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EOSDIS Terminology Specification

Goddard Space Flight Center
Greenbelt, Maryland

National Aeronautics and
Space Administration

EOSDIS Terminology Specification
Signature/Approval Page

Prepared by:

Signature obtained on file	***05/02/2018***
Diane Davies LANCE Operations Manager NASA GSFC Code 619	Date

Reviewed by:

Signature obtained on file	***05/02/2018***
Karen Michael EOSDIS System Manager NASA GSFC Code 423	Date

Approved by:

Signature obtained on file	***05/02/2018***
Andrew Mitchell ESDIS Project Manager NASA GSFC Code 423	Date
Signature obtained on file	***05/02/2018***
Kevin Murphy Program Executive for Earth Science Data Systems NASA Earth Sciences Division NASA HQ-DK000	Date

[Electronic] Signatures available in B32 Room E148
online at: / https://ops1-cm.ems.eosdis.nasa.gov/cm2/

Preface

This document is under ESDIS Project configuration control. Once this document is approved, ESDIS approved changes are handled in accordance with Class I and Class II change control requirements described in the ESDIS Configuration Management Procedures, and changes to this document shall be made by change bars or by complete revision.

Any questions should be addressed to: esdis-esmo-cmo@lists.nasa.gov

ESDIS Configuration Management Office (CMO)
NASA/GSFC
Code 423
Greenbelt, Md. 20771

Abstract

The ESDIS Project manages the science systems of the Earth Observing System Data and Information System (EOSDIS). EOSDIS is a comprehensive distributed Earth science data and information system designed to support NASA's Earth science missions.

This document defines the common terminology to be used for all data managed by EOSDIS on behalf of NASA's Earth Science Division (ESD). The purpose of this document is to define Earth Science terminology so there is a common definition among new and existing science teams, science data processing systems and data archive elements across all of EOSDIS.

Keywords: Low latency, Near Real-Time, NRT, Expedited, Standard Quality, Science Data Products, Level 0, Level 1A, Level 1B, Level 2, Level 3, Level 4

Change History Log

Revision	Effective Date	Description of Changes (Reference the CCR & CCB Approval Date)
Orginal/Baseline Revision -	05/02/2018	CCR 423-ESDIS-181; CCB Approved 04/244/2018 Pages: Cover through 11; see DCN for detail

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1 INTRODUCTION

1.1 Purpose

NASA's Earth Science program was established to use the advanced technology of NASA to understand and protect our home planet by using our view from space to study the Earth system and improve prediction of Earth system change. To meet this challenge, NASA promotes the full and open sharing of all data with the research and applications communities, private industry, academia, and the general public. Earth Observing System Data and Information System (EOSDIS) distributes thousands of Earth system science data products and associated services for interdisciplinary studies. There are a number of shared services offered by EOSDIS that contribute to the discovery, access and use of EOSDIS data. In order for users to more effectively search for and utilize data, there needs to be a common understanding of terminology across these services and service providers. The purpose of this document is to specify EOSDIS terminology such as product level definitions and latency definitions in order to make the data easier to discover and utilize.

1.2 Scope

This document defines the common terminology to be used for all data managed by EOSDIS on behalf of NASA's Earth Science Division (ESD). This document outlines product level and latency definitions used by EOSDIS. The scope of this document will be expanded as needed to accommodate other EOSDIS specifications.

1.3 Related Documentation

The latest versions of all documents below should be used. The latest ESDIS Project documents can be obtained from URL: https://ops1-cm.ems.eosdis.nasa.gov. ESDIS documents have a document number starting with either 423 or 505. Other documents are available for reference in the ESDIS project library website at: http://esdisfmp01.gsfc.nasa.gov/esdis_lib/default.php unless indicated otherwise.

1.4 Applicable Documents

The following documents are referenced within or are directly applicable, or contain policies or other directive matters that are binding upon the content of this document.

420-01-01	Earth Systematic Missions Program Plan
ESSPPO-0001	Earth System Science Pathfinder Program Office Program Plan

2 OVERVIEW

2.1 Background

The goal of the Earth Observing System (EOS) is to advance the understanding of the entire Earth system on a global scale by improving our knowledge of the components of the system, the interactions among them, and how the Earth system is changing.

The Earth Science Data and Information System (ESDIS) Project maintains and operates a data and information system for NASA's Science Mission Directorate (SMD) and its Earth Science Division (ESD) to support multidisciplinary research in earth science and public data access. This system, called the EOSDIS, acquires, archives, manages, and distributes Earth system science data to a broad user community.

The Earth Observing System Data and Information System is a key core capability in NASA's Earth Science Data Systems Program. It provides end-to-end capabilities for managing NASA's Earth science data from various sources—satellites, aircraft, field measurements, and various other programs. EOSDIS distributes thousands of Earth system science data products and associated services for interdisciplinary studies.

The EOSDIS has common elements that apply across the system. Standards are the key to interoperability. A common user interface to search and download data across the Distributed Active Archive Centers (DAACs) is one such example. This common user interface, called Earthdata Search (https://search.earthdata.nasa.gov/search), is made possible by a Common Metadata Repository (CMR). Data must be organized and cataloged, which makes accurate, complete, and consistent metadata a requirement for efficient accessibility. In addition to standard data formats such as the Hierarchical Data Format (HDF), it is necessary to define a common language to describe the data in terms of the levels of processing as well as the latency of the data.

3 PROCESSING LEVELS

3.1 Definition of Processing Levels

EOSDIS data products are processed at various levels ranging from Level 0 to Level 4. Level 0 products are raw data at full instrument resolution. At higher levels, the data are converted into more useful parameters and formats. All Earth Science instruments funded by NASA's ESD are required to produce Level 1 products. Most have products at Levels 2 and 3, and many have products at Level 4. These processing levels are also consistent with the terms defined at: https://earthdata.nasa.gov/earth-science-data-systems-program/policies/data-information-policy/data-levels

Science quality, or higher-level "standard" data products are an internally consistent, well-calibrated record of the Earth's geophysical properties to support science. They are made available within 8-40 hours of satellite observation. Some data products are made available more quickly than standard processing to support users interested in monitoring a wide variety of natural and man-made phenomena.

Table 3-1. Scientific Data Processing Level Definitions.

Level Name	Processing Level
Level 0 (L0)	Level 0 data products are reconstructed, unprocessed instrument/payload data at full resolution; any and all communications artifacts, e.g. synchronization frames, communications headers, duplicate data removed.
Level 1A (L1A)	Level 1a data products are reconstructed, unprocessed instrument data at full resolution, time-referenced, and annotated with ancillary information, including radiometric and geometric calibration coefficients and georeferencing parameters, e.g., platform ephemeris, computed and appended but not applied to the Level 0 data.
Level 1B (L1B)	Level 1A data that have been processed to sensor units (not all instruments will have a Level 1B equivalent).
Level 2 (L2)	Level 2 data products are derived geophysical variables at the same resolution and location as the Level 1 source data.
Level 3 (L3)	Level 3 data products are variables mapped on uniform space-time grid scales, usually with some completeness and consistency.
Level 4 (L4)	Level 4 data products are model output or results from analyses of lower level data, e.g. variables derived from multiple measurements.

4 PRODUCT LATENCY

4.1 Definition of Product Latency

In addition to science quality data products, NASA makes near real-time (NRT) data available. One example of this is the for select datasets via the Land, Atmosphere Near Real-time Capability for EOS (LANCE). LANCE supports application users interested in monitoring a wide variety of natural and man-made phenomena. LANCE is a distributed system and all elements make data available to the user via network access within 3 hours of observation. Over the past decade there has been an increase in the use of NASA's EOS data and imagery for time-sensitive applications such as monitoring wildfires, floods and extreme weather events.

Latency for EOSDIS is defined as the time elapsed between imaging or satellite observation and the time the data are available to the end user. More specifically, latency for a data granule is defined as the time taken from the midpoint between the start and end of acquisition of the data for that granule to the granule's being ready on-line for users to download via network access. NRT, low latency or expedited data all refer to data made available much faster than standard routine processing allows. These terms used to describe expedited processing have often used interchangeably. In addition, it was discovered that there were many other "NRT" data providers in NASA who all had different definitions of Near Real-time.

A workshop titled "NASA Data for Time Sensitive Applications" data was held at the NASA Langley Research Center (LaRC), Hampton, Virginia USA, on 27-29th September 2016 to identify, coordinate and focus attention on low latency satellite data. At this NASA workshop the terms for latency were defined and agreed to by participants across NASA. The workshop

attendees converged on the definition of data latency as the time elapsed between imaging or satellite observation and the time the data is available to the end user, and this definition is used hereafter.

From an applications perspective there is an additional component of latency, which incorporates the time to the next observation. This measure is important to the application because in most cases they will need to update the information in order to make the "next" decision. For example, if the satellite goes over a location once a day but this overpass is an hour after a decision needs to be made, then the data will always be 23 hours old, even with very low latencies. The definitions for latency were further broken down and agreed to and can be found in in Table 4-1.

Table 4-1. Definition of Product Latency

Term	Latency*	Purpose
Real-time	Less than 1 hour	These terms are often used to refer to data that are made quicker than routine processing allows. They are used for a range of applied sciences, decision and tactical support, monitoring and early warning of events.
Near real-time (NRT)	1-3 hours	
Low latency	3-24 hours	
Expedited	1-4 days	
Standard routine processing	Generally, 8 – 40 hours but up to 2 months for some higher-level products	Standard products provide an internally consistent, well-calibrated record of the Earth's geophysical properties to support science

Note: *Latency is defined as the time elapsed between imaging or satellite observation and the time the data are available to the end user via network access.

Appendix A Abbreviations and Acronyms

CCB	Configuration Change Board
CCR	Configuration Change Request
CMO	Configuration Management Office
CMR	Common Metadata Repository
DAACs	Distributed Active Archive Centers
DCN	Document Change Notice
EOS	Earth Observing System
EOSDIS	Earth Observing System Data and Information System
ESD	Earth Science Division
ESDIS	Earth Science Data Information System
GSFC	Goddard Space Flight Center
HDF	Hierarchical Data Format
HQ	Headquarters
L0-L4	Level zero through Level 4 data
LANCE	Land, Atmosphere Near Real-time Capability for EOSDIS
LaRC	Langley Research Center
NASA	National Aeronautics and Space Administration
NRT	Near Real-time
TBD	To be determined
SMD	Science Mission Directorate