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ARM Facilities Newsletter

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ARM Water Vapor IOP

The SGP CART site will host the third ARM water vapor IOP on September 18-October 8, 2000.

The CART site is home to a powerful array of instruments capable of measuring water vapor, making it a prime location for research of this type.

The first water vapor IOP, conducted in September 1996, focused on using instruments to measure water vapor and determining the accuracy and calibration of each instrument. The second water vapor IOP, held in September and October of 1997, pursued absolute calibration of the water vapor instrumentation. Proper calibration of instruments is necessary for correct, accurate measurements. During the 1997 IOP, the Raman lidar (an instrument that employs a laser to measure water vapor in a column directly overhead) proved its potential by providing high-quality values of water vapor in

the atmosphere. The Raman lidar is now the standard for water vapor measurements. Another benefit of this instrument is that it can collect data continuously, unlike radiosondes and aircraft.

The third water vapor IOP will focus on the lower portions of the atmosphere. Again, scientists will work to achieve absolute calibrations of water vapor instrumentation. For this purpose, several instruments will be deployed, and measurements will be compared. Instruments to be used include radiosondes, Raman lidar, chilled-mirror hygrometers, surface meteorological observation station (SMOS) towers, a variety of microwave radiometers, and global positioning systems (GPS).

The current experiment has two goals. The first is to characterize the accuracy of the water vapor measurements, especially the daily operational observations being made around the clock in the lower levels of the atmosphere at the CART site.

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The second goal is to develop techniques for improving the accuracy of these observations in order to obtain the best possible water vapor measurements under a wide range of atmospheric conditions.

If a computer model is to mimic Earth's complicated atmosphere successfully, the model must contain correct variables and parameters as the basis for its calculations. Results from this year's water vapor IOP will be used to improve radiative transfer models through incorporation of water vapor algorithms. The ultimate benefit will be more realistic and accurate model output. Advances will also be made toward more accurate measurement of water vapor near Earth's surface from satellites in orbits high above. At present, the most accurate input comes from surface-based instruments. Results from the 2000 water vapor IOP will improve our ability to incorporate cloud, water vapor, and aerosol parameters into a climate model and determine the effects of water vapor on climate and global warming accurately.

On the Internet

To find out more about ARM radiometric instruments:

<http://www.arm.gov/docs/instruments.html#Radiometric>

For information about water vapor in the atmosphere:

http://www.agu.org/sci_soc/mockler.html