



Project **A**tmospheric **B**rown **C**loud - Asia



October 2004 Field Campaign

*Comparison of instruments and measurements/
Validation of regional and global aerosol models*



Mission Statement

The ABC project will initiate its first field campaign by bringing together experimentalists and modelers in order to understand the fundamental issues involved with measuring and modeling the carbonaceous and inorganic components of combustion influenced aerosols in Atmospheric Brown Clouds.

Goals

Main Goal: To understand the uncertainties in critical ABC measurements and facilitate improvements in instruments, measurement techniques and protocols.

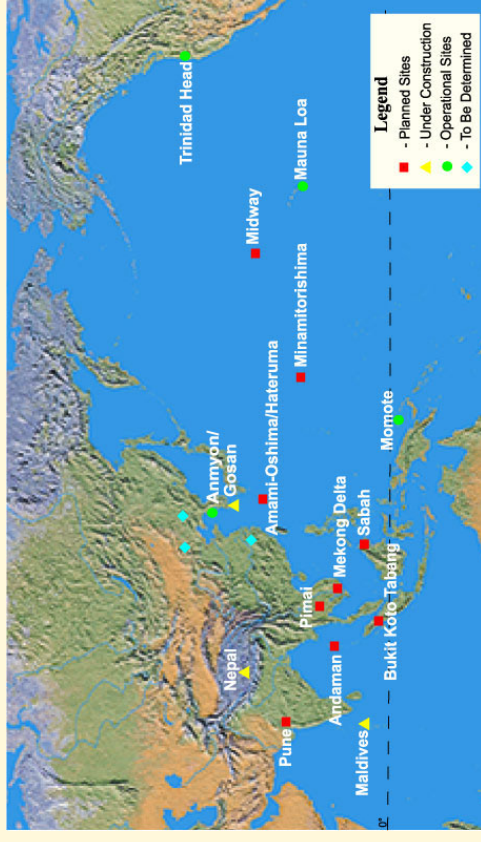
Supplementary Goal: Jump-start the ABC observational program and begin the process of collaborating across national boundaries.

Objectives

Comparison of Instruments and Measurements: To understand the range of various measurement techniques for determining critical parameters. In particular, the following parameters will be emphasized: Aerosol chemistry, aerosol optical properties, aerosol physical properties, gas measurements, rain chemistry, solar fluxes and Lidar profiles. It is our hope this comparison study will be useful for assessing the uncertainties in ABC measurements and for identifying the most superior methods and techniques.

Model Validation: Validate three-dimensional aerosol models using average and high resolution measurements of the parameters identified above. The model results will also be used to constrain expected values during instrument and measurement comparisons.

Training and Capacity Building: A one week workshop will be organized with lectures by the science team members on Brown cloud research, observational techniques and instrumentation. The participants will have a chance to assist in the observation campaign. The program will be coordinated by the super-site managers and the UNEP secretariat.



Organization

Planning Committee

| | | |
|---------------|--------------|-----------------------|
| G. Carmichael | A. Jayaraman | V. Ramanathan (Chair) |
| C. Corrigan | Y. Kondo | G.Y. Shi |
| E. Dutton | T. Nakajima | S.C. Yoon |
| L. Granat | J. Ogren | |

Coordinating Teams

MALDIVES

(Funded by NOAA, NSF, NASA)

Chief Scientist – V. Ramanathan
 Site Manager – H. Nguyen
 Site Scientists – C. Corrigan & M. Ramana

Aerosol – C. Corrigan
 Radiation – E. Dutton & M. Ramana
 Lidar – A. Jayaraman & M. Ramana
 Gas Phase –
 Rain Chemistry – L. Granat
 Model Validation – G. Carmichael

GOSAN

Chief Scientist –
 Site Manager –
 Site Scientists –

Aerosol – Y. Kondo
 Radiation –
 Lidar –
 Gas Phase – H. Tanimoto & T. Wang
 Rain Chemistry – L. Granat
 Model Validation – G. Carmichael

Instrument and Method Comparison Strategy

Component 1 – Intra-instrument/method calibration

All similar instruments (or methods) will be calibrated and compared to ensure that reliable data is being obtained from every instrument participating in the ABC network. All comparisons of this type do not need to be done at one of the Super Observatories. Comparisons may be done by different regions or countries with only a few representative instruments being sent to the Super observatories. The measurements will also give an estimate of the expected data scatter for each type of instrument.

Example. All K&Z pyranometers compared to establish range of data scatter and to discern any faulty pyranometers.

Component 2 – Inter-instrument/method calibration

All instruments (or methods) utilizing the same general method of measuring a specific parameter, but of a different model or a different manufacturer, will be compared to establish calibration and correction criteria. These corrections will be applied to standardize the actual ABC data.

Example. Ecotech and TSI nephelometers

Example. EC/OC analysis methods

Component 3 – Comparison of Techniques

Selected instruments using different methods to measure the same specific parameter will be compared to determine which method is most suitable for use at the ABC sites. These top instruments and methods will be emphasized as the suggested standard for future and upgraded ABC observatories.

Example. Filters vs. Aethalometer

Example. PM1, PM2.5, and PM10 filter cuts using different inlets



Instruments/Parameters Proposed for Comparisons

- Aerosol Chemistry
 - ◊ Sulfate
 - ◊ Nitrate
 - ◊ Organic carbon
 - ◊ Black carbon
 - ◊ other
- Aerosol Optical Properties
 - ◊ Scattering
 - ◊ Absorption
 - ◊ Aerosol optical depth
- Aerosol Physical Properties
 - ◊ Mass
 - ◊ Sub-micron size distribution
 - ◊ Coarse mode size distribution
- Gas Measurements
 - ◊ Ozone
 - ◊ CO
- Rain Chemistry
- Lidar
 - ◊ MPL and NIES
- Solar Fluxes
 - ◊ Pyranometers
 - ◊ Pyrhemometers
 - ◊ Narrowband radiometers
 - ◊ Global vs. direct + diffuse



Modeling Comparison Strategy

Pre-Mission Activities: In preparation of the October 2004 experiment the various modeling tools that will be used in the integration, interpretation, and evaluation will be identified, and protocols established. The tasks to be performed are outlined below:

1. Establish a modeling team by April 1 to develop detailed plans of campaign.
2. Develop preliminary tests of analysis methods using available data sets.
3. Coordinate with measurement teams
 - Data availability
 - Integration of measurement data into models
 - Determine model results influence on measurement strategy
 - What model products will be available to help understand measurements.
4. Prepare emissions data base for use in the analysis.
 - Coordinated with the on-going emission work in the region by ABC-Asia.
 - Decide whether or not to use a common emission inventories.
 - Establish emission database similarities and differences BEFORE we present results.
5. Establish a modeling web-site to coordinate and display ongoing analysis and model products.

Intensive and Post-Mission Activities: During the intensive period model products in support of the operations are planned. Post-mission activities will focus on the comparison of model results with observed quantities, context analysis including source identification, and the inter-comparison of the model results. Specifically,

1. Real-time modeling analysis will be performed to support the intensive operations. Information will be disseminated via a web-site
2. Comparison of model results with observations.
3. Context analysis including source identification.
4. Comparison of model results, and analysis to identify reasons for similarities and differences.
5. Workshop to discuss preliminary findings.

ABC Regional Capacity Building & Training



Senior research scientist Lalith Chandrapala from Sri Lanka's Department of Meteorology participated in the regional training program in May 2000 at the Kaashidhoo Climate Observatory, the Maldives.



Azim Abdullaheem from the Republic of Maldives learned about solar and atmospheric monitoring instruments during INDOEX at the Kaashidhoo Climate Observatory, the Maldives.



Environment Officer Bidya Bannali Pradhan from Nepal's International Centre for Integrated Mountain Development (CIMOD) maintains an ABC solar radiometer installed at the Kathmandu, Nepal during Winter 2003 campaign.

Approach

During the Field campaign, a training workshop will be held in the Maldives for students and scientists from S. and SE Asia.

The training workshop will include the following:

- Lectures on Aerosols, Air Pollution, and Climate
- Demonstration of Instruments and Experimental Techniques
- Hands On Experience with experimental Techniques

Project ABC will develop several regional resources, including:

- an Asian Climate Modeling Center
- Regional Training and Instrument Calibration Centers
- an Integrated Data Center on Climate, Agriculture and Public Health



The training process and exchange of ideas will be facilitated by televideoconference. During an ABC workshop in February 2002 in La Jolla, California, ABC scientists (image on left monitor) "met" with Director of UNEP Regional al Resources Centre for Asia Pacific, Surendra Shrestha, who was at the Asian Institute of Technology in Bangkok, Thailand (image on right monitor)

ABC Participating Institutions

- ABC Participating Institutions
- Center for Clouds, Chemistry, and Climate, SIO, UCSD, USA
 China Academy of Meteorological Sciences, Beijing, CHINA
 China Meteorological Administration, Beijing, CHINA
 Chinese Academy of Sciences, Beijing, CHINA
 Chinese Research Academy of Environmental Sciences, Beijing, CHINA
 Chulalongkorn University, THAILAND
 Department of Hydrology and Meteorology, NEPAL
 Department of Meteorology, Colombo, SRI LANKA
 Frontier Research System for Global Change, Tokyo, JAPAN
 Hankuk University of Foreign Studies, Seoul, KOREA
 Hong Kong Polytechnique University, Hong Kong, CHINA
 Indian Institute of Tropical Meteorology, New Delhi, INDIA
 Institute for Global Change Research, Yokohama, JAPAN
 Institute for Atmospheric Physics, Beijing, CHINA
 International Centre for Integrated Mountain Development, Kathmandu, NEPAL.
 Korea University, Seoul, KOREA
 Korea Meteorological Administration, KOREA
 Kyoto University, JAPAN
 Kwangju Institute of Science and Technology, Kwangju, KOREA
 Max Planck Institute for Chemistry, Mainz, GERMANY
 Meteorological Research Institute, Tsukuba, JAPAN
 Ministry of Science and Technology, CHINA
 Ministry of Environment and Natural Resources, Colombo, SRI LANKA
 Ministry of Home Affairs, Housing and Environment, Male, MALDIVES
 NASA- Goddard Space Flight Center, Maryland, USA
 National Center for Atmospheric Research, Boulder, Colorado, USA
 National Institute for Agro-Environmental Sciences, Tsukuba, JAPAN
 National Institute for Environmental Studies, Tsukuba, JAPAN
 National Physical Laboratory, New Delhi, INDIA
 National Natural Science Foundation of China, CHINA
 National University of Computer and Emerging Sciences, Islamabad, PAKISTAN
 NOAA - Climate Modeling and Diagnostics Laboratory, Boulder, Colorado, USA
 NOAA - Geophysical Fluid Dynamics Laboratory, Princeton University, New Jersey, USA
 Pacific Northwest National Laboratory, Richland, WA, USA
 Peking University, Beijing, CHINA
 Physical Research Laboratory, Ahmedabad, INDIA
 Scripps Institution of Oceanography, La Jolla, California, USA
 Seoul National University, Seoul, KOREA
 State Environmental Protection Administration, CHINA
 Stockholm University, Stockholm, SWEDEN
 Tribhuvan University, Kathmandu, Nepal
 TERI: The Energy & Resources Institute, New Delhi, INDIA
 UNEP Regional Resource Centre for Asia and the Pacific, Bangkok, THAILAND
 University of California, San Diego, California, USA
 University of Dhaka, Dhaka, BANGLADESH
 University of Iowa, Iowa City, USA
 University of Miami, Miami, Florida, USA
 University of Peradeniya, SRI LANKA
 University of Tokyo, Tokyo, JAPAN
 University of Wisconsin, Madison, Wisconsin, USA
 World Meteorological Organization, Geneva, SWITZERLAND