

GACP ACCOMPLISHMENT REPORT

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TITLE: The application of regional aerosol properties to
AVHRR aerosol retrieval algorithms

ABSTRACT, GOALS, and OBJECTIVES:

Assessing the importance of the direct and indirect effect of anthropogenic aerosols on the radiative forcing of climate requires an understanding of the global distribution of aerosol properties and an estimate of what fraction of the total aerosol is from anthropogenic sources. Assembling a global distribution of these aerosol properties will require a combination of in-situ measurements covering a globally representative range of natural and anthropogenically perturbed environments, satellite observations and chemical transport models. We propose to use our unique data set of in-situ aerosol measurements, shipboard sun-photometer measurements and high-resolution AVHRR observations collected on five oceanographic research cruises in the Pacific (RITS-93, RITS-94, ACE-1, and CSP) and Atlantic (ACE-2) Oceans to:

1. develop a regional database of marine boundary layer aerosol properties (number size distribution, mass size distribution of individual chemical species, and light extinction) over the oceans,
2. use these regional aerosol properties to develop regional AVHRR aerosol retrieval algorithms for optical depth and aerosol size, and
3. perform a series of case-study analyses whereby the regional aerosol retrievals are tested with simultaneously acquired aerosol in-situ measurements, shipboard optical depth measurements and AVHRR overpasses during the five research cruises.

In addition, as part of the NASA Aerosol Climatology Research Team, we will work with the other Team members to exploit more fully our 10 years of aerosol field data (Figure 1). Our data sets should be particularly useful in testing chemical transport models needed to develop a global aerosol climatology.

RESULTS TODATE:

Our data analysis efforts during year one have concentrated on the ACE 2 data set. Our results have been summarized in three manuscripts submitted for the ACE 2 special issue of *Tellus* that will be published in early 2000. In these manuscripts we compare the regional aerosol properties from ACE 1 and ACE 2 and divide the ACE 2 data set into different air mass types. The manuscript citations are listed below.

In an effort to make our data more accessible, we have begun constructing a data server on our web page. The initial data sets are available at:

<http://saga.pmel.noaa.gov:80/data/>

We have begun the process of identifying periods for case study comparisons of in-situ and satellite retrieved aerosol properties. Dr. Jim Johnson (PMEL) spent one week at the Naval Postgraduate school last fall and will spend another week there in August 1999 to work with Mr. Kurt Nielsen (NPGS) on the satellite data sets.

PUBLICATIONS:

1. Bates, T.S., P.K. Quinn, D.S. Covert, D.J. Coffman, J.E. Johnson, and A. Wiedensohler (1999). Aerosol physical properties and processes in the lower marine boundary layer: A comparison of shipboard sub-micron data from ACE 1 and ACE 2. *Tellus*, in press.
2. Durkee, P.A., K. E. Nielsen, P. J. Smith, P. B. Russell, B. Schmid, J. M. Livingston, B. N. Holben, D. Collins, R. C. Flagan, J. H. Seinfeld, K. J. Noone, E. Öström, S. Gassò, D. Hegg, L. M. Russell, T. S. Bates, and P. K. Quinn (1999). Regional aerosol properties from satellite observations: ACE-1, TARFOX and ACE-2 results, *Tellus*, in press.
3. Quinn, P.K., T.S. Bates, D.J. Coffman, T.L. Miller, J.E. Johnson, D.S. Covert, J.P. Putaud, C. Neususs, and T. Novakov (1999). A comparison of aerosol chemical and optical properties from the First and Second Aerosol Characterization Experiments, *Tellus*, in press.

FUTURE PLANS:

We will continue to analyze our in-situ data sets to define regional aerosol properties. As the data sets are reduced, they will be made available on our web based data server. We will also include summaries of regional aerosol properties.

During year 2 of the NASA-GACP we plan to begin case study comparisons of in-situ and satellite retrieved aerosol properties.