CLPX-Satellite: AVHRR/HRPT Brightness Temperatures and Reflectances, Version 1

USER GUIDE

How to Cite These Data

As a condition of using these data, you must include a citation:

Cline, D. 2004. *CLPX-Satellite: AVHRR/HRPT Brightness Temperatures and Reflectances, Version 1*. [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. https://doi.org/10.5067/FCK3KVGQPH3O. [Date Accessed].

FOR QUESTIONS ABOUT THESE DATA, CONTACT NSIDC@NSIDC.ORG

FOR CURRENT INFORMATION, VISIT https://nsidc.org/data/NSIDC-0152

National Snow and Ice Data Center

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1 DETAILED DATA DESCRIPTION

The Advanced Very High Resolution Radiometer (AVHRR) data set is comprised of data collected by the AVHRR sensor, carried aboard the National Oceanic and Atmospheric Administration's Polar Orbiting Environmental Satellite series. The AVHRR sensor is a broadband 5-channel scanning radiometer, sensing in the visible, near-infrared, and thermal infrared portions of the electromagnetic spectrum. Please refer to NOAA's AVHRR site for further information about this sensor.

This data set includes AVHRR/HRPT rasters; five bands co-registered to the UTM and Geographic (lat-lon) grids of the CLPX LRSA. Data are provided for the five wavelengths 0.63, 0.91, 1.61, 10.8 and 12.0 microns; HRPT channels 1, 2, 3a, 4 and 5. Data are calibrated to reflectance and brightness temperature using on-board coefficients, reprojected from swath space to geographic grid, and exported as 16-bit binary rasters. The data are also reprojected to UTM, Zone 13. Daylight passes were collected from NOAA-16 and NOAA-17.

1.1 Format

Reflectance files contain flat binary rasters of 2-byte unsigned integers. The values represent percent albedo, multiplied by 100, ranging from 0 to 10000. The brightness temperature files contain 2-byte unsigned integer representing interpolated temperatures in tenths of Kelvins. The values range roughly from 2300 to 3100. Data are gridded to the LRSA, at 1.1 km (or 30 arc-second) resolution.

1.2 File and Directory Structure

Data are provided as tarred and zipped binary and tiff files; one each for UTM and geographic grids. Within the compressed files, the data structure is:

```
binary_geo.tgz/
     2001-11-09.2030.noaa-16.geo.ch1.bil
     2001-11-09.2030.noaa-16.geo.ch1.blw
     2001-11-09.2030.noaa-16.geo.ch1.hdr
     etc...
binary_utm.tgz/
     2001-11-09.2030.noaa-16.utm.ch1.bil
     2001-11-09.2030.noaa-16.utm.ch1.blw
     2001-11-09.2030.noaa-16.utm.ch1.hdr
     etc...
```

```
tiff_geo.tgz/
     2001-11-09.2030.noaa-16.geo.ch1.tfw
     2001-11-09.2030.noaa-16.geo.ch1.tif
     2001-11-09.2030.noaa-16.geo.ch2.tfw
     etc...
tiff_utm.tgz/
     2001-11-09.2030.noaa-16.utm.ch1.tfw
     2001-11-09.2030.noaa-16.utm.ch1.tif
     2001-11-09.2030.noaa-16.utm.ch2.tfw
     etc...
lrsa-meta.tgz/
     2001-11-09.2030.noaa-16.geo.ch1.blw
     2001-11-09.2030.noaa-16.geo.ch1.meta
     etc...
```

1.3 File Naming Convention

Compressed files are named `binary_geo.tgz`, `binary_utm.tgz`, `tiff_geo.tgz`, and `tiff_utm.tgz`. WIthin the compressed files, individual data files are named as follows.

Raw reflectance data files are named YYYY-MM-DD.HHMM.noaa-SS, where

YYY = Year
MM = Month
DD = Day
HHMM = Hour Minute
SS = Satellite number (16 or 17).

Processed data files are split into two subdirectories, binary and tiff. Within each subdirectory data have been reprojected into Geographic and UTM formats. The file naming structure for binary data in geographic format is YYYY-MM-DD.HHMM.noaa-SS.geo.chX, where

YYY = Year
MM = Month
DD = Day
HHMM = Hour Minute
SS = Satellite number (16 or 17)
X = Channel (1, 2, 3a, 4 and 5).

Each file is available in *.bil (binary interleaved by line), *.blw (georeferencing information) and *.hdr (standard header information) formats. The file naming structure for binary data in UTM format is similar to the geographic format, except for the use of 爽 tm' instead of 組 eo' in the file naming format. For example:

`YYYY-MM-DD.HHMM.noaa-SS.utm.chX`

The tiff subdirectories follow the same file naming structure for both Geographic and UTM reprojections as the binary subdirectories. However the file types in the tiff subdirectory are `*.tif` (image files) and `*.tfw` (header files for TIF files).

Metadata files are available to support each AVHRR scene, in both UTM and Geographic reprojections. Metadata files follow the same naming structure as the processed data files but with `*.meta` file types.

1.4 Spatial Coverage

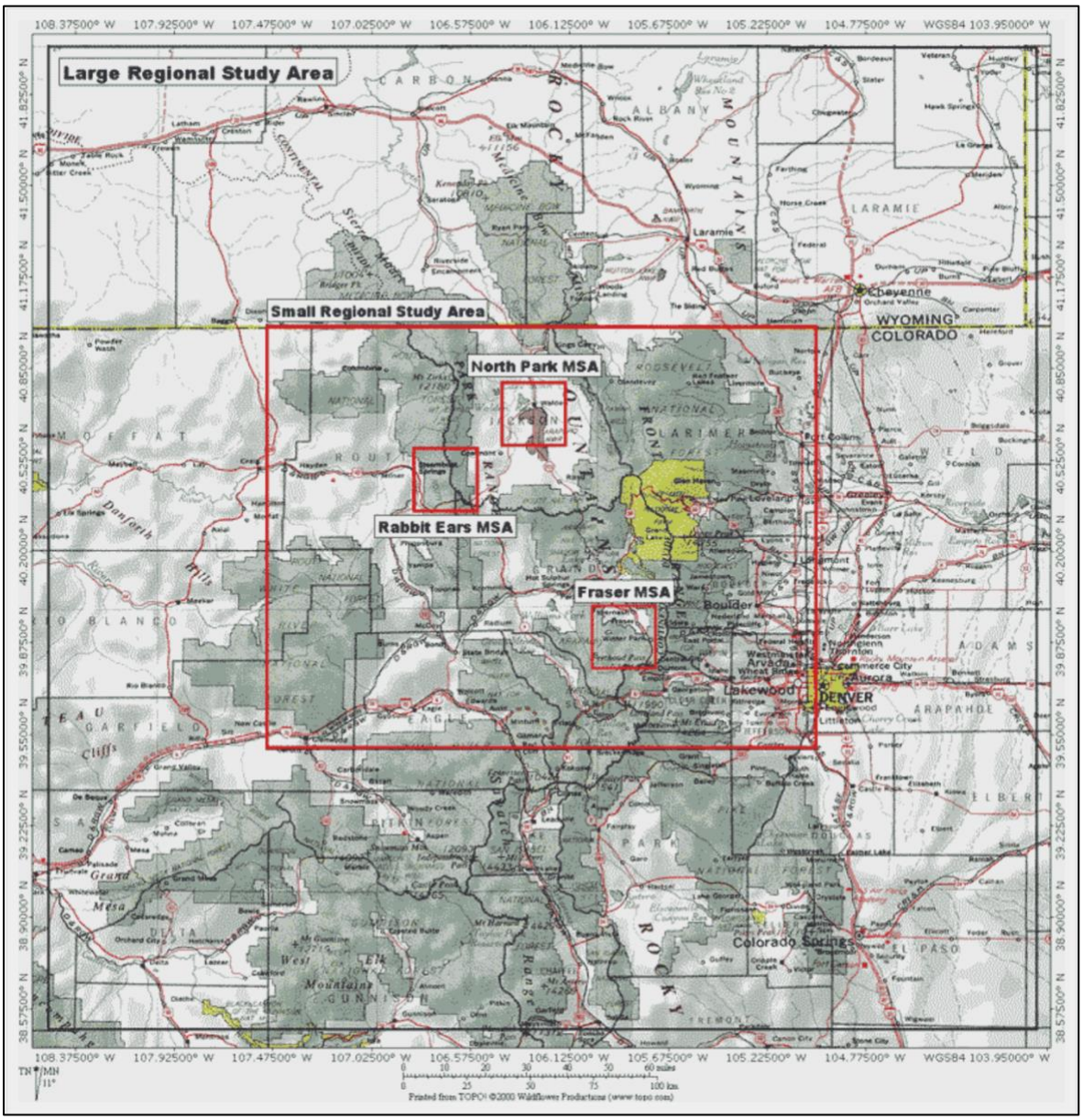
This data set covers the CLPX LRSA in Colorado and Wyoming.

Upper Left Boundary: 42°N, 108.5°W
Lower Right Boundary: 38.5°N, 104°W

Data are gridded to the LRSA, at 1.1 km (or 30 arc-second) resolution.

Spatial Coverage Map:

The following map shows the CLPX LRSA:



1.5 Temporal Coverage

Data were collected between 9 November 2001 and 26 June 2003. The complete temporal coverage is given in the following table.

Year	Month	Day	Time
2001	11	9	2030
2001	12	7	2050
2002	2	12	2005
2002	2	20	2034

Year	Month	Day	Time
2002	3	1	2037
2002	3	9	2052
2002	3	12	2017
2002	3	13	2006
2002	3	20	2032
2002	3	21	2020
2002	3	22	2009
2002	3	31	2012
2002	4	8	2025
2002	4	10	2003
2002	4	17	2028
2002	4	28	2008
2002	5	5	2034
2002	5	6	2023
2002	5	7	2012
2002	12	2	2020
2002	12	5	1717
2002	12	23	1713
2003	1	7	2021
2003	1	17	1752
2003	1	21	1802
2003	1	23	1722
2003	1	27	1732
2003	1	29	1828
2003	2	3	2021
2003	2	10	1712
2003	2	12	1807
2003	2	17	1756
2003	2	18	1732
2003	2	22	2008
2003	2	27	1724
2003	3	3	1739
2003	3	10	2032
2003	6	13	1744
2003	6	17	1753

Year	Month	Day	Time
2003	6	21	1804
2003	6	22	1741
2003	6	24	2050
2003	6	25	1814
2003	6	26	1751

1.6 Parameter or Variable

Parameters presented in this data set are brightness temperatures and reflectances.

1.6.1 Sample Data Record

Accompanying the raw data files are header files (*.hdr) that provide information about each raw reflectance file. An example of a header files is shown below.

```
           Space Science & Engineering Center
           University of Wisconsin - Madison
       Man computer Interactive Data Access System (McIDAS)

Satellite: NOAA-16                    SSEC ID Number: 66
Image Date: 7 DEC 01 (YYDDD=01341)    Image Start Time: 20:36:29 GMT

                  IMAGE COORDINATES
Start Line    Start Element     Line Resolution     Element Resolution
   1240           284                 1                   1

                    IMAGE FILE(S)
File Name     Parameter    Unit     Band     Lines    Elements    Element Format    Scale
----------- ------------  ----     ----    -------   --------   ------------------ -----
W341.HDR     Header ASCII (80 Chars)
W341.001     Raw Sensor    none       1       2000     1400 Int      (16 bit)         1
W341.002     Raw Sensor    none       2       2000     1400 Int      (16 bit)         1
W341.003     Raw Sensor    none       4       2000     1400 Int      (16 bit)         1
W341.004     Raw Sensor    none       5       2000     1400 Int      (16 bit)         1
W341.005     Raw Sensor    none       6       2000     1400   Int    (16 bit)         1
W341.LAT     Latitude      NA        2000     1400     Integer       (16 bit)         100
W341.LON     Longitude     NA        2000     1400     Integer       (16 bit)         100
  * - Navigation files resolution: 1 Lat/Lon per every 1   image element(s)
  * - Navigation files missing data value = 65535

                SSEC NAVIGATION BLOCK (All nonzero entries)
  1. TIRO            2. 6601341          3. 203259           4. 1
  5. 11209           6. 12246            7. 722992           8. 1094
  9. 98849          10. 260389          11. 99859           12. 286025
 13. 2048           14. 54128           15. 621             46. 1
 47. 1040           48. 73979117        49. 167             51. 2200
 52. 2048           53. 166667          54. 8138
```

The following is an example of a UTM metadata file:

```
HRPT data for LRSA

Date:           2001-11-09
Time:           2030
Satellite:  NOAA-16
Upper Left latitude:     42.04999923706055
Upper Left longitude:  -108.55000305175781
Lower Right latitude:    38.45
Lower Right longitude: -103.95
Datum: WGS84
Approximate coverage: 4.6 x 3.6 degrees =~ 400km x 400km
UTM Grid
Zone: 13
Semi-Major Axis of Ellipsoid: 6378137.000 meters
Semi-Minor Axis of Ellipsoid: 6356752.314245 meters
Scale Factor of C Meridian:     0.999600
Longitude of Central Meridian: -105.0000  degrees
Upper Left XY:  175000.0, 4675000.0 = 42.159677085 M. 108.933826235 W
Lower Right XY: 600000.0, 4250000.0 = 38.392627781 N, 103.854898585 W
Datum: WGS84
X resolution: 816.83574327477345
Y resolution: -816.83574327477345
Upper Left X: 190250.60697080070000
Upper Left Y: 4661756.31889947410000
Rows: 497
Columns: 491
Nbits: 16
Nbands: 1
```

2 SOFTWARE AND TOOLS

2.1 Quality Assessment

The AVHRR sensor was designed to view cold space and one or more internal warm blackbodies for each scan sequence while in orbit. In general, radiometric calibration involves exposing a radiometer to sources of radiation that have been calibrated against primary or secondary standards and determining a relationship between the output of the radiometer and the intensity of the incident radiation (radiance). All of the radiometers flown on the NOAA/TIROS satellites undergo extensive prelaunch testing and calibration by their manufacturers to characterize their performance.

As the spacecraft moves through its orbit, the expected angular distance between the nadir of adjacent LAC/HRPT scans is approximately 0.0296 degrees of arc, or 3.2914 kilometers, as measured from the center of Earth. The actual value of the average angular distance can vary by up to about 0.1712 kilometers due to variations in satellite height, scan angle, and other factors. The instantaneous field-of-view (IFOV) for all channels is specified to be 1.3 +/- 0.1 milliradians.

3 DATA ACQUISITION AND PROCESSING

These data were captured on a McIDAS SDI system and processed in the McIDAS software package (a suite of applications for analyzing and displaying meteorological data). Data are calibrated to reflectance and brightness temperature using on-board coefficients, reprojected from swath space to geographic grid, and exported as 16-bit binary rasters. The data are also reprojected to UTM, Zone 13.

4 REFERENCES AND RELATED PUBLICATIONS

4.1 Related Data Collections

All CLPX Data Sets

5 CONTACTS AND ACKNOWLEDGMENTS

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6 DOCUMENT INFORMATION

6.1 Publication Date

19 February 2004

6.2 Date Last Updated

5 April 2021