# EOSDIS Processing Levels

## 1.1 Status of this Memo

This document describes a naming convention for the NASA Earth Science Data Systems (ESDS) community. Distribution of this document is unlimited.

## 1.2 Copyright Notice

## 1.3 Suggested Citation

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## 1.4 Abstract

The Earth Science Data and Information System (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.

This document recognizes the processing level definitions established by the ESDIS Configuration Management Library document Earth Observation System Data and Information System (EOSDIS) Terminology Specification (Davies, 2020) [1] and establishes those definitions as the baseline for future updates.

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## 2    Introduction

The goal of the NASA Earth System Observatory (ESO) 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 (EOSDIS) is a key core capability in NASA's Earth Science Data Systems (ESDS) 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.

This document recognizes the processing level definitions established by the ESDIS Configuration Management Library document Earth Observation System Data and Information System (EOSDIS) Terminology Specification (Davies, 2020) [1] and establishes those definitions as the baseline for future updates.

## 3    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.

**Table 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 1B data are 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  References

Normative References

[1] Davies, D. (2020). *Earth Observation System Data and Information System (EOSDIS) Terminology Specification* (423-SPEC-002, Revision A). ESDIS Configuration Management Library.

Informative References

[2] National Aeronautics and Space Administration (NASA), Earth Observing System (EOS) Reference Handbook, ed. G. Asrar and D. J. Dokken. National Aeronautics and Space Administration, Earth Science Support Office, Document Resource Facility, Washington D.C., 1993

[3] R. Weaver, Processing Levels, in: Njoku, E.G. (eds) Encyclopedia of Remote Sensing, Encyclopedia of Earth Sciences Series. Springer, New York, NY. https://doi.org/10.1007/978-0-387-36699-9_36, 2014

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## 6    Appendix A

### 6.1    Glossary of acronyms

| Acronym | Description |
| --- | --- |
| CMR: | Common Metadata Repository |
| DAACs: | Distributed Active Archive Centers |
| DOI: | Digital Object Identifier |
| EOS: | Earth Observing System |
| EOSDIS: | Earth Observing System Data and Information System |
| ESCO: | ESDIS Standards Coordination Office |
| ESD: | Earth Science Division |
| ESDIS: | Earth Science Data and Information System |
| ESDS: | Earth Science Data Systems |
| HDF: | Hierarchical Data Format |
| L0: | Level 0 |
| L1A: | Level 1A |
| L1B: | Level 1B |
| L2: | Level 2 |
| L3: | Level 3 |
| L4: | Level 4 |
| RFC: | Request for Comments |
| SMD: | Science Mission Directorate |