Global Hydrology Resource Center

Data User Guide

NEXRAD IMPACTS datasets

Introduction

The NEXRAD IMPACTS datasets consist of Next Generation Weather Radar (NEXRAD) Level II surveillance data that were collected at 31 NEXRAD sites from January 1 to March 1, 2020 during the Investigation of Microphysics and Precipitation for Atlantic Coast-Threatening Snowstorms (IMPACTS) field campaign. IMPACTS was a three-year sequence of winter season deployments conducted to study snowstorms over the U.S Atlantic Coast. The campaign aimed to (1) Provide observations critical to understanding the mechanisms of snowband formation, organization, and evolution; (2) Examine how the microphysical characteristics and likely growth mechanisms of snow particles vary across snowbands; and (3) Improve snowfall remote sensing interpretation and modeling to significantly advance prediction capabilities. There are currently 160 Weather Surveillance Radar-1988 Doppler (WSR-88D) or NEXRAD sites throughout the United States and abroad. These Level II datasets contain meteorological and dual-polarization base data quantities including: radar reflectivity, radial velocity, spectrum width, differential reflectivity, differential phase, and cross correlation ratio. The IMPACTS NEXRAD Level II data files are available in netCDF-4 format. It should be noted that this dataset will be updated in subsequent years of the IMPACTS campaign.

Notice: The long range max range is 460km and the short range max range is 230km. But while the long-range config theoretically has a max range of 460km, once the beams get out that far, they are high above the Earth's surface so will only be able to detect the most intense storms and systems at the longer ranges.

Citations

The following citations include all 31 NEXRAD IMPACTS datasets:

KAKQ NEXRAD IMPACTS

Brodzik, Stacy. 2020. KAKQ NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA101

KBGM NEXRAD IMPACTS

Brodzik, Stacy. 2020. KBGM NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA102

KBOX NEXRAD IMPACTS

Brodzik, Stacy. 2020. KBOX NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA103

KBUF NEXRAD IMPACTS

Brodzik, Stacy. 2020. KBUF NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA104

KCCX NEXRAD IMPACTS

Brodzik, Stacy. 2020. KCCX NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA105

KCLE NEXRAD IMPACTS

Brodzik, Stacy. 2020. KCLE NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA106

KCXX NEXRAD IMPACTS

Brodzik, Stacy. 2020. KCXX NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA107

KDIX NEXRAD IMPACTS

Brodzik, Stacy. 2020. KDIX NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA108

KDOX NEXRAD IMPACTS

Brodzik, Stacy. 2020. KDOX NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA109

KDTX NEXRAD IMPACTS

Brodzik, Stacy. 2020. KDTX NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA110

KDVN NEXRAD IMPACTS

Brodzik, Stacy. 2020. KDVN NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA111

KENX NEXRAD IMPACTS

Brodzik, Stacy. 2020. KENX NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA112

KFCX NEXRAD IMPACTS

Brodzik, Stacy. 2020. KFCX NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA113

KGRB NEXRAD IMPACTS

Brodzik, Stacy. 2020. KGRB NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA114

KGRR NEXRAD IMPACTS

Brodzik, Stacy. 2020. KGRR NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA115

KGYX NEXRAD IMPACTS

Brodzik, Stacy. 2020. KGYX NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA116

KILN NEXRAD IMPACTS

Brodzik, Stacy. 2020. KILN NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA117

KILX NEXRAD IMPACTS

Brodzik, Stacy. 2020. KILX NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA118

KIND NEXRAD IMPACTS

Brodzik, Stacy. 2020. KIND NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA119

KIWX NEXRAD IMPACTS

Brodzik, Stacy. 2020. KIWX NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA120

KJKL NEXRAD IMPACTS

Brodzik, Stacy. 2020. KJKL NEXRAD IMPACTS[indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA121

KLOT NEXRAD IMPACTS

Brodzik, Stacy. 2020. KLOT NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA122

KLWX NEXRAD IMPACTS

Brodzik, Stacy. 2020. KLWX NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA123

KMHX NEXRAD IMPACTS

Brodzik, Stacy. 2020. KMHX NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA124

KMKX NEXRAD IMPACTS

Brodzik, Stacy. 2020. KMKX NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA125

KOKX NEXRAD IMPACTS

Brodzik, Stacy. 2020. KOKX NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA126

KPBZ NEXRAD IMPACTS

Brodzik, Stacy. 2020. KPBZ NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA127

KRAX NEXRAD IMPACTS

Brodzik, Stacy. 2020. KRAX NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA128

KRLX NEXRAD IMPACTS

Brodzik, Stacy. 2020. KRLX NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA129

KTYX NEXRAD IMPACTS

Brodzik, Stacy. 2020. KTYX NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA130

KVWX NEXRAD IMPACTS

Brodzik, Stacy. 2020. KVWX NEXRAD IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/NEXRAD/DATA131

Keywords:

NASA, GHRC, IMPACTS, NOAA, NWS, NEXRAD, KAKQ, KBGM, KBOX, KBUF, KCCX, KCLE, KCXX, KDIX, KDOX, KDTX, KDVN, KENX, KFCX, KGRB, KGRR, KGYX, KILN, KILX, KIND, KIWX, KJKL, KLOT, KLWX, KMHX, KMKX, KOKX, KPBZ, KRAX, KRLX, KTYX, KVWX, NCAR

Campaign

The Investigation of Microphysics and Precipitation for Atlantic Coast-Threatening Snowstorms (IMPACTS), funded by NASA's Earth Venture program, is the first comprehensive study of East Coast snowstorms in 30 years. IMPACTS will fly a complementary suite of remote sensing and in-situ instruments for three 6-week deployments (2020-2022) on NASA's ER-2 high-altitude aircraft and P-3 cloud-sampling aircraft. The first deployment began on January 17, 2020 and ended on March 1, 2020. IMPACTS samples U.S. East Coast winter storms using advanced radar, LiDAR, and microwave radiometer remote sensing instruments on the ER-2 and state-of-the-art microphysics probes and dropsonde capabilities on the P-3, augmented by ground-based radar and rawinsonde data, multiple NASA and NOAA satellites (including GPM, GOES-16, and other polar orbiting satellite systems), and computer simulations. IMPACTS addressed three specific objectives: (1) Provide observations critical to understanding the mechanisms of snowband formation, organization, and evolution; (2) Examine how the microphysical characteristics and likely growth mechanisms of snow particles vary across snowbands; and (3) Improve snowfall remote sensing interpretation and modeling to significantly advance prediction capabilities. More information is available from NASA's Earth Science Project Office's IMPACTS field campaign webpage.

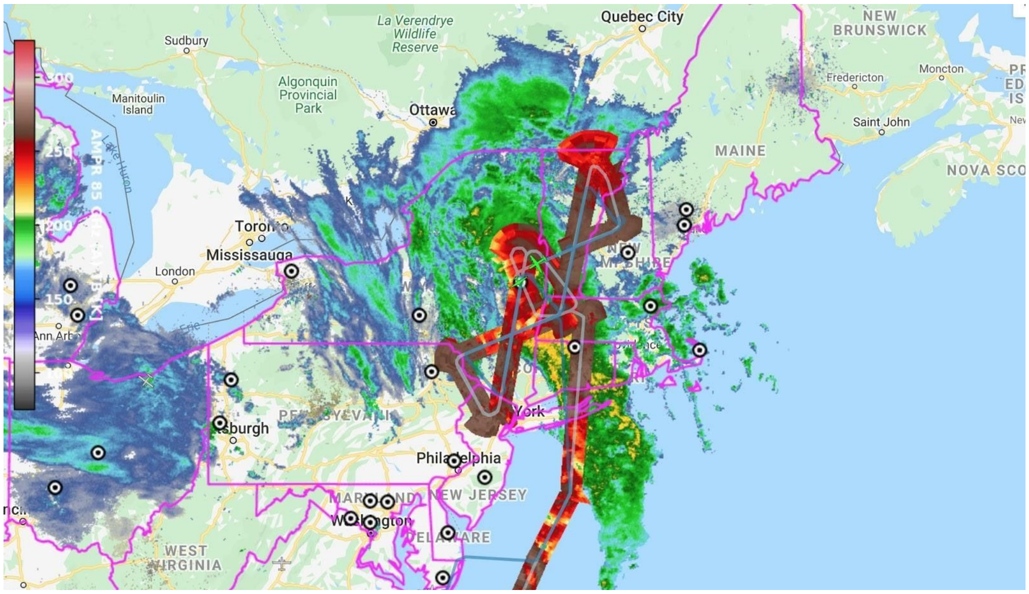

Figure 1: IMPACTS field campaign operations on January 25, 2020 with plots of ER-2 and P-3 flight tracks in addition to ground radar sites and radar reflectivity over the region (Image source: Dr. Timothy Lang, NASA MSFC)

Instrument Description

The Next-Generation Radar system (NEXRAD) consists of 160 Weather Surveillance Radar - 1988 Doppler (WSR-88) sites located throughout the United States and at select locations around the world (Figure 2). The system is jointly operated and maintained by the Department of Commerce, Department of Defense, and the Department of Transportation. However, the National Oceanic and Atmospheric Administration's (NOAA) National Weather Service (NWS) is responsible for general operations. The main purpose of NEXRAD is to provide real-time measurements of winds and precipitation, which improves weather forecasting; specifically the prediction of severe weather events.

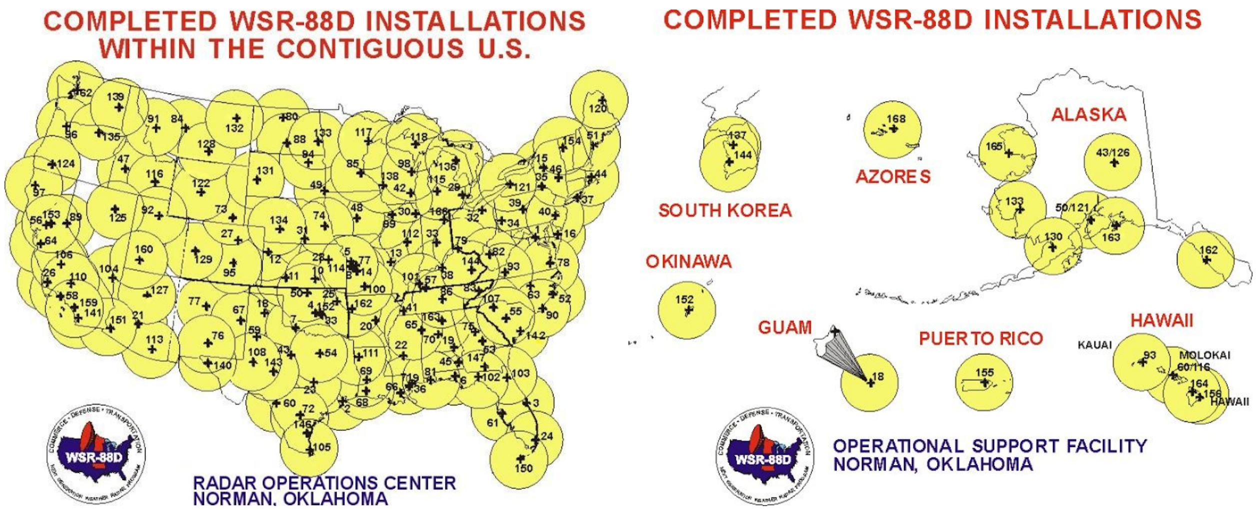

Figure 2: Location of WSR-88D NEXRAD radar stations.
(Image source: NWS Radar Operations Center)

NEXRAD is a 10 cm wavelength (S-Band) Dual-polarization Doppler ground station radar (Figure 3) with systems that operate within a range of 2,700 - 3,000 MHz. There are two scan modes for each station. Precipitation Mode is a fast tracking scan that is designed to detect different types of precipitation during active weather events. Clear Air Mode is a slow-scanning mode used for observing air movements when there is little to no precipitation. The NEXRAD radar stations collect data in a 360 degree swath, with the radar location at the center, at several predetermined elevation angles at specific periods of time. The radars are continually scanning around each site to a radius of a few hundred kilometers. Most data products are generated from radar scan times of 4.5, 5, 6 and 10 minute periods. The radar's transmitter, receiver, and antenna are contained within the radar data acquisition (RDA) component of the system. The RDA samples the following parameters: reflectivity, radial velocity, spectrum width, differential reflectivity, differential phase, and correlation coefficient. NEXRAD has 250m range resolution for reflectivity with a maximum range of 460 km, and 250m range resolution for Doppler velocity and spectrum width with a maximum range of 300 km. The azimuthal resolution is 0.5 degree for reflectivity, velocity and spectrum width. Data coverage can vary by station but generally NEXRAD data are available from the mid-1990s to the present with nearly continuous archived data.

Figure 3: Image of NEXRAD radar site with an antenna tower and radome.
(Image source: NOAA Photo Library)

The NEXRAD IMPACTS datasets include data from 31 NEXRAD locations listed in Table 1 below:

Table 1: IMPACTS NEXRAD Sites

Site Name	Location	Latitude	Longitude
KAKQ	Wakefield, VA	36.979	-77.004
KBGM	Binghamton, NY	42.196	-75.980
KBOX	Boston, MA	41.951	-71.133
KBUF	Buffalo, NY	42.944	-78.732
KCCX	State College, PA	40.918	-77.999
KCLE	Cleveland, OH	41.408	-81.855
KCXX	Burlington, VT	44.506	-73.161
KDIX	Mt. Holly, NJ	39.942	-74.406
KDOX	Dover AFB, DE	38.821	-75.435
KDTX	Detroit, MI	42.695	-83.467
KDVN	Quad Cities, IA	41.607	-90.576
KENX	Albany, NY	42.581	-74.059
KFCX	Blacksburg, VA	37.019	-80.269
KGRB	Green Bay, WI	44.493	-88.106
KGRR	Grand Rapids, MI	42.889	-85.540
KGYX	Portland, ME	43.886	-70.252
KILN	Cincinnati/Wilmington, OH	39.415	-83.817

KILX	Lincoln, IL	40.146	-89.332
KIND	Indianapolis, IN	39.703	-86.275
KIWX	Northern Indiana, IN	41.354	-85.695
KJKL	Jackson, KY	37.586	-83.308
KLOT	Chicago, IL	41.599	-88.080
KLWX	Sterling, VA	38.970	-77.473
KMHX	Newport/Morehead, NC	34.772	-76.872
KMKX	Milwaukee, WI	42.963	-88.546
KOKX	Upton, NY	40.861	-72.859
KPBZ	Pittsburgh, PA	40.526	-80.213
KRAX	Raleigh/Durham, NC	35.661	-78.486
KRLX	Charleston, WV	38.306	-81.718
KTYX	Montague, NY	43.751	-75.675
KVWX	Evansville, IN	38.255	-87.719

More information about the WSR-88D NEXRAD system and Level II data can be found at the following links:

NWS Radar Operations Center NEXRAD webpage
Office of the Federal Coordinator for Meteorological (OFCM)
NOAA's National Center for Environmental Information (NCEI) website
Huber and Trapp (2009)

Investigators

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Data Characteristics

The NEXRAD IMPACTS datasets consist of NEXRAD Level II surveillance data for 31 Dopper radar sites in netCDF-4 format. The netCDF-4 data files were created using the National Center for Atmospheric Research (NCAR) RadxConvert software. The data products were generated from radar scan times of 4.5, 5, 6 and 10 minute periods. These data are available at a Level 2 processing level. More information about the NASA data processing levels are available on the EOSDIS Data Processing Levels webpage. The characteristics of these datasets are listed in Table 2 below.

Table 2: Data Characteristics

Characteristic	Description
Platform	Ground Stations

Instrument	Next Generation Weather Radar (NEXRAD)
Spatial Coverage	*The long range max range is 460km and the short range max range is 230km. But while the long-range config theoretically has a max range of 460km, once the beams get out that far, they are high above the Earth's surface so will only be able to detect the most intense storms and systems at the longer ranges. **KAKQ** (Wakefield, VA) Lat: 36.979 Lon: -77.004 **KBGM** (Binghamton, NY) Lat: 42.196 Lon: -75.980 **KBOX** (Boston, MA) Lat: 41.951 Lon: -71.133 **KBUF** (Buffalo, NY) Lat: 42.944 Lon: -78.732 **KCCX** (State College, PA) Lat: 40.918 Lon: -77.999 **KCLE** (Cleveland, OH) Lat: 41.408 Lon: -81.855 **KCXX** (Burlington, VT) Lat: 44.506 Lon: -73.161 **KDIX** (Philadelphia, PA) Lat: 39.942 Lon: -74.406 **KDOX** (Dover AFB, DE) Lat: 38.821 Lon: -75.435 **KDTX** (Detroit, MI) Lat: 42.695 Lon: -83.467 **KDVN** (Quad Cities, IA) Lat: 41.607 Lon: -90.576 **KENX** (Albany, NY) Lat: 42.581 Lon: -74.059 **KFCX** (Blacksburg, VA) Lat: 37.019 Lon: -80.269

	KGRB (Green Bay, WI) Lat: 44.493 Lon: -88.106 **KGRR** (Grand Rapids, MI) Lat: 42.889 Lon: -85.540 **KGYX** (Portland, ME) Lat: 43.886 Lon: -70.252 **KILN** (Cincinnati/Wilmington, OH) Lat: 39.415 Lon: -83.817 **KILX** (Lincoln, IL) Lat: 40.146 Lon: -89.332 **KIND** (Indianapolis, IN) Lat: 39.703 Lon: -86.275 **KIWX** (Northern Indiana, IN) Lat: 41.354 Lon: -85.695 **KJKL** (Jackson, KY) Lat: 37.586 Lon: -83.308 **KLOT** (Chicago, IL) Lat: 41.599 Lon: -88.080 **KLWX** (Sterling, VA) Lat: 38.970 Lon: -77.473 **KMHX** (Newport/Morehead, NC) Lat: 34.772 Lon: -76.872 **KMKX** (Milwaukee, WI) Lat: 42.963 Lon: -88.546 **KOKX** (Upton, NY) Lat: 40.861 Lon: -72.859 **KPBZ** (Pittsburgh, PA) Lat: 40.526 Lon: -80.213 **KRAX** (Raleigh/Durham, NC) Lat: 35.661 Lon: -78.486

	KRLX (Charleston, WV) Lat: 38.306 Lon: -81.718 **KTYX** (Montague, NY) Lat: 43.751 Lon: -75.675 **KVWX** (Evansville, IN) Lat: 38.255 Lon: -87.719
Spatial Resolution	230k m - 460 km radar range
Temporal Coverage	January 1, 2020 - March 1, 2020
Temporal Resolution	1 minute -< 1 hour
Sampling Frequency	< 1 second
Parameter	Radar reflectivity, radial velocity, spectrum width, differential reflectivity, differential phase, cross correlation ratio
Version	1
Processing Level	2

File Naming Convention

The NEXRAD IMPACTS data files are organized by radar site name. Each dataset contains netCDF-4 data files with the following naming convention:

Data files: IMPACTS_nexrad_YYYYMMDD_hhmmss_<site>.nc

Table 3: File naming convention variables

Variable	Description
YYYY	Four-digit year
MM	Two-digit month
DD	Two-digit day
hh	Two-digit hour in UTC
mm	Two-digit minute in UTC
ss	Two-digit second in UTC
site	NEXRAD site: kakq, kbgm, kbox, kbuf, kccx, kcxx, kdix, kdox, kenx, kfcx, kgyx, kjkl, klwx, kmhx, kokx, kpbz, krax, krlx, ktyx, kcle, kdtx, kdvn, kgrb, kiln, kilx, kind, kiwx, klot, kmkx, kvwx, or kgrr
.nc	netCDF-4 format

Data Format and Parameters

The NEXRAD IMPACTS datasets consist of polar CfRadial files (netcdf/cf compliant) created from the compressed NEXRAD Level II surveillance data using NCAR's RadxConvert software. The data products were generated from radar scan times of 4.5, 5, 6 and 10 minute periods. These data were collected at 31 NEXRAD Doppler radar sites in the Midwest/U.S. East Coast (Table 1). The dataset files are stored in netCDF-4 format and organized by radar site. The data fields included in each file are listed and described in Table 4 below. Note: "h" and "v" stand for "horizontal" and "vertical" respectively and refer to the NEXRAD horizontal and vertical dual-polarization channels

Table 4: NEXRAD IMPACTS netCDF-4 Data Fields

Field Name	Description	Data Type	Unit
volume_number	Data volume index number	float64	-
platform_type	Platform type	string	-
primary_axis	Primary axis of rotation	string	-
status_xml	Status of instrument	string	-
instrument_type	Type of instrument	string	-
radar_antenna_gain_h	Nominal radar antenna gain h channel	float64	db
radar_antenna_gain_v	Nominal radar antenna gain v channel	float64	db
radar_beam_width_h	Half power radar beam width h channel	float64	degrees
radar_beam_width_v	Half power radar beam width v channel	float64	degrees
radar_rx_bandwidth	Radar receiver bandwidth	float64	s^{-1}
time_coverage_start	Data volume start time UTC (ray times are relative to start time in secs)	string	-
time_coverage_end	Data volume end time UTC	string	-
grid_mapping	Grid mapping (radar lidar radial scan)	int32	-
latitude	Latitude	float64	Degrees north
longitude	Longitude	float64	Degrees east
altitude	Altitude	float64	meters
altitude_agl	Altitude above ground level	float64	meters
sweep_number	Sweep index number (0 based)	float64	-
sweep_mode	Scan mode for sweep	string	-
polarization_mode	Polarization mode for sweep	string	-
prt_mode	Transmit pulse mode	string	-
follow_mode	Follow mode for scan strategy	string	-
fixed_angle	Ray target fixed angle	float32	degrees

target_scan_rate	Target scan rate for sweep	float32	degrees per second
sweep_start_ray_index	Index of first ray in sweep	float64	-
sweep_end_ray_index	Index of last ray in sweep	float64	-
rays_are_indexed	Flag for indexed rays	string	-
ray_angle_res	Angular resolution between rays	float32	degrees
r_calib_time	Radar calibration time UTC	string	-
r_calib_pulse_width	Radar calibration pulse width	timedelta64 [ns]	-
r_calib_xmit_power_h	Calibrated radar xmit power h channel	float32	dBm
r_calib_xmit_power_v	Calibrated radar xmit power v channel	float32	dBm
r_calib_two_way_waveguide_loss_h	Radar calibration two way waveguide loss h channel	float32	db
r_calib_two_way_waveguide_loss_v	Radar calibration two way waveguide loss v channel	float32	db
r_calib_two_way_radome_loss_h	Radar calibration two way radome loss h channel	float32	db
r_calib_two_way_radome_loss_v	Radar calibration two way radome loss v channel	float32	db
r_calib_receiver_mismatch_loss	Radar calibration receiver mismatch loss	float32	db
r_calib_k_squared_water	Radar calibration k squared water	float32	-
r_calib_radar_constant_h	Calibrated radar constant h channel	float32	db
r_calib_radar_constant_v	Calibrated radar constant v channel	float32	db
r_calib_antenna_gain_h	Calibrated radar antenna gain h channel	float32	db
r_calib_antenna_gain_v	Calibrated radar antenna gain v channel	float32	db
r_calib_noise_hc	Calibrated radar receiver noise h co-polar channel	float32	dBm
r_calib_noise_vc	Calibrated radar receiver noise v co-plar channel	float32	dBm
r_calib_noise_hx	Calibrated radar receiver noise h cross-polar channel	float32	dBm
r_calib_noise_vx	Calibrated radar receiver noise v cross-polar channel	float32	dBm
r_calib_i0_dbm_hc	Radar calibration i0 dbm h co-polar channel	float32	dBm

r_calib_i0_dbm_vc	Radar calibration i0 dbm v co-plar channel	float32	dBm
r_calib_i0_dbm_hx	Radar calibration i0 dbm h cross-polar channel	float32	dBm
r_calib_i0_dbm_vx	Radar calibration i0 dbm v cross-polar channel	float32	dBm
r_calib_receiver_gain_hc	Calibrated radar receiver gain h co-polar channel	float32	db
r_calib_receiver_gain_vc	Calibrated radar receiver gain v co-polar channel	float32	db
r_calib_receiver_gain_hx	Calibrated radar receiver gain h cross-polar channel	float32	db
r_calib_receiver_gain_vx	Calibrated radar receiver gain v cross-polar channel	float32	db
r_calib_receiver_slope_hc	Calibrated radar receiver slope h co-polar channel	float32	-
r_calib_receiver_slope_vc	Calibrated radar receiver slope v co-polar channel	float32	-
r_calib_receiver_slope_hx	Calibrated radar receiver slope h cross-polar channel	float32	-
r_calib_receiver_slope_vx	Calibrated radar receiver slope v cross-polar channel	float32	-
r_calib_dynamic_range_db_hc	Radar calibration dynamic range db h co-polar channel	float32	db
r_calib_dynamic_range_db_vc	Radar calibration dynamic range db v co-polar channel	float32	db
r_calib_dynamic_range_db_hx	Radar calibration dynamic range db h cross-polar channel	float32	db
r_calib_dynamic_range_db_vx	Radar calibration dynamic range db v cross-polar channel	float32	db
r_calib_base_dbz_1km_hc	Radar reflectivity at 1km at zero snr h co-polar channel	float32	dBZ
r_calib_base_dbz_1km_vc	Radar reflectivity at 1km at zero snr v co-polar channel	float32	dBZ
r_calib_base_dbz_1km_hx	Radar reflectivity at 1km at zero snr h cross-polar channel	float32	dBZ
r_calib_base_dbz_1km_vx	Radar reflectivity at 1km at zero snr v cross-polar channel	float32	dBZ

r_calib_sun_power_hc	Calibrated radar sun power h co-polar channel	float32	dBm
r_calib_sun_power_vc	Calibrated radar sun power v co-polar channel	float32	dBm
r_calib_sun_power_hx	Calibrated radar sun power h cross-polar channel	float32	dBm
r_calib_sun_power_vx	Calibrated radar sun power v cross-polar channel	float32	dBm
r_calib_noise_source_power_h	Radar calibration noise source power h channel	float32	dBm
r_calib_noise_source_power_v	Radar calibration noise source power v channel	float32	dBm
r_calib_power_measure_loss_h	Radar calibration power measurement loss h channel	float32	db
r_calib_power_measure_loss_v	Radar calibration power measurement loss v channel	float32	db
r_calib_coupler_forward_loss_h	Radar calibration coupler forward loss h channel	float32	db
r_calib_coupler_foward_loss_v	Radar calibration coupler forward loss v channel	float32	db
r_calib_dbz_correction	Calibrated radar dbz correction	float32	db
r_calib_zdr_correction	Calibrated radar zdr correction	float32	db
r_calib_ldr_correction_h	Calibrated radar ldr correction h channel	float32	db
r_calib_ldr_correction_v	Calibrated radar ldr correction v channel	float32	db
r_calib_system_phidp	Calibrated radar system phidp	float32	degrees
r_calib_test_power_h	Radar calibration test power h channel	float32	dBm
r_calib_test_power_v	Radar calibration test power v channel	float32	dBm
time*	Time in seconds since volume start	datetime64 [ns]	ns
range*	Range from instrument to center of gate	float32	meters
ray_n_gates	Number of gates	float64	-
ray_start_index	Array index to start of ray	float64	-

ray_start_range	Start range for ray	float32	meters
ray_gate_spacing	Gate spacing for ray	float32	meters
azimuth	Ray azimuth angle	float32	degrees
elevation	Ray elevation angle	float32	degrees
pulse_width	Transmitter pulse width	timedelta64 [ns]	ns
prt	Pulse repetition time	timedelta64 [ns]	ns
prt_ratio	Pulse repetition frequency ratio	timedelta64 [ns]	ns
nyquist_velocity	Unambiguous Doppler velocity	float32	m s^{-1}
unambiguous_range	Unambiguous range	float32	meters
antenna_transition	Antenna is in transition between sweeps: 1 if antenna is in transition, 0 otherwise	float32	-
n_samples	Number of samples used to compute moments	float64	-
r_calib_index	Calibration data array index per ray	float64	-
measured_transmit_power_h	Measured radar transmit power h channel	float32	dBm
measured_transmit_power_v	Measured radar transmit power v channel	float32	dBm
scan_rate	Antenna angle scan rate	float32	degrees per second
DBZ	Radar reflectivity	float32	dBZ
VEL	Radial velocity	float32	m s^{-1}
WIDTH	Spectrum width	float32	m s^{-1}
ZDR	Differential reflectivity	float32	dB
PHIDP	Differential phase	float32	deg
RHOHV	Cross correlation	float32	-

Note: the “time” and “range” fields are coordinate fields

Algorithm

Several steps are taken to calculate the reflectivity, velocity, and spectrum width from NEXRAD’s measurements. The volume reflectivity is calculated using the average power of the radar signal that is returned from the precipitation particles in the sample volume, along with the characteristics of the radar system. The mean radial velocity is estimated by using the Doppler shift to determine motions toward or away from the radar. The spectrum width uses the same estimate from the mean radial velocity calculation along with some assumptions to estimate the velocity spectrum standard deviation. More information on the data calculation methods can be found in Heiss et al. 1990.

Quality Assessment

The transmitter and receiver design, pulse characteristics, and calibration techniques used all contribute to improved radar data quality. For example, ground clutter, erroneous return signal received from ground interference, is reduced due to the design of the NEXRAD transmitter and receiver, and calibration methods. More information on quality control methods can be found in Heiss et al. 1990.

Software

No special software is needed to view these data files. The netCDF-4 NEXRAD files can be viewed using the NASA Panoply Data Viewer.

Known Issues or Missing Data

The long range max range is 460km and the short range max range is 230km. But while the long-range config theoretically has a max range of 460km, once the beams get out that far, they are high above the Earth's surface so will only be able to detect the most intense storms and systems at the longer ranges.

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Related Data

The full list of IMPACTS campaign data can be located using the GHRC Hydro2.0 search tool and searching the term 'IMPACTS'. The following datasets are from other field campaigns that used NEXRAD:

GPM Ground Validation NEXRAD OLYMPEX (3 radars)
GPM Ground Validation NEXRAD IPHEx (7 radars)
GPM Ground Validation NEXRAD IFloodS (4 radars)
GPM Ground Validation NEXRAD GCPEx (7 radars)
GPM Ground Validation NEXRAD MC3E (6 radars)

Contact Information

To order these data or for further information, please contact:

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