Visible Infrared Imaging Radiometer Suite (VIIRS) Sensor Data Record (SDR) Error Budget

VIIRS SDR Science Team

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1. Radiometric Calibration Performance

1.1 VIIRS SDR Requirements and Performance

Table 1. VIIRS SDR Radiometric Performance and requirements chart

Band	Driving EDR(s)	Center Wavelength (µm)	Equiv. Width (µm)	Horizontal Sample Interval (km) (track × scan)		Band Gain	Ltyp or Ttyp (Spec)	Lmin or Tmin	Lmax or Tmax	Spec SNR or NEdT (K)	On Orbit SNR or NEdT (K)	MODIS equiv. band
				Nadir	End of Scan							
VisNIR												
M1	Ocean Color Aerosol	0.411	0.0198	0.75×0.75	1.60x1.58	H	44.9	30	135	352	588	B8
						L	155		615	316	1045	
M2	Ocean Color Aerosol	0.444	0.0143	0.75×0.75	1.60x1.58	H	40	26	127	380	572	B9
						L	146		687	409	1010	
M3	Ocean Color Aerosol	0.486	0.0190	0.75×0.75	1.60x1.58	H	32	22	107	416	628	B10
						L	123		702	414	988	
M4	Ocean Color Ae-rosol	0.551	0.0209	0.75×0.75	1.60x1.58	H	21	12	78	362	534	B4/B12
						L	90		667	315	856	
I1	Imagery EDR	0.639	0.0775	0.375x0.375	0.80x0.79	S	22	22	718	119	214	B1
M5	Ocean Color Aerosol	0.672	0.02	0.75×0.75	1.60x1.58	H	10	9	59	242	336	B13/B1
						L	68		651	360	631	
M6	Atmosph. Correct.	0.745	0.0146	0.75×0.75	1.60x1.58	S	9.6	5.3	41	199	368	B15
I2	NDVI	0.862	0.0394	0.375x0.375	0.80x0.79	S	25	25	349	150	264	B2
M7	Ocean Color Aerosol	0.862	0.0387	0.75×0.75	1.60x1.58	H	6.4	3.4	29	215	457	B16/B2
						L	33.4		349	340	631	
DNB	NCC Imagery	0.700	0.200	0.75×0.75	0.75×0.75	LG/MG/HG	3E-9	3E-9	0.02	6	>9	-
S/MWIR												
M8	Cloud Particle Size	1.238	0.0271	0.75×0.75	1.60x1.58	S	5.4	3.5	165	74	221	B5
M9	Cirrus/Cloud Cover	1.375	0.0150	0.75×0.75	1.60x1.58	S	6	0.6	77.1	83	227	B26
I3	Binary Snow Map	1.602	0.0572	0.375x0.375	0.80x0.79	S	7.3	7.3	72.5	6	149	B6
M10	Snow Fraction	1.602	0.0587	0.75×0.75	1.60x1.58	S	7.3	1.2	71.2	342	586	B6
M11	Clouds	2.257	0.0467	0.75×0.75	1.60x1.58	S	0.12	0.12	31.8	10	22	B7
I4	Imagery Clouds	3.753	0.360	0.375x0.375	0.80x0.79	S	270	270	353	2.5	0.4	B20
M12	SST	3.697	0.192	0.75×0.75	1.60x1.58	S	270	230	353	0.396	0.12	B20
M13	SST/Fires	4.067	0.165	0.75×0.75	1.60x1.58	H	300	210	343	0.107	0.04	B23
						L	380		634	0.423		
LWIR												
M14	Cloud Top Properties	8.578	0.324	0.75×0.75	1.60x1.58	S	270	190	336	0.091	0.06	B29
M15	SST	10.729	0.990	0.75×0.75	1.60x1.58	S	300	190	343	0.07	0.03	B31
I5	Cloud Imagery	11.469	1.75	0.375x0.375	0.80x0.79	S	210	270	340	1.5	0.4	B31
M16	SST	11.845	0.866	0.75×0.75	1.60x1.58	S	300	190	340	0.072	0.03	B32

1.2 Absolute Radiometric Calibration Uncertainty Specification

Table 2. Requirements of VIIRS Channel Radiometric Calibration Accuracy

Channel	Absolute Radiometric Accuracy
M1-M11	2% at Typical Radiance
M12/M13	0.7%(0.13K) @270K
M14	0.6% (0.26K) @ 270K
M15/M16	0.4% (0.22K/0.24K) @270K
I01-I03	2% at Typical Radiance
I04	5% (0.97K) @270K
I05	2.5% (1.5K) @270K
DNB	5%, 10%, 30% L_{min} (LGS,MGS,HGS)

1.3 Radiometric Uncertainty Budget

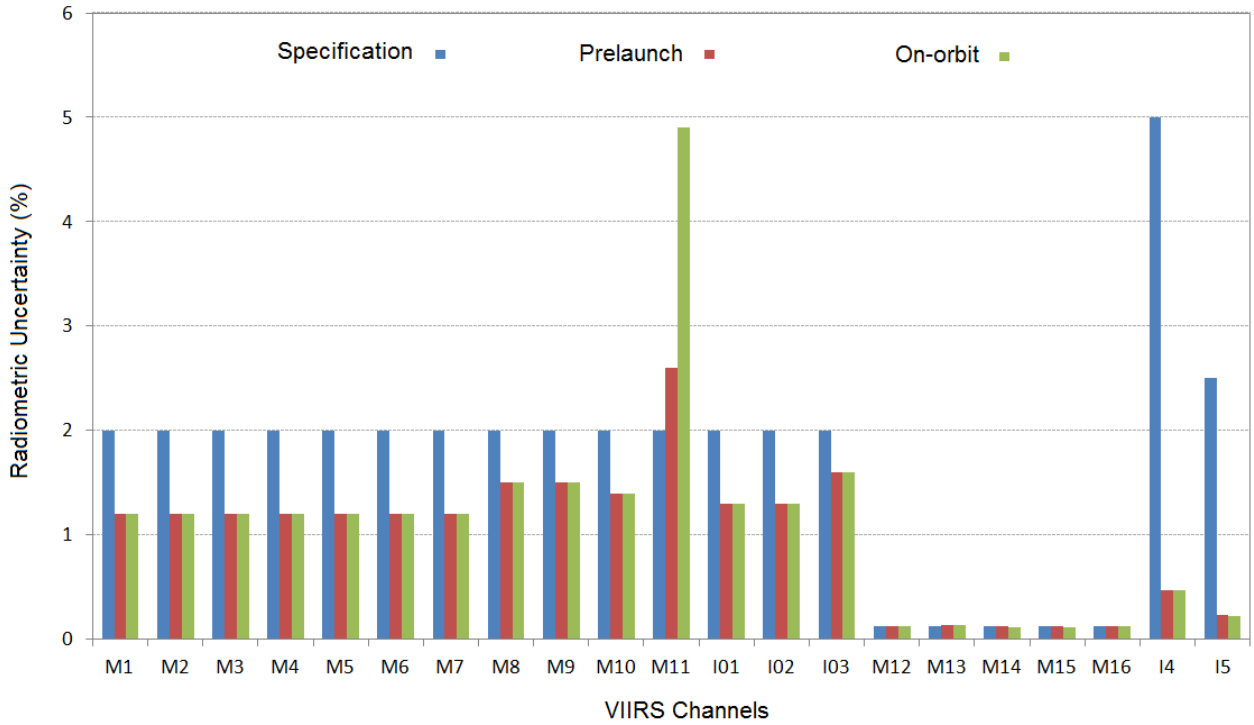

Figure 1. Absolute Radiometric Accuracy of VIIRS Reflective and Thermal Emissive Bands

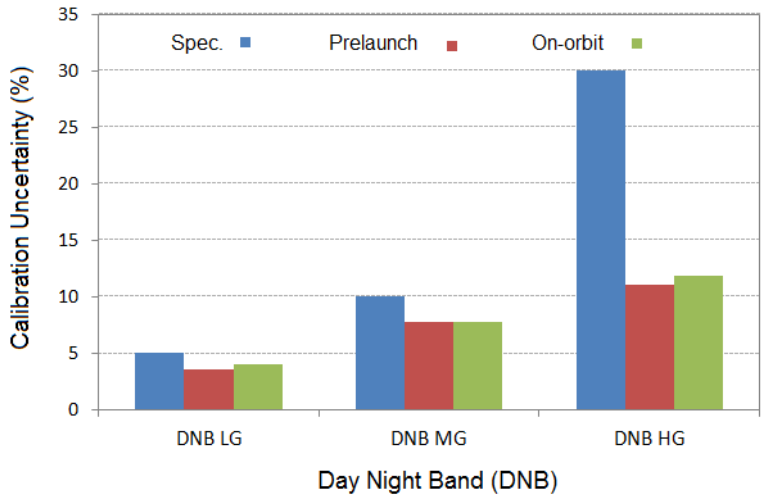

Figure 2. Absolute Radiometric Accuracy of VIIRS Day Night Band.

1.4 Post-launch Radiometric Performance

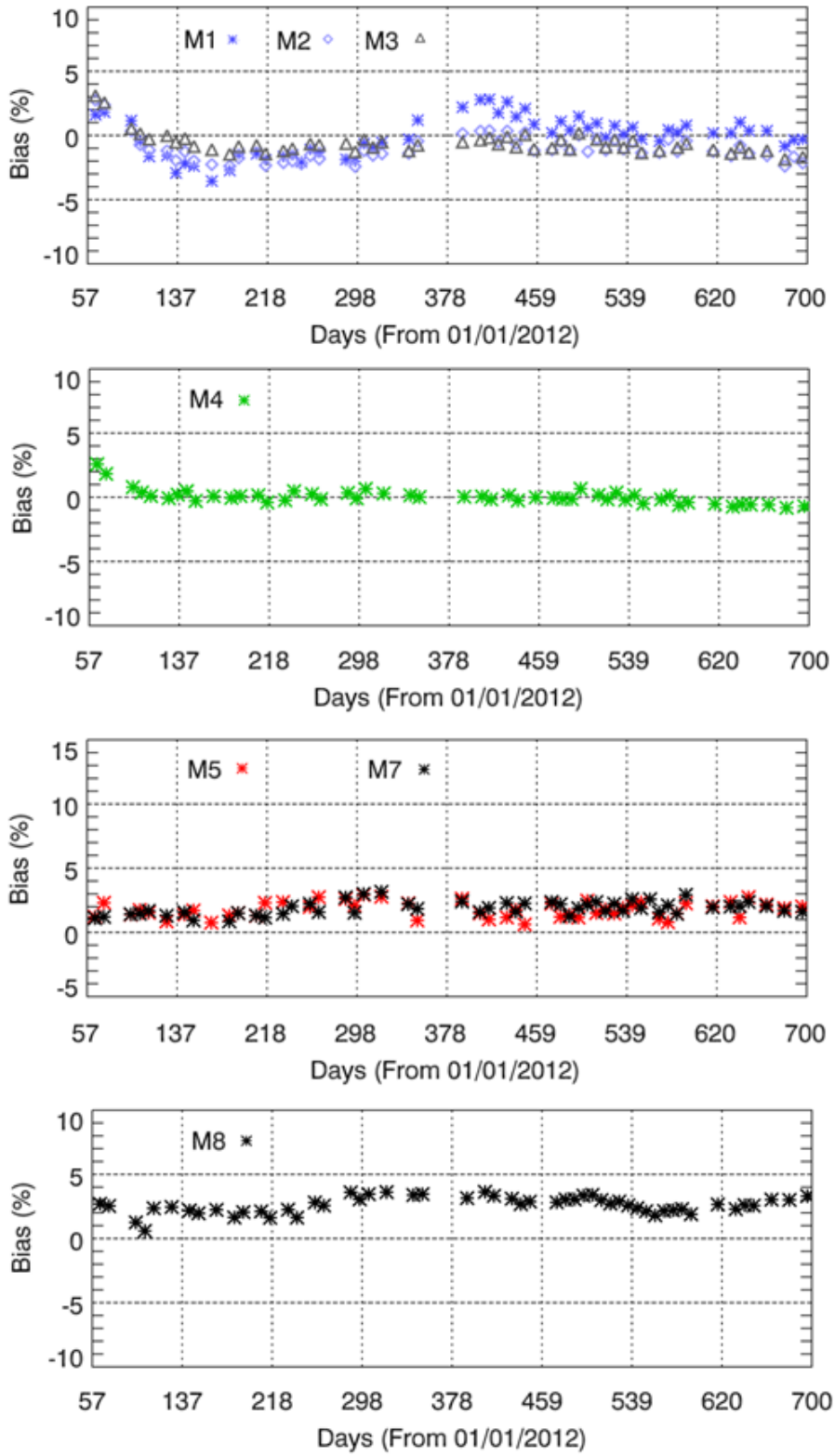

Figure 3. Radiometric bias time series of VIIRS moderate resolution radiometric bands.

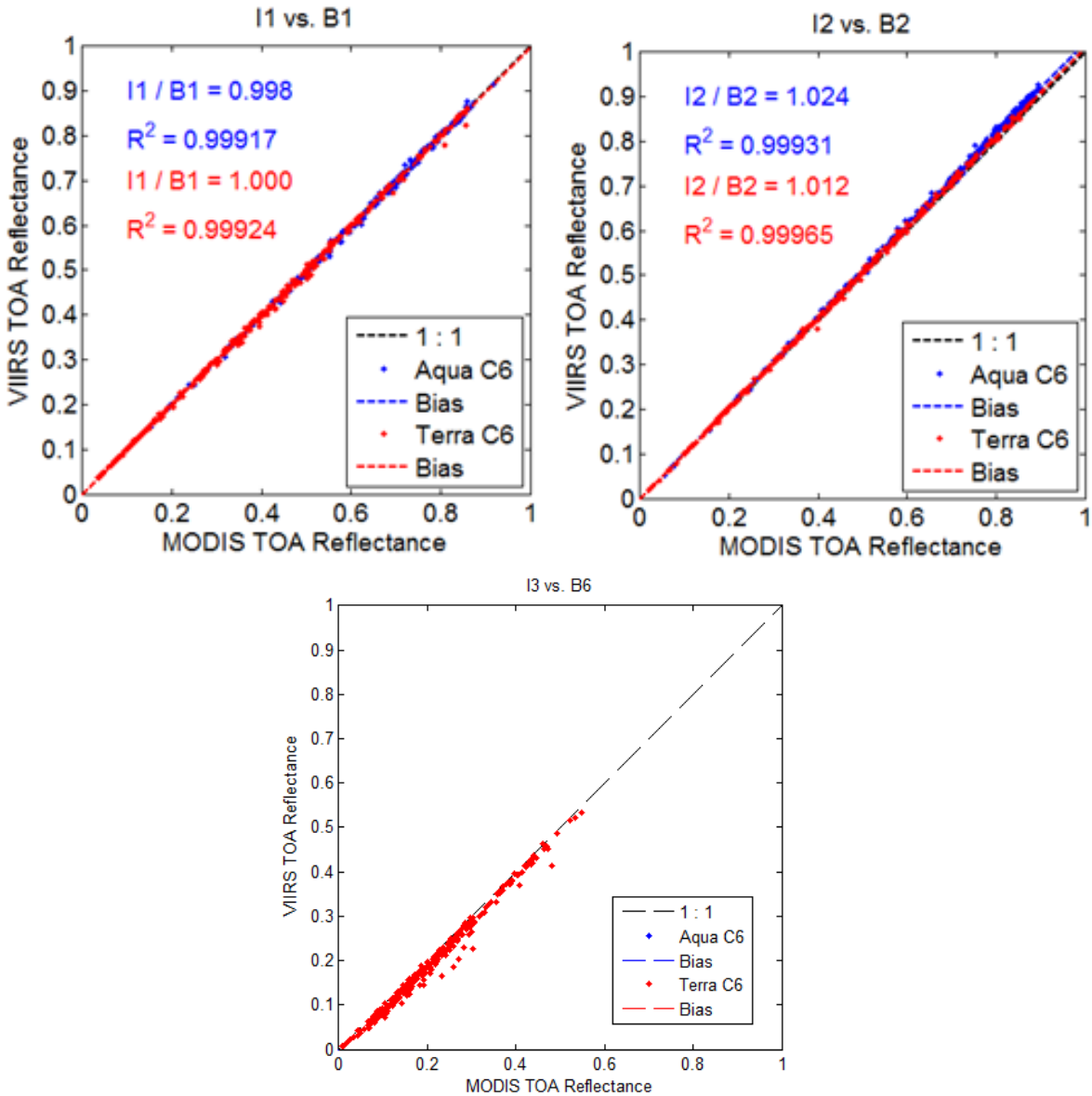

Figure 4. Inter-comparison of VIIRS solar reflective Imagery bands with MODIS

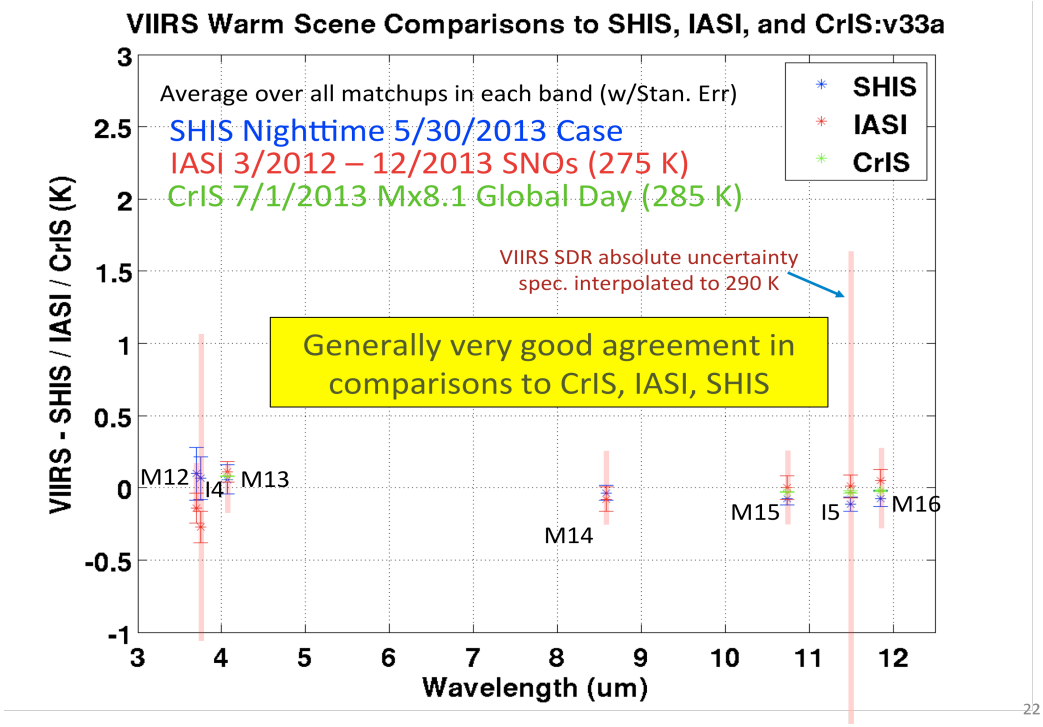

Figure 5. Radiometric Bias of VIIRS thermal emissive bands (TEB)

1.5 VIIRS Channel Noise Sensitivity (NEDT)

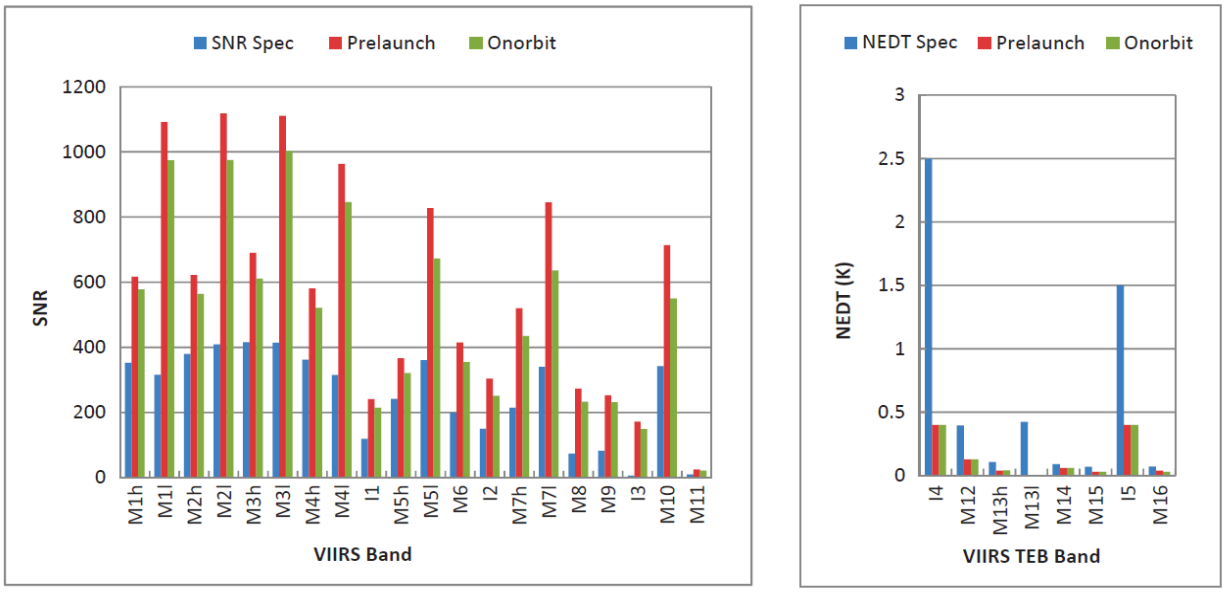

Figure 6. VIIRS NEDT values at a) Specification, b) Prelaunch and c) On-orbit.

1.6 Geolocation Accuracy of VIIRS

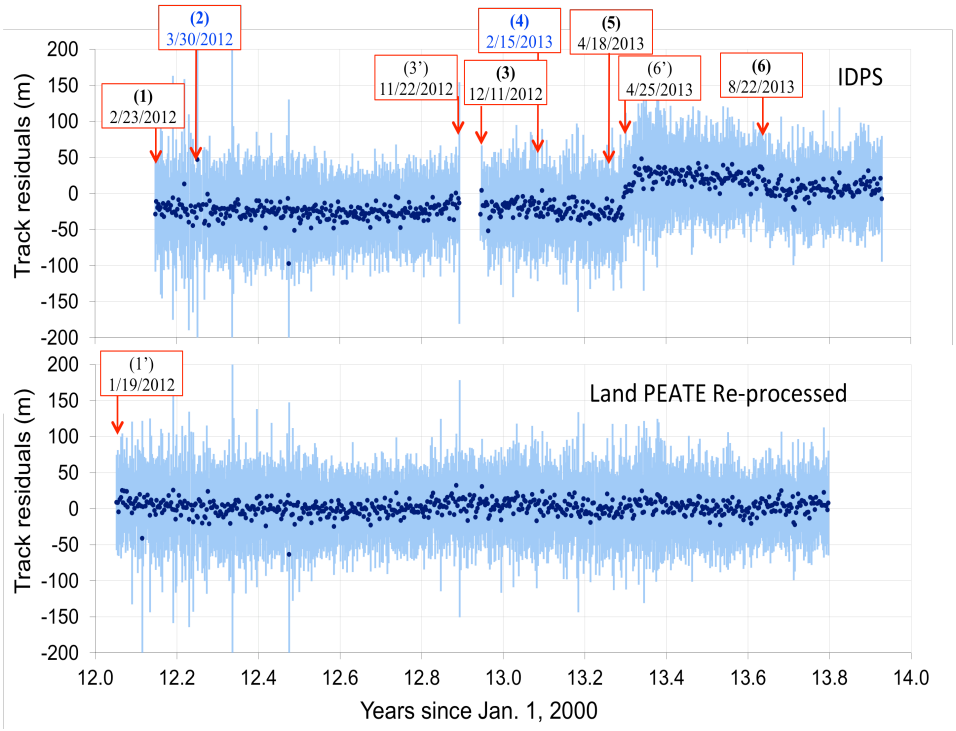

Figure 7. VIIRS geolocation: track residuals

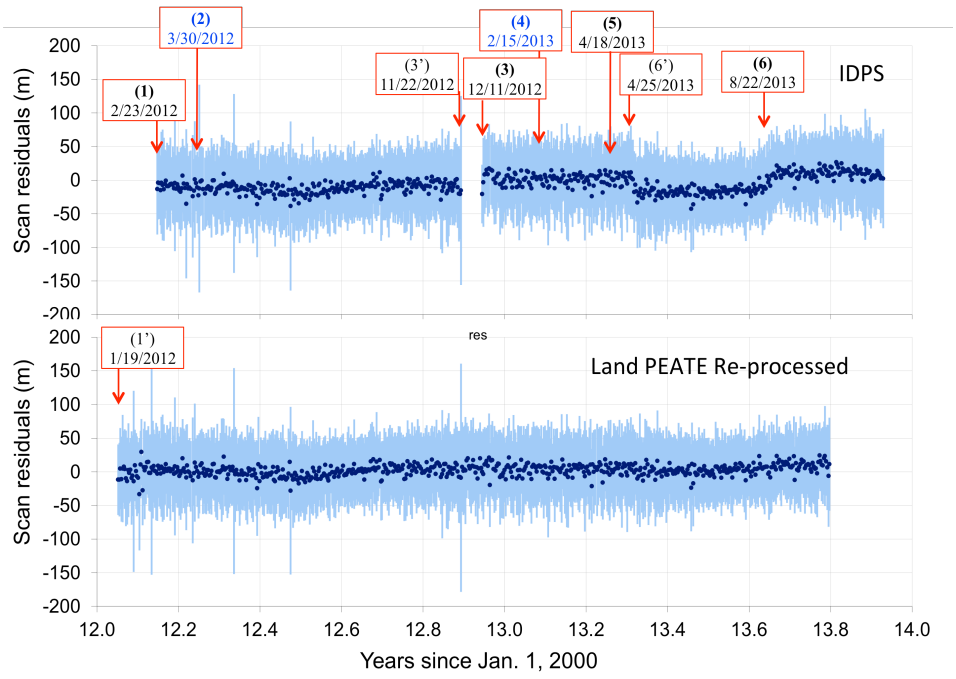

Figure 8. VIIRS geolocation: scan residuals

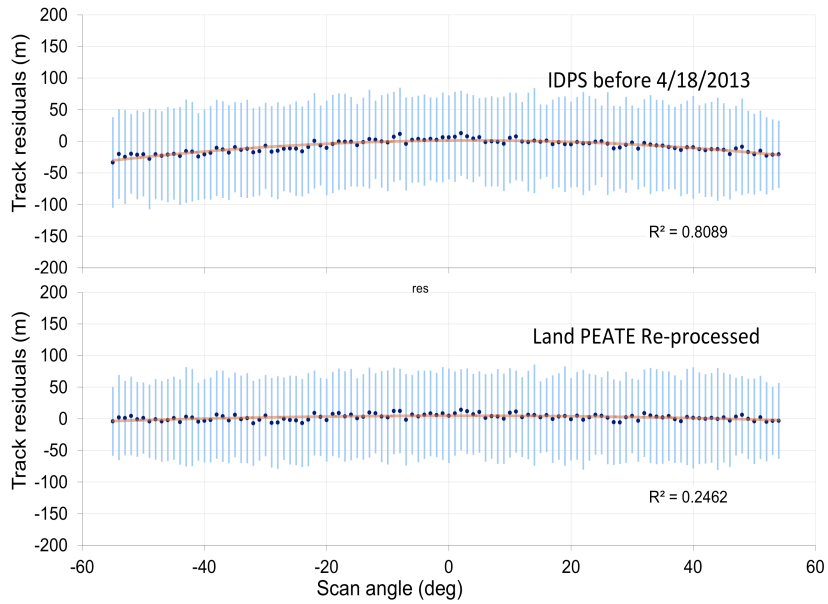

Figure 9. VIIRS geolocation: scan angle residuals

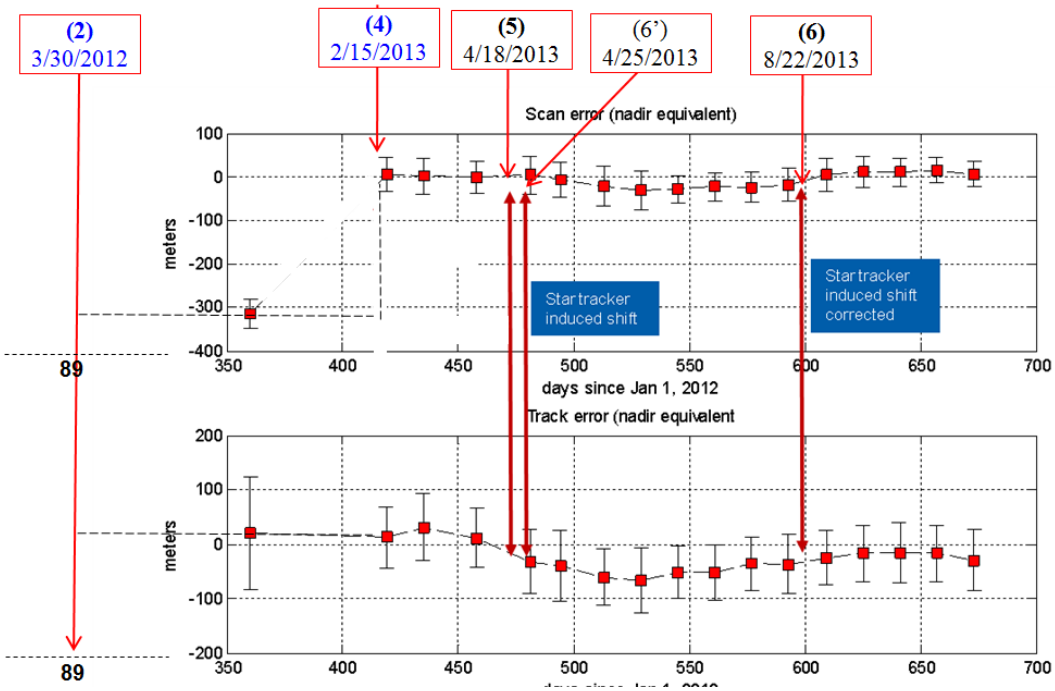

Figure 10. VIIRS DNB Geolocation accuracy. As of Nov 4, 2013, the DNB geolocation accuracy is, Scan : 8 ± 33 µrad ; Track : -35 ± 68 µrad

References

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[7] JPSS VIIRS ATBD, Joint Polar Satellite System (JPSS) VIIRS Radiometric Calibration Algorithm Theoretical Basis Document (ATBD)

[8] Joint Polar Satellite System (JPSS) Operational Algorithm Description (OAD) Document for VIIRS Geolocation (GEO) Sensor Data Record (SDR) and Calibration (CAL) SDR Software