

Title – NOAA PSL S-Band Precipitation Profiler

Authors

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1.0 Data Set Description

This dataset contains S-Band Precipitation Profiler (S-PROF) data from the Courtland, AL, site. Other instruments at this site include 915-MHz and 449-MHz radar wind profilers with RASS, surface meteorology, ceilometer, microwave radiometer, disdrometer, and an infrared spectrometer. The instrument was installed 15 November 2021. Data until 15 April 2022 are available so far. More data will be added.

- Data status: Final
- Time period: Courtland, AL: 15 November 2021 – 15 April 2022
- Site information:
 - Courtland, AL: https://psl.noaa.gov/data/obs/sites/view_site_details.php?siteID=ctd
- Site identifier: Courtland, AL: ctd
- Physical location: Courtland, AL: 34.66 N, 87.35 W, 187 m above mean sea level
- Data Frequency: Three modes of ~20 s each that cycle continuously.
- Data set restrictions: none

2.0 Instrument Description

This instrument is the NOAA S-Band Precipitation Profiler (S-PROF). The S-PROF is a pulsed-Doppler radar operating at 2875 MHz. This radar is described at <https://psl.noaa.gov/data/obs/instruments/SbandDescription.html>. The radar operates using three modes which run in sequence: 1. A high resolution mode covering the lower part of the troposphere. 2. A high resolution mode with lowered sensitivity. 3. A mode that covers higher altitudes. The S-PROF has been operated with three parameter sets while installed at Courtland, AL. These modes are detailed in the tables below:

3.0 Data Collection and Processing

Data are collected continuously. The SPROF is an analogue system utilizing 8-bit A/C conversion of the I and Q channels of the receiver. Processing is done by software in the radar computer. All processing is done at the site and the data is transferred back to Boulder for dissemination without further processing. Time stamps in the data refer to the beginning of the data period. All times are in UTC.

The radar was operated with four different parameter sets:

Parameter Set 1:

First Record: 15 September 2021 (day of year (DOY) 258) 00:17:12

Last Record: 27 September 2021 (DOY 270) 20:11:31

Parameter	High Mode	Low Mode
Beam Index	0	1
Number of ranges	166	84
First range height (m)	142	142
Range spacing (m)	60	60
Range resolution (m)	60	60
Last Range height (m)	10033	5117
Range aliasing height (m)	11092	5696
Full Scale velocity (m/s)	14.2922	14.6784
Spectral spacing (m/s)	0.1117	0.1147
Number of code bits	8	1

Parameter Set 2: The third, low sensitivity mode was added to the first parameter set.

First Record: 27 September 2021 (DOY 270) 20:12:03

Last Record: 28 September 2021 (DOY 271) 19:32:11

Parameter	High Mode	Low Mode	Low Sensitivity Mode
Beam Index	0	1	2
Number of ranges	166	84	84
First range height (m)	142	142	142
Range spacing (m)	60	60	60
Range resolution (m)	60	60	60
Last Range height (m)	10033	5117	5117
Range aliasing height (m)	11092	5696	5696
Full Scale velocity (m/s)	14.2922	14.6784	14.6784
Spectral spacing (m/s)	0.1117	0.1147	0.1147
Number of code bits	8	1	1

Parameter Set 3: The first gate height was changed for all modes from 142 m to 157 m.

First Record: 28 September 2021 (DOY 271) 19:35:19

Last Record: 17 February 2022 (DOY 48) 16:34:14

Parameter	High Mode	Low Mode	Low Sensitivity Mode
Beam Index	0	1	2
Number of ranges	166	84	84
First range height (m)	157	157	157
Range spacing (m)	60	60	60
Range resolution (m)	60	60	60
Last Range height (m)	10033	5117	5117
Range aliasing height (m)	11092	5696	5696
Full Scale velocity (m/s)	14.2922	14.6784	14.6784
Spectral spacing (m/s)	0.1117	0.1147	0.1147
Number of code bits	8	1	1

Parameter Set 4: The modes were changed to avoid range aliasing and dynamic range issues.

First Record: 17 February 2022 (DOY 48) 16:48:40

Last Record: Operating in this mode still on 13 December 2022.

Parameter	High Mode	Low Mode	Low Sensitivity Mode
Beam Index	0	1	2
Number of ranges	220	100	100
First range height (m)	157	157	157
Range spacing (m)	60	60	60
Range resolution (m)	60	60	60
Last Range height (m)	13285	6092	6092
Range aliasing height (m)	21285	21285	21285
Full Scale velocity (m/s)	15.2987	15.2987	15.2987
Spectral spacing (m/s)	0.1195	0.1195	0.1195
Number of code bits	1	1	1

4.0 Data Format

SPROF file formats:

Files containing the processed S-PROF data:

https://psl.noaa.gov/data/obs/data/view_data_type_info.php?DataTypeID=29

The file naming conventions are as follows:

sssYYJJHH_type.raw

where sss = 3-letter site identifier, ctd for Courtland; YY = 2-digit year; JJJ = 3-digit day of the year (DOY)

; type = 'raw'

The time stamp of all data is in UTC. The time stamp is start of the data acquisition period.

5.0 Data Remarks

The S-PROF radar has limited dynamic range. During the first three parameter sets the high mode utilized a complementary pulse code to achieve higher sensitivity. This mode can have saturation problems with large signals. During heavy rain or hail the low-sensitivity mode should be used as the other modes may saturate. During the first three parameter sets there are occasional periods of range aliased signal in the lower gates of the low modes. The last parameter change increased the range aliasing distance to be above the storm tops and turned pulse coding off. This change also reduced the occurrence of saturation in the sensitive modes.

6.0 References

None

7.0 Appendix A

GCMD keywords

Category	Topic	Term	Variable Level 1	Variable Level 2	Variable Level 3	UUID
EARTH SCIENCE	ATMOSPHERE	PRECIPITATION	HYDROMETEORS			56f2cdbd-2a91-4267-97eb-1680e8582322
EARTH SCIENCE	SPECTRAL/ENGINEERING	RADAR	MEAN RADIAL VELOCITY			bb20786b-2499-40b0-a9a5-2cc64421a6d2
EARTH SCIENCE	SPECTRAL/ENGINEERING	RADAR	RADAR BACKSCATTER			625da982-3648-43fc-a640-1b230509944e
EARTH SCIENCE	SPECTRAL/ENGINEERING	RADAR	SPECTRUM WIDTH			41a7f02b-5ab6-4c1e-8583-abb870507ea1
EARTH SCIENCE	SPECTRAL/ENGINEERING	RADAR	RETURN POWER			6eca12d1-bafd-448c-bdce-a4438efb359e

8.0 Appendix B: List of files transferred

ctd21258.raw ctd21295.raw ctd21332.raw ctd22004.raw ctd22041.raw ctd22078.raw
 ctd21259.raw ctd21296.raw ctd21333.raw ctd22005.raw ctd22042.raw ctd22079.raw
 ctd21260.raw ctd21297.raw ctd21334.raw ctd22006.raw ctd22043.raw ctd22080.raw
 ctd21261.raw ctd21298.raw ctd21335.raw ctd22007.raw ctd22044.raw ctd22081.raw
 ctd21262.raw ctd21299.raw ctd21336.raw ctd22008.raw ctd22045.raw ctd22082.raw
 ctd21263.raw ctd21300.raw ctd21337.raw ctd22009.raw ctd22046.raw ctd22083.raw
 ctd21264.raw ctd21301.raw ctd21338.raw ctd22010.raw ctd22047.raw ctd22084.raw
 ctd21265.raw ctd21302.raw ctd21339.raw ctd22011.raw ctd22048.raw ctd22085.raw

ctd21266.raw	ctd21303.raw	ctd21340.raw	ctd22012.raw	ctd22049.raw	ctd22086.raw
ctd21267.raw	ctd21304.raw	ctd21341.raw	ctd22013.raw	ctd22050.raw	ctd22087.raw
ctd21268.raw	ctd21305.raw	ctd21342.raw	ctd22014.raw	ctd22051.raw	ctd22088.raw
ctd21269.raw	ctd21306.raw	ctd21343.raw	ctd22015.raw	ctd22052.raw	ctd22089.raw
ctd21270.raw	ctd21307.raw	ctd21344.raw	ctd22016.raw	ctd22053.raw	ctd22090.raw
ctd21271.raw	ctd21308.raw	ctd21345.raw	ctd22017.raw	ctd22054.raw	ctd22091.raw
ctd21272.raw	ctd21309.raw	ctd21346.raw	ctd22018.raw	ctd22055.raw	ctd22092.raw
ctd21273.raw	ctd21310.raw	ctd21347.raw	ctd22019.raw	ctd22056.raw	ctd22093.raw
ctd21274.raw	ctd21311.raw	ctd21348.raw	ctd22020.raw	ctd22057.raw	ctd22094.raw
ctd21275.raw	ctd21312.raw	ctd21349.raw	ctd22021.raw	ctd22058.raw	ctd22095.raw
ctd21276.raw	ctd21313.raw	ctd21350.raw	ctd22022.raw	ctd22059.raw	ctd22096.raw
ctd21277.raw	ctd21314.raw	ctd21351.raw	ctd22023.raw	ctd22060.raw	ctd22097.raw
ctd21278.raw	ctd21315.raw	ctd21352.raw	ctd22024.raw	ctd22061.raw	ctd22098.raw
ctd21279.raw	ctd21316.raw	ctd21353.raw	ctd22025.raw	ctd22062.raw	ctd22099.raw
ctd21280.raw	ctd21317.raw	ctd21354.raw	ctd22026.raw	ctd22063.raw	ctd22100.raw
ctd21281.raw	ctd21318.raw	ctd21355.raw	ctd22027.raw	ctd22064.raw	ctd22101.raw
ctd21282.raw	ctd21319.raw	ctd21356.raw	ctd22028.raw	ctd22065.raw	
ctd21283.raw	ctd21320.raw	ctd21357.raw	ctd22029.raw	ctd22066.raw	
ctd21284.raw	ctd21321.raw	ctd21358.raw	ctd22030.raw	ctd22067.raw	
ctd21285.raw	ctd21322.raw	ctd21359.raw	ctd22031.raw	ctd22068.raw	
ctd21286.raw	ctd21323.raw	ctd21360.raw	ctd22032.raw	ctd22069.raw	
ctd21287.raw	ctd21324.raw	ctd21361.raw	ctd22033.raw	ctd22070.raw	
ctd21288.raw	ctd21325.raw	ctd21362.raw	ctd22034.raw	ctd22071.raw	
ctd21289.raw	ctd21326.raw	ctd21363.raw	ctd22035.raw	ctd22072.raw	
ctd21290.raw	ctd21327.raw	ctd21364.raw	ctd22036.raw	ctd22073.raw	
ctd21291.raw	ctd21328.raw	ctd21365.raw	ctd22037.raw	ctd22074.raw	
ctd21292.raw	ctd21329.raw	ctd22001.raw	ctd22038.raw	ctd22075.raw	
ctd21293.raw	ctd21330.raw	ctd22002.raw	ctd22039.raw	ctd22076.raw	
ctd21294.raw	ctd21331.raw	ctd22003.raw	ctd22040.raw	ctd22077.raw	