NOAA/NESDIS

NESDIS-REQ-1002.1

NESDIS PRODUCT BASELINE

September 2021

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National Environmental Satellite, Data, and Information Service

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Table of Contents

Table of Figures

This document contains no figures.

Table of Tables

1. Introduction

The National Environmental Satellite, Data and Information Service (NESDIS) provides environmental products, information and services to promote and protect the Nation's security, environment, economy, and quality of life. NESDIS works to maximize the value of products and services it provides in support of the national, regional, state and local needs, international agreements and organizations, and National Oceanic and Atmospheric Administration (NOAA) Line Offices' operational mission requirements. The NESDIS Level Requirement (NLR)-001 codifies what products NESDIS commits to provide and sustain in the long-term. This document is a part of NLR-REQ-001 and provides in more detail the attribute characteristics that these products need for sustainment. The NLR and Product Baseline together describe the types of products and associated baseline commitment NESDIS will provide to its users at all times.

2. Scope

The NESDIS Product Baseline defines the set of products and accompanying threshold attribute specifications that NESDIS commits to sustain and maintain in terms of geographic coverage, refresh, and latency. It represents the baseline level of service that NESDIS commits to its users and stakeholders. However, this document does not preclude product performance above the baseline. NESDIS will enhance the baseline with available resources, and maintain the flexibility to optimize products for users with available data aligned with user impact-driven priority and budget profiles.

The NESDIS Product Baseline provides a strategic look at how NESDIS maintains its data and products in a data source-agnostic approach. It sets the foundation for NESDIS to focus on users' fundamental needs, optimize products, and maximize benefits from using the most effective combination of data sources for its user community. The NLR REQ-001 and the Product Baseline describe the types of products and associated level of service that NESDIS commits to in perpetuity.

The NESDIS Product Baseline sets the basis for the NESDIS Five-Year Product Plan, which documents the set of algorithms and data sources that NESDIS will fund to adopt and enhance the NESDIS baseline products aligned with user impact-driven priority and given budget profiles.

The performance-specific attributes that are tied to instrument measurements and algorithms (i.e., product resolution, product accuracy and precision, product formats) are not included in the Product Baseline. Those performance-specific attributes are currently documented in program level requirements documents under multiple NESDIS satellite programs. In the future, the performance-specific attributes will be consolidated and documented in a NESDIS Level Product Requirements Document.

The NESDIS Product Baseline will be reviewed and updated on an annual basis to match the ongoing changes to the NESDIS baseline commitment. New baseline products or updated threshold attributes of existing baseline products will be added into the Product Baseline using the Product Requirements Change process outlined in the NESDIS Requirements Management Plan (NESDIS-PLN-1312.1).

3. Methodology

The NESDIS Integrated Products List (IPL) is a vetted, living catalogue that captures data and products that NESDIS generates and delivers to its users. It provides data sources for NESDIS products, product capability, and their identified users. It presents how NESDIS serves its users' existing needs for data and products as documented in the NESDIS Consolidated Observation User Requirements List and other user requirements.

The NESDIS Product Baseline documents the product capabilities that NESDIS can sustain and maintain for an extended period, and is traceable to all NESDIS continuity products documented in the IPL. In general, the product capability supported only by a single research satellite without planned follow-ons will not be included as a baseline commitment since NESDIS cannot guarantee the support for continuity. Therefore, in some cases, the Product Baseline could represent a lower threshold of service than what NESDIS provides today. However, this does not prevent NESDIS from continuously using the data and enhancing the baseline commitment when funding resources are available.

The baseline products are specified with the attributes of geographic coverage, refresh and latency, which outline the fundamental needs and expectations of users in a data source-agnostic approach. The Product Baseline documents the threshold specifications of the attributes for each baseline product that NESDIS commits to sustain and maintain for continuity purposes.

The current version documents mostly the continuity capability. When evaluating the attribute specifications of the operational products that NESDIS provides today, the product capabilities supported by sustainable data sources are primarily considered, which are provided from NOAA and its partners under long-term operational agreements and partnership, such as the Initial Joint Polar-orbiting System (IJPS)/Joint Polar-orbiting System (JPS) agreement, Coordination Group for Meteorological Satellites (CGMS) commitments, etc.

Methodologies adopted in development of the NESDIS Product Baseline are as follows:

1. The products and their associated attribute specifications are determined based

on the contribution of sustainable data sources from NOAA and its partners. a. Managed Data Sources – NOAA-owned and operated satellites

i. Low Earth Orbit (LEO) baseline: one satellite in the PM orbit with resiliency on orbit, one potential satellite in early morning, and one altimeter in the Reference Orbit (10-day repeat)
ii. Geostationary Earth Orbit (GEO) baseline: two satellites coverage one in the East and one in the West

b. Partnered Data Sources - Partner operational satellites under IJPS/JPS, Jason-Continuity of Service (CS) 4-Partner Memoranda of Agreement & CGMS baseline
i. LEO baseline: one satellite in the AM, and one altimeter in the Reference Orbit (10-day repeat)
ii. GEO baseline: GEOs from the CGMS baseline

c. High Reliable Data Sources – Non-operational satellites under long-term partner agreements
i. Only considered when long-term stable support resources are identified

2. Only one entry is included for the same type of products from different algorithms that have the same threshold attribute specifications. More detailed algorithm implementation will be captured in the Five-Year Product Plan.
3. When Geographical Coverage and Refresh are the same, the Product Baseline documents the product entry with the largest Latency as the Baseline commitment.
4. When Geographical Coverage and Latency are the same, the Product Baseline documents the product entry with the lowest Refresh as the Baseline commitment.
5. When the Refresh and Latency are the same, the Product Baseline documents the product entry with the larger Geophysical Coverage over multi-small-local regions. For example, if Snow Cover is generated over Hemi US, CONUS and Mesoscale with the same Refresh and Latency, only Snow Cover over Hemi US is documented as the Baseline commitment.
6. Product names in the same family of observations with the same attribute specifications (geographic coverage, refresh and latency) are documented as one entry. For example, Ocean Surface Wind to cover both Ocean Surface Wind and Direction.
7. For blended/gridded products, the Refresh actually represents how frequently the products are made available to users, which is different from the general definition in Appendix B.

8. For blended/gridded products, the Latency represents the average data age, which is different from the general definition in Appendix B.
9. For Full Disk/Sectorized products, the Latency represents the interval between the end of an observation by an instrument on the satellite to the observation and

products made available to users, which is different from the general definition in Appendix B.

All baseline products are traceable to what NESDIS is doing today with a baseline level of performance that can be sustained by the data from NOAA and partner missions and long-term partnership.

The NESDIS Product Baseline is aligned with the 31 product categories in NLR REQ 001 for continuity products, which encompass many user applications. Each product category includes:

- A brief product category description
- A product table, summarizing all products covered under each category and their associated threshold attributes specifications: geographic coverage, refresh, and latency.

The Data Type is included in Tables for reference purpose, but it is not a requirement.

4. Sources of Information

4.1. Applicable Documents

a. NESDIS-REQ-1001.1, NESDIS Level Requirements
b. NESDIS-PR-1302.1, NESDIS Requirements Management Procedural Requirements
c. NESDIS-PLN-1312.1, NESDIS Requirements Management Plan
d. NESDIS-PLN-1314.1, NESDIS Configuration Management Plan
e. NESDIS-PLN-1003.1, NESDIS Five-Year Product Plan

4.2. References

Several sources are used to analyze the product threshold attributes specifications documented in the Product Baseline, which include:

- NESDIS Integrated Products List
- Joint Polar Satellite System (JPSS) Level 1 Requirements Document Supplement – Final V2.11
- JPSS Ground Segment Data Product Specification - 474-01543, Revision B
- Geostationary Operational Environmental Satellites (GOES)-R Series Level-1

Requirements, June 2020

- GOES-R Ground Segment Project Functional and Performance Specification
- GOES-R Product Definition and User's Guide
- IJPS/JPS Agreement
- Jason-3 and Jason-CS 4-Partner Memoranda of Agreement

- EUMETSAT Polar System (EPS)-Second Generation (SG) End User Requirements Document v5A, February 2020
- Metop-SG NOAA Products List v1.2
- Satellite Products and Services Review Board (SPSRB) User Request Database
- Others

5. The Product Baseline

5.1. Foundational

The NESDIS Foundational Thematic Product Area represents the raw sensor data generated from a satellite observing system to include calibration and geolocation information. Products within this thematic area are instrument specific and serve as building blocks for NESDIS Geophysical Products as well as for user applications.

5.1.1 Imagery

Products in the Imagery category include but are not limited to visible, near-infrared, infrared, microwave and solar imagery at multiple wavelengths. These include but are not limited to direct interpretation of single-channel images and processed multi-channel images such as multispectral compositing, temporal combination of animated sequences, or multi-satellite mosaics, etc.

Table 1: Product Specifications/Attributes in NLR Category: Imagery

Products Data Type	Geographic Coverage	Refresh	Latency	Baseline
Visible and Infrared Imagery	Granule	Global	12 hours	96 mins Blended
Microwave Sounder Imagery				
Microwave				

Arctic 60 mins 3 hours Blended 60S to 60N
60 mins 60 mins Full Disk Hemi US 10 mins Orbital Global 4 hours 3 hours
55 secs
Sectorized CONUS 5 mins 55 secs

Sectorized Targeted

Mesoscale 30 secs 28 secs

Imager Imagery Orbital Global 12 hours 130 mins Near Constant
Contrast Imagery Exclusive

Synthetic
Granule Global 12 hours 96 mins US

Aperture Radar Granule and 10 days 1~8 hours
Imagery Economic Zone (EEZ) Coastal Areas,

Products Data Type	Geographic Baseline
	Lakes, CONUS, Alaska (AK), and Hawaii (HI). Targeted Global Tropical Cyclone Coverage

5.1.2 Sensor Data

Coverage **Refresh Latency** Arctic, US Great

Products in the Sensor Data category include but are not limited to radiances, radar/lidar

backscatter amplitudes and phases, backscattered radiation, brightness temperatures, sensor radiometric calibration information and geolocation, and in-situ observations such as electrons, ions, energetic particles and electric and magnetic fields, conductivity, etc.

Table 2: Product Specifications/Attributes in NLR Category: Sensor Data

Products Data Type	Geographic Coverage	Refresh Latency	Baseline
Shortwave Ultraviolet-Visible (UV/Vis) Sounder Raw Data Records	Granule	Global 24 hours 96 mins	
Shortwave (UV/Vis) Sounder Sensor Data Records	Granule	Global 24 hours 96 mins	
Shortwave (UV/Vis) Sounder Reflectance	Granule	Global 24 hours 96 mins	
Shortwave (UV/Vis) Sounder Solar Irradiance	Granule	Global 6 hours 2 hours	
Infrared Sounder Cloud Cleared Radiances	Granule	Global 6 hours 2 hours	Infrared Sounder
Radiances	Granule	Global 6 hours 2 hours	Infrared Sounder
Principal Components / Thinned Radiances	Granule	Global 6 hours 2 hours	
Infrared Sounder Raw Data Records	Granule	Global 6 hours 2 hours	
Infrared Sounder Sensor Data Records	Granule	Global 6 hours 2 hours	

Products Data Type	Geographic Coverage	Refresh Latency	Baseline
Optical Imager Reflectance	Granule	Global 6 hours 2 hours	
Optical Imager Raw Data	Granule	Global 6 hours 2 hours	

Full Disk Hemi US 10 mins 10 mins

Sectorized Targeted

Optical Imager Radiances

Optical Imager Clear Sky Radiance

Optical Imager Brightness Temperatures

Microwave Radiometer Brightness Temperatures Microwave Radiometer Raw Data Records Microwave Radiometer Temperature Data Records Microwave Radiometer Sensor Data Records

Coverage **Refresh Latency**

Orbital Global 12 hours 3 hours Full Disk Hemi US 15 mins 15 mins Orbital Global 12 hours 3 hours Full Disk Hemi US 15 mins 15 mins Orbital Global 12 hours 3 hours Full Disk Hemi US 15 mins 15 mins Sectorized Targeted

Mesoscale 5 mins 5 mins

Orbital Global 12 hours 3 hours Full Disk Hemi US 15 mins 15 mins Sectorized CONUS 15 mins 15 mins Climate Data Records 70S to 70N 3 hours 3 months Orbital Global 4 hours 3 hours

Climate Data Records Global 24 hours 1 month Orbital Global 12 hours 137 mins Orbital Global 4 hours 2 hours Orbital Global 4 hours 2 hours Orbital Global 12 hours 137 mins

Orbital Global 4 hours 2 hours

Mesoscale 5 mins 5 mins

Climate Data Records Arctic, Antarctic 12 hours 24 hours

Lightning Imager Point Hemi US 20.5 secs 20 secs Scatterometers Orbital Global 12 hours 3 hours Radar Altimeter Orbital Global 10 days 2~5 hours 15 hours (high latitude) / 42 hours (tropics) 150 mins

Radio Occultation Data Orbital Global

5.2. Geophysical

lattitude) / 26 hours (mid

The NESDIS Geophysical Thematic Products Area describes the earth, atmosphere and surrounding space environment. Geophysical products are derived through mathematical algorithms that process observing system foundational data. Geophysical products are

distributed to our end user community in support of weather, climate, cryosphere, oceanic and space forecast and monitoring capabilities.

5.2.1 Atmospheric Composition and Air Quality

Products in the Atmospheric Composition and Air Quality sub-category include but are not limited to aerosol detection, optical depth, particle size, height, ozone, methane, CO, CO2, and other trace gases, etc.

Table 3: Product Specifications/Attributes in NLR Category: Atmospheric Composite and Air Quality

Baseline Products Data Type	Geographic Coverage	Refresh Latency
Biomass Burning Emissions	Orbital Global Land	6 hours 6 hours
Aerosol Optical Depth/Thickness	Full Disk Hemi US Sectorized CONUS Granule Global Climate Data	10 mins 10 mins 5 mins 5 mins 24 hours 96 mins
Aerosol Particle Properties	Record Global Ocean Granule Global	24 hours 3 months 24 hours 96 mins
Aerosol Detection	Granule Global	24 hours 96 mins
Total Ozone	Full disk Hemi US Sectorized CONUS Granule Global	10 mins 10 mins 5 mins 5 mins 24 hours 103 mins
Ozone Profile	Blended Global Gridded Global Granule Global	24 hours 24 hours Weekly 1 week 12 hours 96 mins
Trace Gases Product Suite (i.e., Methane, Sulfur Dioxide, Carbon Dioxide, Carbon Dioxide Profile, Carbon Monoxide, Carbon Monoxide Profile, etc.)	Granule Global	24 hours 119 mins Gridded Global Weekly 1 week
Dust/Ash/Smoke	Granule Global	6 hours 2 hours

	Sectorized CONUS 24 hours 24 hours Gridded Global Land 6 hours 6 hours Gridded Global Land 24 hours 24 hours
Full disk Hemi US 30 mins 30 mins	

5.2.2 Atmospheric Water Vapor

Products in the Atmospheric Water Vapor sub-category include but are not limited to moisture profiles, total precipitable water, total precipitable water anomaly and stability indices, etc.

Table 4: Product Specifications/Attributes in NLR Category: Atmospheric Water Vapor

Products Data Type	**Geographic Coverage**	**Refresh Latency**
Baseline		
Atmospheric Water Vapor Profiles		Orbital Global 4 hours 3 hours Granule Global 6 hours 2 hours Full Disk Hemi US 60 mins 60 mins Sectorized CONUS 30 mins 30 mins Sectorized Targeted Meso 5 mins 5 mins
Total Precipitable Water (TPW)		Orbital Global 4 hours 3 hours Granule Global 12 hours 96 mins Full disk Hemi US 15 mins 15 mins Sectorized CONUS 5 mins 5 mins Sectorized Targeted Meso 30 secs 30 secs Blended Global 60 mins 6 hours
Percentage of TPW Normal		Blended Global 60 mins 6 hours Layered
Precipitable Water (LPW)		Blended Global 60 mins 6 hours

5.2.3 Atmospheric Temperature

Products in the Atmospheric Temperature sub-category include but are not limited to near-surface air temperature and pressure, temperature profiles, atmospheric temperature indices, atmospheric pressure profile, virtual temperature, upper air temperature, etc.

Table 5: Product Specifications/Attributes in NLR Category: Atmospheric Temperature

Products Data Type	Geographic Baseline	
Surface Pressure	In-situ Global Weekly 1 week	In-situ Global (?) Quarterly 3 months Granule Global 12 hours 96 mins Orbital Global 6 hours 3 hours Climate Data Record Global Annually 1 year Gridded Hemi US 60 mins 60 mins Gridded CONUS 30 mins 30 mins Sectorized Targeted Meso 5 mins 5 mins In-situ Global 24 hours 24 hours
Atmospheric Temperature Profile		

Products Data Type	Geographic Baseline	
Surface Air Temperature	In-situ Global Monthly 1 month	In-situ Global Quarterly 3 months In-situ Global Decadal 10 years
Temperature Upper Air	In-situ CONUS, AK, HI,	CONUS, AK, HI,
Virtual Temperature (Near-surface air properties)	US Territories Monthly 1 month	In-situ CONUS, AK, HI,
	US Territories Quarterly 3 months	In-situ CONUS, AK, HI,
Maximum/Minimum Temperatures		
US Territories 12 hours 3 days		
In-situ Global Monthly 1 month		
In-situ CONUS, AK, HI,		
US Territories 60 mins 60 mins	In-situ CONUS, AK, HI,	
US Territories 24 hours 24 hours	In-situ	US Territories Annually 1 year

Monthly 1 month

In-situ CONUS, AK, HI,

US Territories Decadal 10 years In-situ Global

Stagnation Index In-situ CONUS Monthly 1 month Lifted Index Orbital Global 6 hours 3 hours

Stability Indices (Convective Index, Convective Available Potential Energy, etc.) US 60 mins 60 mins Sectorized CONUS 30 mins 30 mins Sectorized Targeted Meso 5 mins 5 mins

5.2.4 Clouds

Granule Global 6 hours 2 hours Full disk Hemi

Products in the Clouds sub-category include but are not limited to water/ice path, cloud mask, height (top and base), layers, optical depth, liquid/ice path, phase, particle size, etc.

Table 6: Product Specifications/Attributes in NLR Category: Clouds

Baseline Products Data Type	Geographic Coverage	Refresh	Latency
Cloud Fraction	Orbital Global	6 hours	3 hours
	Granule Global	12 hours	96 mins
	Full disk Hemi	US 10 mins	10 mins
Cloud Layers	Sectorized CONUS	5 mins	5 mins
	Sectorized Targeted	Mesoscale 30 secs	30 secs
Cloud Phase	Granule Global	12 hours	96 mins
	Full disk Hemi	US 10 mins	10 mins

Baseline Products Data Type	Geographic Coverage	Refresh	Latency
	Sectorized CONUS	5 mins	5 mins
	Sectorized Targeted Mesoscale	5 mins	5 mins
	Granules Global	12 hours	96 mins
Cloud Heights (Top and Base)			
Cloud Optical Depth/Thickness			
Particle Size Distribution			
Cloud Mask			
Cloud Liquid/Ice Water			

	mins 15 mins Sectorized CONUS 5 mins 5 mins Orbital Global 6 hours 3 hours Granule Global 12 hours 96 mins Gridded Global 24 hours 24 hours Full disk Hemi US 15 mins 15 mins Sectorized Targeted
Cloud Top Temperature	
Cloud Top Pressure Full disk Hemi US 60 mins 60 mins Sectorized Targeted	
Mesoscale 5 mins 5 mins Granule Global 12 hours 96 mins Orbital Global 6 hours 3 hours Full disk Hemi US 15 mins 15 mins Sectorized Targeted	
Mesoscale 5 mins 5 mins Granule Global 12 hours 96 mins Orbital Global 6 hours 3 hours Orbital Global 6 hours 3 hours Full disk Hemi US 15 mins 15 mins Orbital Global 6 hours 3 hours Full disk Hemi US 15	Mesoscale 5 mins 5 mins Orbital Global 6 hours 3 hours Full disk Hemi US 60 mins 60 mins
Cloud Emissivity Orbital Global 6 hours 3 hours	Fog Full disk Hemi US 10 mins 10 mins Sectorized CONUS 5 mins 5 mins

5.2.5 Lightning

Products in the Lightning sub-category include but are not limited to lightning events, groups and flashes.

Table 7: Product Specifications/Attributes in NLR Category: Lightning

Products Data Type	**Geographic Coverage**	**Refresh Latency Baseline**
Lightning Detection: Events, Groups and Flashes Lightning Detection Products (flash extent density,	Point Hemi US	20 secs 20 secs Gridded Hemi US 1 min 1 min

Products Data Type **Geographic**
Baseline

minimum flash
area, total optical
energy, etc.)

5.2.6 Precipitation

Coverage **Refresh Latency**

The products in the Precipitation category include but are not limited to rain rate, snowfall rate, total rainfall estimates, rainfall potential and probability, Quantitative Precipitation Estimate and Precipitation Climate Data Records, etc.

Table 8: Product Specifications/Attributes in NLR Category: Precipitation

Baseline Products Data Type **Geographic**

Coverage **Refresh Latency**
Granule Global 12 hours 96 mins
Orbital Global 4 hours 3 hours
Global 60 mins 6 hours Climate Data

Rain Rate
Blended Global 15 mins 30 mins Blended Record Global 24 hours 1 month

Snowfall Rate Granule Global 12 hours 96 mins Orbital Global 4 hours 3 hours
Blended Global 60 mins 60 mins

Accumulated Rainfall
Total

In-situ CONUS, AK, HI,

Maximum/Minimum
Precipitation

5.2.7 Radiation Budget

US Territories Decadal 10 years

Blended Global 24 hours 24 hours In-situ CONUS 5 mins 24 hours In-situ CONUS 15 mins 1 month In-situ CONUS 60 mins 1 month

In-situ CONUS, AK, HI,

US Territories Annually 1 year

Products in the Radiation Budget sub-category includes but is not limited to all

incoming/outgoing radiances and irradiances, reflectance, emissivity, albedo, etc.

Table 9: Product Specifications/Attributes in NLR Category: Radiation Budget

Baseline Products Data Type	Geographic Coverage	Refresh Latency
Outgoing Longwave Radiation	hours 24 hours	
Absorbed Shortwave Granule	Global	12 hours 96 mins
Gridded 24		
Solar Radiation	Gridded Global 24 hours	24 hours
Surface Albedo	Gridded Global Land 24 hours 24 hours	
Full disk Hemi US Land 60 mins 30 mins		
Surface Emissivity Orbital Global Land	6 hours	3 hours
Surface Reflectance Orbital Global Land	24 hours	24 hours

Baseline Products Data Type	Geographic Coverage	Refresh Latency
Reflected Shortwave Radiation: Top Of Atmosphere	Sectorized CONUS	60 mins 60 mins
	Full disk Hemi US 60 mins	60 mins
Downward Shortwave Radiation	Sectorized CONUS 60 mins	60 mins Gridded
Global 24 hours 24 hours		
Full disk Hemi US 60 mins 60 mins		
Radiative Flux Full disk Hemi US	3 hours	3 hours
Photosynthetically Active Radiation	Global 60 mins	60 mins
Full Disk Hemi US 60 mins 60 mins Gridded		
Total Solar Irradiance Climate Data Record	Global 24 hours	3 months
Solar Spectral Irradiance Climate Data Record	Global 24 hours	3 months
Outgoing Longwave Radiation Climate Data Record	Global 24 hours	3 day
Global Monthly 1 month		
Reflectance Climate Data Record	Global Land 24 hours	24 hours

5.2.8 Tropical Cyclone Characteristics

Products in the Tropical Cyclone Characteristics sub-category include but are not

limited to tropical cyclone formation probabilistic forecasts, position and intensity estimates of tropical disturbances and cyclones and static and animated imagery of tropical disturbances, cyclones and areas of interest, and wind analysis, etc.

Table 10: Product Specifications/Attributes in NLR Category: Tropical Cyclone Characteristics

Baseline Products Data Type	Geographic Coverage	Refresh	Latency
Tropical Cyclone Intensity and Point	Storm Regions	6 hours	3 ~ 6 hours
Positions	Gridded Global Ocean	3 hours	18 months
	Orbital Global Ocean	6 hours	3 hours
	Full Disk Hemi US	10 mins	10 mins
Hurricane Imagery Point		30 mins	60 mins
Hurricane Tracks Point	Global	6 hours	4 days
Tropical Cyclone Surface Wind Tropical Cyclone Rainfall Potential/Probabilit y	Gridded Global Ocean	6 hours	4 hours
Tropical Cyclone Formation Probability			
Gridded Storm Regions		6 hours	60 mins
Blended Storm Regions		6 hours	3 ~ 6 hours
Gridded Storm Regions		6 hours	3 hours

5.2.9 Volcanic Eruption Characteristics

Products in the Volcanic Eruption Characteristics sub-category include, but are not limited to, the detection, tracking, and characterization of volcanic emissions (primarily ash and SO2) and volcanic heat signatures (lava, hot gases, and incandescent material). This sub-category also includes specialized multi-spectral imagery and volcanic event centric eruption attributes such as source volcano, eruption timing, cloud height, mass of emissions, and cloud microphysical properties.

Table 11: Product Specifications/Attributes in NLR Category: Volcanic Eruption Characteristics

Products Data Type	Geographic Coverage	Baseline
Volcanic Ash		

Detection, Tracking, and Characterization Volcanic SO2 Hemi US 10 mins 10 mins

Detection, Tracking, and Characterization Volcanic Thermal Anomaly Granule Global 6 hours 2 hours

Detection, Tracking, and Characterization Granule Global 12 hours 96 mins Full Disk Hemi

US 10 mins 10 mins

5.2.10 Winds

Products Data Type	Geographic Coverage	Refresh Latency	Baseline
Ocean Surface Wind Sectorized	Granule Global Ocean	10 hours	3 hours
	Orbital Global Ocean	12 hours	130 mins US EEZ and Coastal Areas and US Great Lakes. Global Coverage as needed.
	Tropical Cyclone	12 hours	1 ~ 8 hours
	disk Hemi US	60 mins	60 mins Sectorized
	CONUS	15 mins	15 mins Sectorized
	Targeted Mesoscale	5 mins	5 mins
Atmospheric Winds	Orbital Global Ocean	10 days	180 mins Full disk Global Land 12 hours 96 mins Full disk

Products in the Wind sub-category include but are not limited to derived motion winds, near-surface and ocean surface winds, winds at various levels in the atmosphere, wind profiles and aircraft turbulence, etc.

Table 12: Product Specifications/Attributes in NLR Category: Winds

Baseline	Sea Surface	Coverage	Refresh Latency
		Sectorized Polar Regions	12 hours 204 mins
		Sectorized Polar Regions	6 hours 3 hours
Winds Data Set	In-situ Global Ocean	As needed	24 hours

5.2.11 Lake and Sea Ice

Products in the Lake and Sea Ice sub-category include ice extent, thickness and age, concentration, type, motion, surface temperature, and climatology.

Table 13: Product Specifications/Attributes in NLR Category: Lake and Sea Ice

Baseline Products	Data Type	Geographic Coverage	Refresh Latency
Ice Thickness	Granule Global Ocean	12 hours 96 mins	Full Disk Hemi US 3 hours 3 hours
Ice Age	Granule Global Ocean	12 hours 96 mins	Hemispheric 24 hours 12 hours
Ice Extent	Ice Surface	Blended Northern Hemisphere	12 hours 12 hours
		Blended Southern Hemisphere	24 hours 24 hours
		Full Disk Hemi US	3 hours 3 hours
		Orbital Global Ocean	12 hours 130 mins
		Blended	
Temperature	Granule Global Ocean	12 hours 96 mins	Granule Global Ocean 12 hours 96 mins
Sea Ice Concentration/Exten t	Hemispheric	24 hours 12 hours	Climate Data Record
		Polar Regions	24 hours 1 year
		Orbital Global Ocean	6 hours 3 hours
		Full Disk Hemi US	3 hours 3 hours
		Blended	
Sea Ice Motion	Sectorized Arctic, Antarctic	24 hours	24 hours Full Disk Hemi US 3 hours 3 hours

5.2.12 Snow and Glacier

Products in the Snow and Glaciers sub-category include, but are not limited to, snow cover/extent, density, size of snow particles in the snowpack, snow depth, and snow water equivalent, snow analysis, etc.

Table 14: Product Specifications/Attributes in NLR Category: Snow and Glacier

Products	Data Type	Geographic Coverage	Refresh Latency
Baseline Snow Cover		Granule Global Land	12 hours 96 mins
		Orbital Global Land	6 hours 3 hours
		Full disk Hemi US	60 mins 60 mins
		Gridded Global Land	24 hours 12 hours

Products Data Type	Geographic Coverage	Refresh Latency	Baseline
Climate Data Record	Hemisphere	24 hours	1 month
	North Hemisphere	24 hours	12 hours
	Orbital Global Land	12 hours	130 mins
	Blended Global Land	24 hours	12 hours
	In-situ Hemi US	24 hours	2 days
Snow Depth	Blended North Hemisphere	24 hours	12 hours
	Orbital Global Land	6 hours	3 hours
	Granule Global Land	12 hours	96 mins
Snow Water Equivalent			

5.2.13 Fires

Products in the Fires sub-category include fire detection and mapping, fire occurrence and hotspot characterization, smoke analysis, smoke plumes and concentration, etc.

Table 15: Product Specifications/Attributes in NLR Category: Fires

Products Data Type	Geographic Coverage	Refresh Latency	Baseline
Fire Detection and Characterization	CONUS	5 mins	5 mins
Fire and Smoke	Sectorized	1 min	1 min
	Mesoscale	1 min	1 min
	Granule Global Land	12 hours	96 mins
	Full Disk Hemi US	10 mins	10 mins
	Sectorized		
Analysis	Analysis US and Canada	24 hours	24 hours

5.2.14 Flood

Products in the Flood sub-category include but are not limited to near-real time, daily and multi-day composite flood maps, etc.

Table 16: Product Specifications/Attributes in NLR Category: Flood

Products Data Type	Geographic Coverage	Refresh Latency	Baseline

			Sectorized	Global Land	
Flood Detection					
Coverage	**Refresh Latency**				
Granule	CONUS and Alaska	(80S~80N)	6 hours	24 hours	12 hours 60 mins

5.2.15 Surface Moisture

Products in the Surface Moisture sub-category include but are not limited to soil moisture and evapotranspiration, hydrologic forecasts and drought monitoring, etc.

Table 17: Product Specifications/Attributes in NLR Category: Surface Moisture

Products Data Type	**Geographic**						
Baseline							
Coverage	**Refresh Latency**						
Soil Moisture	Orbital Global Land	12 hours 130 mins	Blended Global Land	6 hours 2.5 hours			

Products Data Type	**Geographic**						
Baseline			Global Monthly	1 month + 2 days			
Drought Indices							
Coverage	**Refresh Latency**						
			In-situ CONUS Monthly	1 month + 2 days			
24 hours	24 hours		In-situ North American Monthly	1 month + 2 days			
In-situ CONUS Weekly	1 week + 2 days	In-situ					

5.2.16 [Land] Surface Temperature

Products in the Surface Temperature sub-category include but are not limited to the surface and skin temperatures of the apparent surface of land (bare soil or vegetation).

Table 18: Product Specifications/Attributes in NLR Category: Surface Temperature

Products Data Type	Geographic Coverage	Refresh Latency
Land Surface Temperature Baseline	Orbital Global Land	6 hours 3 hours
	Global Land	12 hours 96 mins
	Full disk Hemi US	60 mins 60 mins
Land Surface Air Temperature	In-Situ Global	Monthly 1 month

5.2.17 Vegetation

Products in the Vegetation sub-category include but are not limited to vegetation type and dynamic status (vegetation density and health), and climate data records, etc.

Table 19: Product Specifications/Attributes in NLR Category: Vegetation

Baseline Products Data Type	Geographic Coverage	Refresh Latency
Green Vegetation Fraction Vegetation/Surface Gridded	Global Land	24 hours 24 hours
Type	Gridded Global Land	24 hours 1 week
Leaf Area Index	Gridded Global Land	24 hours 1 week
Vegetation Health Indices	Gridded Global Land	24 hours 1 week
Vegetation Indices (Normalized Difference Vegetation Index (NDVI), Enhanced Vegetation Index, etc.) Gridded	Global Land	24 hours 1 week
Climate Data Record	Global Land	24 hours 1 week

5.2.18 Topography and Bathymetry

Products in the Topography and Bathymetry sub-category include but are not limited to ocean bathymetry information, sea floor topography, water depths, coastal shoreline

mapping, bathymetric and fishing maps, sediment thickness, and the combination of land topography, ocean bathymetry and glacial information, etc.

Table 20: Product specifications/attributes in NLR Category: Topography and Bathymetry

Products Data Type	Geographic Coverage	Refresh Latency

Baseline Coastal			**Coverage** **Refresh Latency**	
Bathymetry	In-situ	Global	Annually 1 year	
Sea Floor Bathymetry	Mean Dynamic	In-situ Global Annually 1 year	Orbital Global Annually 1 year	
Topography	Gridded	Global	Annually 1 year	Water Depth In-situ Global Annually 1 year

5.2.19 Surface Height

Products in the Surface Height sub-category include but are not limited to surface and wave height products for both large and small features from waves to tsunamis.

Table 21: Product Specifications/Attributes in NLR Category: Ocean Surface Height and Roughness

Products Data Type	**Geographic**		
Baseline		Global 10 days 2 ~ 3 days Orbital Global 10 days 2 months	
Sea Surface Height			
Significant Wave Height		Gridded Global 10 days 3 hours ~ 10 days Orbital Global 10 days 2 ~ 5 hours Gridded Global 10 days 2 ~ 3 days Orbital Global 10 days 2 months Gridded Global 10 days 24 hours	
Absolute Dynamic Topography			
Coverage **Refresh Latency** Orbital Global 10 days 2 ~ 5 hours Orbital		Gridded Global 10 days 2 months	

5.2.20 Water Temperature and Salinity

Products in the Temperature and Salinity sub-category include but are not limited to Sea Surface Temperature (SST), Lake Surface Temperature, SST Anomalies, SST Hot Spots, Degree Heating Weeks, Coral Bleaching Alerts, Ocean Heat Content, and Salinity Measurements, etc.

Table 22: Product Specifications/Attributes in NLR Category: Water Temperature and Salinity

Products Data Type	**Geographic**		
Baseline		Global Ocean Sea Surface Temperature Granule 12 hours 103 mins Orbital 6 hours 2 hours Gridded Global Ocean 6 hours 2 hours Full Disk Hemi US 60 mins 60 mins	
Blended			
Coverage **Refresh Latency** 24 hours 24 hours			

NESDIS Product Baseline

Expiration Date: Sept 29, 2026

Products Data Type	Geographic Coverage	Refresh Latency	Baseline
Sea Surface Temperature Anomaly	3 hours	3 hours	
Sea Surface Temperature Front	24 hours	24 hours	
Isotherm Depth (20C, 26C)	Blended Arctic	24 hours	24 hours Gridded
Ocean Mixed Layer Depth	Global Ocean	60 mins	6 hours Climate Data Record
Ocean Heat Content	Global Ocean	24 hours	3 months In-situ
Coral Reef Hot	Global Ocean	24 hours	24 hours In-situ
	Global Ocean	Monthly	1 month Gridded
	Global Ocean	60 mins	6 hours Basin
	Global Ocean	24 hours	24 hours Gridded
	North Atlantic		
	North Pacific		
	South Pacific		

Basin 24 hours 24 hours

Gridded North Atlantic

Basin 24 hours 24 hours

Gridded South Pacific

Basin 24 hours 24 hours

Gridded North Pacific

Basin 24 hours 24 hours

Gridded North Atlantic

Basin 24 hours 24 hours

Gridded North Pacific

Basin 24 hours 24 hours

Gridded South Pacific

Basin 24 hours 24 hours

Spots Gridded Global 6 hours 3 hours Degree Heating

Weeks Gridded Global Ocean Weekly 1 week Ocean Surface

Salinity Gridded Global Ocean 12 hours 24 hours **5.2.21 Biology and Biogeochemistry**

Products in the Biology and Biogeochemistry sub-category include but are not limited to remote sensing reflectance, ocean color, concentration of chlorophyll and suspended particulates, water-leaving radiance, dissolved colored organic matter, turbidity, surface and varying depths and diffuse attenuation coefficients, etc.

Table 23: Product Specifications/Attributes in NLR Category: Biology and Biogeochemistry

Products Data Type	Geographic Coverage	Refresh Latency	Baseline
Granule	Water Diffuse Attenuation Gridded 24 hours 24 hours Coastal Global Gridded Weekly 1 week Gridded Monthly 1 month	12 hours 12 hours	
Gridded	Global Ocean	24 hours 24 hours	
Gridded Weekly 1 week Gridded Monthly 1 month			
Granule	Global Ocean	12 hours 12 hours	
Chlorophyll-a Concentration Gridded 24 hours 24 hours and Coastal Gridded Weekly 1 week	Gridded Monthly 1 month		
Global Chlorophyll-a Anomaly	Granule Global Ocean, Coastal Global, Gridded 24 hours 24 hours Coastal US Global Ocean	12 hours 12 hours	
Chlorophyll-a Front Granule	and Coastal Global	12 hours 12 hours	
Granule True Color	Coastal US	12 hours 12 hours	Gridded 24 hours 24 hours
Granule		12 hours 12 hours	
Gridded 24 hours 24 hours Coastal Global Gridded Weekly 1 week Gridded Monthly 1 month			
Normalized Water-leaving Radiance Gridded (Reflectance) Gridded Weekly 1 week Gridded Monthly 1 month	Global Ocean	24 hours 24 hours	
Granule	Coastal US	12 hours 6 hours	
Gridded 24 hours 24 hours Gridded Bi-monthly 61 days			

5.2.22 Water Pollution

Products in the Water Pollution sub-category include but are not limited to oil spill mapping.

Table 24: Product Specifications/Attributes in NLR Category: Water Pollution

Products Data Type	Geographic	Baseline

Oil spills and Marine Debris Detection

Coverage **Refresh Latency**

and EEZ 5 days 4 hours

Granule US Coastal Zone

5.2.23 Heliosphere

Products in the Heliosphere sub-category include but are not limited to solar wind measurements and models.

Table 25: Product Specifications/Attributes in NLR Category: Heliosphere

Products Data Type **Geographic**

Baseline

Coverage **Refresh Rate Latency**

WSA-Enlil Solar

Wind Prediction Gridded Heliosphere Hourly 60 mins Solar and
Galactic
Energetic
Protons
Magnetic Field
In-situ GEO In-Situ 30 secs 30 secs

Measurements In-situ L1 In-Situ 0.5 sec 60 secs Solar Wind and
Energetic Particle
In-situ L1 In-Situ 30 secs 30 secs

Plasma Density In-situ L1 In-Situ 1 min 5 mins Plasma Velocity In-situ L1 In-Situ 1 min 5 mins Plasma

Temperature In-situ L1 In-Situ 1 min 5 mins

5.2.24 Ionosphere

Products in the Ionosphere sub-category include but are not limited to ionospheric monitoring, total electron count, energetic charged particles, etc.

Table 26: Product Specifications/Attributes in NLR Category: Ionosphere

Products Data Type **Geophysical**

Baseline

Coverage **Refresh Latency**

Vertical Total

Electron Content	Gridded	Global	10 mins	15 mins	Ionospheric
Plasma Parameters (electron density profiles, scintillation, plasma drift, Rate of change Of TEC Index) D Region Absorption Prediction		Global	1 min	Negligible	
In-situ LEO	In-Situ	24 hours	15 mins	Gridded	
Ionosonde	Ground-Based				
		Profiles	Global	5 mins	5 mins

5.2.25 Magnetosphere

Products in the Magnetosphere sub-category include but are not limited to enhanced magnetic models, space environment magnetic field, magnetic field calculators, geomagnetic models, earth magnetic anomaly grid, gravity field database, magnetopause location and crossing detection, etc.

Table 27: Product Specifications/Attributes in NLR Category: Magnetosphere

Products Data Type	Geographic Coverage	Refresh Rate	Latency
Baseline			
Energetic Particle (electron, ion) spectra	In-situ GEO	In-Situ 1 sec	60 secs
	In-situ LEO	In-Situ 1 sec	60 secs
World Magnetic Model	Gridded Global	5 Years	Static
Magnetic Field Measurements	In-situ GEO	In-Situ 0.5 sec	60 secs
	In-situ LEO	In-Situ 0.5 sec	60 secs
High Definition Geomagnetic Model	Gridded Global	Annually	Static

5.2.26 Solar

Products in the Solar sub-category include but are not limited to solar and coronal images, solar irradiance measures, and derived products.

Table 28: Product Specifications/Attributes in NLR Category: Solar

Products Data Type	Geographic Coverage	Refresh Rate	Latency
Baseline Solar UV			
Imagery	Image Whole Sun	4 mins	1 min
Coronal Imagery	Image Coronal	15 mins	15 mins
Solar UV			
Irradiances	Time series Whole Sun	20 mins/90 mins	15 mins
Solar X-ray			
Irradiances	Time series Whole Sun	3 secs	3 secs

6. Analytical

NESDIS Analytical Products synthesize geophysical information into highly processed datasets such as fused and blended analysis datasets, multi-mission time series, climate data records, written reports, and human interpretive analyses and assessments. Beyond numerical representations of data, analytical products describe how geophysical products help us to monitor the environment for global changes and significant weather events. These products support national and international users responsible for environmental monitoring and weather forecasts.

6.1. Analytical – Climate

Products in the Climate sub-category include but are not limited to quantitative analysis of climate variables in the ocean, atmosphere, land, cryosphere, and regional climate summaries around the world including: United States National Climate Assessment, Annual State of the Climate, Monthly Monitoring, etc.

Table 29: Product Specifications/Attributes in NLR Category: Analytical – Climate Reports

Products Data Type	Geographic Coverage	Refresh	Latency
Baseline			
Bulletin of American Meteorological Society State of the Climate Societal Impacts:	Reports Global HI,	Annually	1 year CONUS, AK,

Billion Dollar Disasters	Monthly State of	Reports	Puerto Rico and US Territories	Quarterly 3 months
			CONUS, AK, HI,	
Climate: National Overview				
Monthly State of Climate: National Snow and Ice		Monthly State of		
Reports		CONUS, AK, HI	Monthly	1 month
Reports		CONUS, AK, HI	Monthly	1 month
Climate: Synoptic	Discussion			
	Monthly State of	Reports	Puerto Rico, US Territories	Monthly 1 month
		Reports	CONUS, AK, HI	Monthly 1 month
Climate: Tornadoes		Reports	Global	Monthly 1 month
Monthly State of Climate: Global Analysis Report			CONUS, AK, HI,	
National Climate Assessment	Reports Monthly State of		Pacific Islands and Ocean	4 years 4 years
		Reports	Global Atmosphere	Monthly Monthly
Climate: Upper Air Temperature Report				
World Meteorological Organization Annual Statement		Reports	Global	Annually 1 year
Climate and Health Reports	Southeast			
			Region	4 years 4 years
Climate and Forecast Perspectives	Reports		National, Southeast Region	24 hours 24 hours

Products	Data Type	Geographic Coverage	Refresh Latency	Baseline
Sporting Events				
Climatology	Reports	National	Annually 1 year	Monthly State of
Climate: Global Snow and Ice Report		Reports	Global	Monthly 1 month
Monthly State of				

Climate: Wildfire	Reports	CONUS	Monthly	1 month
Monthly State of Climate: Tropical Cyclones	Climate at a Reports	North Atlantic Ocean and Eastern North Pacific Ocean	Monthly	1 month
Glance	Reports	Global	Monthly	1 month
Publication Products, Monthly Climatic Data for the World	Publication Reports	Global	Monthly	1 month
Publication Products, CD Pubs incl. QAR/Extremes reports to NWS Value of National	Centers for Environmental Reports	CONUS, AK, HI, US Territories	Monthly	1 month Annually 1 year
Information (NCEI)		CONUS, AK, HI, US Territories	Weekly	1 week
Information Reports		Monitor	Reports	
Global Climate Product Generation for Climate Forecast Perspectives The Drought	Reports Climate and	U.S. Global Change North American	Weekly	1 week
Reports	Global	As Needed	As Needed	
		Research Program Indicators Suite Wind		
		Climatology and Monitoring		
Reports	Global	Annually	18 months	Reports
Reports	Global	Monthly to		
		CONUS	Monthly	1 month
Quarterly	1 year			
Reports	Southeast US	24 hours	24 hours	

Products Data Type **Geographic**

Baseline				
	Coverage	Refresh Latency		
Disaster Reports Reports	CONUS, AK, HI, US Territories	Quarterly 3 months		
Precipitation Climate Reports	Reports Global	Monthly 1 month	Tornado Climatology	Reports CONUS, AK, HI Daily 6 days

6.2. Analytical – Oceans, Freshwater and Coasts

Products in the Oceans, Freshwater and Coasts sub-category include but are not limited to qualitative analysis of ocean observations and marine data including United States National Climate Assessment, Annual State of the Climate, Monthly Monitoring, Oil spill detection and monitoring, etc.

Table 30: Product Specifications/Attributes in NLR Category: Oceans, Freshwater and Coasts

Products Data Type	Geographic		
Baseline			
	Coverage	Refresh Rate	Latency
GPRA Performance Measure Reports Marine Pollution Analysis	Reports EEZ US	As needed	As needed

6.3. Analytical – Weather

Products in the Weather sub-category include but are not limited to interpretive analyses based on satellite data and its derived products in helping monitoring and forecasts of significant weather events including: Hurricane intensity and position, Significant Precipitation, Volcanic Ash, and Fire and Smoke, etc.

Table 31: Product Specifications/Attributes in NLR Category: Analytical/Weather

Products Data Type	Geographic		
Baseline			
	Coverage	Refresh	Latency
Global Hazards Report Regional Monitoring	Reports Global	Weekly	1 week
Winter Weather Northeast	Reports CONUS	Daily	24 hours
Freeze/Thaw Reports	US Region	Daily	24 hours
Tropical Weather and Impacts	Wildfire Reports	Gulf of Mexico and Atlantic Ocean	As needed As needed

Monitoring Reports CONUS Monthly 1 month

Products Data Type	Geographic Baseline		
Land Surface Data Sets / Coverage	Refresh Latency	CONUS,	
Publication Products, Storm Data	Reports Reports	US Territories Monthly 6 months	Monthly 1 month
Monitoring, US, Monthly State of Climate: Drought	HI, US Territories		
Volcanic	CONUS, AK, HI,		
Hazard Advisory Database	Analysis Global 6 hours 15 mins	Volcanic Ash CONUS 2 - 10 mins 5 mins	
Automated Severe Weather Analyses and Nowcasts			
Analysis Global Static Static Analysis			

6.4. Analytical – Climate Data Records

Products in the Climate Data Records (CDR) sub-category include but are not limited to long-term environmental data records produced for continuity over long time periods serving NOAA's users. These include well-characterized and cross-calibrated satellite observations and uniform records of geophysical data of the atmosphere, ocean and land. The former Climate Data Record Program categorized the CDRs into 4 areas: Atmospheric, Oceanic, Terrestrial and Fundamental in Tables 32 - 35 following these categorical assignments.

The following are the categories of CDR Types:

- FCDR - Fundamental CDRs provide intersatellite calibrated brightness temperatures.
- TCDR - Thematic CDRs provide retrievals of geophysical values. L1b -

Satellite observations with corrections for intersatellite differences. Data are still at the original satellite projection (e.g., swath)

- L1g - Satellite observations with corrections for intersatellite differences. Data are mapped to a fixed projection grid.
- L2 - Level 2 indicates the data are on the same projection as the source data.
- L3 - Level 3 indicates data have been re-projected. While some data have been filled to ensure completeness of the field in space and time, our criteria for level 3 does not require it. Level 3 data indicates that data primarily derive from satellite observations.
- L3b - Level 3b identifies a field that has blended satellite data and *in situ* data.

Table 32: Product Specifications/Attributes in NLR Category: Analytical/Climate Data Records for the Atmospheric CDRs

Baseline Products	CDR Type	Geographic Coverage	Refresh Rate	Latency
Aerosol Optical Depth/Thickness	TCDR	L3 Global Ocean	24 hours	3 months
		TCDR L3b 60S-60N	24 hours	3 months
Rain Rate		L3b Global	Monthly	1 month
	TCDR	L3b Global	24 hours	1 month
Total Solar Irradiance	TCDR	Global	24 hours	3 months
Solar Spectral Irradiance	TCDR	Global	24 hours	3 months
Radiation Budget	TCDR	L3 Global	Monthly	1 month
Outgoing Longwave Radiation			24 hours	3 day
Surface Heat Flux	TCDR	L3 Global Oceans	24 hours	3 months
		TCDR L3 Global	3 hours	3 months
Cloud Fraction		L3 Poles	12 hours	3 months
	TCDR	L3 Global	12 hours	24 hours
Cloud Optical Depth	TCDR	L3 Global	3 hours	3 months
		TCDR L3 Global	12 hours	24 hours
Cloud Particle Size	TCDR	L3 Global	12 hours	24 hours
Cloud Top Temperature		L3 Global	12 hours	24 hours
	TCDR	L3 Global	3 hours	3 months
		TCDR L3 Poles	12 hours	3 months
Cloud Emissivity	TCDR	L3 Global	12 hours	24 hours
Cloud Top Pressure	TCDR	L3 Global	12 hours	24 hours
Cloud Liquid/Ice Water	TCDR	L3 Global	12 hours	24 hours
Cloud Type	TCDR	L3 Global	12 hours	24 hours
Total Precipitable Water	TCDR	L2 Global	12 hours	4 months
Total Ozone	TCDR	L3b Global	Monthly	3 months
Ocean Surface Wind	TCDR	L3 Global Oceans	3 hours	3 months
Mean Layer Temperatures	TCDR	L3 Global	Monthly	1 month
Mean Layer				

Temperatures, Radio Occultation TCDR L3 Global Static Static

Surface Radiative Flux TCDR L3 Poles 3 hours 3 months Top of Atmosphere

Radiative Flux TCDR L3 Poles 3 hours 3 months Near Surface Specific

Humidity TCDR L3 Global Oceans 3 hours 3 months Near Surface Air

Temperature TCDR L3 Global Oceans 3 hours 3 months

Table 33: Product Specifications/Attributes in NLR Category: Analytical/Climate Data Records for the Oceanic CDRs

Baseline Products CDR Type	Geographic Coverage	Refresh Rate	Latency
Ocean Heat Content TCDR L3	Global	3 months	3 months
Sea Surface Temperature TCDR L3b	Global Oceans	24 hours	15 days
TCDR L2	Global Oceans	12 hours	3 months
TCDR L3	Global Oceans	3 hours	3 months
Sea Ice Concentration TCDR L3	Poles	24 hours	1 year
Sea Ice Thickness TCDR L3	Poles	12 hours	3 months

Table 34: Product Specifications/Attributes in NLR Category: Analytical/Climate Data Records for the Terrestrial CDRs

Baseline Products CDR Type	Geographic Coverage	Refresh Rate	Latency
Surface Reflectance TCDR L3	Global Land	24 hours	24 hours
NDVI TCDR L3	Global Land	24 hours	1 week
Leaf Area Index TCDR L3	Global Land	24 hours	1 week
FAPAR TCDR L3	Global Land	24 hours	1 week
Snow Cover TCDR L3b	North Hemisphere	24 hours	1 month
Snow Water equivalent TCDR L2	Global Land	12 hours	3 months
Surface Temperature TCDR L3	Polar regions	12 hours	3 months
Surface Albedo TCDR L3	Polar Regions	12 hours	3 months
Emissivity TCDR L2	Global	12 hours	3 months

Table 35: Product Specifications/Attributes in NLR Category: Analytical/Climate Data Records for the Fundamental CDRs

Baseline Products CDR Type	Geographic Coverage	Refresh Rate	Latency
Optical Sounder Brightness Temperatures			
Optical Imager Radiances			

Optical Imager Brightness Temperatures

Microwave Sounder Radiometer Brightness Temperatures

Microwave Imager Radiometer Brightness Temperatures

FCDR L1b Global 12 hours 1 month

FCDR L1g Poles 12 hours 24 hours FCDR L1b Global 12 hours 24 hours

FCDR L1g 70S to 70N 3 hours 3 months

FCDR L1b Global 12 hours 1 month FCDR L1g Global 24 hours 1 month

FCDR L1b Global 12 hours 10 days

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Appendix A: References

1. NESDIS-REQ-1001.1, NESDIS Level Requirements
2. NESDIS IPL
3. NESDIS-PR-1302.1, NESDIS Requirements Management Procedural Requirements
4. JPSS Level 1 Requirements Document – Final Version: 2.0 5. GOES-R Ground Segment Project Functional and Performance Specification 6. GOES-R Product Definition and User's Guide
7. IJPS Agreement
8. Jason-3 and Jason-CS 4-Partner Memoranda of Agreement 9. EPS-SG End User Requirements Documentv5A, 6 February 2020
10. Metop-SG NOAA Products List v1.2
11. SPSRB User Request Database
12. Consolidated Observation User Requirements List

13. Technology, Planning, and Integration for Observation Glossary 14. NOAA Space Platform Requirements Working Group – Report, 2018 15. CoastWatch User Requests Database
16. Interagency or International Memoranda of Understandings

Appendix B: Glossary

Baseline: An agreed-to set of requirements, designs, budgets, schedules, or documents that will have changes controlled through a formal approval and monitoring process.

Blended Product: A value-added product that merges the geophysical parameters retrieved from various satellite/sensors with the same or different algorithms, sometimes including those from ground observations and model outputs, to provide users a unified high-quality product of the same kind.

Climate Data Records: Data records produced with inter-satellite calibrated observations over a very long time -period.

Consolidated Observation User Requirements List: An extensive database that

documents observing requirements of NOAA Line Offices users

Data Type: An attribute that describes the type of data products.

- Granule: data products from a segment of a satellite revolution with a given number of lines along track.
- Orbital: data products from one complete satellite revolution.
- Full Disk: data products from a full geostationary satellite diameter circle centered at nadir
- Sectorized: data products from sub-regions of a full geostationary satellite diameter circle or any regional area over global.
- Gridded: data products mapped into grid cells with a specific map projection.
- Blended: gridded products merged from multiple data sources
- Analysis: data products integrated with human interactive inputs
- Reports: An authoritative document that describes the state of the environment based on data products and is integrated with expert review.
- Point: data products specified on irregular grid cells with particular latitude and longitude information
- In-situ: observations made at the point where the instrument is located
- GEO In-Situ: in-situ measurement of a geostationary satellite parked over the U.S
- LEO In-Situ: an in-situ observation made in low-Earth polar orbit
- L1 In-Situ: an in-situ observation made at the solar L1 Lagrange point between Earth and Sun
- Ground-Based Profiles: vertical distribution of solar observations from Earth
- Climate Data Records: Data records produced with inter-satellite calibrated observations over a very long time-period

- Time Series: A group of observations or data products on a single entity over time
- Image: Visualized observations and data products in imagery format

Latency: Elapsed time from the start of data acquisition until delivery of data/products to the user, including observing, downlink, data processing and product generation time.

NESDIS-Level Requirements: Requirements that define customer expectations in the context of the NESDIS mission, strategic plans, Mission Essential Functions , policies and regulations.

NESDIS Office(s): A term used in the widest sense to include NESDIS Headquarters elements, NESDIS Operations and Acquisitions offices, the Center for Satellite Applications and Research (STAR), and the National Centers for Environmental Information.

Process: A set of activities used to convert inputs into desired outputs to generate expected outcomes and satisfy a purpose.

Project: A specific investment that has defined goals, objectives, requirements, lifecycle cost, a beginning, and an end. A project yields products or services that directly address NESDIS' strategic needs. In this document, the term 'project' applies in the widest sense to include projects, programs, portfolios, and major initiatives.

Raw Data Records (RDRs): Full resolution digital sensor data, time referenced and earth located, with absolute radiometric and geometric calibration coefficients appended (or identified in the SRD metadata), but not applied, to the data and with communications artifacts removed.

Refresh: Averaged time interval between consecutive measurements of the same area of the environment.

Requirement: A statement that identifies a system, product, or process characteristic or constraint. A requirement statement must be clear, correct, feasible to obtain, unambiguous in meaning, and able to be validated at the level of the system structure at which it is stated.

Sensor Data Records (SDRs): Data Records produced when an algorithm is used to convert the reconstructed unprocessed instrument and payload data at full resolution as delivered by RDRs into processed instrument data at full resolution, time-referenced, and with radiometric and geometric calibration coefficients and georeferencing parameters (i.e., platform ephemeris) computed and applied.

Temperature Data Records (TDRs): Data Records produced from geolocated antenna temperatures (Ta) with all relevant calibration data counts and ephemeris data to revert from Ta into counts.

Appendix C: Acronyms

AK Alaska
AM Ante meridiem: Before noon
CDRs Climate Data Records
CONUS Continental United States
EEZ Exclusive Economic Zone
EPS EUMETSAT Polar System
FAPAR Fraction of Absorbed Photosynthetically Active Radiation
FCDR Fundamental CDR
GEO Geostationary Earth Orbit

GOES Geostationary Operational Environmental Satellites
GPRA Government Performance and Results Act
HI Hawaii
IJPS Initial Joint Polar-orbiting System
IPL Integrated Product List
JPS Joint Polar-orbiting System
JPSS Joint Polar Satellite System
L1RDS Level 1 Requirements Document Supplement
LEO Low Earth Orbit
NCEI National Centers for Environmental Information
NDVI Normalized Difference Vegetation Index
NESDIS National Environmental Satellite, Data, and Information Service
NLR NESDIS Level Requirements
NOAA National Oceanic and Atmospheric Administration
NWS National Weather Service
OMAO Office of Marine and Aviation Operations
PM Post meridiem: After noon
RDRs Raw Data Records
REQ Requirement
SDRs Sensor Data Records
SG Second Generation
SPSRB Satellite Products and Services Review Board
TCDR Thematic CDR
TDRs Temperature Data Records
US United States
UV/Vis Ultraviolet Visible

Appendix D: Geographical Coverage Definitions

Reference: Technology, Planning, and Integration for Observation Glossary: https://nosc.noaa.gov/tpio/main/geocoverages.html

Geographical Coverage Name	Definition
3-axis orthogonal	3-axis orthogonal refers to 3 measurements made at 90 degrees to each other to define a vector
35 deg Pitch Angle	Pitch angle is the position angle between the geocentric north pole and the solar

	rotational north pole measured eastward from geocentric north.
Aircraft Track	The track that an aircraft travel
Alaska Complex	One of the Regional Ecosystem Complexes defined by the Coastal Large Marine Ecosystems and Regional Governance Organizations of the Atlantic Ocean
	Europe and Africa in the east and the Americas in the west.
California Current	One of the Regional Ecosystem Complexes defined by the Coastal Large Marine Ecosystems and Regional Governance Organizations of the United States. The California Current is a surface oceanic current that is a southward-flowing continuation of the Aleutian current along the west coast of North America between latitudes 48° N and 23° N.
Caribbean Sea	One of the Regional Ecosystem Complexes defined by the Coastal Large Marine Ecosystems and Regional Governance Organizations of the United States. The area of the Caribbean Sea lies between latitudes 9° and 22° N and longitudes 89° and 60° W, and is approximately 1,063,000 square miles in extent.
Chesapeake Bay	The Chesapeake Bay is approximately 200 miles (320km) long from its northern headwaters in the Susquehanna River to its outlet in the Atlantic Ocean and is 3 to 25 miles (5 to 40km) wide. The coast is defined as the part of the land adjoining or near the ocean and the immediate area offshore of the coast.
Coastal Global	Coastal Global is an area 3 miles inland and 12 miles offshore that borders the shoreline.
Coastal US	The coast is defined as the part of the land adjoining or near the ocean and the immediate area offshore of the coast. The coastal area of the United States, including Alaska and Hawaii, is
Coastal US-Alaska	defined as the land and sea areas that are 3 miles inland and 12 miles offshore that border the shoreline. The coast is defined as the part of the land adjoining or near the ocean and the immediate
Geographical Coverage Name	Definition
Alaska Complex	United States. The Alaska Complex is made up of 5 distinct ecosystems: the Aleutian Islands, the Eastern Bering Sea, the Gulf of Alaska, the Beaufort Sea, and the Chukchi Sea.
Atlantic Ocean	The Atlantic Ocean extends from the Arctic Ocean in the north to the Southern Ocean in the south and is bounded by

Coastal US-East Coast	Coastal US-East is the coastal area from Maine to Florida that is 3 miles inland and 12 miles offshore from the coastline. The coast is defined as the part of the land adjoining or near the ocean and the immediate area offshore the coast.
Coastal US-Gulf of Mexico	Coastal US-Gulf of Mexico is the coastal area of the United States bordering the Gulf of Mexico that is 3 miles inland and 12 miles offshore from the coastline. The coast is defined as the part of the land adjoining or near the ocean and the immediate area offshore of the coast.
Coastal US-Hawaii	Coastal US-Hawaii is the coastal area 3 miles inland and 12 miles offshore the Hawaiian coastline. The coast is defined as the part of the land adjoining or near the ocean and the immediate area offshore of the coast.
Coastal US-West Coast	Coastal US-West Coast is the coastal area of Washington, Oregon, and California. This includes the areas 3 miles inland and 12 miles offshore from the coastline. The coast is defined as the part of the land adjoining or near the ocean and the immediate area offshore of the coast.
CONUS	The Contiguous United States or the Lower 48 States.
CONUS+AK+HI	The Contiguous United States plus Alaska and Hawaii.
CONUS+AK+HI+US Territories	The Contiguous United States plus Alaska, Hawaii, and the US Territories.
CONUS+AK+HI+US Territories	The Contiguous United States plus Alaska, Hawaii, and the US Exclusive Economic Zone (US EEZ). An EEZ is a sea zone over which a state has special rights over the exploration and use of marine resources. Generally, a state's EEZ extends to a distance of 200 nautical miles (370 km) out from its coast.
Eastern Tropical Pacific	Area of the Pacific Ocean bounded by a line from San Diego, California to, and surrounding the Hawaiian Islands to Tacna, Peru, and back to San Diego, California.
EEZ Equatorial	Under the law of the sea, an Exclusive Economic Zone (EEZ) is a sea zone over which a state has special rights over the exploration and use of marine resources. The Equatorial EEZ starts at the coast of all states/countries within the equatorial regions of the world (limited in latitude by the Tropic of Cancer in the northern hemisphere at approximately 23°26’ (23.4°) N latitude and the Tropic of Capricorn in the

Geographical Coverage Name Definition

	southern hemisphere at 23°26’ (23.4°) S latitude) and extends 200 nautical miles (370 kilometers) out into the sea, perpendicular to the baseline.
EEZ Global	Under the law of the sea, an Exclusive Economic Zone (EEZ) is a sea zone over which a state has special rights over the exploration and use of marine resources. Generally, a state's EEZ extends to a distance of 200 nautical miles (370 km) out from its coast.
EEZ Hawaiian	Under the law of the sea, an Exclusive Economic Zone (EEZ) is a sea zone over which a state has special rights over the exploration and use of marine resources. The EEZ around the Hawaiian Islands starts at the coastline baseline and extends perpendicularly 200 nautical miles offshore.
EEZ US	Under the law of the sea, an Exclusive Economic Zone (EEZ) is a sea zone over which a state has special rights over the exploration and use of marine resources. The United States EEZ starts at the coastline baseline and extends perpendicularly 200 nautical miles offshore. Thus, the United States EEZ overlaps both the contiguous zone and US territorial waters.
Equatorial Atlantic Ocean	The Equatorial Atlantic Ocean is limited in latitude by the Tropic of Cancer in the northern hemisphere at approximately 23°26’ (23.4°) N latitude and the Tropic of Capricorn in the southern hemisphere at 23°26’ (23.4°) S latitude.
Equatorial Indian Ocean	The Equatorial Indian Ocean is limited in latitude by the Tropic of Cancer in the northern hemisphere at approximately 23°26’ (23.4°) N latitude and the Tropic of Capricorn in the southern hemisphere at 23°26’ (23.4°) S latitude.
Equatorial Ocean	The Equatorial Ocean is seated in the equatorial regions of the world and is limited in latitude by the Tropic of Cancer in the northern hemisphere at approximately 23°26’ (23.4°) N latitude and the Tropic of Capricorn in the southern hemisphere at 23°26’ (23.4°) S latitude.
Equatorial Pacific Ocean	The Equatorial Pacific Ocean is limited in latitude by the Tropic of Cancer in the northern hemisphere at approximately 23°26’ (23.4°) N latitude and the Tropic of Capricorn in the southern hemisphere at 23°26’ (23.4°) S latitude.
GEO In-situ, Global	A local geosynchronous observation required at multiple locations in that orbit

Geographical Coverage Name	Definition
GEO In-situ, Hemi US	In-situ measurements of a geostationary satellite parked over the U.S.
Global	Of, relating to, or involving the entire earth; worldwide
Global Land	The continents and islands that cover nearly 30% of the surface of the earth.
Global Ocean	The whole body of salt water that covers 71% of the surface of the earth.
Great Lakes	The Great Lakes, Superior, Michigan, Huron, Erie, and Ontario, are a series of interconnected freshwater lakes, and are one of the defined by the Coastal Large Marine Ecosystems and Regional Governance Organizations of the United States.
Regional Ecosystem Complexes	One of the Regional Ecosystem Complexes
Greater than 30 deg N and S	The area north and south of the 30° latitude
Greater than 75 deg N	The area north of 75°N latitude
Gulf of Mexico	defined by the Coastal Large Marine Ecosystems and Regional Governance Organizations of the United States. The Gulf of Mexico (GOM) has an area of 700,000 square miles (1,813,000 square km) and is an arm of the Atlantic Ocean surrounded by the US, Cuba, and Mexico.
Heliocentric	A location relative to the center of the sun, or in some cases, relative to the center of the observed solar disk.
Hemi Eur	Hemispheric footprint of a geostationary satellite parked over Europe
Hemi India	Hemispheric footprint of a geostationary satellite parked over India
Hemi Japan	Hemispheric footprint of a geostationary satellite parked over Japan
Hemi US	Hemispheric coverage centered on the US.
Indian Ocean	Ocean bordered by Africa in the west, Asia in the north, and Australia in the east and merging with the Antarctic Ocean in the south.
L1 In-situ	An in-situ observation made at the solar L1 Lagrange point between Earth and sun.
L5 In-situ	An in-situ observation made at the solar L5 Lagrange point between Earth and sun.
LEO In-situ, Polar	An in-situ observation made in low-Earth polar orbit
Marine Sanctuaries	A network of underwater parks encompassing more than 170,000 square miles of marine and Great Lakes waters from Washington state to the Florida Keys, and from Lake Huron to American Samoa. The network includes a system of 13 national marine sanctuaries, as well as the PaSDKłQDXPRNXłNHD DQG 5RVH $WROO PDULQH national monuments.

Geographical Coverage Name	Definition
NERRS	The National Estuarine Research Reserve System (NERRS) is a network of 28 protected areas established by partnerships between the National Oceanic and Atmospheric Administration (NOAA) and coastal states. NERRS protects more than 1.3 million acres of coastal and estuarine habitats. The National Estuarine Research Reserve System (NERRS) in SW Florida. The SW Florida Research is in Rookery Bay, 5 miles south of Naples, Florida. The National Estuarine Research Reserve System is a network of 28 protected areas established by partnerships between the National Oceanic and Atmospheric Administration (NOAA) and coastal states.
NERRS-SW Florida	
North America + US Territories	The United States, including Alaska, Hawaii, and the US Territories, plus Canada and Mexico.
North Atlantic Ocean	The North Atlantic Ocean is located north of the equator. It extends north to the Arctic Ocean and is bounded by Europe and Africa in the east and the Americas in the west
North Pacific Ocean	The North Pacific Ocean is located north of the Ocean and is bounded by Asia and Australia in the west and the Americas in the east.
Northeast US Shelf	The Northeast Shelf Regional Ecosystem extends from northern Maine to Cape Hatteras, North Carolina. The continental shelf is a coastal plain that extends from the coast to the continental slope.
Pacific Island Complex	The Pacific Island Complex is one of 8 US Large Marine Ecosystems (LME) and stretches west from the Hawaiian Islands to Guam and the Marianas and south to American Samoa. The Pacific Island Complex LME is one of the Regional Ecosystem Complexes defined by the Coastal Large Marine Ecosystems and Regional Governance Organizations of the United States. The Pacific Ocean extends from the Arctic Ocean in the north to the Southern Ocean (or, depending on the definition, to Antarctica) in the south and is bounded by Asia and Australia in the west and the Americas in the east.
Pacific Ocean	
Point Source	A single identifiable localized source; has negligible extent.
Polar Regions	The area of the earth north of 66° N and south of 66° S.
Polar Regions-Antarctic	Polar Regions-Antarctic is usually defined as south of 60° south latitude.
Polar Regions-Arctic	Polar Regions-Arctic is usually defined as north of 60° north latitude.

Geographical Coverage Name	Definition
Ship Track	The track that a ship travels.
South Atlantic Ocean	The South Atlantic Ocean is located south of the equator. It extends south to the Southern Ocean and is bounded by Asia and Australia in the west and the Americas in the east.
South Pacific Ocean	The South Pacific Ocean is located south of the equator. It extends south to the Southern Ocean and is bounded by Europe and Africa in the east and the Americas in the west
Southeast US Shelf	The Southeast US Shelf is one of 8 US Large Marine Ecosystems (LME) and stretches south from Cape Hatteras, North Carolina to Key West, Florida and roughly to the Exclusive Economic Zone (EEZ) limit. The Southeast US Shelf LME is one of the Regional Ecosystem Complexes defined by the Coastal Large Marine Ecosystems and Regional Governance Organizations of the United States.
Storm Area	A National Weather Service (NWS) User Defined Area Forecast related to winter storms, hurricanes, and severe weather.
Targeted Global	Specific, targeted observations (horizontal dimensions generally range from around 5 kilometers to several hundred kilometers) for re definable geographic areas globally.
Targeted Mesoscale	A specific, targeted observational capability over a specific region, i.e., a 1,000 by 1,000 km rectangle
TC/Marine/ Surface Analysis AOR	An Area of Responsibility (AOR) for tropical cyclone and marine analysis, forecasting, and warning operations, and surface analysis responsibilities of the National Hurricane Center and Central Pacific Hurricane Center/WFO Honolulu. The area falls within the Pacific Ocean bounded at 40° N and 30° S and the Atlantic Ocean bounded at 60° N and 30° S.
Tropics (30N-30S)	Seated in the equatorial regions of the world, limited in latitude by 30° N to 30° S.
US Coral Reefs	Coral reef communities within the EEZ waters of Western US States Bureau, which includes 13 states: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.
Whole Sun	Whole Sun is a Space Weather spatial coverage that includes a view of the entire solar disk as seen from a fixed point relative to the Earth. This spatial coverage includes an additional angular width of 1
CONUS US, Alaska, Hawaii, and the US Territories.	
Western US as defined by the Census	

solar radius around the entire solar disk.

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