

AN AUTOMATIC DOPPLER SPECTRUM CLASSIFIER FOR THE MMCRS

E. Luke, P. Kollias, E. Clothiaux, K. Johnson, M. Miller, K. Widener,
M. Jensen, and A. Vogelmann

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**Environmental Sciences Department/Atmospheric Sciences Division
Brookhaven National Laboratory
P.O. Box, Upton, NY
www.bnl.gov**

ABSTRACT

The ARM MMCR receivers at the SGP, NSA and TWP/Darwin sites have been upgraded with the new processor, and the upgrade at the other TWP ARM sites will be completed by mid 2006. The new processors offer higher temporal resolution, 256-point FFTs, and high data rate transfers that allow for storage of full Doppler spectra over all times at each range gate. The recorded Doppler spectra contain important cloud microphysical and turbulence information, particularly when the spectra exhibit strong non-Gaussian features, such as multi-modalities or skewness. We present a Doppler spectrum classifier that has utility both as a real-time quality control filter and as a flexible cloud property search agent for locating infrequently occurring conditions in voluminous Doppler datasets. The technique hinges on a neural network-based algorithm that extracts information from the morphology of primary Doppler spectrum peaks (gradient, curvature, and integral parameters). In one successful application of the method, we generate an insect/cloud mask for the MMCR boundary layer mode to identify spectral signatures of insects and classify radar returns as cloud or insect returns. The insect/cloud mask has been extensively tested on a large dataset from the ARM SGP site during the summer months, and exhibits great agreement when compared with cloud base detections from the ceilometer and MMCR polarimetric mode measurements available at the SGP.