

## **ITR-(ASE+EVS)-(dmc+sim): A Comprehensive Framework for Use of NEXRAD Data in Hydrometeorology and Hydrology**

The objective of this project is to provide the broad science and engineering communities with ready access to the vast archives and real-time information collected by the national network of weather radars known as NEXRAD. The main focus is on radar-rainfall data for use in hydrology, hydrometeorology, and water resources. Currently, the NEXRAD data, which are archived at NOAA's National Climatic Data Center (NCDC), are converted to operational products and used by forecasters in real time. The scientific use of the full resolution NEXRAD information is presently limited because current methods of accessing this data require considerable expertise in weather radar observing process, data quality control, formatting and handling, and radar-rainfall algorithms.

This effort will incorporate the collective experience of the hydrometeorology groups at The University of Iowa and Princeton University as well as the scientific data and service providers of Unidata of the University Corporation for Atmospheric Research and the NCDC. Following a comprehensive framework of information science, the team will develop a set of tools for access, visualization, management, rainfall estimation algorithms, and scientific analysis of full resolution NEXRAD data. The framework will address the issues of data dissemination, format conversions and compression, management of terabyte-sized datasets, rapid browsing and visualization, metadata selection and calculation, relational and XML databases, integration with geographic information systems, data queries and knowledge mining, and Web Services.

Our goal is to provide professionals in the scientific, engineering, education, and public policy sectors with on-demand NEXRAD data and custom products that are at high spatial and temporal resolutions. Furthermore, the data and custom products will be of a quality suitable for scientific discovery in hydrology and hydrometeorology and in data formats that are convenient to a wide spectrum of users. The data and the developed tools will be provided to the community via the services and the infrastructure of Unidata and the NCDC. The tools will perform instantaneous comprehensive quality control and radar-rainfall estimation using a variety of algorithms. The algorithms that the user can select will range from "quick look" to complex and computing-intensive and will include operational algorithms used by federal agencies as well as research grade experimental methods. Options available to the user will include user-specified spatial and temporal resolution, ancillary products such as storm advection velocity fields, estimation of uncertainty associated with rainfall maps, and mathematical synthesis of the products.

**Intellectual Merit.** The work addresses the National Priority Area (NPA) of Advanced Science and Engineering (ASE) as well as the Economic Prosperity and Vibrant Civil Society (EPVCS). This interdisciplinary effort will greatly increase the utilization of the national archives of radar data for new discoveries in water cycle studies, prediction of rainfall induced natural hazards, and methods of water resources management and planning.

**Broader Impact.** The project fulfills the NPA of ASE by providing hydrologists and water resources engineers, with access to formerly inaccessible NEXRAD data and the comprehensive tools for using this data in analyses, theory development, and modeling of hydrologic processes and systems. The new discoveries will improve predictability of flooding and land slides and will help mitigate these and other rainfall-induced natural hazards. The proposed work addresses the Information Technology needs as envisioned by the Consortium of Universities for the Advancement of Hydrologic Science, Inc. and its initiatives. Engineers will use the new information in the planning and design of civil infrastructure and the sustainable management of natural resources. Improved use of nation-wide radar-rainfall data addresses the NPA of EPVCS in the aforementioned ways as well as by improving transportation systems, trade, agriculture, and the understanding and effective management of natural and man-made environments.