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RESULTS FROM THE SAVANNAH RIVER LABORATORY MODEL VALIDATION WORKSHOP, NOVEMBER 19-21, 1980.

by

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1. INTRODUCTION

In the last 25 years, numerous models have been developed to address the country's problems on air pollution; most have accuracies within an order of magnitude under ideal conditions. However, the accuracy of a model becomes very important when used to establish particular emission requirements. The Department of Energy, the American Meteorology Society, and the Air Pollution Control Association have all recently emphasized the need for model verification and testing against real data (Proceedings, 1978; AMS, 1978; J. Air Poll. Cont. Assoc., 1979).

To evaluate existing and newly developed models used in DOE-funded laboratories, the Savannah River Laboratory (SRL) approached DOE to sponsor a model validation workshop. The workshop was to use the Kr-85 measurements and meteorology data obtained at SRL during 1975-1977 (Telegadas, et al., 1980). Nine DOE laboratories agreed to participate in the exercise, with the work culminating in a workshop on November 19-21, 1980 at Hilton Head Island, SC. The following DOE laboratories participated:

Brookhaven National Laboratory (BNL)
Argonne National Laboratory (ANL)
Atmospheric Turbulence & Diffusion Laboratory (ATDL)
Battelle-Pacific Northwest Laboratory (PNL)
Los Alamos Scientific Laboratory (LASL)
Lawrence Livermore National Laboratory (LLNL)
Air Resources Laboratory (ARL)
Savannah River Laboratory (SRL)
Oak Ridge National Laboratory (ORNL)

These representatives also attended the workshop:

Nuclear Regulatory Commission (NRC)
Environmental Protection Agency (EPA)
Electrical Power Research Institute (EPRI)
Air Pollution Control Association (APCA)
Atomic Industrial Forum (AIF)
AMS Committee on Turbulence & Diffusion

2. MODEL VALIDATION WORKSHOP DATA BASE

Meteorological data from 1975 through 1977 consisted of rawinsonde observations at 4 sites surrounding the Savannah River Plant (SRP); hourly surface observations at approximately 60 sites surrounding SRP; and hourly tower data from 6 power plant sites, the WJBF-TV tower (3 levels), and a wind average from the 62-m towers on the SRP site.

Kr-85 source emission from SRP for the 2-1/2 year period and Kr-85 air concentrations measured at the 13 sample sites were also compiled. A description of the complete data base is given by Telegadas, et al. (1980). The entire data set is available from the National Climate Center in Asheville, NC.

3. METHOD OF CONDUCTING THE TESTS

SRL distributed tapes of the source term and meteorological data to invited participants prior to the workshop. Tapes of calculated concentrations were returned to SRL for statistical comparison with the observations. The actual measurements were not released to the participants, in order to decrease empirical adjusting and restructuring to more closely fit the site specific data. Each individual laboratory was responsible for debugging and maintaining its own computer codes.

In order to standardize the model results from each of the laboratories, a grid on which to report calculated results and preferred time periods were specified. The grid chosen was a 33 by 33 mesh with a 5 km spacing between grid points. Results were reported on a gridded basis and at sample locations to allow effects of errors in wind speed and direction to be estimated. The grid covered an area containing eight of the thirteen sampler locations located northeast of the release point (Figure 1). The eight sampler locations had a higher frequency of detecting significant levels of Kr-85 than the remaining 5 sampler locations.

Individual laboratories used models to calculate daily, weekly, monthly, or annual test periods. For each model, a time period was chosen depending on 1) the number of daily and weekly samples, 2) the availability of average wind speed and direction from data for the SRP 7-tower network, 3) the amount of Kr-85 released during the specific test period, and 4) the quantity of Kr-85 collected in the samples. The laboratories, models used, and time periods analyzed are shown in Table I.

Cumulative integrated air concentrations were reported at each grid point and each of the

eight sampler locations falling within the grid for the weekly and 10 hourly samples. Values of cumulative integrated air concentration at all the thirteen sampler locations were reported for monthly, seasonal and annual average calculations.

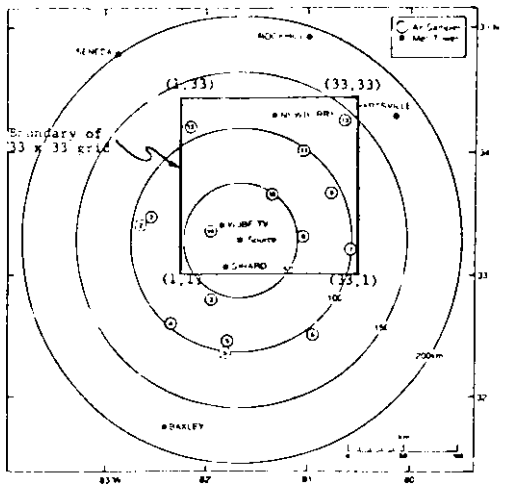
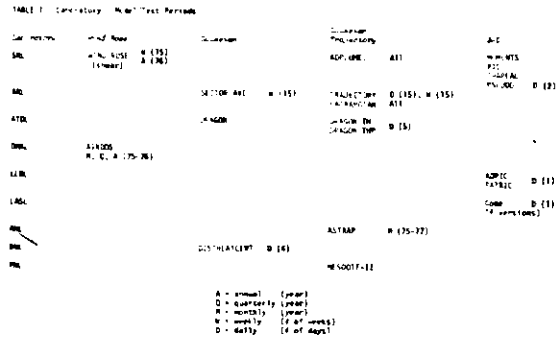


Figure 1. Krypton-85 cryogenic air sampling stations and meteorological towers. Dashed circles indicate earlier sampling location.



4. STATISTICAL ANALYSIS

Statistical analysis of the model results were undertaken by SRL after receiving the model prediction from each of the participants. A computer code developed by Bencala and Seinfeld (1979) was obtained by SRL, but proved to be difficult to use because of the wide variety of results and input/output requirements from the participants. A number of the suggested statistical tests in the computer code were used to generate a general statistical analysis program for use on the SAS*-IBM 360/195 systems at SRL.

5. RESULTS

Due to the requirements that the extended abstracts be submitted prior to the November 19 workshop date, results of the workshop will be discussed at the meeting in March 1981. A formal publication will be released in ~~early~~ 1981.

6. REFERENCES

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