

FINAL REPORT

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GRANT NUMBER: NAG1-553

INSTITUTION: University of Wisconsin-Madison

TITLE: Satellite Studies of Cirrus Clouds for Project Fire

GENERAL GOALS:

Examine global cloud climatologies for evidence of human caused changes in cloud cover and their effect on the Earth's heat budget through radiative processes.

Quantify climatological changes in global cloud cover and estimate their effect on the Earth's heat budget.

Improve our knowledge of global cloud cover and its changes through the merging of several satellite data sets.

WORKING OBJECTIVES and APPROACH:

Calculate the time trends in clouds from four long term satellite data sets: the Wisconsin NOAA HIRS cloud climatology (7.5 years and continuing), the Wisconsin GOES VAS climatology (6 years), the Stratospheric Aerosol and Gas Experiment (SAGE, 6.5 years), and the International Satellite Cloud Climatology Project (ISCCP, 13.5 years and continuing).

Evaluate regional differences in the time trends of clouds for evidence of human caused changes.

Quantify the effects of cloud cover changes on the Earth's heat budget through radiative modeling using the radiative characteristics of the clouds found in these data sets.

Provide data and cloud forecasts for the research aircraft flights in the FIRE experiments.

TASKS COMPLETED:

Quantitatively inter-compared three major satellite cloud data sets: ISCCP-HIRS (Jin, Rossow and Wylie, J. of Climate), and HIRS-SAGE (Wylie and Wang, JGR).

Provided detailed data on cloud trends to Drs. Steffan Kinne (NASA AMES) and Pat Minnis (NASA Langley) for further radiative calculations.

Provided weather forecasts and satellite data for the following data collection programs:

FIRE-II Cirrus in Coffeyville, KS, November 1991.

FIRE Marine Stratus in Azores, Portugal, June-July 1992.

TOGA-COARE in the Western Pacific in December 1992 through February 1993.

SUCCESS in Salina, KS in April 1996.

Dr. Wylie aided these programs by providing current weather data and weather forecasting support. Weather satellite data also were archive for these programs and delivered to the Langley DAAC.

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PAPERS PUBLISHED:

- Wylie, D. P., and W. P. Menzel, 1989: Two years of cloud cover statistics using VAS., *J. Climate.*, **2**, 380-392.
- Starr, D. O. C., and D. P. Wylie, 1990: The 27-28 October 1986 FIRE cirrus case study: Meteorology and clouds., *Mon. Wea. Rev.*, **118**, 2259-2287.
- Menzel, W. P., D. P. Wylie, and K. I. Strabala, 1992: Seasonal and diurnal changes in cirrus clouds as seen in four years of observations with the VAS., *J. Appl. Meteor.*, **31**, 370-385.
- Wylie, D. P., W. P. Menzel, H. M. Woolf, and K. I. Strabala, 1994: Four years of global cloud statistics using HIRS., *J. of Climate*, **7**, 1972-1986.
- Wylie, D. P., P. Piironen, W. Wolf, and E. Eloranta, 1995: Understanding satellite cirrus cloud climatologies with calibrated lidar optical depths., *J. Atm. Sci.*, **52**, 4328-4343.
- Jin, Y., W. B. Rossow, and D. P. Wylie, 1996: Comparison of the climatologies of high-level clouds from HIRS and ISCCP., *J. of Climate.*, **9**, 2850-2979.
- Menzel, W. P., D. P. Wylie, and K. I. Strabala, 1996: Seven years of global cirrus cloud statistics using HIRS., International Radiation Symposium, Fairbanks, AK.
- Wylie, D. P., and P. H. Wang, 1997: Comparison of cloud frequency data from the High-resolution Infrared Radiometer Sounder and the Stratospheric Aerosol and Gas Experiment., *J. Geoph. Res.*, **102,D25**, 29,893-29,900.