and other closure profiles in RF03, RF08, RF12, and RF18. Some of the interesting stories from this data are column closure/remote sensing validation, local closure from chemistry to size to optics to radiation, absorbers vs altitude, and the many forms of carbon in EC and OC.

Preliminary Manuscript Ideas and Contact People:

Comparison of P3 and C-130 data: ozone, CO, CO2, Weber ions, HC/CFC – Maxwell

Comparison of P-3 and C-130 optics data – McNaughton

Vertical distributions of OC and EC (and absorption?) – Huebert and T. Anderson

Mass closure and volatility on C-130 - Howell

Empirical relationships between vertical distributions of EC, PSAP absorption, AOD/flux divergence, and volatility-derived soot estimates – T. Anderson

Determination of aerosol radiative effects; radiative closure including computing from composition and size – Redemann

Age of emissions and aerosols with several approaches – gas phase tracers, modeled ages, SO2/sulfate – L. Russell

Health impacts of ITCT of aerosols and accompanying species – Chen

PHOBEA case study with C-130 – Jaffe, with Huebert

Nucleation amidst large aerosol concentrations (may be more than 1 paper, include. TRACE-P) – Howell, with Brechtel, Covert

Interactions of anthropogenic pollution and dust - Maxwell, with Huebert

MBL size distributions, from many platforms – Howell and Covert

Aerosol optical properties, including aerosol classification and spatial variability analyses – T. Anderson

Airmass characterization, platform-wide – Masonis

OPC/APS/SEM Size comparison, using Irina's dust database for refractive indices and non-sphericity – Howell

Calcium chemistry – Maxwell, with Huebert

Impact of dust on cloud properties – Rodgers

Case study of RF16: frontal impact of rainfall on aerosols – McNaughton

Other case study papers? RF06, for instance? Discussed but no conclusions yet.

Lidar ratio paper – Masonis

Hg as a tracer: sources, attribution, other tracers – Friedli

f(RH) – Clarke

f(RH) from composition – L. Russell & S. Maria

Comparison of sunphotometer profiles with nephs and psap – Masonis, Redemann, Howell

V.D.2.b. Twin Otter Breakout Session

The Twin Otter breakout group presented a brief summary of key data sets, followed by a discussion of collaborative studies both among the groups with instruments on the Twin Otter and with groups on other platforms, principally the C-130 and the Ron Brown. A number of collaborative projects were identified, including:

1. Comparison of data on organic and elemental carbon aerosol levels among different platforms, including surface measurements at Kosan
2. Comparison of aerosol size distributions measured on different platforms
3. Closure studies involving aerosol optical depth measurements and AODs predicted from in situ data
4. Closure studies involving spectral radiative flux data and fluxes predicted on the basis of in situ data and radiative transfer models
5. Comparison of data on inorganic aerosol composition between mass spectrometry and filter sampling on the Twin Otter and among different platforms
6. Comparison of direct measurements of aerosol hygroscopicity with predictions based on aerosol composition
7. Comparison of AODs measured by sunphotometry and satellite data
8. Use of in situ data to constrain atmospheric chemical transport models that predict aerosol size and chemical composition.

V.D.2.c. Ron H. Brown Breakout Session – Tim Bates

Participants at the RH Brown breakout session initially discussed issues regarding data reduction and air mass classification. Data files have been added to the RH Brown ACE-Asia web page http://saga.pmel.noaa.gov/aceasia/rhb_data/index.htm with information for cruise participants.

This includes:
1. a narrative description of air masses encountered along the cruise track.
2. cruise track maps
3. back trajectories
4. radiosonde plots
5. one-minute files of CN and relative wind direction to indicate periods of ship contamination of the air sampling inlets.
6. the pump log indicating when the sampling pumps were off or on.
7. a ship position file.
8. the temperature and RH of the humidity controlled box (location of impactors).

The remainder of the session was comprised of short reports from each group about interesting aspects of their data set and their plans for data reduction and manuscripts. A list of planned manuscripts (listed below) was discussed by the group.

1. Anderson, Gao et al.   Single particle characterization of well-aged mineral dust along the transit from Hawaii to Japan.   A second paper will focus on the single particle data in the atmospheric column combining data from the C130 and ship.
2. Bates, D., Welton et al.   Aerosol extinction retrieval through variable-ratio lidar measurements from RH Brown.
3. Bates, Quinn, Covert et al. An overview of aerosol characteristics in various air masses measured during the cruise. Potential collaborators include: vertical aerosol distribution (Welton/David Bates), other chemical species (Cahill/Perry) (Prather/Guazzotti) (Russell/Rivera) (Turpin/Lim) (Kawamura/Mochida) (Anderson/Gao) (Arimoto) (Schauer).
4. Carrico, Rood et al.   Aerosol optical properties as a function of RH.
5. Carrico, Rood et al. Aerosol hydration state in the MBL
6. Covert et al., Presentation of particle size distribution data. Number-size distribution, surface area, mass and scattering moments of distribution, relation to source region via trajectories and chemistry, hygroscopic growth distributions, modeled distributions at ambient RH for MBL, examples as a function of height. Portions of this paper may be combined with MBL measurements from other platforms.
7. Flatau et al. Sea salt aerosol radiative forcing. Use data from the Pacific Transect of the cruise, JD85 seems promising as it was after the storm and the optical thickness was large (but there was continental aerosol). Time dependence (hours) of scattering properties of sea salt. May be interesting project, somewhat speculative. Needed collaborations: chemistry, size distributions, in-situ scattering and absorption.
8. Frouin et al. Evaluation of SeaWiFS atmospheric correction/ocean color during ACE-Asia, will present the performance of SeaWiFS atmospheric correction in varied conditions (sulfate, pollution, dust aerosols). Derived aerosol optical depth and marine reflectance will be compared with in situ measurements, and differences explained. Various atmospheric correction schemes will be compared?
9. Guazzotti, Sodeman, Prather et al. General particle classes encountered in the sampled regions: the aerosol chemical composition for different regions together with the temporal evolutions of relevant particle classes.
10. Guazzotti, Sodeman, Prather et al. Asian dust from a single particle perspective: what types of particles do we see? what associations do we find? Also, we will correlate our data with source characterization studies we are planning on carrying out with dust samples collected in some of the regions under study during ACE-Asia.
11. Hsu, Christina et al., Retrieval of aerosol properties from SeaWiFS over ocean during ACE-Asia.
12. Kahn et al. Lessons learned about how to do aerosol retrievals with multi-angle imaging data. The most useful information we could have from the aggregate of in situ and surface measurements is a good "community consensus" picture of the aerosol column optical depth, component particle mixing ratios and microphysical properties, aerosol vertical distribution, and some indication of sea surface visible light reflection function, for the key times when MISR overflew the campaign region. We expect a first paper focusing on MISR validation in 6 to 8 months.
13. Lim, Turpin et al.   Semi-continuous carbon measurements.
14. Markowicz, Flatau et al. Aerosol forcing for clear days JD95, JD96, JD98, perhaps JD99, JD100, JD102, (simple meteorology), JD103. Use BSI PAR channel and ASD.

Need radiosondes and columnar water (Johnson). Define single scattering properties. Derive size distribution from the ASD inversion. Derive aerosol radiative model using PSAP, Neph (Quinn), APS, DMA (Covert), aerosol chemistry (Quinn/Bates). Compare hyperspectral and spectral radiometric Angstrom with Angstrom coefficient from the 3 channel neph. (Quinn) Compare inversion with observed surface size distribution (Covert). Use Streamer code to derive forcing as a function of single scattering properties observable during the ACE Asia cruise.

15. Miller, Flatau, Frouin, Quinn, Welton et al. Intercomparison of optical depth (clear and cloudy sky) measurements aboard RH Brown during ACE-Asia. Intercompare to include shadowband (diffuse/direct) continuous retrievals (Miller), PREDE/Simbad (Froiun), microtops (Quinn, Flatau, Welton). Use total sky camera to determine periods of clear skies. Describe AOT variations throughout cruise.
16. Mitchell et al. Ocean irradiance reflectance for climate models
17. Mochida, Kawamura et al., 1. Oxygen contents in organic aerosols using comparison of dicarboxylic (and monocarboxylic) acid concentrations with those of OC/EC. 2. Information of inorganic species in aerosols can be used for determination of source regions of diacids.
18. Quinn, Bates, Covert. Mass closure and calculation of mass fractions of chemical components. Mass closure will include gravimetric mass, chemically analyzed mass, and mass derived from the number size distribution.
19. Quinn et al. Aerosol optical properties during ACE Asia as a function of aerosol source region. Values of the scattering coefficient, absorption coefficient, single scattering albedo, Angstrom Exponent, and AOD will be presented for the different aerosol types encountered. The measured extinction coefficient will be partitioned among the dominant chemical components. Mass extinction efficiencies for the chemical components will be presented.
20. Rivera, Russell et al. Characterization of airmass source regions based on chemical signatures.
21. Vogelman, Flatau, Minnett, Sczerbak, Markowicz, Jaffola, Johnson. M-AERI spectra (high resolution, FTIR spectra taken by Minnett and (Szczodrak) along with correlative data taken during the NOAA Ship R. H. Brown cruise (e.g, optical depths, soundings, etc) to understand IR radiative forcing during ACE-Asia. Analysis of the M-AERI data involves modeling of the radiative fluxes at line-by-line resolution. Later, we will relate the IR forcing to the shortwave forcing.
22. Welton et al., Transport/evolution of dust, China to East Coast of US, from MPL network.

V.D.2.d. Kosan Site Report – Fred Brechtel

Approximately twenty investigators attended the Kosan breakout sessions with the goal to define ‘themes’ and coordinators for the following general areas: (1) intercomparison of similar measurements at Kosan, (2) intercomparison and closure studies between different platforms and between measurements at Kosan, (3) science ‘themes’ that could be developed into manuscripts.

The following ‘consistency’ or ‘harmony’ study areas and coordinators were identified at the data workshop to intercompare ‘duplicate’ measurements at Kosan: size distributions (F. Brechtel**),** radiation fluxes and optical depth (B. Bush**)**, aerosol mass spectrometers (J. Allan**)**, total mass and inorganic species (S. Cliff**)**, organics speciation & EC/OC (J. Schauer**)**, and meteorological data (J.-Y. Kim**).**

Intercomparisons and ‘closure’ between individual measurements on different platforms (C-130, Ron Brown, Satellites, other surface-network sites and models) and between measurements at Kosan were briefly discussed and individual PI’s are encouraged to pursue these efforts. A few that were identified include:

1. Integrated light scattering dry and f(RH) (**A. Jefferson**, K.C. Moon) vs. Size distribution, chemical composition & hygroscopic growth (F. Brechtel, K.C. Moon, C. Jung, G. Buzorius, J. Allan, P. Chuang, other PI’s)
2. Optical Depth (**B. Bush, F. Valero**, CMDL, Ji-Young Kim, S. Yoon, S. Kim, J. Kim) vs. Aircraft Measured Extinction Profiles (**B. Bush, F. Valero**)
3. Optical depth (**Y.J. Kim**, S. Yoon, B. Bush, CMDL, J. Kim) vs. Lidar derived aerosol profiles (Y.J. Kim, S. Yoon)
4. Mobility, optical , and aerodynamic size distributions at Kosan (**P. Williams**, F. Brechtel, G. Buzorius, C. Jung, J. Kim, S.N. Oh, B. Choi, A. Zelenyuk, P. Chuang) vs. same on C-130 during fly-bys (A. Clarke, L. Russell, S. Howell, others?)
5. Mobility, optical, and aerodynamic size distributions at Kosan (F. Brechtel, G. Buzorius, **C. Jung**, J. Kim, S.N. Oh, B. Choi, P. Williams, D. Imre, A. Zelenyuk, J. Han [Korean EPA = NIER]) vs. same on Ron Brown during April 5-6th and April 14-16th ‘Golden Days’ (D. Covert, A. Wiedensohler)
6. Size-resolved water uptake properties at Kosan (**G. Buzorius**, F. Brechtel) vs. same on Ron Brown during April 5-6th and April 14-16th ‘Golden Days’ (D. Covert, A. Massling)
7. MISR aerosol optical depth (**Ralph Kahn**) vs. optical depth measured by radiometer (**B. Bush, F. Valero**, CMDL, J. Kim) and lidar at Kosan (**Y.J. Kim**, S. Yoon) and by C-130 (**B. Bush, F. Valero**) for ‘Golden Days’: April 16th 02:37:00 UTC and May 2nd 02:37:00 UTC
8. Satellite derived vs. in-situ and column measurements of optical depth for ‘non’ Golden Days (**B. Bush, F. Valero, R. Kahn,** S. Yoon, Ji-Young Kim, J. Kim…**)**
9. Evaluation of the representativeness of surface measurements using lidar colum backscatter observations (**Y.J. Kim**, A. Jefferson, BNL, J. Schauer, P. Chuang, others?)
10. Comparison of Aerosol Mass Spectrometric and Impactor methods for size discriminated particle mass of nitrate, sulphate, organic and water soluble organic mass (**J. Allan**, K. Moon, P. Chuang, others)
11. A Hygroscopic closure study of aerosol at Kosan during ACE-ASIA (**G. McFiggans**, G. Buzorius, F. Brechtel, A. Jefferson, T. Cahill?)
12. Intercomparison of aerosol microphysical, chemical and radiative properties with other ACE surface network sites (PI’s?)
13. Comparison of PILS (Weber, **Orsini**, Lee) with Aerodyne Mass Spectrometer (**J. Allan**), semi-continuous Water Soluble Ions (J. Han, S. Lee) and BNL SPLAT (Imre, Zelenyuk) observed particle chemical composition during C-130 flights over Kosan

14. Intercomparison of TSP elemental composition with PM2.5 (J. Schauer, Y.J. Kim, R. Arimoto)
15. Optical depth (J. Kim) vs. MATCH and GOCART model output (P. Rasch, M. Chin)
16. Optical depth (J. Kim) vs. SeaWiFs satellite retrievals (Dr. Hsu)

The following scientific 'themes' and lead investigators (bold face type) were identified, please contact the lead person noted for each theme if you are interested in participating in that analysis effort.

1. Meteorological characteristics and air mass source regions at Kosan during ACE-Asia (incorporating meteorological, back trajectory, local influence criteria, isotope and trace gas analyses) (**J. Kim**, **J. Merrill**, F. Brechtel, H. Swan, others?)
2. Intercomparison of real-time (AMS and ?others?) and time-integrated measurements (filter and impactor) (J. Allan, J. Schauer, P. Chuang, A. Zelenyuk) Discussed as perhaps too similar to one of the above topics
3. Unexpectedly large f(RH) (and absorption?) of coarse mode during dust events (**A. Jefferson,** J. Schauer, P. Chuang, F. Brechtel)
4. Comparison between historical and ACE-Asia intensive period aerosol measurements at Kosan (**K.C. Moon**, C. Kang): comparable quantities include EC/OC, inorganic ions, aerosol mass; would involve all chemistry people, CMDL
5. Aerosol chemical (internal vs. external mixtures) and microphysical differences between dust and non-dust input periods at Kosan (if possible: more and less-aged Asian dust plumes): Do chemically modified Asian dust particles significantly impact climate? (**F. Brechtel**, Proposed as a review/ summary/ synthesis of individual Kosan PI articles – longer term effort)
6. Studies of recent new particle formation: spatial distributions, platform intercomparisons, role of microphysics, chemistry, air mass source region, frontal passages and other factors (**G. Buzorius**, D. Covert, F. Brechtel, S. Howell, H. Swan)
7. Evaluation of scattering efficiencies of chemical components of the aerosol at Kosan (CMDL, K. C. Moon, J. Schauer, others?)
8. The composition of the organic aerosol at Kosan during ACE-Asia (S. Fuzzi, R. Alfarra, J. Schauer, others…)
9. Observations and modeling of precipitation scavenging of aerosols at Kosan during ACE-Asia (**C. Chang**, J. Kim, F. Brechtel)
10. Direct evidence for the role of aerosol chemical composition in determining particle size-resolved water uptake from simultaneous observations of individual ambient particle size, hygroscopicity and composition (**BNL**)
11. Prediction of hygroscopic growth properties using continuous single particle mass spectrometer results and coupled MS/HTDMA measurements. (**BNL**)
12. Measurements of volatile and semi-volatile aerosol composition at Kosan during ACE-ASIA using an Aerosol Mass Spectrometer (**R. Alfarra**, J. Allan, others?)
13. Case studies of cloud microphysics and chemistry at Kosan during ACE-ASIA (**K. Bower**, Chang-hee Kang, S. Fuzzi, F. Brechtel)
14. The influence of cloud processing on observed aerosol microphysical and chemical properties (**K. Bower**)

15. Relationships between air mass source region and single particle characterization by TEM (**J. Anderson**)
16. Source region apportionment through analysis of PM2.5 from surface network sites (**J. Schauer**, P. Chuang)
17. Chemical characterization and water solubility of resuspended soil by TSP, PM1.0, PM2.5 (**J. Schauer**, P. Chuang)
18. Molecular markers and organic tracers for ACE surface sites (**J. Schauer**, P. Chuang)
19. Relationship between PM2.5 and PM1.0 composition (PIs?)

V.D.2.e. Lidar network Breakout Session – Toshi Murayama

In this breakout sessions, two lidar reports were given: a brief summary of key events from lidar observations during ACE-Asia by T. Murayama (you may request a very informative ppt file from him at murayama@ipc.tosho-u.ac.jp) and the summary of Micro pulse lidar observation and analysis at Kosan site by S.-C. Yoon and J.-G. Won (Seoul National University). Related with so-called "Perfect dust storm", we found a common elevated dust layer over Japan, Cheju, and R/V Ron Brown in Japan Sea on April 10-11. The base height was about 4km and had a sharp rising edge. SNU groups presented a full set of extinction profile during the April and derived the radiative forcing due to Asian dust combined with radiation measurements. However, they found a significant discrepancy between Aerosol Optical Thickness (AOT) derived from Sun photometer and lidar in dust events: lidar analysis tends to underestimate AOT. We discussed the ratio of backscatter to extinction coefficients of the dust. The value ranged from 30 to 70 sr in the discussion, which may change the lidar-retrieved AOT double. At the session, a list of lidar observation during ACE-Asia was given to participants (an Excel file with the locations, sampling times, and details of measurements can also be gotten from TM).

V.D.2.f. PRC sites – Rich Arimoto & Si-Chee Tsay

The breakout session for the PRC sites mainly consisted of presentations and discussions of preliminary results by Rich Arimoto (Zhenbeitai chemical data, including dust composition, with some comparisons to Barry Huebert's results), Wang Mingxing (dust storm trends), and Si-Chee Tsay (Zhenbeitai and other optical data). Joe Prospero also presented some results from Midway reflecting changes in the concentrations of pollutants over the past ~20 years.

V.D.2.g. Carbonaceous Aerosol Break Out Session (Jamie Schauer)

Two major topics were discussed in the carbonaceous aerosols break out session: 1) measurement of carbon in particulate matter samples and 2) the speciation of organic compounds in particulate matter samples. The ACE-Asia Science team has made significant progress in the measurement of carbonaceous aerosols by adopting standardized methods for the thermo-evolution and combustion measurement of organic and elemental carbon (OC and EC). A manuscript is already in progress, which covers the ACE-Asia ECOC inter-laboratory analysis comparison. Briefly, excellent agreement between ACE-Asia laboratories was obtained for the measurement of OC and EC when all laboratories utilized the same analysis procedure. As a follow up to this effort, the Carbonaceous Aerosol Working Group is developing a unified nomenclature for different measurements of carbonaceous aerosols to avoid incorrect comparisons of different measurements. As an example, a distinction between the elemental carbon measured by the standardized Ace-Asia ECOC thermo-evolution and combustion method and other ECOC methods as well as optical measurement. Since this EC is by nature operationally defined, we now need to determine its relationship to the absorption required by radiative transfer models. Two major initiatives for the group will be to 1) develop a unified approach to relating particulate matter organic compound mass to particulate matter organic carbon that is appropriate for different aerosol populations and 2) address the impact of organic carbon absorption artifacts. Emerging data sets that are being generated and merged by the ACE-Asia Participants are very complimentary and are expected to effectively address these important issues. Appendix A lists planned manuscripts that will cover effects of the carbonaceous aerosols working groups.

Efforts associated with particle-phase organic compound speciation were discussed and four major goals of organic compounds speciation were identified: 1) tracers for source attribution, 2) means to estimate ratio of organic compound mass to organic carbon and the density of the organic fraction, 3) to determine optical properties, and 4) to address hydroscopic growth and activation. Organic speciation efforts are currently underway by several groups and the integration of these efforts in the future will require continued interactions among the group members. To facilitate these efforts the working group will compile and distribute a summary of the goals and efforts of each group to assure maximal collaboration and benefit from organic speciation efforts.

V.D.2.h. ACE-Asia Column Closure Breakout Session - Phil Russell and Don Collins

The session began with thirteen 5-minute presentations describing column closure studies being conducted by ACE-Asia researchers using satellites, ground sites, the RV Brown, Twin Otter, and C-130. The presentations identified “golden incidents” and highlighted issues deserving special multigroup attention (see agenda table below for details). Remaining time was devoted to discussing those issues.

<u>The “golden incidents” included</u>:

- *The Apr 4 MISR overflight of Oki & Amami
- *The Apr 13 MISR overflight of Oki
- *The Apr 16 MISR overflight of Cheju
- The Apr 20 MISR overflight of Oki & Amami
- The Apr 27 MISR overflight of Amami
- *The May 2 MISR overflight of Cheju
- Apr 4, 7, 8, 9, 12, 13, 15, 19 on the RV Brown
- The Apr 8 C-130 and Otter overflights of the Ron Brown
- The Apr 23 C-130 profile at the TUMM lidar
- Profiles in the Apr 12, 13, 17, 22, and 23 Otter flights
- Profiles in the Apr 4, 13, 23 and May 2 C-130 flights

*Identifies best cases for MISR.

Types of radiative closure studies presented included:

- Satellite vs. aircraft and surface in situ and remote measurements
- Lidar vs. in situ data and sunphotometers
- Size and composition based predictions vs. direct optical measurements
- In situ scattering and absorption vs. sunphotometer
- Calculated vs measured radiative flux changes [presented in other breakouts]

Agreement obtained in initial studies ranged from fair to excellent.

Important issues included:

- How does spatial variability impact closure, and how can it be accounted for (nephelometer data)?
- How should inlet effects be included in closure studies (TO vs. C130)?
- How to categorize the aerosol to identify strengths and deficiencies in our understanding of the radiative properties of certain types of aerosols?
- How should the optical properties of non-spherical particles be modeled?
- How does the pronounced vertical variability often observed influence assumptions of the backscatter to extinction ratio?
- How should the impact of cirrus on satellite and sunphotometer measurements be accounted for?
- How should ocean surface reflectance variability (spectral and spatial) be considered?
- How close is close enough for inter-platform studies?

Agenda Table: ACE-Asia Column Closure Breakout Session

Speaker	**Analysis example**	**Golden incidents**	Issue	**Pasa-dena poster**	**Pub plan** (see list below)
Satellites					
Ralph Kahn	MISR retrievals & comparisons	*Apr 4 Oki & Amami *Apr 13 Oki *Apr 16 Cheju *May 2 Cheju Apr 20 Oki &	Which key sites have enough in situ constraints? Should MISR algorithms be modified? How?	Kahn et al.	

		Amami Apr 27 Amami	Volume closure/ variability		
Ground Sites					
Toshi Murayama	TUMM Lidar vs A/C sunphot, neph, PSAP	Apr 23 TUMM Lidar, C-130	Vertical variety of aerosol optical properties. Extinction-to-backscatter ratio of dust/aerosol.	Mura- yama et al.	Murayama et al.
Soonchang Yoon	Kosan Lidar AOT, ext(z), dust radiative effect	Apr 15, 25 Kosan	Validation of MPL AOT	Yoon et al.	Yoon et al. Won J.
[Brent Holben in absentia]	AERONET AOD, α, ω, P(Θ), n(r), n & k ~12 sites in China, S. Korea, Taiwan and Japan	Any coincident satellite and airborne opportunities over Kosan or sites in China, Taiwan or Japan	Horizontal and vertical structure of aerosol layer(s), AERONET must have AOD(blue) > 0.4 for ω, P(Θ), k retrievals		
RV Brown					
Greg Mitchell	UV-vis ocean reflectance: meas & model		Effect of ocean surface reflectance variations on radiation closure		
Robert Frouin	water-leaving radiance and AOT	Apr 7, 8, 9, 12, 13, 15, 19			
Trish Quinn	AOD, α, ω, scat, abs	Apr 8: C-130, Otter			
Piotr Flatau	AOT, Angstrom, water vapor, solar flux	April 8, April 4	Solar and IR radiative forcing, sea salt forcing, long range gradient		Vogelman et al., Flatau or Markowicz et al.
Twin Otter					
Jian Wang	AOD & ext from n(r) & comp(r)	Apr 17, 23		Wang et al.	
Beat Schmid	AOD & ext: AATS-14 vs neph + PSAP	Apr 12, 13, 17, 22, 23 +	Correlation between α and degree of closure	Schmid et al.	Schmid et al.
Dave Covert	AOD & ext from neph + PSAP	Apr 12, 13, 17, 23 +			
C-130					
Sarah Masonis, Tad Anderson	Group data by airmass type (e.g., fine mode fraction) Spatial variability Column α	Base on model performance	Spatial variability. Uncertainties. Intensive properties in column closure.		Premature (but see Murayama et al., Redemann et

					al.)
Jens Redemann	AOD, ext: AATS-6 vs neph + PSAP	Apr 4, 13, 23 May 2	Importance of humidification factors to column closure	Rede- mann et al.	Redemann et al.

Planned publications

Several ACE-Asia column closure papers were identified before and during the breakout session. The list is expected to grow as progress is made on the more immediate issues of data quality, harmony, and identification of incidents. The current list follows:

Flatau or Markowicz et al., [RV Brown solar paper]

Murayama, T., et al., [Tokyo lidar vs C-130 in situ and AATS-6]

To date have compared only aerosol light extinction from C-130 RF#12 on Apr 23, 5:35-6:25 UTC.

Redemann, J., et al., "Determination of aerosol radiative effects in the Pacific Basin troposphere based on aerosol extinction and optical depth closure studies aboard the NCAR C-130 in ACE-Asia"

Currently we are only comparing profiles of aerosol light extinction, but I think we can also look at angstrom exponent. Have analyzed two profiles from C-130 RF#08 on Apr 13 (2:05-3:35 UTC and 3:15:3:25 UTC) and one from RF#12 on Apr 22-23 (23:48-00:16 UTC).

Schmid, B., et al., "Airborne, space-borne, ground-based and shipborne measurements of aerosol optical depth and extinction vertical profiles during ACE-Asia"

For the aircraft I would focus on Twin Otter. Groundbased woild be Cimel Sites and Lidars, Satellite: SeaWifs, MISR, AVHRR, TOMS ...?, Ship: Welton Lidar

Vogelmann et al [RV Brown IR paper]

Wang, Jian, Richard C. Flagan, John H. Seinfeld, Don R Collins, Haflidi H. Jonsson, Beat Schmid, Jens Redemann, John. M. Livingston, Philip B. Russell, Song Gao and Dean A. Hegg, [a publication based on the AAAR poster "In situ aerosol size distributions and radiative closure during ACE-ASIA"]

Won, J. et al., [Kosan lidar paper]

Yoon, S. et al., [Kosan lidar paper]

V.D.2.i. Trace Metals Session – Mitsu Uematsu and Rich Arimoto

The following groups may have trace metal data to contribute.

as of 1 Nov. 2001			
Name	Affiliation	Technique	Output
Jianzhen Yu	Hong Kong Univ. of Sci. & Technol.		organic carbon and total carbon content
Tom Cahill	DELTA Group, UC Davis	synchrotron	Na and elements to U
Kim Prather	Univ of California, San Diego	ATOFMS	
Jim Anderson	Arizona State University	SEM+EDS,WDS	Na, Mg, Al, Si, K, Ca, Fe, Mn, P, Ti, Zn, Cl and a few other elements.
James Schauer	University of Wisconsin-Madison		40 elements by ICPMS, Sr isotopes by TIMS, and Pb isotopes by ICPMS.
Hans Friedli	NCAR/ASP		Hg
Chang-Hee Kang	Cheju National University	ICP-AES	Al, Fe, Ca, Na, K, Mg, Ti, Mn, Ba, Sr, Zn, V, Pb, Cr, Cu, Ni, Cd
Rich Arimoto	NMSU	ICP-MS	
Shaw Liu	Chinese Taipei	ICP-MS	
Rivera, Russell	Princeton Univ.		
Maxwell, Weber	Georgia Tech	PILS/IC	Na,, NH3, Ca, Mg, K, Cl, NO3, SO4
David Cohen			
Trish Quinn	NOAA PMEL		Na, Mg, Al, Si, P, S, Cl, K, Ca, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ga, As, Se, Rb, Sr, Ba, Pb, Bi

The sampling details of two groups are available.

Subjects	U-Tokyo	NOAA/PMEL
site	VMAP network__sites	Ron Brown
duration	March 2001-present	March/April 2001
frequency	Intensive: Daily, normal: Weekly	3 to 24 hrs for 2 stage impactors, 2 to 3 days for 7-stage Berner impactors
instrument	HV >2.5; <2.5	2-stage and 7-stage Berner impactors
filter media	Teflon; 90mm	Teflo filters and Tedlar films
analytical method	ICP-AES	2-stage impactors analyzed by XRF
		7-stage impactors analyzed by ICP-MS and AA by Rich Arimoto's group
calibration	yes	yes
when	by March 2001	Preliminary data was available by the time of the workshop

V.D.2.j Satellite Intercomparisons - Phil Durkee

Satellites provide a regional perspective to general ACE-Asia analysis of observations from ship, aircraft and surface sites. There is therefore strong motivation to intercompare the results from various satellite sensors in order to assure the reliability of the results and understand the strengths and weaknesses of each sensor's capabilities.

Much of the discussion focused on validation of satellite-based results. The products of interest that can be derived from satellite radiance measurements include but are not limited to:

- aerosol optical depth
- Angstrom exponent (or generally information about the shape of the aerosol size distribution that produced the scattered radiation measured by the satellite)
- total radiance, water-leaving or surface radiance, aerosol radiance, and radiative flux

Some retrieval schemes also derive an aerosol model that is consistent with multi-spectral or multi-angle measurements (e.g.; MISR).

Beyond retrieved aerosol properties, validation of the components of the various retrieval approaches was discussed. A priori assumptions are required in all aerosol retrieval schemes. These include expected particle size distribution characteristics, index of refraction (including absorption), scattering phase function, mixture modes of the aerosol, vertical distribution, etc. It is important that component-level validation studies are completed in order to adequately characterize the sources of error in the retrievals. Additional important error sources include cloud screening, surface properties, calibration, scene variability, and gaseous effects.

The final products of the satellite-focused studies will begin with case studies where the best combination of surface, aircraft and satellite observations are available during important aerosol episodes. Studies of the dynamics of aerosol outbreaks will also be greatly aided by satellite observations. Satellites are particularly well-suited for composite summary analysis of the regional aerosol characteristics. Ultimately satellites will play an important role in producing reliable aerosol radiative forcing estimates.

An important new initiative was discussed that will attempt a combined analysis of aerosol properties from multiple satellite platforms. The satellites available during ACE-Asia provide observations at multiple wavelengths and multiple angles on a wide range of spatial and temporal scales. This methodology will attempt to combine the strengths of the various sensors to produce an optimum aerosol characterization for high priority case studies. This effort first depends on the successful completion of the validation studies described above.

V.D.2.k. Inorganic Aerosols, Impactors, and Intercomparison Breakout Session – Summary - Trish Quinn

Results of ion comparison. The results of the intercomparison of anion and cation standards was shown in terms of ratios of measured concentrations to calculated concentrations (based on the content of the standard reference material that the working standards were made from). For the lower level anion standard, agreement between measured and calculated concentrations for all laboratories was within 15% for chloride, sulfate, and phosphate. Agreement for nitrate degraded as the length of time between preparation of the standard and analysis increased, i.e., the nitrate appears to have reacted away in the solution vial. For the higher level anion standard, agreement was within 10% for all ions except nitrate. For the lower and higher level cation standards, agreement was within 12% for all ions.

Submission of aerosol sampling information for inorganic ions. Prior to the data workshop, ion people were asked to answer a series of questions about their sampling and analysis methods. Several groups submitted their information. Trish Quinn will re-send the request for information via the inorganic ions working group email list once it is revived. This information will be passed onto the appropriate person for the harmony exercise.

List of data that could be compared in either a harmony exercise or for air mass characterizations. Ideas were solicited for parameters that would be useful to compare in a harmony exercise to check consistency in the data or in a characterization of air masses. It was suggested that for the harmony exercise absolute concentrations and mass ratios of uncorrected species be considered. Here, uncorrected means, for example, no separation of non-sea salt from total mass. Specific parameters include absolute concentrations of all ions measured, NH_4^+ / nss $SO_4^=$ molar ratios, and mass ratios of MSA/nss $SO_4^=$, NO_3^-/nss Ca^{+2}, nss $SO_4^=$/Ca^{+2}, Na^+/Cl^-, Mg^{+2}/Na^+, NO_3^-/nss $SO_4^=$, Ca^{+2}/$SO_4^=$ (to check for particle bounce in impactors), OC/nss $SO_4^=$,(nss K^+ + non-crustal K^+)/BC, nss $SO_4^=$/mass, and nss soluble Ca^{+2}/Al.

Methods for getting data into comparable quantities – similar RH of measurement, size cuts, etc. Ideas were solicited for methods available within the ACE Asia data set and community to align all measurements for a harmony comparison. This alignment requires that all size cuts and resulting ion concentrations be reported at a common RH. Rick Flagan suggested using the Twin Otter TDMA measurements and the paired wet and dry DMPS measurements. In addition, several groups are running chemical models that can estimate the mass of water associated with the aerosol.

Other issues that came up.

1) It was decided that the unit of choice for submitting data would be $\mu g\ m^{-3}$ at STP where STP is 298K and 1 atm. In addition, for those that choose to do so, the data could also be reported in terms of mixing ratio (i.e., there would be two columns for each concentration reported – one in $\mu g\ m^{-3}$ and one in mixing ratio).

2) It was recommended that a mechanism be put in place for submission of data to the Harmony exercise.

3) A standard format for data submission should be agreed upon – both for the benefit of the harmony exercise and for ease of use by modelers.

4) When submitting data to CODIAC, methods of making non-sea salt and non-crustal corrections need to be well defined.

5) It was recommended that the working group email aliases be revived.

V.D.2.l. Radiation Gradient Experiments Breakout Session – Shelley Pope

Several groups presented their preliminary results. Andy Vogelmann described a study of IR forcing by aerosols using aerosol optical depth (AOD) measurements made on the Ron Brown. Brett Bush showed a comparison between TDDR and CIMEL AODs (at 500nm) measured at the surface site at Kosan. Shelly Pope presented a comparison between TDDR and AATS6 AODs (at 500 and 526 nm, respectively) measured on the C130. Jens Redemann showed AOD gradients as seen by the AATS6 onboard the C130 on April 8 (RF05) and May 1 (RF17). Beat Schmid described a gradient as seen by the AATS14 instrument onboard the Twin Otter on April 23. Maura Rabbette presented spectra from the Twin Otter-mounted SSFR which showed a possible spectral signature due to aerosol.

So, to date, some AODs have been compared (and the comparisons look good) and some gradients have been identified. Further comparisons will be carried out as data are processed and times of interest (gradients) are identified. Phil Durkee pointed out that vertical radiation gradients are also of interest. There was discussion of possible AOD ‘harmony’ papers, based on various platforms or instruments. It was deemed premature to decide on any specifics regarding such papers.

V.D.2.m. Optics (neph/psap) Breakout Session - Tad Anderson, facilitator/reporter

The goals of this session were (1) identify all platforms where nephelometer and/or absorption photometer (PSAP) instruments were deployed; (2) assess the degree to which the measurements are comparable and, where possible, adopt common data reduction procedures to promote data consistency across platforms; (3) discuss various thorny technical issues and develop strategies for dealing with them; (4) discuss the important scientific products that neph/psap data can provide and develop strategies for providing them.

Neph/psap data were acquired during ACE-Asia at 5 ground stations (Yulin, Kosan, Yasaka, Amami, and Tokyo), 4 aircraft (C130, Twin Otter, P-3, and Jaffe’s Beechcraft), and the Ron Brown. A list of technical contacts and an inventory of sampling and data reduction protocols for each platform has been completed and is available through Tad Anderson. Many data products will be consistent across most platforms. Some examples: of the six groups that did sub-micron sampling, all but one used the same cut diameter (1 micron aerodynamic at low RH), 10 groups will supply continuous data on low-RH scattering, 7 groups will supply low-RH submicron scattering, 7 groups will provide the wavelength dependence of low-RH scattering, 6 will provide low-RH single scatter albedo, 4 will provide submicron low-RH single scatter albedo, and 4 will provide the dependence of scattering on RH. Our goal is that, in each of these cases, the data be strictly comparable across platforms and be made available in common formats to the ACE-Asia investigators.

The thorny technical issues that were discussed largely involved coarse mode aerosol. These were (1) coarse mode sampling efficiency (inlet and plumbing), (2) coarse mode scattering measurement (neph angular truncation and the discrepancy between TSI and Radiance nephelometers that shows up only during coarse-dominated sampling, (3) concerns about the accuracy of the PSAP for determining coarse mode absorption, and (4) an apparent anamoly in measurements of coarse-mode hygroscopicity where the Kosan station, in contrast to three other platforms, reports a highly hygroscopic aerosol during "dusty" periods. An additional issue was (5) the accuracy of using a 2-point-fit exponential function to represent the hydration dependence of scattering. Strategies were developed for addressing each of these issues. Formal leaders were not appointed, but the informal understanding of who is taking leadership on each issue was: (1) Steve Howell, (2) Tad Anderson, (3) Tad Anderson, (4) Anne Jefferson, (5) Mark Rood.

Three main scientific products were identified: (1) mass and component scattering efficiencies, (2) aerosol classifications based on the fine-mode-fraction of scattering, and (3) aerosol variability assessments from neph data. The participants generally agreed on the importance of these products and efforts are underway to produce them across all platforms where the requisite measurement were made.

The neph/psap measurement group will remain in close contact, facilitated by Tad Anderson, with the goals of providing a consistent suite of data products to all ACE-Asia investigators and of examining this overall data set for deriving general characteristics of the Asian aerosol.

V.D.2.n. Regional model comparisons - Phil Rasch

The meeting began with brief presentations from the three modeling groups that participated in the field program with updates on what has been learned and how the models have changed since that time.

P. Rasch presented results from the NCAR modeling effort. Their model underwent modifications to: a) facilitate higher resolution simulation; b) correct biases in the dust simulation; c) incorporate the satellite retrievals in the aerosol assimilation more fully. Two time periods were examined (weeks of April 8 and April 13) that showed very different regimes. The latter week was one of the ``golden'' periods, with very strong outflow of dust. Weekly averaged aerosol radiative forcing at the surface exceeded 100 W/m2 for this period.

I. Uno and G. Carmichael presented results using the RAMS model. In addition to the products developed for the field phase they are now also producing estimates of AOD, extinction and single scattering. Many of their products are now available on their web site. They also found they were able to reproduce the dust outbreaks seen in the Yellow sea much more closely with the introduction of a ``missing'' dust source just north and west of the yellow sea.

M. Chin presented results from the GOCART model. They have begun comparison with the measurement sites. Their comparison indicated some problems with reproducing the scattering and absorption profiles compared to the UW datasets. They also found that their model misrepresented the dust outbreak of Feb 24 and 25 and they attributed it to the lack of an anthropogenic source in the same region as Uno and Carmichael, and have introduced a similar new source, that greatly improved their simulation.

We then moved into a discussion phase.

Phil Rasch provided a set of bullets to provide a start to the discussion. Carmichael suggested that we might try and identify some of the differences in the model simulations to using the same source distributions. He noted that this would be quite difficult with the dust formulations. Prospero showed a long term time series at Midway Island for dust, nitrate and sulfate. The anthropogenic aerosols measured at Midway seem to track the emissions, even to showing the recent reductions in emissions estimated for Asia. No trends were seen in the dust there, and he asked how this could be reconciled with the postulated missing anthropogenic source described above. We then moved on to a discussion of how to compare the models to each other and the observations. P. Rasch suggested that it would be nice to agree on such mundane things as units, averaging intervals (both space and time, possible stratified in the vertical and horizontal), and when measurements were influenced by cloud contamination, Carmichael suggested we might compare species ratios as well as absolute amounts as they will tell us something different. C. Zender suggested we consider comparing deposition. P. Flatuea asked that we consider downward surface solar insolation.

We then moved on to consider how to write up results. Rasch and Carmichael proposed that we consider a few papers covering the following topics: 1) Intercompare models; 2) comparison against obs. with a focus on the mean properties over the whole IOP and for a few selected golden periods. We agreed to continue this discussion by email following the meeting.

V.D.2.o. Physical size - Steve Howell

Report not yet available

V.D. 2.p. Chemical characterization of airmass types- Jose Jimenez

The goal of this group is to provide a **time line of air mass types for each platform or site**. In particular we want to avoid the problems of some previous field campaigns in which people defined air masses differently for several data sets of the same platform, and published their data according to conflicting air mass classifications.

The anticipated **uses** of this airmass classification are at least three-fold:

1) to perform statistical data analysis of each data set with a consistent definition of the air masses sampled.

2) to serve as an aid for modelers when comparing model output with data.

3) to provide typical size distributions and intensive/chemical/optical properties of the aerosols for each air mass type for use in satellite & LIDAR retrieval algorithms.

The **coordinators** of this classification for each platform are:

- C-130: Sarah Masonis and Tai Chen
- Twin Otter: Brian Mader, Roya Bahreini, and Jose Jimenez

- Ron Brown: Tim Bates
- Kosan: Anne Jefferson, Fred Brechtel, Jiyoung Kim, and Wlodek Zahorowski

The **organization of this task** will be as follows:

1) Coordinators have proposed:

1.1) a series of air mass types

1.2) a plottable format for reporting the air mass types, as in the figure at this site: you can download this excel file from http://www.its.caltech.edu/~jljimene/aceasia.htm

2) The coordinator(s) of each platform will work with the researchers on their platform/site (via the platform mailing list)

2.1) Making sure that all researchers on their platform use the same air mass types, classification criteria, and reporting format

2.2) Compiling the timelines of airmasses from the researchers in their platform

2.3) Making sure that those timelines are consistent, and sharing them back with the researchers in their platform

3) The coordinators will communicate between themselves to keep "harmony" in airmass definitions and classification criteria across platforms. The means of communication will the be following email list:

- List name: aa-airmass-working@joss.ucar.edu (former aa-airmass-size)
- Description: Internal discussions of Working Group on Air Mass Characterization

4) The classification criteria and other relevant information will be shared with all interested researchers via the email list

- Name: aa-airmass-info@joss.ucar.edu (former aa-chemistry)
- Description: Results of the Working Group on Air Mass Characterization

We agreed on a set of **six primary air mass types** and three subtypes to be used in this classification, plus a mixed airmass type:

1. Dust
2. Pollution
    3. Pollution from China
    4. Pollution from Japan
    5. Pollution from Korea
6. Biomass burning
7. Volcano
8. Marine aerosol
9. Clean Troposphere
10. Mixed of two or more types

The **strategy** that we plan to follow to achieve the classification is:

1) Start with whatever we have available now
2) Add more data as they become available
3) Share the results on a common format

We will use as **classification criteria** all the relevant parameters available for each platform/site, including, but not limited, to:

1) Back trajectories
2) Meteorology (e.g. RH, wind direction, wind shifts)
3) Gas-phase measurements (CO, SO2, Radon, organics…)
4) Aerosol scattering (fine/coarse, angstrom exponent…)
5) Aerosol concentration (CPC), size modes
6) Aerosol hygroscopicity
7) Fast aerosol chemistry (PILS, mass spectrometers)
8) Any other relevant measurements

V.D.2.q. Dust composition and radiative effects - Irina Sokolik

Realizing that a large number of individual teams have been working on various aspects of the dust-radiation problem, a strategy selected for the breakout session was to give the opportunity for each group to report its data and/or modeling efforts. The individual reports were organized under the following general themes to facilitate the discussion:
(1) dust source characterization => dust properties => dust radiative effects in the source region;
(2) dust evolution during transport => properties of aged dust => radiative effects (aged dust in the marine environment; aged dust in Kosan, Korea; and aged dust over Japan)

The breakout session really helped to comprehend what various groups are doing and define the collaborative projects. Table (see attached file) summarizes the individual teams (PI info), available data, models used by the team, and planned work.

Given a body of the acquired data and model capabilities, several scientific issues were identified to guide the study of the dust radiative impact:

1.Elucidate the links between dust morphology/composition, physiochemical properties, optical properties and radiative effects
(i) in the dust source areas: link soil composition and wind-blown dust properties to model dust radiative properties (optics & radiation observations were extremely limited);
Aged dust:
(ii) in the marine boundary layer: integrated analysis of aerosol chemical, optical and radiative data from R/V R. Brown (excellent data sets);
(iii) in the marine atmospheric column: analysis of C-130 & Twin Otter data in conjunction with collocated satellite observations (MISR, SeaWiFS, TOMS, MODIS, AVHRR).

2. Characterize the spatial and temporal distribution of dust over the ACE-Asia domain in spring of 2001 by combining transport model simulations and field data.

3. Evaluate the relative role of processes controlling the physical and chemical evolution of dust and hence its radiative properties during transport. Main processes to consider: heterogeneous chemistry, coagulation, selective removal processes and cloud processing.

4. Estimate top-of-the-atmosphere and surface radiative forcing of dust at various time- and space-scales over the ACE-Asia domain.

5. Characterize the vertical distribution of dust over the region and associated radiative heating/cooling rates: modeling in conjunction with lidar data from Korea and Japan and C-130 & Twin Otter profile observations.

PARTICIPANTS OF DUST– RADIATION SESSION (as of 10/27/2001)			
PI & Affiliation	DATA	MODELS	PLANNED WORK
Ralph Kahn @ JPL - Cal. Tech. ralph.kahn@jpl.nasa.gov	MISR (satellite sensor): multi-angle, multi-spectral radiances, from which aerosol column optical depth and aerosol types are derived	Radiation transfer codes to simulate MISR reflectances, and to derive TOA and surface fluxes	Validate the MISR aerosol algorithms, and then calculate the radiative forcing and regional transports
Phil Russell @ NASA Ames prussell@mail.arc.nasa.gov	C-130: Aerosol optical depth (380-1021 nm) & H2O vapor column **Twin Otter** Aerosol optical depth (353-1558 nm) & H2O vapor column	Radiation transfer codes, Mie code	a) Analyses of closure among in situ measurements, AOD measurements, and the models that link them (e.g., models of composition, shape, size, mixing state). Lead by Schmid & Redemann b) Comparisons between satellite-retrieved AOD(lambda) and aircraft measurements. Comparisons to date include MISR (Kahn), SeaWiFS (Hsu), TOMS (Torres). Lead by Schmid & Redemann c) Comparisons between model-predicted AOD/ext vertical profiles and aircraft measurements. Ditto for horizontal transects of AOD. Lead modelers would be Chin, Collins, & Carmichael
Brent Holben@ NASA Goddard brent@aeronet.gsfc.nasa.gov * not attending the meeting in Pasadena	**AERONET** Radiation measurements at W and NE China, Beijing, Amnyon Is.& Kosan, Midway Is. and affiliated sites in Taiwan&Japan	Dubovik's inversion code to retrieve dust microphysical, radiative and optical properties using spheroids	a) Characterize optical, radiative, and microphysical properties of dust from source region to long range transport sites b) Compare integrated column observations to in situ aerosol optical properties (close collaboration w/CAS) c) Participate in validation of satellite dust aerosol retrievals

Peter Pilewskie @ NASA ARC ppilewskie@mail.arc.nasa.gov	**Twin Otter Upwelling/downwelling solar spectral irradiance (between 300-1700 nm)**	Radiation transfer code (DISORT+Correlated-k distribution for gas transmission).	a) Compare measured and modeled solar spectral irradiance and conduct sensitivity analysis to various optical parameters. Model the radiative forcing due to dust aerosol using a custom designed model to match SSFR slit functions. RT model developed by Bergstrom. b) Multivariate analysis methods developed for SSFR spectra by Rabbette will be used to determine the amount and spectral dependence of variability in solar irradiance explained by dust aerosol.
Trish Quinn @ NOAA PMEL quinn@pmel.noaa.gov	**R/V RONALD H. BROWN** Trace element concentrations from which dust concentrations are derived. Scattering coefficient at 450, 550, and 700 nm for the submicron and total aerosol. Absorption coefficient at 550 nm for the submicron and total aerosol	Mie code	Calculate the extinction due to the dominant chemical components (including dust) using size distributions and chemical composition measured during the R/V R. H. Brown cruise
Kimberly A. Prather @ Univ. of CA, San Diego kprather@chem.ucsd.edu	**R/V RONALD H. BROWN** Single particle analysis by Aerosol Time-of-Flight Mass Spectrometry (ATOFMS): size and chemical composition of individual dust particles	**-**	Analysis of size and chemical properties of individual dust particles. Characterization of the presence of chemical species and their combinations which could give indication on the origin of the sampled particles and on the extent of heterogeneous reactions during their evolution.
Andrew Vogelmann @ Scripps, UCSD avogelmann@ucsd.edu	**R/V RONALD H. BROWN** Visible optical depths, angstrom coefficients, p-t-h2ov profiles, and M-AERI spectra (high resolution, FTIR spectra)	Line-by-line radiation transfer code (LBLRTM)	Calculate the infrared radiative forcing during ACE-Asia using M-AERI spectra and correlative data taken during the NOAA Ship R. H. Brown cruise. Relate it to the shortwave forcing.
Rich Arimoto@ New Mexico State Univ. arimoto@cemrc.org	**YULIN, CHINA** KOSAN (Korea): Dust elemental composition	-	Analysis of dust elemental and mineralogical composition

Laurent Gomes @ Meteo-France, Toulouse laurent.gomes@meteo.fr * not attending the meeting in Pasadena	YULIN, CHINA Routine radiation observations since 4/30/01 1 CIMEL sunphotometer + 1 thermal IR radiometer (CLIMAT) Available data: spectral aerosol optical depth, water vapor content, visible and IR sky irradiance, aerosol size distribution.	Radiation transfer code, Mie code, RAMS	a) Modeling optical properties of dust as a function of composition. Lead by Lafon b) Modeling dust optical depth and concentration fields in China using RAMS. Lead by Gomes&Zhang
Jiyoung Kim @ Meteorological Research Institute(METRI)/KMA jykim@metri.re.kr	KOSAN (Korea): Radiation observations: Sunphotometer (MS-110) and skyradiometer (POM-01) Available data: aerosol optical depth(368, 500, 675, 778, and 862 nm), Angstrom parameter, spectral scattering phase function, aerosol volume size distribution, and single scattering albedo	Mie code	Spectral response and sensitivity of atmospheric radiation to dust loading
Toshiyuki Murayama @ Tokyo Univ., Japan murayama@ipc.tosho-u.ac.jp	Lidar (Japan): Linear Depolarization ratio, Extinction-to-backscatter ratio	Mie code	Link the lidar measurements and calculation of the dust radiative forcing.
Jim Anderson @ Arizona State Univ. janderson@asu.edu	C-130, R/V RONALD H. BROWN, and KOSAN (Korea): Individual particle analysis data (particle size, composition, and shape)	-	Analysis of dust particles size, composition, and shape
Tom Cahill @ Univ. of California, Davis tacahill@ucdavis.edu	**R/V RONALD H. BROWN** Aerosol data by size (8 modes), time (6 hr; 3 and 1½ possible), and composition (elements Na – U), completed; mass, optical parameters pending CHEJU (KOSAN + HIGH SITE) Aerosol data (as above), plus 3 size modes (only latter completed); plus filters, isotopes, and chemistry (in progress) 15 SURFACE SITES, CHINA- US	Statistical analysis Principal Component Analyses (PCA)	a) Complete elemental analyses, most 8 and 3 stage DRUM strips, Fall, 2001 b) Begin analyses filters, elements, isotopes, and chemistry, with completion Spring, 2002. c) Couple with trajectory analyses, add source regions (dust, anthropogenic sources, etc.).

	Aerosol data; Mauna Loa 8, Adak, Crater Lake 3s completed.		
Wang Ming-Xing @ wmx@mail.iap.ac.cn	BEIJING (China) Dust data, meteorological data (320 m tower), Historical, Spring, 2000, ACE 2001	-	a) Dust compositional analysis. b) High time resolution profiles during dust storm, particles size and composition
Mian Chin@ Georgia Tech/NASA GSFC chin@rondo.gsfc.nasa.gov	-	Global scale aerosol transport model (GOCART)	Compare model results with data, identify the sources and understand the processes, and estimate the forcing
Itsushi Uno @ Kyushu Univ., Japan iuno@riam.kyushu-u.ac.jp	-	Regional Scale 3D dust and aerosol transport model (CFORS)	Analysis of aerosol transport
Irina Sokolik@ Univ. of CO at Boulder sokolik@lasp.colorado.edu	NORTHERN CHINA ASIAN DUST DATABANK: Met data from 301 stations since 1950; geochemical and geographical characteristics of dust sources in Northern China	DuMO: Dust Module that couples dust composition-, shape- and size-resolved microphysics, aerosol dynamics and transport, heterogeneous chemistry, optics, and radiation transfer codes	a) Characterization of dust sources b) Elucidate the links between dust morphology, composition and optical properties c) Aging of mineral dust during transport and associated radiative effects: implications for climate and remote sensing d) Dust forcing in the ACE-Asia domain during 2001 and at the climatic (30-year averaged) time-scales

V.D.2.r. Hygroscopic Growth Report – Don Collins

The collection of measurements made during ACE-Asia provides a very unique dataset for understanding the hygroscopic growth properties of aerosols. The capabilities of each of the sites and platforms have already provided substantial insight into different aspects of hygroscopic growth, and it is certain that with continued analysis an even better understanding will be gained. The suite of instrumentation on board the ship offered the most complete, and most continuous, description of the hygroscopic properties of the aerosol during the campaign. In addition to measurements of light scattering as a function of relative humidity, three independent measurements of size-resolved hygroscopicity were made. These included two humidified tandem differential mobility analyzers and one tandem DMA / aerodynamic particle sizer. Collectively, these three instruments analyzed particles ranging from less than a tenth of a micron to over a micron in diameter.

Measurements on board the ship clearly indicate that the sampled aerosol often exhibited deliquescence / efflorescence hysteresis behavior, which must be considered not only for interpretation of these hygroscopic growth measurements, but also many other measurements made of sampled aerosols that were not dried. At Kosan, a series of experiments was conducted in which a single particle mass spectrometer was coupled to a TDMA to investigate compositional differences between hygroscopic and non-hygroscopic particles. Preliminary data show that at least in some cases, the mass spectra of these two classes of particles are quite similar, suggesting that they have some common characteristics. Direct measurement of the hygroscopicity of free tropospheric dust particles and pollution layer aerosols were made on board the Twin Otter aircraft using a high flow TDMA. These data suggest that there was little internal mixing of dust and other soluble substances in the free troposphere, but that as the dust moved through the pollution layers and towards the surface it often became coated with some hygroscopic material.

It was agreed upon that consistency between measurements made at different sites and on different platforms should be quickly assessed for those periods when possible due to proximity of the platforms. For these comparisons, theoretical adjustments will be applied to each of the datasets to correct for variations in the setpoint humidities employed. Interest was expressed by each of the platforms for an assessment of hygroscopic closure, which will focus primarily on comparison of size-resolved hygroscopic growth measured directly with that predicted based on measurements of chemical composition and a description of the mixing state of the aerosol. Following the approach taken by ACE-2 investigators, a single publication will be written that combines the size-resolved hygroscopic growth measurements made on the various platforms during ACE-Asia in order to present a cohesive picture of the data.

V.D.2.s. Future Collaboration Among the Asian Surface Sites - YJ Kim

It was agreed that collaboration among scientists in the region would continue utilizing the research infrastructure built at the Asian surface sites for the 2001 ACE-Asia program. Young J. Kim from Korea, Shaw Liu from Taiwan, Mikio Kasahara, and Mitsuo Uematsu from Japan presented each country's on-going programs and future plans for post ACE-Asia research and field experimental works in the area of aerosol characterization and climate change. It was agreed to hold a planning meeting spring of 2002 in either Hong Kong or China to promote participation of Chinese scientists for future coordinated field and analysis works in time for the next year's dust storm season. Information available from yjkim@kjist.ac.kr.