ARM Progress Report FY 1998

Continuation of Data Analysis Software Development for the Atmospheric Emitted Radiance Interferometer (AERI)

Knuteson, Robert O.
University of Wisconsin
University of wisconsin
1225 W. Dayton Street
Madison, WI 53706

FY 1998 $165K
FY 1997 $155K
FY 1996 $152K
FY 1995 $190K

DOE Program Manager: Patrick A. Crowley

KEYWORDS: radiative transfer, temperature profiles, moisture profiles

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

APPROACH: A long-term quality-measurement experiment continues to provide valuable insight into the size and character of uncertainties in clear-air radiative-transfer models. An improved planetary boundary layer retrieval algorithm has been implemented that combines data from a variety of sensors to best characterize the atmospheric state in the first 3 km of the Earth's atmosphere in both clear and cloudy conditions. Algorithms are being developed to obtain microphysical cloud properties from the infrared spectra.

RESULTS TO DATE: Algorithms for providing temperature and moisture profile retrievals from AERI, micropulse lidar, and microwave total precipitable water data have been transferred to PNL. Software has been implemented at PNL for the routine production and archiving of planetary boundary layer thermodynamic structure data from the SGP CART site. The retrievals possess good accuracy within the PBL; temperature and dewpoint temperature agreement with radiosondes is consistently better than 1 and 3 degrees K, respectively. Comparisons of daily vertical-time cross-sections with cross-sections of raman-lidar water-vapor profiles show that the 10-min-interval AERI retrievals provide an important enhancement of the PBL water-vapor structure that is ill-defined by 3-h-interval radiosonde measurements conducted during ARM IOPs. The retrievals obtained for several IOPs have proved to be useful for defining important dynamic mesoscale meteorological features, including frontal structures, dryline characteristics, and diurnal variations in PBL structure. An improved version of the software to provide accurate profiles under low-cloud conditions is now under test at the University of Wisconsin and is planned to be transferred to the PNL as soon as the validation is completed.

DELIVERABLES:

COLLABORATIONS:

OTHER: