



Project Summary

Preparation, Archiving, and Documentation of Available Meteorological and Tracer Data for Model Evaluation

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The aim of this effort was to develop and test a means for archiving invaluable data sets in a timely fashion before the necessary supporting information about the data becomes lost forever. It was anticipated that no one fixed format could possibly cope with the variety of data collected during typical large-scale micrometeorological and tracer diffusion field studies. The use of these data is hampered, as much of it exists in tabular form in reports. While the intent was to develop a means for preserving these data and making these data more readily available, it was not the goal of this project to design a data base management system. The envisioned need was a procedure for storing the data that was sufficiently flexible to encompass a variety of data types and formats. To accomplish this, a survey was conducted of field data available from studies conducted prior to 1980. Based on the findings of the survey, it was determined that the archived data should include descriptive information as well as the data values. The entries in the descriptive portion of the archive would include, among other items, a data fact summary, a description of the experiment, and special information regarding the data. The archived data are described using a structure called a data map. The data map allows the data to be entered in original formats, while providing the user with a machine-readable pathway for accessing the diverse data formats. Standard words

are used for mapping variables and their units within the various data sets. This feature allows global scanning of data sets for specific variables. The data archive procedures are demonstrated using the Minnesota 1973 micrometeorological field data and the Hanford 1964 tracer diffusion field data.

This Project Summary was developed by EPA's Atmospheric Sciences Research Laboratory, Research Triangle Park, NC, to announce key findings of the research project that are fully documented in four separate reports (see Project Report ordering information at back).

Introduction

There is a relatively large and diverse body of data from micrometeorological and tracer field experiments that has been and could be used for development and evaluation of numerical simulation models. The use of these data is hampered, as much of it exists in tabular form in reports. The intent of this project was to develop a means for preserving these data and of making these data more readily available to the technical community. It was anticipated that no one fixed format could possibly cope with the variety of data collected. Furthermore, the goal of the project was not to design a data base management system. The envisioned need was a procedure for storing the data that was sufficiently flexible to encompass a variety of data types and formats.

Results and Discussion

To become familiar with the data types and formats likely to be encountered, a survey was performed of field experiments conducted prior to 1980. This survey not only provided information about the general character of the body of data, but also identified data of potential interest. This survey identified 22 micrometeorological and 41 tracer diffusion data sets of primary interest for potential future archiving. The focus of the survey was on data sets for relatively flat to gently rolling uniform rural terrain with small to moderate roughness elements. Only diffusion studies with controller tracer releases were considered. From these, a subset of five micrometeorological and five tracer diffusion data sets were recommended for first archiving. The recommended data sets include the following:

Micrometeorological

Minnesota 1973
Cabauw 1977-1979
Koorin Expedition
Cooperative Atmospheric Boundary Layer Experiment (CABLE)
Phoenix Project

Tracer Diffusion

Hanford 1964
Hanford Secondary Series
Cabauw
Karlsruhe 1969-1974
Ocean Breeze

For the purpose of developing and testing the archive structure, process, procedures, and documentation, two data sets were selected: The Minnesota 1973 and the Hanford 1964. The criteria for selection were flexible and included such considerations as potential level of current interest in the data, the comprehensiveness of measurements, the availability of the original data, and the attributes of the data set to provide a realistic test of archival process and procedures. The findings of the survey, including the data summaries outlining the instrumentation nature and extent of the field studies are presented in the following report:

"Survey of Meteorological and Tracer Data for Demonstrating a Data Archive", by R. K. Woodruff and C. S. Glantz, EPA/600/3-85/052.

Based on the findings of the survey, it was decided that an archive of data should include descriptive information as well as the data values. The entries in the descriptive portion of the archive

are data set fact summary, a narrative description of experiment and data, special information, references, a description of archive data files, contacts (names, addresses, and phone numbers), and standard experiment summary tables. This documentation is not meant to replace existing documentation of the experiments. The data archive narrative information provides sufficient information to identify relevant data for particular analyses. It also provides room to advise users of special considerations that otherwise might go unnoticed, such as deposition or especially high quality data.

The data are entered into the archive in a form as close to original form as possible to maintain a clear link with original records. The archived data are contained within a well-defined structure called a data map. The data map allows data to be entered in original formats, while providing the user with a machine-readable pathway for accessing the diverse data formats. Standard words are used for mapping variables and their units within the various data sets. This feature allows global scanning of data sets for specific variables. The data structure is designed so that selected portions may be loaded into the user's data base system or it may be accessed using a custom computer program.

A complete description of the proposed data archive format including a FORTRAN computer code for accessing the data is presented in the following report:

"Introduction to Micrometeorological and Tracer Data Archive Procedures," written by J. G. Droppo, Jr. and C. R. Watson, EPA/600/3-85/053.

As mentioned earlier, two data sets were selected to develop, test and demonstrate the archival procedures. The narrative documentation is contained in two reports:

- (1) "The Minnesota 1973 atmospheric boundary layer experiment. Micrometeorological and tracer data archive set 001 documentation report," by R. K. Woodruff, J. G. Droppo and C. S. Glantz, EPA/600/3-85/054.
- (2) "The Hanford 1964 atmospheric dispersion experiment. Micrometeorological and tracer data archive set 002 documentation report." by C. S. Glantz, R. K. Woodruff and J. G. Droppo, EPA/600/3-85-055.

The Minnesota 1973 archive provides the data for the 11 daytime experiments that were conducted in northwestern Minnesota during late summer. This was a full-scale measurement program over flat, smooth terrain to measure turbulent fluxes at multiple levels from a 32-m tower and a tethered balloon. The meteorological conditions measured represent fully developed stationary convective periods with mixing depths to approximately 2300 m. Measurements include mean profiles of wind and temperature and fluctuations of three wind components. A unique aspect of these measurements is the high vertical spatial density of turbulence measurements in the surface layer and extending to a height of 1220 m in the mixed layer. Unique to this archive is the original Minnesota 1973 rawinsonde data that were provided by Yutaka Izumi of the Air Force Geophysical Laboratory.

The Hanford 1964 archive provides the data for the 14 tracer experiments conducted during the spring and summer of 1964. These nighttime experiments were conducted during generally stable atmospheric stability over the relatively flat terrain of the U.S. Government's Hanford Reservation in southeastern Washington. The tracer (ZnS) was released at an elevation of 121.9 m from a fixed tower and sampled on a number of arcs arrayed between 200 m and 12,800 m downwind of the release tower. Sampling was conducted at 1.5 m above ground level. Meteorological measurements include wind speed and direction, standard deviation of the horizontal wind direction, and temperature measured at eight levels on a 121.9-m tower.

Conclusions and Recommendations

The results of the survey of meteorological and tracer field studies conducted prior to 1980 suggest there are data sets of significant value that would be worthwhile to preserve. As evidenced by the data donated by Yutaka Izumi, it is important to establish the archive before the original participants are no longer available and before the original notes of the experiments are lost. The use of the data map to define the storage format and structure of the data values proved successful. The data from two field studies were entered into the archive in a form that was close to the form of the original records. The

data map was successfully used to retrieve and access these values from the archive. It is recommended that the effort be continued. It is anticipated that the archive procedures developed and tested are flexible enough to accommodate most data sets. The archive procedures require minimal changes to the data format from that provided in the original records. The preservation of field data has obvious benefits to ongoing and future research and model development efforts.

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J. S. Irwin is the EPA Project Officer (see below).

This Project Summary covers the following reports:

"Survey of Meteorological and Tracer Data for Demonstrating a Data Archive," (Order No. PB 85-235 190/AS; Cost: \$10.00, subject to change).

"Introduction to Micrometeorological and Tracer Data Archive Procedures," (Order No. PB 85-235 216/AS; Cost: \$10.00, subject to change).

"The Minnesota 1973 Atmospheric Boundary Layer Experiment: Micrometeorological and Tracer Data Archive Set 001 Documentation Report," (Order No. PB 85-243 152/AS; Cost: \$9.95, subject to change).

"The Hanford 1964 Atmospheric Boundary Experiment: Micrometeorological and Tracer Data Archive Set 002 Documentation Report," (Order No. PB 85-243 145/AS; Cost: \$9.95, subject to change).

The above reports will be available only from:

*National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Telephone: 703-487-4650*

The EPA Project Officer can be contacted at:

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