



Unidata

Providing data, tools, and community leadership for enhanced Earth-system education and research

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HYDRO-NEXRAD is a prototype system that allows hydrologists to obtain user-specified rainfall data for their research. These data are based on observations collected by the national network of WSR-88D radars, known as NEXRAD. HYDRO-NEXRAD is developed by researchers from The University of Iowa, Princeton University, UCAR's Unidata Program Center, and the National Climatic Data Center, with funding from the National Science Foundation. A major objective of HYDRO-NEXRAD is shielding users from the complexities of transforming radar reflectivity measurements (Z) centered on radar locations, to rainfall (R) estimates in a basin-centric framework.

Users interact with HYDRO-NEXRAD through a web-based interface that has map-based components for spatial navigation, calendar- and time series plot components for temporal navigation and a menu-based component for selection of processing options. Through the interface, users browse the HYDRO-NEXRAD metadata and select data of interest. The HYDRO-NEXRAD backend then computes rainfall estimates that users can download and use in their research. HYDRO-NEXRAD archives and uses the NEXRAD Archive Level II data for rainfall estimates. This is the most basic (unprocessed) NEXRAD available to end users. HYDRO-NEXRAD ingests real-time data via a Unidata LDM feed, but can ingest ad hoc data transfers from NCDC's main archive as well. See image highlight top left.

Metadata is an important part of HYDRO-NEXRAD. Searching interesting cases based on metadata can save users a tremendous amount of time. For example, it is simple to compute the following descriptive statistic/metadata for the base scan in Archive Level II files: map the reflectivity values through a fixed reflectivity-rainfall (Z - R) relationship to rainfall. Then pick a rain/no rain threshold, and determine the area under the radar umbrella where the radar "indicated" rain at that time. One can do this for a number of rain thresholds. Once the resulting numbers are in a database, a user can quickly find volume scans that contain light, medium, or heavy rainfall without going through the very time-consuming process of reading a large number of files that contain no rain. Additionally, metadata can provide insight into the data. For example, simple time-series plots of spatial overages can show annual cycles and diurnal variations. Note that for descriptive statistic-type metadata to be useful, an accurate Z - R relationship or the rain/no-rain threshold is not crucial. See image below.



Time series display generated from meta-data derived from Level II NEXRAD Radar data

HYDRO-NEXRAD uses two types of metadata. The first is radar-based metadata. These metadata fields are computed on a per-radar basis and are specific to a particular radar. The second type of metadata used is basin-centric metadata. As was mentioned above, the goal of HYDRO-NEXRAD is to provide basin centric estimates. Multiple radars may cover a basin, so HYDRO-NEXRAD may have to merge such data. Further, the NEXRAD radar collects data in polar coordinates, and there are several possibilities to transform to a grid product on the ground. HYDRO-NEXRAD computes and maintains metadata for a large number of basins on rainfall data after these transformations.

Unidata plays several important roles in the HYDRO-NEXRAD project. First, Unidata maintains the LDM feed that is the primary source for the NEXRAD Level II data. Second, Unidata hosts the mapserver that is an integral part of the HYDRO-NEXRAD user interface and meta-data generation. Further, Unidata has established the experimental HYDRO feed. This feed is distributed via the IDD, and as the name suggests, is dedicated to hydrology users. At present the HYDRO-NEXRAD client is the only user. However, any IDD user with an LDM setup can subscribe to the feed. The HYDRO feed carries radar-based metadata for all the radars used by HYDRO-NEXRAD. The radar-based metadata are computed at Unidata and then pushed through the IDD. Internally, HYDRO-NEXRAD uses the NEXRAD data in a very space- and I/O efficient format. In addition to the metadata, Unidata performs this conversion and pushes the radar data through the IDD.

The project is now in a beta testing phase. Several users from the hydrologic community are accessing the system and providing feedback to developers. It is expected that HYDRO-NEXRAD will become available to all users early in 2008.

Regional Workshop in Oklahoma

The regional training workshop concept has long been a popular one at Unidata, and though they've been few and far between, we are happy to report that the University of Oklahoma stepped up to the plate and offered to host a Unidata Regional Workshop, September 10-12. The workshop will feature training in the use of Unidata's Integrated Data Viewer for the introductory and for the advanced user. Workshop registrants will have the opportunity to interact one on one with developers. And, in addition, an overview of the LEAD project will be presented that will include a session on using the IDV for visualization within the LEAD portal. [Details.](#)



2007 Training Workshop Sessions

You can see from the image that Unidata's Training Workshops are not entirely buckled-down, wrinkled-brow affairs. Teaching and learning rule the day of course, but interspersed with that are some lighter moments. Beginning with a first-ever netCDF Developers session July 20, proceeding through GEMPAK, LDM, THREDDS, and IDV sessions the workshop winds down on August 10 with the McIDAS session. There were 78 registered participants with guests from six countries other than the U.S. Thirty registrants were from the education community, 30 from government entities, twelve from research organizations, and one representative from "other."

