Providing pre-Launch VIIRS, CrIS, and ATMS Proxy Datasets to facilitate NPP Validation Activities

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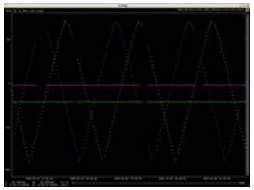
The IPO Data Products Division has implemented a capability to use data from existing environmental sensors as proxy for NPP Sensor Data Records (SDR). Data from Terra, Aqua and MetOp are transformed to mimic NPP SDRs and are formatted according to the mission HDF5-NPOESS standard. Data are retrieved from near-real time sources and are immediately transformed. The software runs on the Government Resource for Algorithm Verification, Independent Testing, and Evaluation (GRAVITE) system. GRAVITE maintains a 30-day rolling store of the resulting products and makes them available for use and distribution to the Cal/Val team and to IPO customers.

VIIRS PROXY

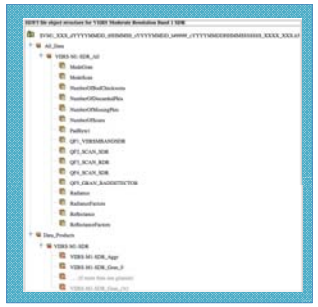
NRTPE streaming L0 Terra and Aqua MODIS → five minute MODIS L0 granules [requires three contiguous granules] → "CUTTER" process → 48 scan line MODIS L0 format VIIRS length granules [contiguous granules with no overlap] → GSFC SeaDAS L1B Processor → 48 scan line MODIS L1B VIIRS length granules [HDF-EOS format] → MODIS to VIIRS converter "MOVICON" process →

- 22 Band-specific Proxy for VIIRS SDR granules
- 3 Proxy for VIIRS M, I, and DNB Geolocation
- [HDF5-NPOESS format]



VIIRS Proxy from MODIS

- Adapted from "SDRGen" by NOAA, Raytheon, NASA GSFC Land PEATE and IPO NDPD
- MODIS detector pixels values are piecewise interpolated to simulate 16 detector VIIRS
- No special processing for striping
- Pixel Geolocation is bilinearly interpolated for each of the VIIRS resolution scales, Moderate, Imagery, and Day/Night
- Simulates VIIRS bow-tie deletion
- Radiance and Brightness Temperatures are scaled by VIIRS factors and cast to integer.



MODIS Band	VIIRS Band
8 EV_1KM_RefSB	M1 (DAY)
9 EV_1KM_RefSB	M2 (DAY)
3 EV_500_Aggr1km_RefSB	M3 (DAY)
4 EV_500_Aggr1km_RefSB	M4 (DAY)
1 EV_250_Aggr1km_RefSB	M5 (DAY)
15 EV_1KM_RefSB	M6 (DAY)
2 EV_250_Aggr1km_RefSB	M7
5 EV_500_Aggr1km_RefSB	M8
26 EV_1KM_RefSB	M9
6 (Terra) EV_500_Aggr1km_RefSB 7 (Aqua) EV_500_Aggr1km_RefSB	M10
7 EV_500_Aggr1km_RefSB	M11
20 EV_1KM_Emissive	M12
21 EV_1KM_Emissive	
22 EV_1KM_Emissive [Band 22 saturated / missing values are replaced with Band 21 values]	M13
29 EV_1KM_Emissive	M14
31 EV_1KM_Emissive	M15
32 EV_1KM_Emissive	M16
1 EV_250_Aggr500_RefSB	I1 (DAY)
2 EV_250_Aggr500_RefSB	I2 (DAY)
6 (Terra) EV_500_RefSB 7 (Aqua) EV_500_RefSB	I3
20 EV_1KM_Emissive	I4
31 EV_1KM_Emissive	I5
(1+2+3+4)/4	
1 EV_250_Aggr500_RefSB	
2 EV_250_Aggr500_RefSB	DNB (DAY)
3 EV_500_RefSB	
4 EV_500_RefSB	
Full values (for radiance)	DNB (NIGHT)

CrIS PROXY

Streaming L1C MetOp IASI → L1C granules → "CUTTER" process → CrIS sized granules → LaRC IASI to CrIS converter process →

- Proxy for CrIS SDR
- Proxy for CrIS Geolocation

$$R_n^{CrIS} = \frac{1}{N}\sum_{k=0}^{N-1}\frac{a(k)}{g(k)}\left(\sum_{j=0}^{N-1} R_j^{IASI} e^{2\pi ijk/N}\right) e^{-2\pi ikn/N}$$

Where, R_n^{CrIS} is the radiance for the nth CrIS channel, R_j^{IASI} is the radiance for the jth IASI channel, N is the number of points in the transformed interferogram, g() is the apodization function for the IASI instrument, a() is the apodization function for the CrIS instrument.

CrIS Proxy from IASI

- Developed by Xu Liu, NASA LaRC, ATBD Available.
- FFT of IASI L1C spectra to generate interferograms
- Apodization and truncation to approximate CrIS interferograms
- Inverse FFT to generate proxy CrIS spectra
- The IASI instrument has 3 spectral bands and each spectral band has 4 pixels within the AMSU field of views (FOV). The CrIS instrument has 3 spectral bands and each spectral band has 9 FOV within a 45 km field of regard (FOR). A spatial linear interpolation is performed to convert the 4 IASI pixels to the 9 CrIS pixels

ATMS PROXY

Streaming MetOp AMSU-A/MHS → 100-minute EPS ATOVS L1B granules converted to NOAA KLM L1B granules → MIT LL MatLAB ATMS Generator → Proxy for ATMS → GRAVITE HDF5 to HDF5-NPOESS formatter →

- Proxy for ATMS SDR
- Proxy for ATMS Geolocation

The ATMS proxy data are computed using a regression relationship derived from a global ensemble of atmospheric profiles together with a physical radiative transfer model considering surface type, polarization, channel bandwidth, and viewing geometry.

ATMS Proxy from AMSU-A/MHS

- Developed by Bill Blackwell, MIT Lincoln Lab
- ATBD available; manuscript under review by IEEE GRSL
- Implemented as MATLAB
- Runs as binary on GRAVITE
- Post processor creates CDFCB-X compliant output files.

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