

MODIS and VIIRS L1B and LUT Updates

MCST / VCST

MODIS Characterization Support Team

VIIRS Characterization Support Team

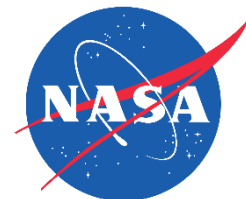
NASA Goddard Space Flight Center, Greenbelt, MD

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MODIS Level 1B Code and LUT Status





MODIS L1B Data Products



- **Two separate sets of code and LUT (look-up-table)**
 - Terra MODIS (**MOD02**) and Aqua MODIS (**MYD02**)
 - C6 (2012 – present): Terra V6.1.26; Aqua: V6.1.37
 - C6.1 (2017 – present): Terra V6.2.2; Aqua: V6.2.1
- **No L1B code update (since last STM (10/2018))**
- **L1B LUT updates (since last STM)**
 - Terra MODIS C6: **15**; C6.1: **14**
Aqua MODIS C6: **15**; C6.1: **15**
 - C6 & C6.1 LUT are identical in the forward LUT update, except TEB and QA for Terra MODIS.



Major C6.1 L1B Improvements



- Aqua: EV_based RVS characterization extended to mission long MODIS bands 1-4
- Terra: MODIS LWIR crosstalk correction
Bands: 27 (6.72 μ m), 28 (7.33 μ m), 29 (8.55 μ m), 30 (9.73 μ m)

Detector Quality Flag after Safe Mode in 2016 (Terra)

Terra MODIS Bands 27-30	Collection 6	Collection 6.1
Noisy Detectors	18	5
Inoperable Detectors	3	0

- Terra: Implemented **new** SWIR cross-talk correction algorithm to MODIS C6.1 via forward LUT update (07/03/2019).

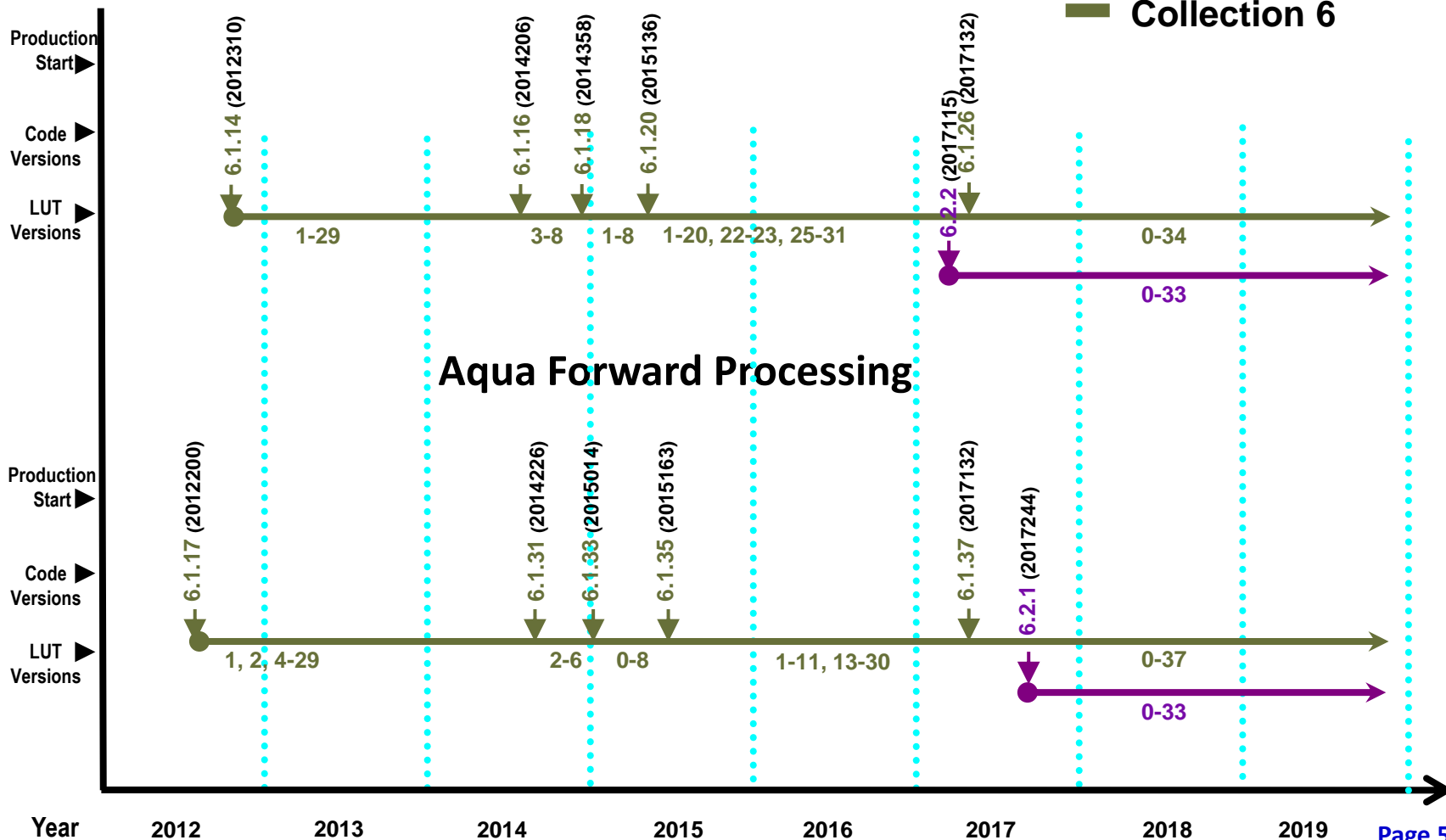


L1B Major Production Timeline



Terra Forward Processing

Collection 6.1
Collection 6





Status of C7 L1B Code Change



- MWIR and LWIR cross-talk corrections have been implemented and tested in L1B for both Terra and Aqua MODIS, and are ready for future collection

- Data product format change from HDF4 to NetCDF/HDF5
 - L1 and L2 granule data: NetCDF
 - L2G-L3-L4 Land tile-based products: HDF5
 - SDST completed PGE01 (L1A and GEO) 07/2019
 - MCST delivered PGE02 (L1B) 09/2019 for testing



VIIRS Level 1B Code and LUT Status





VIIRS SDR Products (S-NPP only) (SIPS Support)



- Land SIPS SDR process using modified IDPS Code with VCST LUTs (C1.0 and C1.1)
 - Modified IDPS SDR/EDR codes Mx based version with LUTs input from VCST.
 - 75 sets of LUTs for RSB and DNB have been delivered to Land SIPS for data reprocessing and SDR/EDR assessments in Collections 1.0 and 1.1.
- Atmosphere SIPS SDR reprocess using IDPS Code with VCST LUTs
 - Mission data reprocessing VIIRS SDR/EDR using Mx8.4 software in late 2014.
 - 9 sets of SDR LUTs were delivered (Nov 2014 - Feb 2016) – same quality as those for Land C1.1.

Collection	Code Base	# of LUTs	Period (Year.Month)	Improvements
LPEATE Early	Mx6.3	5	2012.10 - 2013.01	Smoothed functions for SD degradation H-factor and calibration coefficients F-factor.
	Mx6.4	5	2013.04 - 2013.11	Updated SD/SDSM screen transmission, SD BRDF, RTA mirrors degradation model, and modulated RSRs.
LPEATE C1	Mx7.2	25	2013.12 - 2016.02	Improved time-dependent modulated RSR, DNB stray light correction, H & F fitting functions. (LSIPS data AS3110)
LSIPS C1	Mx8.11	40	2016.03 - 2019.11	Improved Quality Flags, introduced DNB gain ratio and LGS LUTs, fixed solar/lunar vectors, with RSBAutoCal option. (LSIPS data AS5000)



VIIRS S-NPP L1B Products (SIPS Support)



- NASA SIPS L1B Products for S-NPP (6-min granule in NetCDF format)
 - VIIRS L1 software/LUT and data design are developed under NASA EDOS/SIPS.
 - Calibrated data files are reduced from 22,000 SDRs to 720 L1Bs daily.
 - First L1B software V1.1.0 was released in Jan 2016 for SIPS evaluation and testing.
 - V2.0.0 was officially released in Oct 2016.
 - V3.0.0 was officially released in August 2018 for both S-NPP and NOAA-20 (JPSS-1).

Collection	Code Base	# of LUTs	Period (Year.Month)	Improvements
LSIPS Testing	L1B V1.1.0	20	2016.02 - 2017.09	Redesigned L1B software, LUTs, and data format using L1A data input.
LSIPS C1	L1B V2.0.0	35	2016.08 - 2019.11	Improved L1B software functions and algorithms. (LSIPS data A55110)
LSIPS Evaluation	L1B V3.0.0	18	2018.01 - 2019.11	Run for both NPP and J1. Add different RTA encoder start value for J1. Modify J1 DNB GEO over extended mode. Introduce M11 process at Ops_Night. Improve M13 radiometric resolution. Add moon phase and illumination for DNB pixel.
LSIPS C2	L1B V3.1.0	1	2019.09 - 2019.11	Mission LUTs for reprocessing. Add noisy detector quality flags.



VIIRS N20 (JPSS1) L1B Products (SIPS Support)



- NASA SIPS L1B Products for NOAA-20 (JPSS-1)
 - L1B software V3.0.0 was released in August 2018 with full S-NPP and JPSS-1 support.
 - V3.0.0 LUTs updates are being released by VCST with 2 months forward prediction.
 - Land SIPS started JPSS-1 mission reprocessing using V3.0.0 software in June 2019 and completed in September 2019; forward process ongoing.

Collection	Code Base	# of LUTs	Period (Year.Month)	Improvements
LSIPS Evaluation	L1B V3.0.0	6	2018.06 - 2019.05	Run for both NPP and J1. Add different RTA encoder start value for J1. Modify J1 DNB GEO over extended mode. Introduce M11 process at Ops_Night. Improve M13 radiometric resolution. Add moon phase and illumination for DNB pixel. (LSIP data AS3194)
LSIPS C2	L1B V3.0.0	4	2019.06 - 2019.11	Mission LUTs for reprocessing. Add noisy detector quality flags.



Status of NASA VIIRS Level-1 Software



- V3.1.0-rc (release candidate) has been released by Ocean group for testing in September 2019.
- Improvements:
 - L1B (calibrate_viirs)
 - New QA flag to identify noisy detector
 - Update N20 (J1) CMN LUT
 - Fixed bugs in: calibration substitution flag; incomplete conversion of times from IET to tai93; RSB processing for night granules; quality flagging of 'temp_not_nominal' for single-gain bands
 - L1A (l1agen_viirs)
 - Fixed issue with code failing if the output filename did not include a dot ('.')
 - GEO (geolocate_viirs)
 - Update to u_aft to accommodate matrix flip in LUT
 - Update parameters in GEO LUT
 - Discontinuation of updates to orbit number tables
- Future Improvements:
 - DNB straylight correction for N20 at end of scan; for S-NPP with weekly LUT
 - Uncertainty algorithm to be applied in L1B