The Joint Polarization Experiment: An Operational Test of Weather Radar Polarimetry

by Terry J. Schuur

The accurate estimation of precipitation type and accumulation has been a long-standing problem for operational meteorologists and hydrologists. When the estimates are obtained by weather radar, inaccuracies can result from radar miscalibration, attenuation of the signal in heavy precipitation, and the presence of non-meteorological scatterers such as ground returns, birds, and insects. Natural variations in the size, shape, and ice density of cloud and precipitation particles can also result in estimation uncertainties. Fortunately, many of these problems may be at least partially mitigated through the use of radar polarimetry.

As part of the evolution and future enhancement of the WSR-88D, the National Severe Storms Laboratory recently upgraded the KOUN WSR-88D radar to include polarimetric capabilities. Plans are now being made to conduct the Joint Polarization Experiment (JPOLE, scheduled to begin in the Spring of 2002). The overarching goals of JPOLE are to test the engineering design and data quality of the polarimetric KOUN WSR-88D radar, demonstrate the utility and feasibility of the radar to operational users, and collect data and information for a cost/benefit analysis. Of course, another long-term goal is to transfer polarimetric radar technology to an operational setting. Therefore, real-time data collection during JPOLE will be conducted in collaboration with operational hydrologists, meteorologists, and aviation users, whose insight will be of vital importance to the evaluation of WSR-88D radar products.

Engineering Design and Data Quality

Unlike most research polarimetric radars, the polarimetric KOUN WSR-88D radar employs a simultaneous horizontal/vertical transmission scheme. While simultaneous transmission is expected to have practical advantages over the more common alternate horizontal/vertical transmission scheme, it remains largely untested. JPOLE will therefore provide an opportunity to evaluate critical engineering and data quality issues. For example, radar data quality must be assessed through a detailed comparison with verification data sets, the radar scanning strategy evaluated to assess compatibility with requirements of the existing WSR-88D radar system, and the simultaneous transmission mode examined to calibrate polarimetric radar measurements, establish and verify engineering specifications, and investigate short and long term stability.

Benefits to Operational Users

The operational benefits of polarimetric radar data will be examined by conducting an evaluation of polarimetric rainfall rate and hydrometeor classification product performance. Much of this evaluation will completed in real-time in collaboration with meteorologists from the National Weather Service Forecast Office in Norman, OK and hydrologists from the Arkansas Basin River Forecast Center in Tulsa, OK. During JPOLE, polarimetric KOUN WSR-88D radar data and products will be delivered to operational users by the NSSL Warning Decision Support System – Integrated Information (WDSS-II) software package. During the spring and summer of 2002, the hydrometeor classification algorithm will provide detailed information on rain rate intensity, the occurrence of severe hail, location of anomalous propagation, and presence of biological (birds and insects) scatterers. Winter precipitation products will be introduced in the Fall of 2002.

Given the long-term prospect of a future network of polarimetric WSR-88D radars, JPOLE has the potential to have a far-reaching impact for operational meteorologists, hydrologists, and aviation users at a national scale. More information on JPOLE can be found at www.nssl.noaa.gov/JPOLE.

Photo by Dusan Zrnic

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