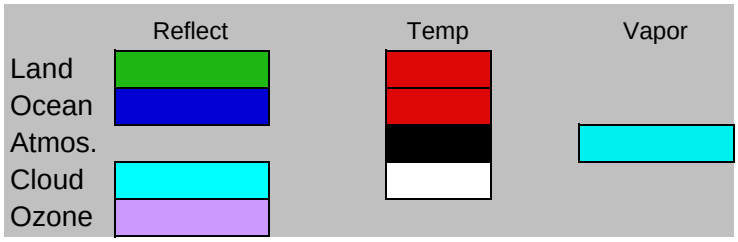
Specifications

Primary Use	Focal Plane	Band	Bandwidth	L_{typ}	L_{max}	L_{cloud}	L_{max}	Req. SNR
Land/Cloud	NIR	1	0.620 - 0.670	21.8	685	457		128
Boundaries	NIR	2	0.841 - 0.876	24.7	285	293		201
Land/Cloud	VIS	3	0.459 - 0.479	35.3	593	570		243
Properties	VIS	4	0.545 - 0.565	29	518	559		228
	SWIR/MWIR	5	1.230 - 1.250	5.4	110	138		74
	SWIR/MWIR	6	1.628 - 1.652	7.3	70	68		275
	SWIR/MWIR	7	2.105 - 2.155	1	22	27		110
Ocean Color/	VIS	8	0.405 - 0.420	44.9	175	573		880
Phytoplankton/	VIS	9	0.438 - 0.448	41.9	133	585		838
Biogeochemistry	VIS	10	0.483 - 0.493	32.1	101	539		802
	VIS	11	0.526 - 0.536	27.9	82	538		754
	VIS	12	0.546 - 0.556	21	64	528		750
	NIR	13	0.662 - 0.672	9.5	32	471		910
	NIR	14	0.673 - 0.683	8.7	31	440		1087
	NIR	15	0.743 - 0.753	10.2	26	373		586
	NIR	16	0.862 - 0.877	6.2	16	286		516
Atmospheric	NIR	17	0.890 - 0.920	10	185	252		167
Water Vapor	NIR	18	0.931 - 0.941	3.6	256	267		57
	NIR	19	0.915 - 0.965	15	189	244		250



Primary Use	Focal Plane	Band	Bandwidth	L_{typ}	T_{typ}	L_{max} T_{max}	L_{cloud} T_{cloud}	Req NEDT
Surface/Cloud	SWIR/MWIR	20	3.660 - 3.840	0.45	300	335		0.05
Temperature	SWIR/MWIR	21	3.929 - 3.989	2.38	335	500		2.0
	SWIR/MWIR	22	3.929 - 3.989	0.67	300	328		0.07
	SWIR/MWIR	23	4.020 - 4.080	0.79	300	328		0.07
	SWIR/MWIR	24	4.433 - 4.498	0.17	250	264		0.25
	SWIR/MWIR	25	4.482 - 4.549	0.59	275	285		0.25
Cirrus Clouds	SWIR/MWIR	26	1.360 - 1.390	6		89.9	113	150 SNR
Water Vapor	LWIR	27	6.535 - 6.895	1.16	240	271		0.25
	LWIR	28	7.175 - 7.475	2.18	250	275		0.25
	LWIR	29	8.400 - 8.700	9.58	300	324		0.05
Ozone	LWIR	30	9.580 - 9.880	3.69	250	275		0.25
Surface/Cloud	LWIR	31	10.780 - 11.280	9.55	400	400		0.05
Temperature	LWIR	32	11.770 - 12.270	8.94	400	400		0.05
Cloud Top	LWIR	33	13.185 - 13.485	4.52	260	285		0.25
Altitude	LWIR	34	13.485 - 13.785	3.76	250	268		0.25
	LWIR	35	13.785 - 14.085	3.11	240	261		0.25
	LWIR	36	14.085 - 14.385	2.08	220	238		0.35

MODIS Algorithm Band Map

Algorithm N	(Product N)	1 (35)	2 (07)	2.1(05)	3 (04)	5 (06)	5,6 (06)	6 (06)	7 (28)	8 (11)	9 (09)	10 (43)	11 (10,29)	12 (12)	13 (13)	14 (15)	15 (16,17)	16 (14)
		Cloud mask	T & M Profiles	PW in IR, NIR	AOT & SD	CT H, T&E	CPh	C_OT EPR	SST	LST&E	AC	BRDF Albedo	S/I_M ST	LC	VI	LAI, FPAR	PSN, NPP	Fire
MODIS Band	Suppl. Data Used / Bandwidth		1, 7,8	1	1, PW, Ozone	1, 2, 7, 8	1, 8		1	1, 2, 11, 12, 13	1, 3, 2.2, PV	1, 3, 2.2, 11	1	9, 10, 13, 11, 8	1, 9	9, 10, 12, 1	14, 12, 8, 9, PW	1, PW
1	0.620 - 0.670	clouds					6	land			X	C		C	C	L4	L4	
2	0.841 - 0.876	clouds/shadow		NIR	ocean			ocean			X	C	P	C	C	L4	L4	
3	0.459 - 0.479				land						X	X		X	C	X	L4	
4	0.545 - 0.565	snow			X						X	X		X	X	X	X	
5	1.230 - 1.250			NIR	snow/ocean			snow/ice			X	X		X		X		
6	1.628 - 1.652	snow			ocean		6				X	X		X		X		
7	2.105 - 2.155	heavy aerosol									X	X		X	X	X		
17	0.890 - 0.920			NIR														
18	0.931 - 0.941	low cl./shadow		NIR														
19	0.915 - 0.965			NIR														
20	3.660 - 3.840		X		land				P				P					
21	3.929 - 3.989																	
22	3.929 - 3.989	cloud	X						P						X			
23	4.020 - 4.080		X						P									
24	4.433 - 4.498		X															
25	4.482 - 4.549		X															
26	1.360 - 1.390	thin cirrus																
27	6.535 - 6.895	high moist																
28	7.175 - 7.475																	
29	8.400 - 8.700	cirrus					5		P	X								
30	9.580 - 9.880		X															
31	10.780 - 11.280	window		IR	land		5, 6	X										
32	11.770 - 12.270	low moist		IR			5											
33	13.185 - 13.485									X								
34	13.485 - 13.785																	
35	13.785 - 14.085	high cloud																
36	14.085 - 14.385																	

Ocean Bands

MODIS Band	Bandwidth	17 (18) NWLR	18 (21) Chlr-1	19 (21) Chlr-2	21 (39) CWE	22 (20) CFl	23 (25) DCC
8	0.405 - 0.420	X					
9	0.438 - 0.448	X					
10	0.483 - 0.493	X	X				
11	0.526 - 0.536	X		X			
12	0.546 - 0.556	X					
13	0.662 - 0.672	X					
14	0.673 - 0.683	X					
15	0.743 - 0.753						
16	0.862 - 0.877						

Rem1. Land Channels 3-4 may be used in ocean alg. 23 at saturation of bands 9, 12
Rem2. Bands 17-19 are designed for determining PW. The algorithm
doesn't work over the dark surfaces (ocean, ex. sun glint, vegetation)
Rem3. All ocean algorithms use Cloud Mask, Ozone and PW

Abbreviations

T & M Profiles	- temperature and moisture profiles
PW	- total precipitable water
AOT&SD	- aerosol opt. thickness and size distribution
CT H, T&E	- cloud top height, temperature and emissivity
CPh	- cloud phase
C_OT EPR	- cloud opt. thickness and eff. particle radius
SST	- sea surface temperature
LST&E	- land surface temperature and emissivity
AC	- atmospheric correction
S/I_M, ST	- snow, sea ice map, and snow temperature
NWLR	- normalized water leaving radiance
Chlr-1,2	- chlorophyll concentration
CWE	- clear water epsilon
CFl	- chlorophyll fluorescence
DCC	- detached cocolyth concentration

P	- potential use
C	- uses atmospheric corrected product 9
L4	- L-4 products, based on atmos. corrected data

Application

	Atmosphere
	Land
	Ocean
	Atm.-Land-Ocean
	Fire Products

UGLI (Reduced MODIS)

Algorithm N	(Product N)	1 (35)	2 (05)	3 (04)	5 (06)	5,6 (06)	6 (06)	7 (28)	8 (11)	9 (09)	10 (43)	11 (10,29)	12 (12)	13 (13)	14 (15)	15 (16,17)	16 (14)	17 (18)	18 (21)	19 (21)	21 (39)	23 (25)
UGLI		Cloud mask	PW IR, NIR	AOT & SD	CT H T&E	CPh	C_OT EPR	SST	LST& E	AC	BRDF Albedo	S/I_M ST	LC	VI	LAI, FPAR	PSN, NPP	Fire	NWLR	Chlr-1	Chlr-2	CWE	DCC
(MODIS)	Suppl.Data Used		1, 7, 8	1, PW, Ozone	1, 2, 7, 8	1, 8		1	1, 2, 11, 12, 13	1, 3, PW	1, 3, PW, 11	1	9, 10, 13, 11, 8	1, 9	9, 10, 12, 1	14, 12, 8, PW	1, PW		17, 21	17, 21		
Band	Bandwidth																					
1 (8N)	0.402 - 0.422																	X				
2 (9N)	0.433 - 0.453									X	X		X					X				
3 (3N)	0.480 - 0.500			land							X		X	C	X	L4		X				
4 (4)	0.545 - 0.565	snow									C		C	X	X	X		X				
5 (1)	0.620 - 0.670	clouds				6	land				C		C	C	L4	L4		X				
6 (15)	0.743 - 0.753									P	P		P	P	P	P		X				
7 (2)	0.841 - 0.876	clouds/shadow	NIR	ocean			ocean				C	P	C	C	L4	L4						
8 (19)	0.915 - 0.965	low cl./shadow	NIR																			
9 (5)	1.230 - 1.250		NIR	snow/oc.			snow/ice			X	X		X		X							
10 (26)	1.360 - 1.390	thin cirrus																				
11 (6)	1.628 - 1.652	snow		ocean		6				X	X		X		X							
12 (7)	2.105 - 2.155	heavy aerosol								X	X		X	X	X							
13 (20)	3.660 - 3.840			land				P				P										
14 (21-22)	3.929 - 3.989	clouds						P						P			tri-linear					
15 (27)	6.535 - 6.895	high moist																				
16 (29)	8.400 - 8.700	cirrus				5		P	X													
17 (New)	10.0 - 10.5	cloud/ice discrim.	P		P		P	P														
18 (31)	10.75 - 11.25	window	IR	land		5, 6	X										tri-linear					
19 (32)	11.75 - 12.25	Low moist	IR			5																
20 (33)	13.185 - 13.485	thin cirrus							X													

Deleted Bands - 10-14,16 (Ocean), plus

MODIS Band	Bandwidth	Used in Alg.
17	0.890 - 0.920	2
22	3.929 - 3.989	1, 2, 7, 8, 11
23	4.020 - 4.080	2, 7, 8
24	4.433 - 4.498	2
25	4.482 - 4.549	2
28	7.175 - 7.475	2
30	9.580 - 9.880	2
34	13.485 - 13.785	2, 5
35	13.785 - 14.085	1, 2, 5
36	14.085 - 14.385	2, 5

Abbreviations

T & M Profiles	- temperature and moisture profiles
PW	- total precipitable water
AOT&SD	- aerosol opt. thickness and size distribution
CT H, T&E	- cloud top height, temperature and emissivity
CPh	- cloud phase
C_OT EPR	- cloud opt. thickness and eff. particle radius
SST	- sea surface temperature
LST&E	- land surface temperature and emissivity
AC	- atmospheric correction
S/I_M, ST	- snow, sea ice map, and snow temperature
NWLR	- normalized water leaving radiance
Chlr-1,2	- chlorophyll concentration
CWE	- clear water epsilon
CFl	- chlorophyll fluorescence
DCC	- detached cocolyth concentration

P	- potential use
X	- used in algorithm but not as a primary band
C	- uses atmospheric corrected product 9
L4	- L-4 products, based on atmos. corrected data

Application

Atmosphere
Land
Ocean
Fire Products

6/29/98

MODIS Band	Bandwidth	LTyp/ TTyp	LMax/ TMax	SNR/ NEDT
8N	0.402 - 0.422	44.9	175	880
9N	0.433 - 0.453	40	590/130	243/838
3N	0.480 - 0.500	32	570/100	240/800
4	0.545 - 0.565	29/21	518/64	228/750
1	0.620 - 0.670	22/10	485/35	128/ 910
2	0.841 - 0.876	25/6.4	285/16	201/516
18	0.931 - 0.941	3.6	256	57
19	0.915 - 0.965	15	189	250
5	1.230 - 1.250	5.4	110	74
26	1.360 - 1.390	6	90	150
27	1.628 - 1.652	1.16	240	0.25
6	2.105 - 2.155	7.3	70	275
7	3.660 - 3.840	1	22	1 10
20	3.929 - 3.989	300	335	0.05
21-22	6.535 - 6.895	300/335	335/500	0.07/2
29	8.400 - 8.700	300	324	0.05
New	10.25 - 10.75	400	400	0.05
31	10.78 - 11.28	400	400	0.05
32	11.77 - 12.27	400	400	0.05
33	13.185 - 13.485	260	285	0.25

VIIRS EDR Map (UGLI)

	NPOESS						UGLI					
EDR No	NPOESS Parameter	Threshold, Uncertainty	Objective, Uncertainty	Measurement Range	Horiz.Cell Global(km)	Mapping Uncert., Global	MODIS Prod. No	Bands	Uncertainty (nominal)	Uncertainty (worst case)	Cell (km)	Suggested by (Alg Provider)
2.3.2	Cloud cover (fraction)	0.1	0.1	0-1, step 0.1	-	4>1	MOD06	5-7,10,11,14,16	better than 0.1	-	5	Ackerman
4.2	Cloud layers (trained operator)	• 4 layers	0.1km	-	25>2	4>1	No	-	-	-	-	-
4.1	Cloud base height	2 km	0.25 km	0-15 (0-30)km	25>10	4>1	No	-	-	-	-	-
4.7	Cloud top height	1- 2km	0.3km	0 - 20km	25>10	4>1	MOD06	EDR 4.8+press. prof.	0.5km -cu, 1km-ci		5	Menzel
4.8	Cloud top pressure	100-50mb	30-15mb	50-1050 mb	15>10	4>1	MOD06	16, 18-20	50 mb	100 mb	5	Menzel
4.9	Cloud top temperature	3 - 6 K	1.5 K	180 - 310K	25>10	4>1	MOD06	EDR 4.8+temp. prof.	2 - 5 K	-	5	Menzel
4.6	Cloud optical thickness	10%/0.05	5% or TBD	0 - 10	50>10	4>1	MOD06	5,6,9,11-13,18	10%	25%	1	King
4.3	Cloud effective particle size	10%/4mkm	5% or 2mkm	0 - 50 mkm	50>10	4>1	MOD06	5,6,9,11-13,18	10%/1-3mkm	50%	1	King
4.4	Cloud ice water path	10%/5g/m2	5%	0-2.6>0-10	50>10	4>1	P	-	-	-	-	-
4.5	Cloud liquid water (Ocean)	0.25mm	0.01 mm	0 - 50 mm	25>5	7>1	P	Inferred from EDR	-	-	-	-
	Cloud liquid water (Land)	0.5mm	0.01 mm	0 - 50 mm	25>5	7>1	P	4.3, 4.6	-	-	-	-
3.1.1	Aerosol Optical Thick (Ocean)	0.03	0.01	0-2 (0-10)	10>1	4>1	MOD04	4-7, 9, 11, 12	<0.05	-	10	Kaufman
	Aerosol Optical Thick (Land)	0.2	0.1	0-2 (0-10)	10>1	4>1	MOD04	3-5,9,12,13,18	0.05	20-30% (big values)	10	Kaufman
3.1.2	(Angstrom Exponent-Ocean))	0.3	0.1	-1 to3(-2 to4)	10>1	4>1	P	4-7, 9, 11, 12	two fractions	-	10	Kaufman
3.1.3	Suspended matter (in atmosph) (Aerosol loading, mkg/m3)	dust, sand,	+ salt, smoke, radiat. smoke	0 - 100 for smoke	3>1	3>0.1	P	Inferred from EDR 3.1.1, 3.1.2	30%	-	10	Kaufman
3.2	Ozone total col.(mili atm/cm)	15	5	50-650	50	5>5	No	-	-	-	-	-
3.3	Precipitable water	10% or 2mm	1mm	0-75 (0-100) mm	25>1	3>0.1	MOD05	18,19; 7-9	7% , 10%	13%	1	Gao
3.6	Total water content (of atm.): water vapor, cloud water, ice	2 kg/m2	TBD	0 - 200 kg/m2	20>10	7>7	P	Inferred from EDRs 3.3, 4.4, 4.5	-	-	-	-
5.2	Surface albedo	0.05	0.0125	0 - 1.0	4>0.5	4>1	MOD43	3 - 5, 7, 9,11,12	0.03	0.1	pixel	Strahler
6.1#	Land surface temperature	2.5K	1.0K	213- 343K	4>1	4>1	MOD11	13,14,16-20	1 K	2 - 3 K	1 & 5	Wan
6.2	NDVI	0.05	0.03	-	4>1	4>1	MOD13	5, 7	0.05-0.07	0.11 - 0.12	0.25 & 25	Huete, Justice
6.3	Snow cover/depth	10% of snow	10% for depth	0 - 1	1.3>1	2>1	MOD10	4, 11,12	better than 10%	depth not estimated	0.5	Hall
6.4	Vegetation index/surface type	70% correct	TBD	21 types	20>1*	5>1	MOD12	3 - 5, 7, 9,11,12	80% (17 types)	-	1	Strahler
2.3.2.2.2	Sea ice: concentration Def: Fraction of ice in water	0.1	0.1	0 - 1	-	3>1	MOD29	4, 11,12	better than 0.1	98% recog for pixels > 50-60% by snow/ice	0.5	Hall
7.8	Sea ice: edge	1 km	TBD	-	-	3>1	P	4, 11,12	MODIS resolution	-	0.5	Hall
7.8	Sea ice: edge motion	1 km/day	0.1 km/day	0-50 km/day	3>0.1	3>1	P	4, 11,12	at least 1 km/day	-	-	-
7.8	Sea ice: age	70% correct	90% correct	1st/multi yr.	3>0.1	3>1	P	4, 11,12	-	-	1	Hall
7.2	Fresh water ice (ice fraction) in ocean/water	20% or 1/10	10%	0 - 1	1.6	3>1	MOD29	4, 11,12	better than 0.1	recog pixels w/>50%	0.5	Hall
7.3#	Ice surface temperature	1K	TBD	213 - 293	30>10	3>1	MOD29	18, 19	0.3-2.1 K	2.1 K	1	Hall
2.6	Soil moisture	10 cm/m	1 cm/m	0-100 cm/m	1	3>1	No	-	-	-	-	-
2.4#	Sea surface temperature	0.5 (acc. 0.2)	0.1	271 - 313K	3>1*	1>0.5	MOD28	17 -19	0.35K	-	1 & 10	Brown
7.1#	Ocean currents			0-5 m/s	4>1*	3>1	P	-	-	-	-	-
7.5	Net heat flux (over the ocean)	10 W/m2	1 W/m2	0-1000 W/m2	20>5	7>TBD	P	-	-	-	-	-
7.6#	Ocean color/chlorophyll conc.	30%	30%	0.05-50 mg/m3	2.6>1*	3>0.5	MOD21	1 - 6	30%	-	1	Clark, Gordon
7.11#	Mass loading (mg/l) - cncntr. of suspended matter in ocean	30%	0.1 mg/l	-	1.3>0.25	3>0.5	MOD23 MOD24 MOD25	1 - 4, 6	30%	-	1	Clark
7.4#	Littoral sediment transport (m3/day)	30%	15%	TBD	1.3>0.1	3>0.1	P	1 - 6	-	-	1	-

Min Swath =3000km unless marked with # (=1700 km).
* : Regional Cell Size is 1-1.3km (threshold), 0.25km (objective)

Threshold and Obj. req. expressed in form:
threshold > objective

COLOR MAP		
	Potential UGLI Product	UGLI satisf. NPOESS threshold
	Not UGLI Product	UGLI satisf. NPOESS objective

Additional MODIS Products

	----------UGLI----------				
Product No	MODIS Parameter	Bands	Accuracy (nominal)	Cell (km)	Suggested by
MOD35	Cloud mask	4,5,7,8,10-12,14-20	-	0.25-1	S.Ackerman
MOD06	Cloud phase	5, 11, 16, 18, 19	-	5	P.Menzel, M.King
MOD04	Aerosol size distribution over ocean	3-7, 12, 13	two fractions (coarse & accumulation modes)	10	Y.Kaufman
MOD09	Surface BRDF	3-5, 7, 9,11,12	10%	1	A.Strahler
MOD12	Land Cover/Land Cover Change	3-5, 7, 9,11,12	-	1	A.Strahler
MOD11	Land surface emissivity	13, 14, 16-20	0.02	1	Z.Wan
MOD13	Vegetation indices	3-5, 7	10%	0.25 -1	C.Justice
MOD15	LAI and FPAR	3-5, 7, 9,11,12	10% (FPAR), 0.5 (LAI, total range = 0 - 9)	1	S.Running, R.Myneni
MOD15	PSN and ANPP	3-5, 7	<25% (PSN), <35% (NPP)	1	S.Running
MOD14	Fire products	5,7, 11,12, 14, 19	16% (emitted energy)	1	Y.Kaufman
MOD22	Surface PAR and IPAR	1, 2, 6	6%	1	S.Hawes, K.Carder
MOD25	Detached coccolith concentration	2, 4	10**10 cocol/m3	1	H.Gordon
MOD31	Phycoerythrin Pigment concentration	1,2, 4, 5	4%	1	F.Hoge
MOD27	ANPP (ocean)	1 - 6	-		W.Esaias
MOD18	Normalized water leaving radiance	1 - 6	0.6% (at 443nm)	1	H.Gordon

SARVI - Soil and Atmosphere Resistant Vegetation index
NPP - Net Primary Productivity
LAI - Leaf Area Index
FPAR - Fraction of Absorbed Photosynthetically Active Radiation
PSN - Net Photosynthesis
BRDF - Bidirection Reflectance Distribution Function
ANPP - Annual Primary Productivity