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ARM Progress Report FY 1995

Continuation Of Data-Analysis-Software Development For The Atmospheric Emitted Radiance Interferometer (AERI)

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OBJECTIVE: To improve the modeling of radiative transfer for the molecular atmosphere, the retrieval of temperature and moisture profiles of the planetary boundary layer, and the development of cloud-radiance parameterizations that relate climate-model variables to effective cloud radiative properties.

APPROACH: long-term quality-measurement experiment will continue to provide valuable insight into the size and character of uncertainties in clear-air radiative-transfer models. An improved planetary-boundary-layer-profiling algorithm will be implemented that combines data from a variety of sensors, including the atmospheric emitted radiance interferometer (AERI). Forward models including cloud radiative effects will be developed to allow the retrieval of cloud optical properties (e.g., effective emissivity) and to explore the information contained within the infrared spectra concerning cloud microphysical properties.

RESULTS TO DATE: A long time series (January 1994 to December 1995) has been compiled of comparisons of AERI observations and calculations of the LBLRTM radiative- transfer model. These results are currently under study to distinguish among the radiative contributions of water vapor, aerosols, and clouds. The time period of comparison will continue to be extended into the future while incorporating expected improvements in the characterization of the atmospheric state parameters.

Important improvements in the accuracy and stability of the algorithm for the retrieval of boundary-layer temperature and moisture profiles from AERI infrared spectra has been achieved through the use of (1) a regression first guess based upon a climatology of balloon soundings, (2) cloud-base-height information from cloud lidar data, and (3) coincident microwave radiometer precipitable water data.

Cloud radiative properties have been studied with a combination of AERI data and cloud- base-height information from a cloud lidar. Forward radiative models containing cloud-radiation information are under development for use in the analysis of both thermal-emission and solar- scattered radiance between 3 and 20 microns.

DELIVERABLES: Annual progress report; reprints of publications

COLLABORATIONS: S. A. Clough, AER, Inc.

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