NC2G

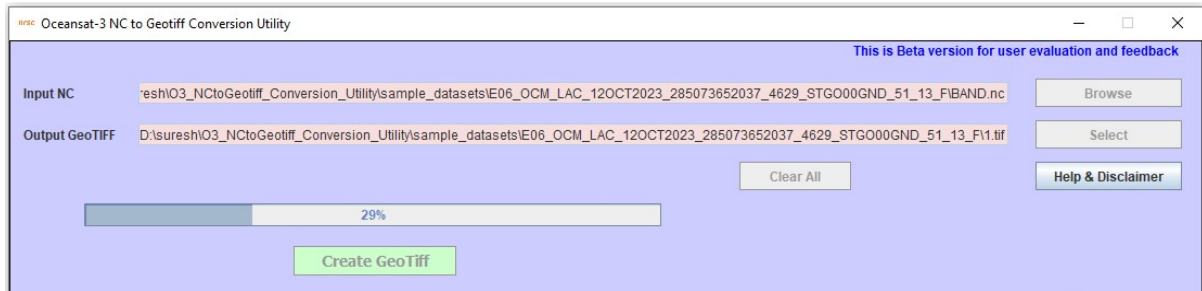| VERSION 1.0	NetCDF to Geo-tiff Conversion Tool (NC2G) for Oceansat-3: OCM Data Products

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Contents

OCEANSAT-3 NetCDF to Geo-tiff Conversion (NC2G) Software Tool

1. Introduction & Objective

NetCDF (Network Common Data Form) is a file format and a set of libraries used to store and share scientific data. It was developed by the Unidata Program Center (UPC) at the University Corporation for Atmospheric Research (UCAR) to facilitate data exchange between scientists and organizations in the Earth and climate sciences, but it has found applications in a wide range of fields beyond atmospheric science The key advantages associated with NetCDF file format as follows:

- Self-describing, contain metadata along with the data.
- Platform-independent, can be used on various operating systems, including Windows, macOS, and Linux.
- Supports various data types for variables, including integers, floating-point numbers, characters, and user-defined data types. This flexibility allows it to handle a wide range of scientific data types.
- Allows for data compression and chunking, which can reduce storage requirements and improve data access times.
- Support efficient data access. By organizing data into chunks and using compression techniques, it's possible to retrieve specific subsets of data without reading the entire file. This is crucial for working with large datasets.

NetCDF files are designed to store multidimensional array-based scientific data. This data can include variables, dimensions, and attributes. Variables represent the actual data arrays, dimensions define the sizes of the arrays, and attributes provide additional information about the variables or the file itself. NetCDF supports hierarchical data structures, which enable the creation of groups within a NetCDF file. Groups allow for the organization of variables, dimensions, and attributes in a structured manner, making it easier to manage and access large datasets.

Though NETCDF is a common data format, none of the COTS packages are updated to handle NETCDF format. Moreover there are no open source packages are available to analyze and visualize NETCDF products. Whereas all open source and COTS packages are proven to handle Geo-tiff format. So it is felt necessary to develop an s/w tool to convert data products from NETCDF to Geo-Tiff format.

NC2G is a software utility developed at PSDD, DPSG, DPA, NRSC, ISRO, to convert NetCDF Level 1C/2C data products to Geotiff format for Oceansat-3 OCM sensors.

2. Contents of Oceansat-3 OCM data products in NetCDF

User data products with following processing levels are supported for OCM-3.

Table 1. OCM-3 Processing Levels

Processing Level	Level-1C (L1C)	Level-2C (L2C)
Description	Radiance Product Geo-referenced	Geo-physical Parameters Geo-referenced
Map Projection	LCC/Geographic	LCC/Geographic
Product Format	NetCDF-4	NetCDF-4
Acquisition Mode	LAC, GAC	LAC, GAC
Content	Geo-referenced Radiance Images of 13 Bands, Map Projection Parameters, tie point information (X and Y values) and Per Pixel View Angles	Geo-referenced Geophysical Parameters and Map Projection Parameters, tie point information (X and Y values)

a. Contents of Standard Products (L1C)

Following variables are present in this product:

Channel Variables: The scaled radiance of various channels (BAND01, BAND02, BAND03, BAND04, BAND05, BAND06, BAND07, BAND08, BAND08, BAND09, BAND10, BAND11, BAND12, BAND13) in 16-bit unsigned integer data type.

Geo-Location Information Variables: The map projection information and Latitude/Longitude information.

Ancillary Variables: Satellite Azimuth, Satellite Elevation, Sensor Azimuth, Sensor Elevation in 32-bit floating point.

b. Contents of Geophysical Parameters (L2)

Table 2. OCM-3 Geophysical Parameters List

Variable Mnemonic	Variable Name in NetCDF File	Description
CL	CL-a	Chlorophyll-a
AO	AOD	Aerosol Optical Depth
DA	DAC	Diffused Attenuation Coefficient (Kd-490)
SE	TSM	Total Suspended Matter
RR	RRS01 to RRS10	Remote Sensing Reflectance of first 10 bands
EV	EVI	Enhanced Vegetation Index
ND	NDVI	Normalized Difference Vegetation Index
VF	VF	Vegetation Fraction

- **Geo-Location Information:** Map projection information and X, Y coordinates values for each pixel of the image.
  - For L1C and L2C products in Geographic Lat/Lon projection, the Lat/Lon values for each axis are stored in "latitude" and "longitude" variable.
  - For L1C and L2C products in LCC projection, the geo-location information is provided in terms of map projection.

With the demand from the users for NetCDF file to Geotiff format conversion, the present module is developed at NRSC for EOS-06 (Oceansat-OCM3).

3. Salient features of the software

- ❖ Format Conversions without reprojection or manipulation of input data.
- ❖ Adding projection information to tiff image which is most useful for all applications.
- ❖ User friendly Java GUI.
- ❖ All Java code built using Java Version jdk1.7 or higher- You will need Java jre7 or higher on your system to run this utility.
- ❖ Does not require any installation as program can run by invoking it through double clicking the run.bat or through command mode.

4. Hardware and software requirements

Desktop computer system with minimum 2 GB RAM and any operating system with pre-installed Java SE JRE 7 (Build 1.7.0 or higher) is good enough to run this utility.

Update Environment Variable Settings:
Add Java Installation directory at the end of 'path' variable inside Environment Variable settings of your system.

a. **Software Requirements:**   Java 1.7 or more with suitable **GDAL** version

b. **Hardware Requirements:**
   Hard Disk   :   5GB and Above
   RAM   :   2GB and Above

Input and Output requirement:
Input file should be in NetCDF format of Oceansat-OCM3 predefined structure. Output file format will always be in Geo-Tiff file.

This software utility may also work with any other satellite data provided they meet the structure of Oceansat-3 satellite. However, its functionality is tested only with NRSC supplied Oceansat OCM-3 data products.

5. Steps to Run the Program

Invoke program by double clicking on "run.bat" in windows system or type the following command in the terminal window of your operating system "run.bat", the GUI appears.
(Give full path of Java command and full path of run.bat in case if above command does not work)

If your system is having more memory try allocating more memory to JVM using –Xmx argument in command mode.
(Example: to allocate 4GB of memory: *"–Xmx4096m"*)

❖ **Download JRE:** Java SE JRE can be downloaded and installed from Oracle website (www.oracle.com).
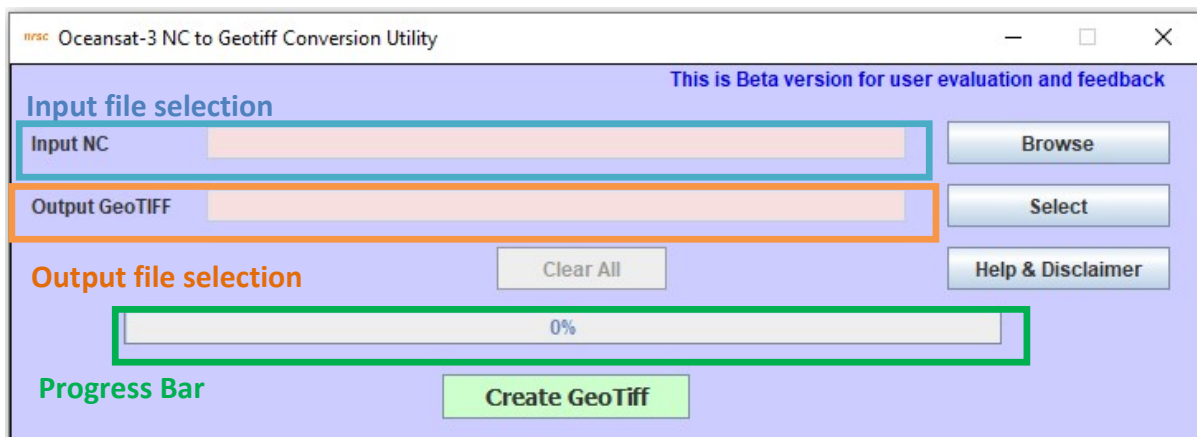
Selection of "*Input NC*" as it prompts for entering the locations of the Oceansat OCM3 data products as shown in the figure below:
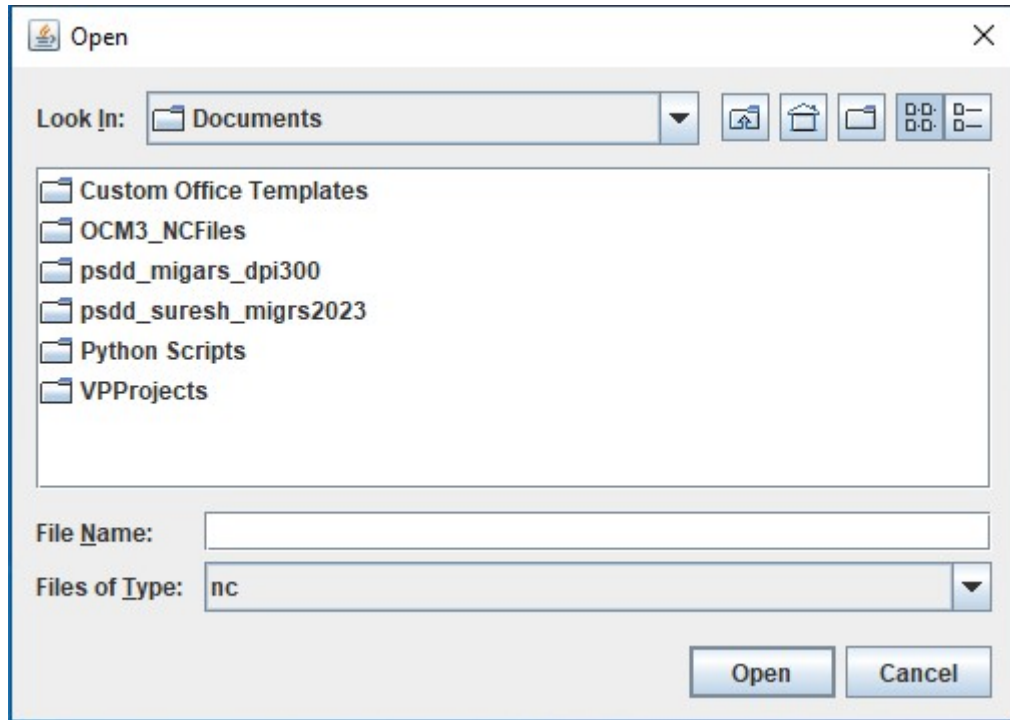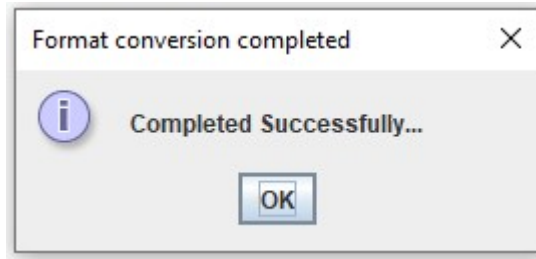
After entering the path of the input NC file, select the name of the output file to be created as shown in the figure below:
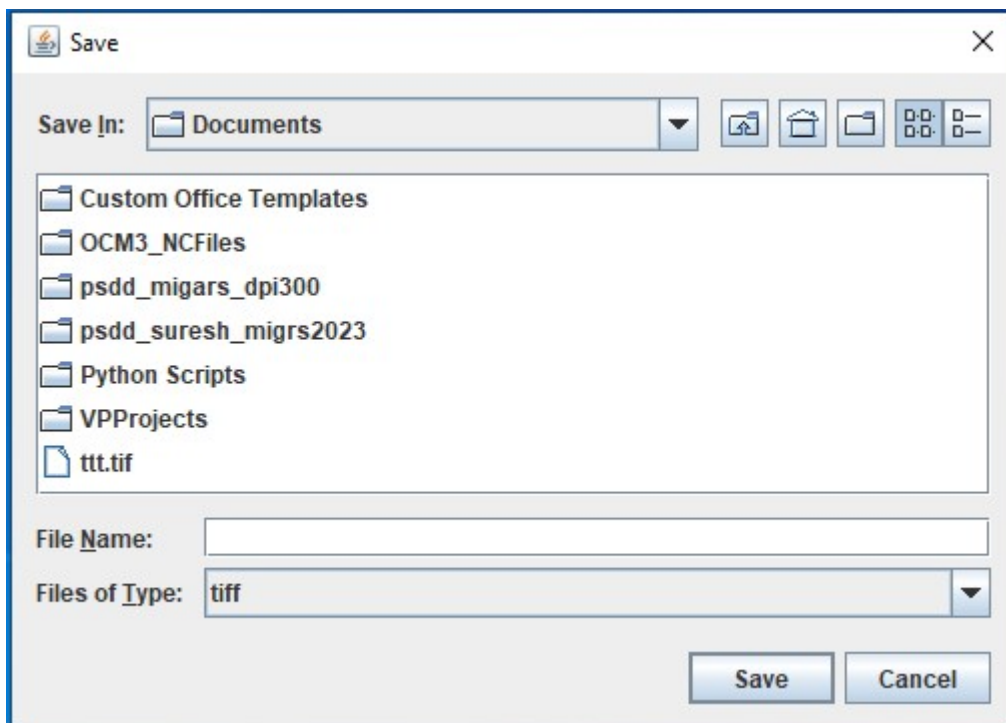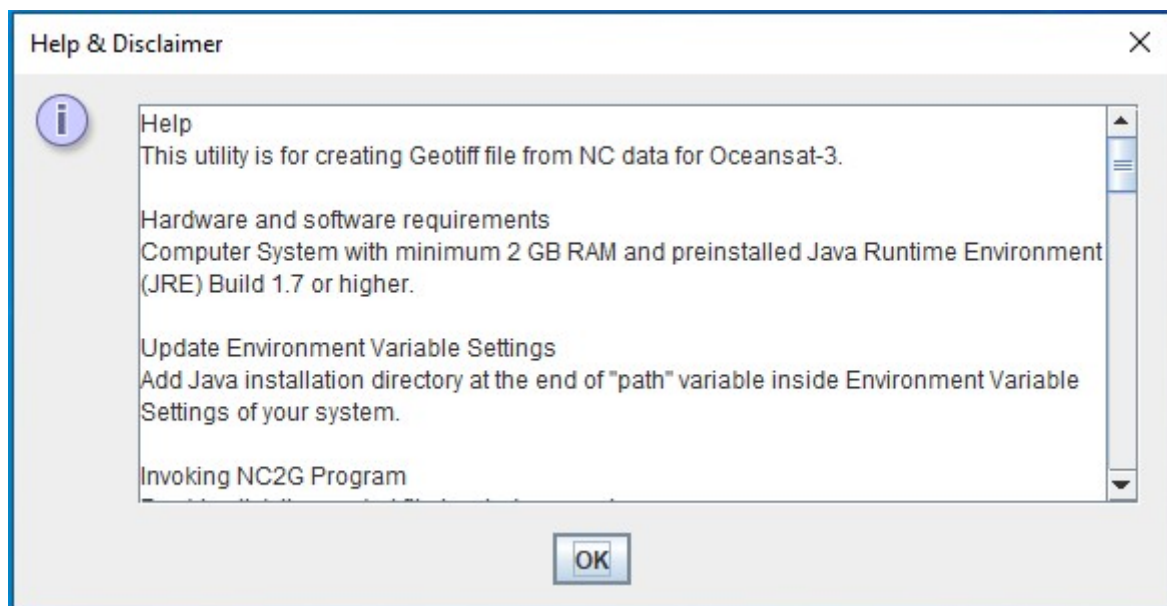

The progress status appears at the bottom of the progress bar as shown below:
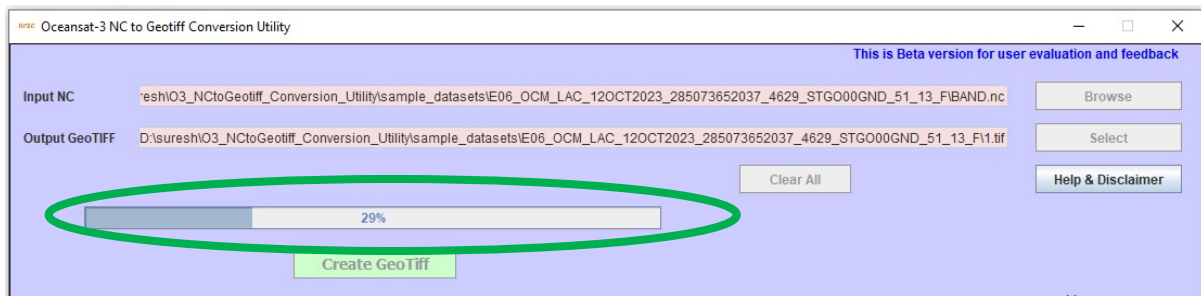
After completion of the conversion the completion status is reported as shown in the figure below:

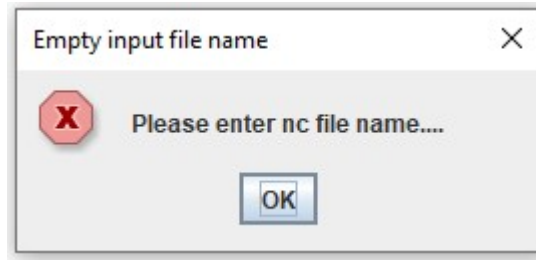If user clicks on Help& Disclaimer button, it will be shows as below:

6. Error conditions and messages

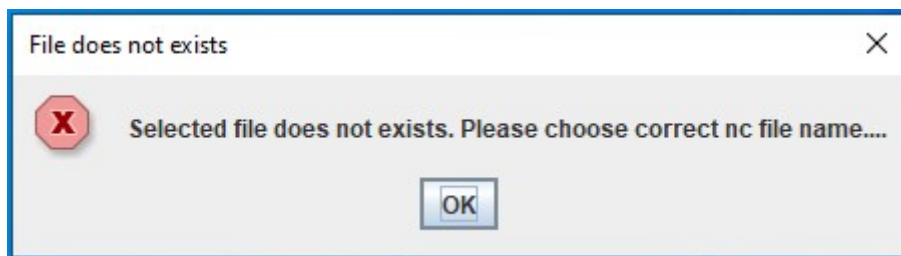***1. Forgot to enter input NC file:*** If one forgets to enter input NC file path, it will give an error message
***Solution:*** *Select input Oceansat-3 OCM product path*

2. Input file does not exists: If one types input HDF5 file name which does not exists, it will given an error message
**Solution:** *Type correct input Resourcesat-2 HDF5 product path*

3. Forgot to enter output TIF file: If one forgets to enter output HDF5 file path, it will give an error message
**Solution:** *Select output **tif** file path*
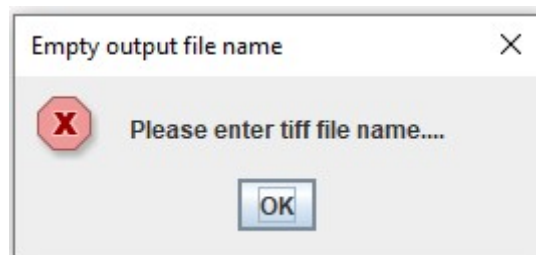
4. Permissions problem in output Geotiff file creation: If utility fails to create output tif file in specified folder such as CD-ROM/DVD-ROM/BD-ROM drive, an error message appears.
**Solution:** *Change output file location to local disk drives.*
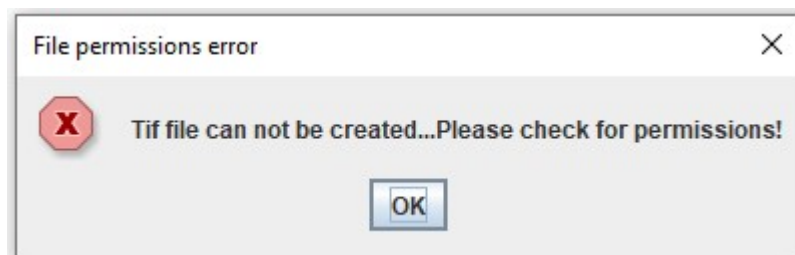
5. Check if output file already exists: The software utility checks whether output tif file already exists or not. If exists, input prompt dialog window appears to user for selecting YES, NO or Cancel. If user selects Yes, the tif file will be deleted.
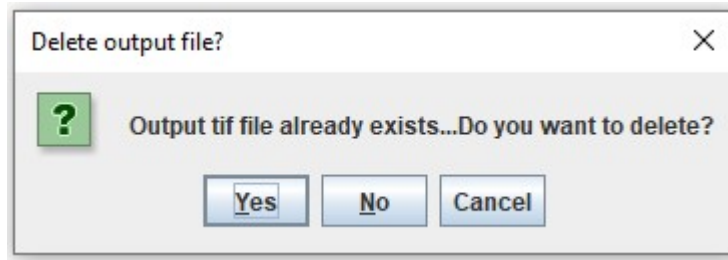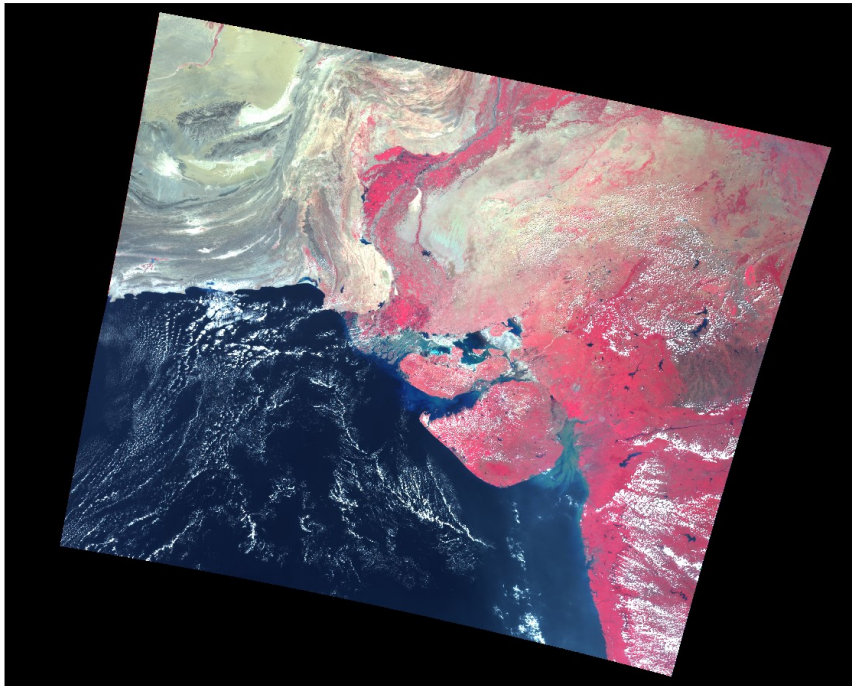
7. Sample Oceansat-3 OCM NetCDF file and Output Geotiff file

1. L1C Product
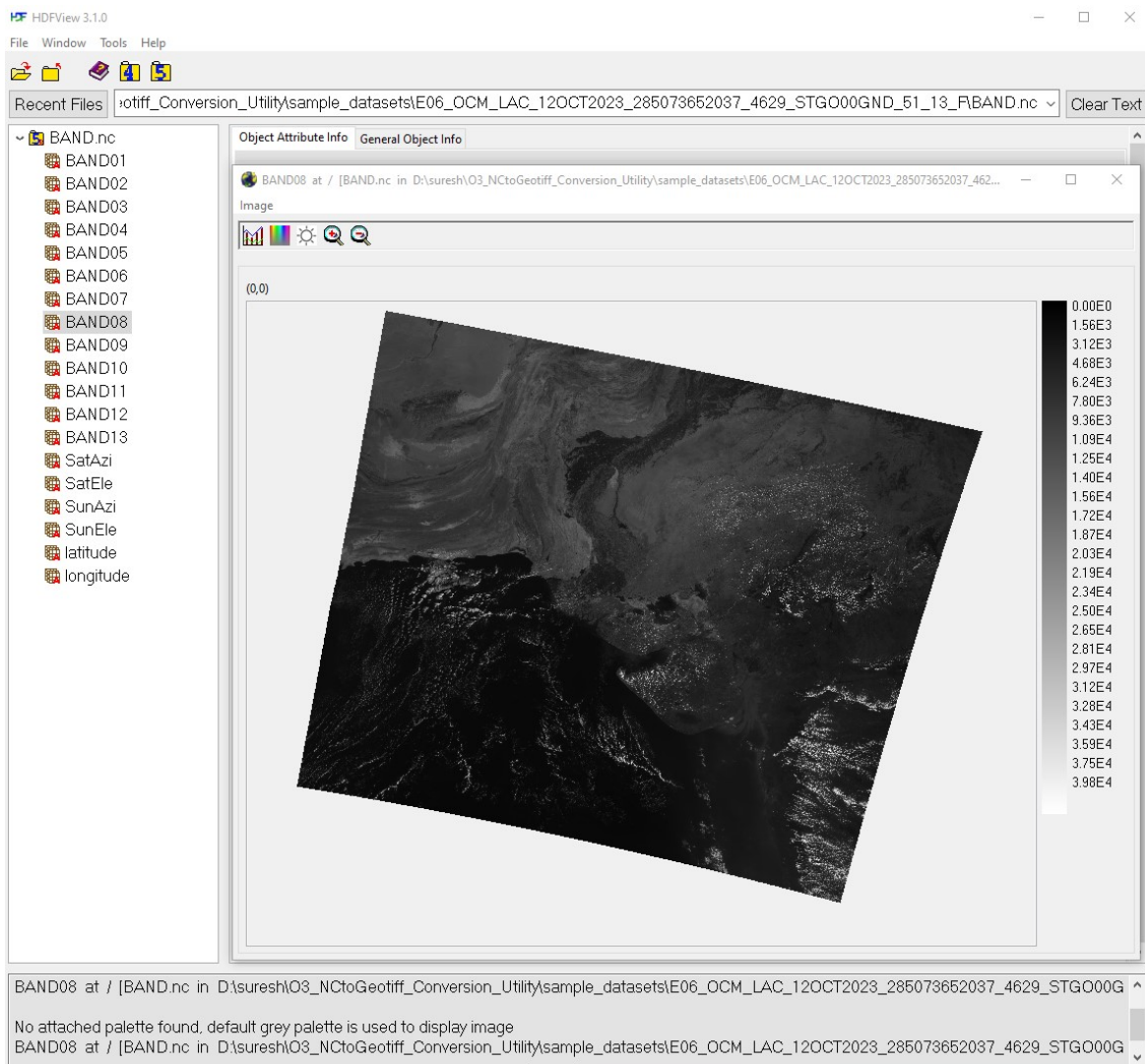
Output Geotiff file (R: Band 12   G: Band 8   B: Band 5)

9. Disclaimer

1. This software product is provided by NRSC "as is" and conveys no license or title under any patent, copyright, or mask work right to the product. NRSC reserves the right to make changes in the software without notification. NRSC also make no representation or warranty that such application will be suitable for the specified use without further testing or modification. There are inherent dangers in the use of any software, and you are solely responsible for determining whether this software product is compatible with your computer and other software installed on your computer. You are also solely responsible for the protection of your system and backup of your data, and NRSC will not be liable for any damages you may suffer in connection with using, modifying, or distributing this software.
2. This software utility is one of the modules implemented based upon the Oceansat OCM-3 file structure. Developer does not claim that this utility will be foolproof and replace any other existing module or sensor.