NOAA-19 AVHRR LEVEL-1C PRODUCTS AT BHOONIDHI

APSDD/ODPG

DATA PROCESSING AREA (DPA)

NATIONAL REMOTE SENSING CENTRE

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1. Introduction

The Advanced Very High Resolution Radiometer (AVHRR) onboard NOAA-19 is a six-channel scanning radiometer that captures data across the visible, near-infrared, and thermal infrared regions. It offers a spatial resolution of approximately 1.1 km at nadir and conducts earth observations twice daily, covering a swath of ~2,700 km (14 orbits/day) using a rotating mirror scan mechanism. Specifications of AVHRR are listed in Table1. For NOAA series, Channel 3A is used during the day, while 3B is used at night. However for NOAA-18 and NOAA-19, channel 3B is used continuously because of its fire detection capabilities.

Table 1: NOAA-19 AVHRR Spectral Channels Overview

Band	Wavelength (µm)
Band 1	0.58 – 0.68
Band 2	0.725 – 1.0
Band 3A	1.58 – 1.64
Band 3B	3.55 – 3.93
Band 4	10.3 – 11.3
Band 5	11.5 – 12.5

2. Data Acquisition and Processing

High Resolution Picture Transmission (HRPT) data is being acquired in real-time at NRSC/IMGEOS, Shadnagar Ground Station. Each AVHRR pass from Acquisition of Signal (AOS) to Loss of Signal (LOS) is stored and processed as a single file. The processing involves radiometric calibration and geo- Tagging, resulting in a Level-1C (L1C) product. The final Level 1C (L1C) product is delivered in HDF format, containing location(lat/long) information, band information, top-of-atmosphere (TOA) reflectance for visible, SWIR bands , brightness temperatures (BT) for Bands 3B,4 and 5. In addition to this, grid wise sun-sensor geometry information and pixel wise quality flags are also provided.

2.1 Contents of Data Product Pack

Orbit wise Level-1C products are in HDF5 format. The following files are generated:

- Level-1C Radiometrically Calibrated , Geo-Tagged Image (.h5)
- Snapshot Image (JPEG) for quick view:
  - RGB B2-B1-B1 composite for Day passes
  - Band 4 for Night passes
- Metadata File (.meta)

3. Product Format Specification

Parameter	Specification
Image File Format	HDF5
Projection	Geographic Coordinates (Latitude/Longitude)
Datum	WGS-84
Spatial Resolution	1.1 km (at Nadir)
Data Type	Short Integer (to be converted to TOA-Reflectance and BT by applying scale factors)

4. File Naming Convention

Each file name contains detailed acquisition and product metadata.

Sample Filename:

N19_AVHR_LAC_26MAR2025_043415_83119_ST0000HTD_1_1_F.h5

Components:

Component	Description
N19	Satellite
AVHR	Sensor
LAC	Acquisition Mode
26MAR2025	Date of Pass (ddmmmyyyy)
043415	Scene Start Time (hhmmss)
83119	Orbit Number
ST0000HTD	Product Code
1	Path
1	Row
F	Sub-scene

Associated Files:

- N19_AVHR_LAC_26MAR2025_043415_83119_ST0000HTD_1_1_F.jpg
- N19_AVHR_LAC_26MAR2025_043415_83119_ST0000HTD_1_1_F.meta

5. Processing Pipeline

The AVHRR HRPT data is processed through the following steps:

1. Raw HRPT Data Acquisition (AOS to LOS)
2. Decoding
3. Radiometric Calibration and Geo-Tagging
4. Level-1C Product Generation in HDF5 format
5. Snapshot and Metadata Generation

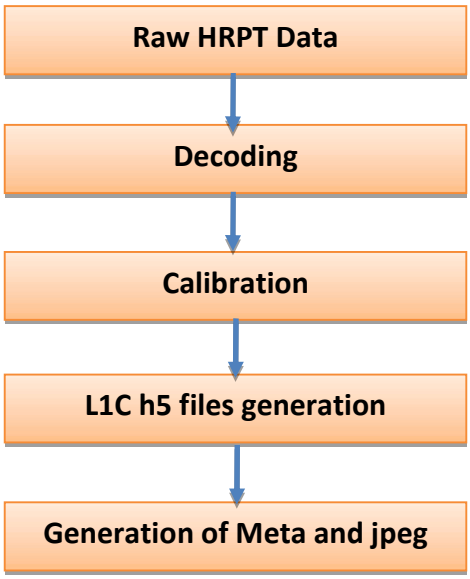

Figure 1: NOAA-19 AVHRR L1C data processing

6. Product Validation

NOAA-19 AVHRR TOA Reflectances are validated with the contemporary satellite products from Metop-B AVHRR, OCM3 and Sentinel-3 SLSTR. Amount of agreement is better than 90 %.

Day and night Brightness temperatures (BT) are compared with the Metop-B and SLSTR BT values. The slope and correlation coefficient values are around 90% with Metop-B and close to 1 with respect to SLSTR BT.

7. Sample Images

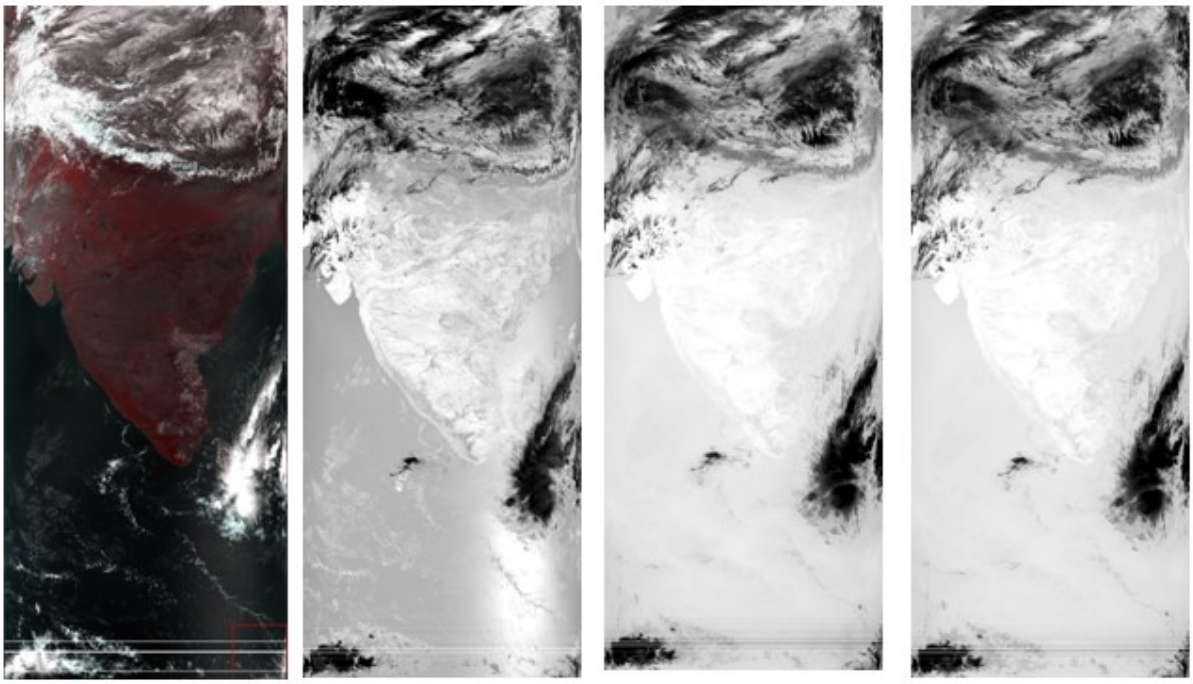

Figure: 2 TOA Reflectance Ch-1, Ch-2 , Brightness Temperature Ch-3B,Ch-4,Ch-5(Left to Right)

8. References

1. NOAA KLM User's Guide, August 2014 Revision (Available from NOAA official documentation)
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5. Devasthale, A., M. Raspaud, C. Schlundt, T. Hanschmann, S. Finkensieper, A. Dybbroe, S. Hornquist, N. Hakansson, M. Stengel and K-G. Karlsson, (2017), PyGAC: An open-source, community-driven Python interface to preprocess nearly 40-year AVHRR Global Area Coverage (GAC) data record", GSICS Quarterly Newsletter, Vol. 11, No. 2 (Sept. 2017): 3-5. DOI: 10.7289/V5R78CFR
6. EUMETSAT (2023): AVHRR Fundamental Data Record - Release 1 - Multimission, European Organisation for the Exploitation of Meteorological Satellites, DOI: 10.15770/EUM_SEC_CLM_0060. https://doi.org/10.15770/EUM_SEC_CLM_0060
7. Kidwell, K., NOAA KLM User's Guide NOAA/NESDIS, Dep. of Comm., Washington, D.C. September, 2000