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13. ABSTRACT *(Maximum 200 words)*

Piotr Flatau has nearly completed a new comprehensive two-stream radiative transfer (RT) code which includes cloud water and ice scattering properties. The code is interfaced to the RAMS bulk cloud microphysics module. Several algorithmic improvements have been made to all three major components of the RT package: molecular gases, single scattering properties of clouds, and radiative transfer solver. Reduction and elimination algorithms for the RT solver have been developed. The code has been efficiently written to take advantage of vectorization and parallelization issues. New interfaces to LOWTRAN7 and MODTRAN are also provided. Single scattering properties are included using the anomalous diffraction theory (ADT). A number of members of our research group participated in the FIRE II Cirrus field experiment in Coffeyville, Kansas (November 12-December 12). This was an extremely successful mission. RAMS was used in a forecasting mode, ans data were gathered for future cases studies including data specially tailored for mesoscale modeling during the Intensive Observing Period. We gathered MAPS and NGM data for all the days of the project, collected satellite pictures, and relevant meteorological information. Piotr Flatau and Graeme Stephens also served as mission planning scientists for the NCAR Saberliner aircraft.

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Introduction

This represents a Research Progress and Forecast Report on our AFOSR contract #AFOSR-91-0269 for June 1991 to December 1991.

Research completed

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Forecast Report and planned research

We are now in the process of acquiring data for case study simulations to develop and test the ability of RAMS to forecast clouds.

The November 25 and 26 and December 5 and 6 FIRE II cases have been selected as candidates for refining and testing RAMS ability to forecast cirrus clouds. Moreover, on several days, including 25 November, both cirrus clouds and low-level stratus clouds were observed. This will offer the opportunity to test RAMS ability to predict both cloud forms. Both Piotr Flatau and Jerry Harrington, a new M.S. student will be concentrating on cirrus cloud prediction.

For stratus cloud prediction we are selecting cases from the FIRE I stratus experiment in July 1987 off of the California coast. Dave Mocko, a new M.S. student is concentrating on the stratus cases.

For deep convective cloud prediction we are concentrating on the 1991 CAPE cases over Florida. We plan to coordinate with Kevin Knupp, University of Alabama-Huntsville in the analysis of those cases. Ben Edwards, an AFIT M.S. student will concentrate on cumulus cloud forecasting.

We plan to finish up the radiative transfer parameterization and test and evaluate it in some of the FIRE cirrus cases.

Submitted publications

Work on mesoscale RT has been submitted (Flatau et al., 1992).
The simulation of the 28 October FIRE I cirrus case is nearly ready for submission (Air Force approval for publication via AFOSR is now being sought).
The technical report and related publication has been completed (Flatau et al., 1991).

References

Flatau, P. J., W. R. Cotton, and G. L. Stephens, 1992: Clouds and two-stream radiative transfer approximation — algorithms, codes, and error analysis. Paper submitted for presentation at the 11th international conference on clouds and precipitation. Montreal, Canada.

Flatau, P. J., R. L. Walko, and W. R. Cotton, 1991: Polynomial fits to saturation vapor pressure. Paper submitted to Journal of Applied Meteorology.