**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 operated from 15 November 2021 to 9 February 2023.

- Data status: Final
- Time period: Courtland, AL: 15 November 2021 – 9 February 2023
- 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 in Section 3.0.

## 3.0 Data Collection and Processing

Data were 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: 9 February 2023 (DOY 40) 05:07:52

| 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:
sssYYJJJHH_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, and is the 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 disabled pulse coding. 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 ctd21339.raw ctd22055.raw ctd22142.raw ctd22223.raw ctd22316.raw
ctd21259.raw ctd21340.raw ctd22056.raw ctd22143.raw ctd22224.raw ctd22317.raw
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ctd21261.raw ctd21342.raw ctd22058.raw ctd22145.raw ctd22226.raw ctd22319.raw

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ctd21276.raw ctd21357.raw ctd22073.raw ctd22160.raw ctd22241.raw ctd22345.raw
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