

Frequently Asked Questions Concerning Weather Surveillance Radar-1988 Doppler (WSR-88D) Level II Data Updated 3/8/10

What Are WSR-88D Level II Data?

Response: Level II data contain the reflectivity, radial velocity, and spectrum width data produced by the WSR-88D. They contain the data from all scans of the radar, at 256 data levels, and at the highest spatial resolution of the radar (1° x 1km for reflectivity, 1° x 0.25 km for radial velocity, and 1° x 0.25 km for spectrum width). At lower elevation angles (generally scans at 1.5° or lower), Super Resolution Data is produced. The difference is that Super Resolution has the following spatial resolution (0.5° x 0.25km for reflectivity, 0.5° x 0.25 km for radial velocity, and 0.5° x 0.25 km for spectrum width). In addition, Super Resolution data contains Doppler data out to a range of 300 km. Level II data is sometimes referred to as “base data.”

How Do Level II Data Differ From Level III Data?

Response: Level II data are the input to the Radar Product Generator (RPG) from the Radar Data Acquisition (RDA) system. The Level III data and other products are output of the RPG meteorological algorithms or displays of the data. The Level II data have 256 data levels while the distributed and archived Level III products have 16 or 256 data levels. The Level II data contain data from all scans while the Level III data displays data from the lowest four scans, at most, though the algorithms can consider data collected at all scans. Level II data is collected and redistributed from 139 sites while the Level III data is collected and redistributed from 155 sites.

How Are The Level II Data Prepared For Distribution?

Response: The Level II data sent to users differs from that used by the RPG in the following ways: (1) The data are compressed using BZIP2 software, (2) A header record containing metadata is added at the start of each volume scan, and (3) Unidata Local Data Manager software is used to route the data.

What Is The Path Of The Level II Data To The User?

Response: The schematic at the following URL outlines the Level II data flow:

http://www.roc.noaa.gov/WSR88D/PublicDocs/Level_II/FOC_LDM_Architecture_v5.pdf.

What is not depicted is the data flow from the four designated top-tier sites to connecting users.

In early 2010 the NWS began transitioning to a new Level II collection and distribution architecture (see http://www.roc.noaa.gov/WSR88D/PublicDocs/Level_II/NewArchCor.pdf).

The target date for completion of the transition is June 2010. In the new architecture, the regional aggregation points will be replaced by a central aggregation point (NWS Telecommunications Communications Gateway, staffed 24/7) with full redundancy at an off-site location (the WSR-88D Radar Operations Center). NOAANet communications will be used to send the data to the central aggregation point(s). This will result in an increased reliability of data flow.

Does The Level II Data Follow The Same Path To Users As The Product Data?

Response: No. The RPG is the last common link for the Level II data and the product data. The product data flows to the associated National Weather Service (NWS) Advanced Weather Interactive Processor System (AWIPS) and then to the Radar Product Central Collection Dissemination Service (RPCCDS) (<http://www.nws.noaa.gov/tg/rpccds.html>) central server in Silver Spring, MD via the AWIPS communications system. As shown in the previous question, the Level II data flows from the RPG to the regional headquarters via different paths.

Is It Possible That I Can Receive Level II In Real-Time But Not Level III And Vice Versa?

Response: Yes. Since the communication paths the Level II and Level III data take to reach users outside of the NEXRAD Program (described above), one path could be operational and the other one down. In addition, since the product data flows through the associated AWIPS and then to the RPCCDS, if the AWIPS is down (e.g., maintenance, loading software), the product data would not be available, but the Level II flow would not be interrupted.

What Is The Latency Of Real-Time Level II Data?

Response: The latency of Level II data traveling from radar sites to users connected to top-tier sites is usually less than 5s. The radars “bundle” 120 radials of data at a time for transmission, which can take 3 s to 30s, based on the scanning strategy of the radar. Thus, the data are generally available to users within ~35s of the time the data are collected by a radar.

What Is the Expected Reliability Of Delivery Of Real-Time Level II Data?

Response: The NWS goal is 95% of the time when the radars are operating. The radar availability goal is 96%. These are annual goals. While the network has consistently met these goals, a consideration for the new network architecture was to greatly increase the reliability of the network delivery of data (i.e., no regional or national outages).

Where Can I Learn the Status Of Real-Time Level II Data?

Response: The NWS has a web site which updates each minute and displays the status of Level II data flow for all 139 sites. The URL for this site is: <http://weather.noaa.gov/monitor/radar2/>.

Should I Contact Radar Sites If The Level II Data Is Not Flowing?

Response: Please do not contact sites. This can cause a disruption for the staff. The sites monitor their Level II data flow at least twice daily as does the NWS Telecommunications Gateway. Once the data flow outage is detected, corrective actions can be taken when the maintenance staff is available.

What Can Cause The Level II Data To Stop?

Response: There are several “single points of failure” in the Level II data stream. Fortunately the hardware/software/communication links are very reliable.

How Can I Determine If A Given Radar Is Operating If The Level II Data Flow Stops?

Response: There are two approaches. The NWS maintains a page, updated each minute, which depicts the status of the flow of product/Level III data to the NWS central server of radar

products: <http://weather.noaa.gov/monitor/radar/>. This assumes the AWIPS at the site and the communications link to the NWS central server are operating – the reliability of this link is very high. In addition, one can check the many sites on the Internet displaying WSR-88D imagery (e.g., <http://weather.noaa.gov/radar/national.html>) to see if the data from the site is current and updating.

How Can I Obtain Level II Data In Real-Time?

Response: Since there is no restriction on the use or redistribution of the data, there are many locations where you can receive Level II data, including private vendors. The NWS does not track where the data are flowing once they have reached the designated top tiers. The top tier sites and their point of contact are listed below:

- Education and Research Consortium of the Western Carolinas (ERC), Hunter Goosmann, 828-350-2415, hgoosmann@ercbroadband.org
- Purdue University, Professor Matthew Huber, 765-494-3258, huberm@purdue.edu
- University of Oklahoma, Craig Cochell, 405-325-8689, craigc@ou.edu

How Can I Obtain Archive Level II Data?

Response: The data are archived at the National Climatic Data Center (NCDC). Check the following web site for the inventory of data and for requesting the data via FTP: <http://hurricane.ncdc.noaa.gov/pls/plhas/has.dsselect>.

How Do I Learn How To Read Or Display Level II Data?

Response: The following resources are available to Level II users:

1. The NEXRAD Radar Operations Center provides technical documentation, called an interface control document (ICD), for Level II data. This ICD can be obtained at: http://www.roc.noaa.gov/ssb/cm/icd_downloads.asp. Request “2620010D ICD for Archive II/User” and “2620002G – ICD for RDA/RPG”.
2. The NWS provides the Radar Product Generator software and some display software at: ftp://ftp.nws.noaa.gov/software/88D_CODE/. This software, which runs on a Linux platform, is provided without warranty or follow on support.
3. The National Climatic Data Center (NCDC) provides software that uses Level II data without warranty or follow on support at: <http://www.ncdc.noaa.gov/oa/radar/radardata.html>.

Can I Ask A Radar Site To Change Their Mode Of Operation?

Response: No. The sites operate the radars to meet the primary mission needs of the NEXRAD agencies and will not change the operating strategy based on external requests.

What Are The Scan Strategies Of The WSR-88D?

Response: During operations, the antenna is controlled by automatic scanning programs. Volume coverage patterns (VCPs) are matched to an operational mode to optimize product generation for given meteorological situations. Please see FMH-11, Part A, Table 4-1, Volume Coverage Pattern Descriptions, available at: <http://www.ofcm.gov/fmh11/fmh11.htm> for details.

Are There Additional References To Better Understand Level II Data And The WSR-88D?

Response: The following references are available which may help:

1. Federal Meteorological Handbook No. 11 (FMH-11), Part A, System Concepts, Responsibilities, and Procedures. Available at:
<http://www.ofcm.noaa.gov/fmh11/fmh11.htm>.
2. Crum, T.D., and R.L. Alberty, 1993: The WSR-88D and the WSR-88D operational support facility. *Bull. Amer. Meteor. Soc.*, **74**, 1669-1687.
3. Crum, T.D., R.L. Alberty, and D.W. Burgess, 1993: Recording, archiving, and using WSR-88D data. *Bull. Amer. Meteor. Soc.*, **74**, 645-653
4. Crum, T.D., R.E. Saffle, and J.W. Wilson, 1998: An update on the NEXRAD program and the future WSR-88D support to operations. *Weather and Forecasting*, 13, 253-262
5. Crum, T. D., S. Smith, J. Casamento, W. Blanchard, P. Cragg, T. Sandman and M. Istok, 2007: An Update on the NWS WSR-88D Level II Data Collection and Distribution Network and Plans for Changes. Preprints, *22nd Int. Conf. on Interactive Information Processing Systems (IIPS) for Meteorology, Oceanography, and Hydrology*, San Antonio, TX, Amer. Meteor. Soc., Paper 5.B.2.
6. Crum, T. D., C. Horvat, D. Horvat, C. Calvert, M. Istok, S. DelGreco, S. Ansari, and A. Hall, 2010: NWS WSR-88D and TDWR-SPG Data Collection and Distribution Network Status and Plans. Preprints, *25th Int. Conf. on Interactive Information Processing Systems (IIPS) for Meteorology, Oceanography, and Hydrology*, Atlanta, GA, Amer. Meteor. Soc., Paper 9.4.

How Can I Request Additional Information About Level II Data?

Response: If you have specific questions or comments in regard to this project, please contact the Radar Operations Center webmaster at: <http://www.roc.noaa.gov/WSR88D/Comments.aspx>.