TITLE: DEVELOPMENT OF A GLOBAL MODEL FOR ATMOSPHERIC BACKSCATTER AT CO_2 WAVELENGTHS

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SIGNIFICANT ACCOMPLISHMENTS TO DATE IN FY 1984:

Work has commenced on three of the tasks included in the present study. These tasks are:

1. The investigation of the effect of aerosol microphysical processes on the back-scatter from an aerosol plume undergoing long-range atmospheric transport. A numerical model which examines the effects of coagulation and sedimentation on an aerosol size distribution is presently under development and the initial results for a single homogeneous layer have been obtained.

2. Use of the SAGE/SAM II data set to study the global variation of aerosol concentration and, hence, to predict the variation of β_{CO_2}. Computer programs have been written to determine the mean, median, and the probability distribution of the measured aerosol extinction as a function of altitude, latitude and geographical conditions. The first data sets analyzed in this way are presently under study.

3. Use of the GAMETAG data to study aerosol behavior over the U.S.A. and the Pacific Ocean. Further analysis of the GAMETAG data set, previously reported by Patterson et al., in 1980, has recently commenced.

FOCUS OF CURRENT RESEARCH ACTIVITIES:

The tasks described above will be completed. In addition, the available CO_2 lidar data set will be critically examined and a detailed intercomparison of the three data sets will be made with each other and with the results of the theoretical modeling. In this intercomparison an improved version of the aerosol models, published by Kent et al., in 198 will be employed.

PLANS FOR FY 1985

To continue work on the modeling of aerosol back scatter. The emphasis of this work will be on the intercomparison of direct back scatter measurements at CO_2 wavelengths with predictions based on modeling and with measurements made at other wavelengths and by other techniques. The aim will be to identify weaknesses in the global models being presently developed and, hence, to identify those geographical areas and conditions where further direct measurement is needed and to assist in the development of suitable experimental programs.

RECOMMENDATIONS FOR NEW RESEARCH:

Simultaneous measurements of CO_2 lidar back scatter and other direct and indirect measurements of aerosol optical and mechanical properties (e.g., SAGE II). Close and detailed integration of these measurements and modeling. Measurements at CO_2 wavelengths other than 10.6 μm (e.g., in the 9.1 - 9.3 μm range) under different geographical and seasonal conditions. Theoretical and experimental investigation of non-aerosol scattering and extinction at CO_2 laser wavelengths, for example, that are due to sub-visible cirrus cloud.

PUBLICATIONS SINCE JUNE 1983:

None yet in this subject area.