8/30/90

I. REQUIRED ANCILLARY DATA:

ATMOSPHERE -- AT LAUNCH

Updated:30 August, 1990

MODIS DATA PRODUCT	ANCILLARY PRODUCT/PARAMETER	MEASUREMENT UNITS	ABSOLUTE ACCURACY (std. error)	PRECISION (RELATIVE ACCURACY)	RESOLUTION (SPATIAL or VERTICAL)	PRODUCT TEMPORAL RESOLUTION	SPACE SCALE	RESPONSIBLE SCIENTIST	COMMENTS
A. Cloud Optical Thickness	Surface Directional Reflectance, or Land or Water Leaving Radiances	Dimensionless W/m^2/sr/μm	±10%	±5%	Pixel size 0.5,1,10 km	Daily Daily	Global Regional/Global		MODIS Near.clear neighbor 0.66,1.6,2.1,3.7μm MODIS.Either above/or. Lambertian
B. Cloud Fractional Area	Surface Temperatures								AMSU or NMC
C. Cloud Effective Emissivity	Cloud Flags Temperature Profiles				5 km	Twice Daily	Global	King	MODIS AIRS/AMSU or MODIS or NMC. Clear areas.
D. Cloud Top Pressure	Temperature Profiles								AIRS/AMSU or NMC
E. Cloud Top Temperature	Cloud Top Pressure Cloud Eff. Emissivity				5-50 km 5-50 km	Twice Daily Twice Daily	Global Global	Menzel Menzel	MODIS MODIS
F. Cloud Particle Effective Radius	Surface Reflectance (Albedo) or Land or Water Leaving Radiance	Dimensionless W/m^2/sr/μm	±10%	±5%					MODIS Near.clear neighbor 0.66,1.6,2.1,3.7μm MODIS. Either (above)/or. Lambertian
G. Cloud Water Thermodynamic Phase	Surface Reflectance (Albedo) or Land or Water Leaving Radiance	Dimensionless W/m^2/sr/μm	±10%						MODIS Near.clear neighbor 0.66,1.6,2.1,3.7μm MODIS. Either (above)/or. Lambertian
H. Spectral Aerosol Optical Thickness (Ocean)	Previous Level 1 Radiances Previous Aerosal Optical Thickness Surface Reflectance (Albedo) Optical Thickness				214/418 M	3/7/16 days			MODIS MODIS MODIS. 16 days previously. MISR
H. Spectral Aerosol Optical Thickness (Land)	Previous Level 1 Radieances Previous Aerosol Optical Thickness Surface Reflectance (Albedo) Optical Thickness				214/418 M	3/7/16 days			MODIS MODIS MODIS. 16 days previously. MISR
I. Mean Radius & Dispersion of Aerosol Size Distribution	Spectral Aerosol Optical Thickness Corrected Radiances								MODIS. MODIS.
J. Aerosol Mass Loading (Dry)	Spectral Aerosol Optical Thickness Aerosol Mean Radiance & Dispersion Total Precipitable Water Temperature Profile								MODIS MODIS MODIS AIRS/AMSU or NMC. Lower Troposphere
K. Atmospheric Stability (Lifted Index)	Forecast Cloud Flags Surface Temperatures	Degrees C			10 km	Twice Daily	Global		NMC MODIS utilities AIRS/AMSU, NMC or MODIS
L. Total Precipitable Water	Cloud Flags Temperature Profiles Surface temperature				1-50 km	Daily	Global		MODIS utilities AIRS/AMSU, NMC or MODIS AIRS/AMSU, NMC or MODIS
M. Total Ozone Content	Forecast Cloud Flags Temperature Profiles Surface Temperature	Degrees C			10 km	Twice Daily	Global		NMC MODIS utilities AIRS/AMSU, NMC or MODIS AIRS/AMSU, NMC or MODIS

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I. REQUIRED ANCILLARY DATA (continued):

LAND -- AT LAUNCH

MODIS DATA PRODUCT	ANCILLARY PRODUCT/PARAMETER	MEASUREMENT UNITS	ABSOLUTE ACCURACY (std. error)	PRECISION (RELATIVE ACCURACY)	RESOLUTION (SPATIAL or VERTICAL)	PRODUCT TEMPORAL RESOLUTION	SPACE SCALE	RESPONSIBLE SCIENTIST	COMMENTS
D. Surface Temperature	AMSU				1-10 km	Daily/Weekly	Global/Region	Susskind?	King input.

OCEANS -- AT LAUNCH

MODIS DATA PRODUCT	ANCILLARY PRODUCT/PARAMETER	MEASUREMENT UNITS	ABSOLUTE ACCURACY (std. error)	PRECISION (RELATIVE ACCURACY)	RESOLUTION (SPATIAL or VERTICAL)	PRODUCT TEMPORAL RESOLUTION	SPACE SCALE	RESPONSIBLE SCIENTIST	COMMENTS
A. Chlorophyll-A Concentration-Case I	Surface Winds	m/sec	±2-4	±2	50 km	Daily*	Global		HIMSS, SCATT, ALT, NMC
	Total Ozone	Dobson	±5-10	±5	20-50 km	Daily*	Global		MODIS, AIRS/AMSU, TOMS
	Surface Pressure	mb	±2-4	±2-4	20-50 km	Daily*	Global		NMC, AIRS/AMSU
B. Chlorophyll-A Concentration-Case II	Surface Winds	m/sec	±2-4	±2	50 km	Daily*	Global		HIMSS, SCATT, ALT, NMC
	Total Ozone	Dobson	±5-10	±5	20-50 km	Daily*	Global		MODIS, AIRS/AMSU, TOMS
	Surface Pressure	mb	±2-4	±2-4	20-50 km	Daily*	Global		NMC, AIRS/AMSU
	Airborne Laser-Induced Chlorophyll Phycoerythrin and DOM Fluorescence	mg/m^3 ("after truth")	±15%	± 8%	0.001 km	Each Pass	Regional	Hoge	Curvature Algorithm Derivation/Validation Overflight of Cruise.
	Airborne Water-Leaving Spectral Radiance	W/m^2/Sr/nm	±5%	±4%	0.001 km	Each Pass	Regional	Hoge	Curvature Algorithm Derivation/Validation
C. Chlorophyll Flour.(Line Height)	Surface Winds	m/sec	±2-4	±2	50 km	Daily*	Global		HIMSS, SCATT, ALT, NMC
	Total Ozone	Dobson	±5-10	±5	20-50 km	Daily*	Global		MODIS, AIRS/AMSU, TOMS
	Surface Pressure	mb	±2-4	±2-4	20-50 km	Daily*	Global		NMC, AIRS/AMSU
C1.Clorophyll Fluor. (Curvature)									
D. Pigment Concentration (CZCS)	Surface Winds	m/sec	±2-4	±2	50 km	Daily*	Global		HIMSS, SCATT, ALT, NMC
	Total Ozone	Dobson	±5-10	±5	20-50 km	Daily*	Global		MODIS, AIRS/AMSU, TOMS
	Surface Pressure	mb	±2-4	±2-4	20-50 km	Daily*	Global		NMC, AIRS/AMSU
E. Primary Productivity (visible)	Surface Winds	m/sec	±2-4	±2	50 km	Daily*	Global		HIMSS, SCATT, ALT, NMC
	Total Ozone	Dobson	±5-10	±5	20-50 km	Daily*	Global		MODIS, AIRS/AMSU, TOMS
	Surface Pressure	mb	±2-4	±2-4	20-50 km	Daily*	Global		NMC, AIRS/AMSU
F. Regional Sea Surface Temp.	Total Water Vapor	cm	5%	5%	10 km	Each Pass		Susskind	AIRS/AMSU
	SFC Wind Speed	m/sec	±2m/s	±2	1.5°	Each Pass		Spencer	HIMSS, ALT, SCATT
	SFC Winds	m/sec	±2m/s	±2	2.5°	Daily	Global	?	NMC, FNOC, EMC
	Total Water Vapor	cm	10%	5%	1 km	Each Pass		Susskind	MODIS
G. Global Sea Surface Temp	Total Water Vapor	cm	5%	5%	10 km	Each Pass		Susskind	AIRS/AMSU
	SFC Wind Speed	m/sec	±2m/s	±2	1.5°	Each Pass		Spencer	HIMSS, ALT, SCATT
	SFC Winds	m/sec	±2m/s	±2	2.5°	Daily	Global	?	NMC, FNOC, EMC
	Total Water Vapor	cm	10%	5%	1 km	Each Pass		Susskind	MODIS
H. Water-Leav Radiance (Visible)	Surface Winds	m/sec	±2-4	±2	50 km	Daily*	Global		HIMSS, SCATT, ALT, NMC
	Total Ozone	Dobson	±5-10	±5	20-50 km	Daily*	Global		MODIS, AIRS/AMSU, TOMS
	Surface Pressure	mb	±2-4	±2-4	20-50 km	Daily*	Global		NMC, AIRS/AMSU
I. Attenuation (Kd) @490, Case 1	Surface Winds	m/sec	±2-4	±2	50 km	Daily*	Global		HIMSS, SCATT, ALT, NMC
	Total Ozone	Dobson	±5-10	±5	20-50 km	Daily*	Global		MODIS, AIRS/AMSU, TOMS
	Surface Pressure	mb	±2-4	±2-4	20-50 km	Daily*	Global		NMC, AIRS/AMSU

I. REQUIRED ANCILLARY DATA (continued):

OCEANS -- AT LAUNCH (cont.)

MODIS DATA PRODUCT	ANCILLARY PRODUCT/PARAMETER	MEASUREMENT UNITS	ABSOLUTE ACCURACY (std. error)	PRECISION (RELATIVE ACCURACY)	RESOLUTION (SPATIAL or VERTICAL)	PRODUCT TEMPORAL RESOLUTION	SPACE SCALE	RESPONSIBLE SCIENTIST	COMMENTS
J. Detach Coccolith Concent. E.huxleyi	Surface Winds	m/sec	±2-4	±2	50 km	Daily*	Global		HIMSS, SCATT, ALT, NMC
	Total Ozone	Dobson	±5-10	±5	20-50 km	Daily*	Global		MODIS, AIRS/AMSU, TOMS
	Surface Pressure	mb	±2-4	±2-4	20-50 km	Daily*	Global		NMC, AIRS/AMSU
K. Dissolved Organic Matter, Case 1, Glbl	Surface Winds	m/sec	±2-4	±2	50 km	Daily*	Global		HIMSS, SCATT, ALT, NMC
	Total Ozone	Dobson	±5-10	±5	20-50 km	Daily*	Global		MODIS, AIRS/AMSU, TOMS
	Surface Pressure	mb	±2-4	±2-4	20-50 km	Daily*	Global		NMC, AIRS/AMSU
	Airborne Laser-Induced Dissolved Organic Matter, Chlorophyll Phyco. Fluorescence	µg, Mol - or - mg/m^3	±15%	± 8%	0.001 km	Each Pass	Regional	Hoge	Algorithm Derivation/Validation Overflight of cruise
L. Diss Organic Matter, Southern	Surface Winds	m/sec	±2-4	±2	50 km	Daily*	Global		HIMSS, SCATT, ALT, NMC
	Total Ozone	Dobson	±5-10	±5	20-50 km	Daily*	Global		MODIS, AIRS/AMSU, TOMS
	Surface Pressure	mb	±2-4	±2-4	20-50 km	Daily*	Global		NMC, AIRS/AMSU
M. Sea Ice (Max. Total Extent)									
N. Phycoerythrin Concentration	Airborne Laser-Induced Phycoerythrin Fluo	mg/m^3	±15%	± 8%	0.001 km	Overflight	Regional	Hoge	NASA P-3 Airborne Oceanographic LIDAR.
	Shipboard Laser-Induced Phycoerythrn Fluo	mg/m^3	±15%	±5%	0.001 km	Ship Cruises	Regional	Hoge	NASA Shipboard Laser on other ships.
	Surface Winds	m/sec	±2-4	±2	50 km	Daily*	Global		HIMSS, SCATT, ALT, NMC
	Total Ozone	Dobson	±5-10	±5	20-50 km	Daily*	Global		MODIS, AIRS/AMSU, TOMS
	Surface Pressure	mb	±2-4	±2-4	20-50 km	Daily*	Global		NMC, AIRS/AMSU
O. Single Scattering Aerosol Radiance	Surface Winds	m/sec	±2-4	±2	50 km	Daily*	Global		HIMSS, SCATT, ALT, NMC
	Total Ozone	Dobson	±5-10	±5	20-50 km	Daily*	Global		MODIS, AIRS/AMSU, TOMS
	Surface Pressure	mb	±2-4	±2-4	20-50 km	Daily*	Global		NMC, AIRS/AMSU
P. Aerosol Angstr. Exp.,Opt Depth	Surface Winds	m/sec	±2-4	±2	50 km	Daily*	Global		HIMSS, SCATT, ALT, NMC
	Total Ozone	Dobson	±5-10	±5	20-50 km	Daily*	Global		MODIS, AIRS/AMSU, TOMS
	Surface Pressure	mb	±2-4	±2-4	20-50 km	Daily*	Global		NMC, AIRS/AMSU
Q. Total Suspended Solids	Surface Winds	m/sec	±2-4	±2	50 km	Daily*	Global		HIMSS, SCATT, ALT, NMC
	Total Ozone	Dobson	±5-10	±5	20-50 km	Daily*	Global		MODIS, AIRS/AMSU, TOMS
	Surface Pressure	mb	±2-4	±2-4	20-50 km	Daily*	Global		NMC, AIRS/AMSU
R. Calibration Data Sets	Surface Winds	m/sec	±2-4	±2	50 km	Daily*	Global		HIMSS, SCATT, ALT, NMC
	Total Ozone	Dobson	±5-10	±5	20-50 km	Daily*	Global		MODIS, AIRS/AMSU, TOMS
	Surface Pressure	mb	±2-4	±2-4	20-50 km	Daily*	Global		NMC, AIRS/AMSU

ATMOSPHERE -- POST LAUNCH:

MODIS DATA PRODUCT	ANCILLARY PRODUCT/PARAMETER	MEASUREMENT UNITS	ABSOLUTE ACCURACY (std. error)	PRECISION (RELATIVE ACCURACY)	RESOLUTION (SPATIAL or VERTICAL)	PRODUCT TEMPORAL RESOLUTION	SPACE SCALE	RESPONSIBLE SCIENTIST	COMMENTS
A. Aerosol Single Scat. Albedo	At-Launch Aerosol Prod.								MODIS
C. Cloud Jnt.Prob.Dens.Funct	All level 2 Cloud Products								MODIS
	Radiances								MODIS Level 1.
D. Cloud Emissivity	Cloud Effective Emissivity							Menzel	MODIS
	Cloud Fractional Area							Menzel	MODIS

I. REQUIRED ANCILLARY DATA (continued):

Ancillary/Validation/Interim/Derivative Data Products (MODIS)

OCEANS -- POST LAUNCH

MODIS DATA PRODUCT	ANCILLARY PRODUCT/PARAMETER	MEASUREMENT UNITS	ABSOLUTE ACCURACY (std. error)	PRECISION (RELATIVE ACCURACY)	RESOLUTION (SPATIAL or VERTICAL)	PRODUCT TEMPORAL RESOLUTION	SPACE SCALE	RESPONSIBLE SCIENTIST	COMMENTS
A. Primary Prod,Case I	chla				20 km	daily	Global		MODIS
	incident PAR	quanta/cm^2 sec	±15%	±5%	20-100 km	daily	Global	Esaias/Guenth	?MODIS, CERES, Guenther/Tanre
	KPAR	per m	±15%	±5%	20-100 km	daily	Global	Gordon	
	Winds. Sea Surface Pressure	m^2/sec	±2 m/s	±2 ms	20-100 km	daily		?	HIMSS, SCATT, NMC
	SST	K	1°	±0.5%	20 km	daily		Brown/Barton	
	in-situ (primary productivity/chla)	gC/m^2/day	±25%	±15%		Week/Month	Regional		
B. Chlorophyll Conc. From Fluorescence	Incident Irradoamce, motor					Each Pass			MODIS
	Winds, Sea Surface Pressure	m/sec, mb			1-20 km	Daily/Weekly	Global/Region	Esaias?	Esaias input.
E. Surface Incident PAR (h nu) Keb	Winds, Sea Surface Pressure	m/sec, mb			1-100 km	Daily	Global	Esaias?	Esaias input.
	AVHRR (NOAA)				1-100 km	Daily	Global	Esaias?	Esaias input.
	GOES (NOAA)				1-100 km	Daily	Global	Esaias?	Esaias input.
F. Attenuation of PAR	Winds. Sea Surface Pressure	m/sec, mb			1-20 km	Daily/Weekly	Global	Esaias?	Esaias input.
G. Pigment Concentration (Curvature)	Winds, Sea Surface Pressure	m/sec, mb			1-20 km	Daily/Weekly	Regional	Esaias?	Esaias input.
H. Beam Attenuat. Coeff	Winds, Sea Surface Pressure	m/sec, mb			1-20 km	Daily/Weekly	Global	Esaias?	Esaias input.
J. Organic Fraction	Winds, Sea Surface Pressure	m/sec, mb			1-20 km	Daily/Weekly	Global	Esaias?	Esaias input.
L. Currents, Fronts, Eddies									

II. MODIS VALIDATION DATA PRODUCTS: Ancillary/Validation/Interim/Derivative Data Products (MODIS)

ATMOSPHERE - VALIDATION

MODIS DATA PRODUCT	VALIDATION PRODUCT/PARAMETER	MEASUREMENT UNITS	ABSOLUTE ACCURACY (std. error)	PRECISION (RELATIVE ACCURACY)	RESOLUTION (SPATIAL or VERTICAL)	PRODUCT TEMPORAL RESOLUTION	SPACE SCALE	RESPONSIBLE SCIENTIST	COMMENTS
A. Cloud Optical Thickness	a/c in-situ measurements						local	King	MODIS
C. Cloud Effective Emissivity	Temperature Profiles							Menzel/King	MODIS. 2-3 km Vertical Resolution.
	Liquid/ice water content from a/c						local	Menzel/King	MODIS

OCEANS - VALIDATION

MODIS DATA PRODUCT	VALIDATION PRODUCT/PARAMETER	MEASUREMENT UNITS	ABSOLUTE ACCURACY (std. error)	PRECISION (RELATIVE ACCURACY)	RESOLUTION (SPATIAL or VERTICAL)	PRODUCT TEMPORAL RESOLUTION	SPACE SCALE	RESPONSIBLE SCIENTIST	COMMENTS
A. Chlorophyll-A Concentration (Case I)	Incident Spectral Irradiance-Ed,Z(0,+)	µW/cm^2/nm	5%	1-2%	sealevel		local	Clark	Buoy and ship measurements
	Downwelled Spectral Irradiance-Ed,Z	µW/cm^2/nm	5%	1-2%	dZ=1m,0<Z<150m		local	Clark	Buoy and ship measurements
	Upward Spectral Radiance-Lu	µW/cm^2/nm/sr	5%	1-2%	dZ=1m,0<Z<150m		local	Clark	Buoy and ship measurements
	Water-Leaving Spectral Radiances-Lw	µW/cm^2/nm/sr	8%	3%	1 m		local	Clark	Buoy and ship meas., act. + normalized
	Spectral Beam Attenuation Coeff.-c	per meter	5%	1-2%	1 m		local	Clark	Buoy and ship measurements
	Diffus.Atten.Coef.Downwel.Irrad.-KEd	per meter	5%	2%	1 m		local	Clark	Buoy and ship measurements
	Diffus. Atten. Coef. Upwel. Rad.-KLu	per meter	5%	2%	1 m		local	Clark	Buoy and ship measurements
	Phycobilipigments (mg/m^3)	mg/m^3	TBD	TBD	5m		loc.,along trak	TBD	Ship meas.
	Spectral Reflec.(or Radiance)Factor-RL	percent	5%	2%	dZ=1m,0<Z<150m		local	Clark	Ship measurements, at depth and in air
	Phyt.Pig(Fluor.Tech)Chlor.a+Phaeopig.a	mg/m^3	15%	10%	dZ=5m		loc.,along trak	Clark	Ship measurements
	Phytoplankton Pigm.(HPLC Technique)	nanomoles/liter	5%	1-2%	dZ=5m		loc.,along trak	Clark	Ship measurements
	Humic and Fulvic acids	g/m^3	±10%	±3%			local	Carder	Ship measurements
	Particle absorption coefficient	per m	±10%	±4%	dZ=1m		local	Carder	Ship measurements
	Detritus absorption coefficient		±15%	±6%	dZ=1m		local		Ship measurements
	Backscattering coefficient bbl	per m	±7%	±4%	dZ=1m		local		Ship measurements
	Total Dissolved Organic Carbon	mg/m^3	TBD	TBD			loc.,along trak		Ship measurements
	Spectral Solar Atmos. transmission (Ta)	percent	NA	1%			local	TBD	Ship ,Shore stations
	AOL fluoresensor(DOM,Chl a, Phycoerythrin	mg/m^3	±15%	±8%	near sfc.		0.01 km av	Hoge	Overflights of cruises, moorings
	Airborne Radiances (Lw 410-750 nm)	µW/cm^2/nm/sr	±10%	±5%	near sfc.		0.01 km av	Hoge	Overflights of cruises, moorings
	In-Situ Validation Observations	µg/liter	±10%	±2%	Test Site	TBD	Test Site	Hoge?	Hoge input. Mid-Atlantic Bight
B. Chlorophyll-A Concentration (Case II)	see A.								
C. Chlorophyll Fluorescence (Line Height)	In-Situ Validation Observations	µg/liter	±10%	±2%	Test Site	TBD	Test Site	Hoge?	Hoge input. Mid-Atlantic Bight.
Chlorophyll Fluorescence (Curvature)	Incident Spectral Irradiance-Ed,Z(0,+)	µW/cm^2/nm	5%	1-2%	sealevel		local	Clark	Buoy and ship measurements
	Downwelled Spectral Irradiance-Ed,Z	µW/cm^2/nm	5%	1-2%	dZ=1m,0<Z<150m		local	Clark	Buoy and ship measurements
	Upward Spectral Radiance-Lu	µW/cm^2/nm/sr	5%	1-2%	dZ=1m,0<Z<150m		local	Clark	Buoy and ship measurements
	Water-Leaving Spectral Radiances-Lw	µW/cm^2/nm/sr	8%	3%			local	Clark	Buoy and ship meas., act. + normalized
	Spectral Beam Attenuation Coeff.-c	per meter	5%	1-2%	dZ=1m,0<Z<150m		local	Clark	Buoy and ship measurements
	Diffus.Atten.Coef.Downwel.Irrad.-KEd	per meter	5%	2%	dZ=1m,0<Z<150m		local	Clark	Buoy and ship measurements
	Diffus. Atten. Coef. Upwel. Rad.-KLu	per meter	5%	2%	dZ=1m,0<Z<150m		local	Clark	Buoy and ship measurements
	Fluoresc. Line Magnit. @685 nm- FLM(z)	1m	10%	4%	dZ=1m,0<Z<150m		local	Clark	Buoy and ship measurements
	Spectral Reflec.(or Radiance)Factor-RL	percent	5%	2%	dZ=1m,0<Z<150m		local	Clark	Ship measurements, at depth and in air
	Phyt.Pig(Fluor.Tech)Chlor.a+Phaeopig.a	mg/m^3	15%	10%	dZ=5m		loc.,along trak	Clark	Ship measurements
	Phytoplankton Pigm.(HPLC Technique)	nanomoles/liter	5%	1-2%			loc.,along trak	Clark	Ship measurements
	Phycobilipigments (mg/m^3)	mg/m^3	TBD	TBD	dZ=5m		loc.,along trak	TBD	Ship measurements
	Spectral Solar Atmos. transmission (Ta)	percent	NA	1%			local	TBD	Ship Shore stations
	AOL fluoresensor(DOM,Chl a, Phycoerythrin	mg/m^3	±15%	±8%	near sfc.		0.01 km av	Hoge	Overflights of cruises, moorings
	Airborne Radiances (Lw 410-750 nm)	µW/cm^2/nm/sr	±10%	±5%	near sfc.		0.01 km av	Hoge	Overflights of cruises, moorings

Updated 30 August, 1990

II. MODIS VALIDATION DATA PRODUCTS (continued):

Ancillary/Validation/Interim/Derivative Data Products (MODIS)

OCEANS - VALIDATION (cont.)

MODIS DATA PRODUCT	VALIDATION PRODUCT/PARAMETER	MEASUREMENT UNITS	ABSOLUTE ACCURACY (std. error)	PRECISION (RELATIVE ACCURACY)	RESOLUTION (SPATIAL or VERTICAL)	PRODUCT TEMPORAL RESOLUTION	SPACE SCALE	RESPONSIBLE SCIENTIST	COMMENTS
D. Pigment Concentration (CZCS)	See C,								
	Except for Fluor. Line Magn(@685nm-FLM(Z)								
	Except for, In-Situ Validation Observations								
E. Ocean Prim. Productivity (Empirically)	See A,								
	Except for Humic and Fulvic Acids								
	Except for In-Situ Validation Observ.								
	Also, Photosynth. Active Radiat.(400-700n	#quanta/s/m^2	5%	2%	1m		local	Clark	Buoy and ship measurements
	Also, Primary Productivity (14-C)	mg C/m^3/hr	±20-100%	±5-10%	5m		loc.,along trac	Clark	Ship measurement
F. Regional Sea Surface Temperatures	Temperature	°C	0.04°C	0.001°C	1m		loc.,along track		Clark. Ship meas., Buoys ±0.2 Acc
	IR Surface Brightness Temperature	°K	0.5K	±0.1°K	1m		loc.,along track		Ship Measurements
	In-Situ Validation Observations	°K	0.5K	±0.1°K		Daily	local	Barton?	Barton input. Ship & Bouy measurements
G. Global Sea Surface Temperatures	Temperature	°C							
	IR Surface Brightness Temperature	°K	0.5K	±0.1°K	1km		loc.,along trac	TBD	
	In-Situ Validation Observations	°K	0.5K	±0.15°K	2km	Pass ±15 min		Brown?	Brown input. ±1km Position on Earth Grid
H. Water-Leaving Radiance (Visible)	See A,								
	Except for In-Situ Validation Observ.								
I. Attenuation (Kd) at 490nm, (Case I)	See A.								
	Also Photosynth. Active Radiat.(400-700nm	#quanta/s/m^2	5%	2%	1m		local	Clark	Buoy and ship measurements
	Except for In-Situ Validation Observ.								
J. Detached Coccolith Conc. (E. huxleyi)	See A.,								
	Also Detach Coccolith Conc.(E.huxleyi)	mg CaCO3,#/m^3					local		Ship measurements
	Except for In-Situ Validation Observ.								
	Except for Humic and Fulvic Acids								
K. Dissolved Organic Matter Case 1 Global	See A,								
	Except for In-Situ Validation Observ.								
L. Dissolved Organic Matter, Southern	See A,								
	Except for In-Situ Validation Observ.								
M. Sea Ice (Maximum Total Extent)	Spectral Solar Atmospheric Transmission	percent	NA	1%			local	TBD	Ship, Shore Stations
N. Phycoerythrin Concentration	See A,								
	Except for Humic and Fulvic Acids								
	Except for In-Situ Validation Observ.								
O. Single Scattering Aerosol Rad., ta < 0.6	See D.								
P. Aerosol Angstrom Exp., Optical Depth	See D.								
Q. Total Suspended Solids	See A,								
	Except for Humic & Fulvic Acids								
	Except for In-Situ Validation Observ.								
	Also, Total Suspend Matter (TSM) Conc.	g/m^3	10%	5%	5m		loc.,along trac	Clark	Ship measurements
	Also, Organic Total Suspend Matter Conc.	g/m^3	10%	5%			loc.,along trac	Clark	Ship measurements
	Also, Inorganic Total Suspend Matter Conc.	g/m^3	10%	5%	5m		loc.,along trac	Clark	Ship measurements
R. Calibration Data Sets	See A,								
	Except for In-Situ Validat. Observ.								

III. MODIS INTERIM DATA PRODUCTS:

The products given below will be available in the process of producing the at- or post-launch data products.

ATMOSPHERE -- AT LAUNCH

MODIS DATA PRODUCT	INTERIM PRODUCT/PARAMETER	MEASUREMENT UNITS	ABSOLUTE ACCURACY (std. error)	PRECISION (RELATIVE ACCURACY)	RESOLUTION (SPATIAL or VERTICAL)	PRODUCT TEMPORAL RESOLUTION	SPACE SCALE	RESPONSIBLE SCIENTIST	COMMENTS
H. Spec.Aerosol Opt.Thk.ocean	Aerosol Optical Thickness				214/428 m	Daily			
Spec.Aerosol Opt.Thk.land	Aerosol Optical Thickness				214/428 m	Daily			
K. Atmosph. Stabil.(lift. ind.)	Temperature Profile								3 levels. archivable
	Dew-point Temperature								2 levels. archivable

OCEANS -- AT LAUNCH:

MODIS DATA PRODUCT	INTERIM PRODUCT/PARAMETER	MEASUREMENT UNITS	ABSOLUTE ACCURACY (std. error)	PRECISION (RELATIVE ACCURACY)	RESOLUTION (SPATIAL or VERTICAL)	PRODUCT TEMPORAL RESOLUTION	SPACE SCALE	RESPONSIBLE SCIENTIST	COMMENTS
H. Water Leaving Radiance	Raleigh Radiance	µw/am^2 sr.m	±5%						Esaias input. Several bands.
	Sea Surface Winds from Glitter	m/s	TBD	TBD	1, 20 km	Daily	Regional/Globa	Gordon	Uses MODIS-N vis. land bands look in glitter
J. Detached Coccolith Conc. (E. huxleyi)	Total Backscattering Coefficient (bb)	per meter	±25%	±10%	1, 20 km	Day/Wk/Mon	Regional/Globa	Gordon	Computed in E. huxleyi blooms w/model.
	Coccolith Backscattering Coefficient (bb*)	per meter	±25%	±10%	1, 20 km	Day/Wk/Mon	Regional/Globa	Gordon	Intermediate to Coccolith concentration.
	Total Backscattering - Phytoplankton	soft, med., hard	TBD	TBD	1, 20 km	Day/Wk/Mon	Regional/Globa	Gordon	Class. of scattr in Coc.free wtrs. Spculatve
L. Sea Ice (Maximum Total Extent)	Cloud Identification	Km^2	TBD		1-10 km	Daily/Weekly	Global/Regionl		Differentiat. &subtr. impor. Ardanuy
N. Phycoerythrin Concentration	Along-Track Laser-Induced Phycoerythrin	counts	±15%	± 8%	0.001 km	Each Pass	A/c overflight	Hoge	Produced from airborne ancillary products.
	and Chlorophyll Fluorescence; SST and DOM						of Cruise Site		Esaias input. Several bands.
	Total Scattering Coefficient b	per meter	TBD	±15%	1, 20 km	Daily/Weekly	Global	Gordon	(Carder)
	Phytoplankton Scattering Coefficient b*	per meter	TBD	±20%	1, 20 km	Daily/Weekly	Global	Gordon	(Carder)
	b - b*	per meter	TBD	±20%	1, 20 km	Daily/Weekly	Global	Carder	Esaias input. Several bands.
	Total Absorptance	per meter	TBD	±115%	1, 20 km	Daily/Weekly	Global	Carder	
	Phytoplankton Absorptance (a/p)	per meter	TBD	±20%	1, 20 km	Daily/Weekly	Global	Carder	
	Non-phytoplankton Absorp.(a/other)	per meter		±20%	1-20 km	Daily/Weekly	Global	Carder	
	Glint Field	Dimensionless	N/A	N/A	1, 20 km	Daily	Global	Evans/Gordon	

ATMOSPHERE -- POST LAUNCH:

MODIS DATA PRODUCT	INTERIM PRODUCT/PARAMETER	MEASUREMENT UNITS	ABSOLUTE ACCURACY (std. error)	PRECISION (RELATIVE ACCURACY)	RESOLUTION (SPATIAL or VERTICAL)	PRODUCT TEMPORAL RESOLUTION	SPACE SCALE	RESPONSIBLE SCIENTIST	COMMENTS
B. Cloud Area & Perimeter Geometry	Cloud Area & Perimeter- Geometry	km^2 & km	N/A	N/A	Pixel	Monthly	Global	Kaufman	

III. MODIS INTERIM DATA PRODUCTS (continued):

LAND -- POST LAUNCH:

MODIS DATA PRODUCT	INTERIM PRODUCT/PARAMETER	MEASUREMENT UNITS	ABSOLUTE ACCURACY (std. error)	PRECISION (RELATIVE ACCURACY)	RESOLUTION (SPATIAL or VERTICAL)	PRODUCT TEMPORAL RESOLUTION	SPACE SCALE	RESPONSIBLE SCIENTIST	COMMENTS
A. Hemispheric Reflectance	BRDF/Albedo	dimensionless			1-10 km	Daily/Weekly	Global/Region	Huete?	Huete input.
B. Nadir Reflectance	BRDF/Albedo	dimensionless			1-10 km	Daily/Weekly	Global/Region	Huete?	Huete input.
C. Atmospheric Correct. (Transmittance)	BRDF/Albedo	dimensionless			1-10 km	Daily/Weekly	Global/Region	Gordn/Susknd	Huete input.
D. Atmospheric Correct. (Transmittance)	Level-2 Leaving Rads.	dimensionless			Pixel size	Daily	Global/Region	Gordn/Susknd	Ardanuy input.

OCEANS -- POST LAUNCH:

MODIS DATA PRODUCT	INTERIM PRODUCT/PARAMETER	MEASUREMENT UNITS	ABSOLUTE ACCURACY (std. error)	PRECISION (RELATIVE ACCURACY)	RESOLUTION (SPATIAL or VERTICAL)	PRODUCT TEMPORAL RESOLUTION	SPACE SCALE	RESPONSIBLE SCIENTIST	COMMENTS
A. Primary Productivity, Case I Waters	Depth of Euphatic Zone Zen Euphatic Biomass	m mgChl/m^2	±10% ±20%	±5%	20-100 km	Week/Month Monthly	Global/Region Regional	Esaias	
B. Surface Winds in Glint Pattern		m/s	Tbd	Tbd	1 km	Daily	Regional	Gordon	Requires distinct glint pattern
C. Glint Field		Dimensionless	Tbd	Tbd	1 km	Daily	Regional	Gordon	Glint correction/mask
D. Total Backscattering Coefficient		m^-1	25%	10%	1, 20 km	Daily/Week/M	Regional	Gordon	
E. Coccolith Backscattering Coefficient		m^-1	25%	10%	1, 20 km	Daily/Week/M	Regional	Gordon	
F. Phytoplankton Backscattering Coefficient		soft, med, hard	Tbd	Tbd	1, 20 km	Daily/Week/M	Regional	Gordon	Requires absence of coccoliths

IV. MODIS DERIVATIVE DATA PRODUCTS:

The products given below will be easily developed from the At-Launch product, and would be expected in the Post-Launch period.

OCEAN -- AT LAUNCH:

MODIS DATA PRODUCT	DERIVATIVE PRODUCT/PARAMETER	MEASUREMENT UNITS	ABSOLUTE ACCURACY (std. error)	PRECISION (RELATIVE ACCURACY)	RESOLUTION (SPATIAL or VERTICAL)	PRODUCT TEMPORAL RESOLUTION	SPACE SCALE	RESPONSIBLE SCIENTIST	COMMENTS
N. Phycoerythrin Concentration	Phytoplankton Speciation Variabil. Images	Dimensionless	200%	±50%	1,20 km	Daily/Weekly	Reg./Global	Hoge	Chlorophyll-normalized phycoerythrin image

OCEAN -- POST LAUNCH:

MODIS DATA PRODUCT	DERIVATIVE PRODUCT/PARAMETER	MEASUREMENT UNITS	ABSOLUTE ACCURACY (std. error)	PRECISION (RELATIVE ACCURACY)	RESOLUTION (SPATIAL or VERTICAL)	PRODUCT TEMPORAL RESOLUTION	SPACE SCALE	RESPONSIBLE SCIENTIST	COMMENTS
A. Primary Productivity, Case I Waters	Ecological Efficiency	gmC/Quanta	±50%	TBD	50 km	Wk/Mon/Yr	Reg./Global	Esaias	