

NEON USER GUIDE TO PARTICULATE MASS (NEON.DP1.00101)

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1 DESCRIPTION

1.1 Purpose

This document provides an overview of the data included in this NEON Level 1 data product, the quality controlled product generated from raw Level 0 data, and associated metadata. In the NEON data products framework, the raw data collected in the field, for example, the dry weights of litter functional groups from a single collection event are considered the lowest level (Level 0). Raw data that have been quality checked via the steps detailed herein, as well as simple metrics that emerge from the raw data are considered Level 1 data products.

The text herein provides a discussion of measurement theory and implementation, data product provenance, quality assurance and control methods used, and approximations and/or assumptions made during L1 data creation.

1.2 Scope

This document describes the steps needed to generate the L1 data product Particulate Mass - the pre- and post-deployment masses PM10 quartz microfiber filters - and associated metadata from input data. This document also provides details relevant to the publication of the data products via the NEON data portal, with additional detail available in the file, NEON Data Variables for Particulate Mass (NEON.DP0.00101) (AD[04]), provided in the download package for this data product.

This document describes the process for ingesting and performing automated quality assurance and control procedures on the data collected in the field pertaining to NEON Preventative Maintenance Procedure: Particulate Analyzer - Mass (AD[05]). The raw data that are processed in this document are detailed in the file, NEON Raw Data Validation for Particulate Mass (NEON.DP0.00101) (AD[03]), provided in the download package for this data product. Please note that raw data products (denoted by 'DP0') may not always have the same numbers (e.g., '10033') as the corresponding L1 data product.

2 RELATED DOCUMENTS AND ACRONYMS

2.1 Associated Documents

AD[01]	NEON.DOC.000001	NEON Observatory Design (NOD) Requirements
AD[02]	NEON.DOC.002652	NEON Level 1, Level 2 and Level 3 Data Products Catalog
AD[03]	NEON.DP0.00101.001_dataValidation.csv	NEON Raw Data Validation for Particulate Mass (NEON.DP0.00101)
AD[04]	NEON.DP1.00101.001_variables.csv	NEON Data Variables for Particulate Mass (NEON.DP0.00101)
AD[05]	NEON.DOC.003505	NEON Preventative Maintenance Procedure: Particulate Analyzer - Mass
AD[06]	NEON.DOC.000008	NEON Acronym List
AD[07]	NEON.DOC.000243	NEON Glossary of Terms
AD[08]		NEON's Ingest Conversion Language (NICL) specifications

3 DATA PRODUCT DESCRIPTION

The mass of atmospheric particulate matter (PM), size fraction $10\mu\text{m}$, will be measured by a particulate mass analyzer using high volume sampling method. The high volume sampling method will collect particulate matter on quartz microfiber filters, which will be archived and available upon request to users.

Size fraction $10\mu\text{m}$ particulate matter is collected continuously at the tower top of selected NEON terrestrial towers using an EcoTech Hivol 3000 collector. Quartz microfiber filters are conditioned according to the EPA Compendium Method IO-2.1 (ER[01]) at the Colorado Department of Health and Environment (CDPHE). After conditioning a pre-deployment weight is determined at the CDPHE, filters are sent to NEON for field deployment. Collection of filters occurs for two weeks, after which the filters are returned to the CDPHE for conditioning and post-deployment weighing. These weights along with sensor data on pressure, air volumes, and temperature are reported as the L1 data product.

3.1 Spatial Sampling Design

Particulate Mass sampling is executed at 6 of NEON's terrestrial sites, located in Domains 10, 13, and 15. The subset of sites included for sampling are those in the Basin and Range, Eastern and Western slopes of the Rocky Mountains, and the Eastern plains of Colorado. This selection of sites focuses on transportation of particulate matter from Domain 15 and the Western portion of Domain 13 by prevailing westerly winds over the Colorado Rocky Mountains, to receptor sites in Eastern Domain 13 and Domain 10.

3.2 Temporal Sampling Design

Technicians service the instrument on a bi-weekly basis, and retrieve sample during instrument service. Sample retrieval is intended to occur every 14 days, however the schedules of field technicians can deviate from that schedule due to factors such as safety concerns or temporary lack of personnel. Additionally, technicians are instructed not to retrieve sample during precipitation events, which can delay sample collection. The maximum expected number of samples per site per year is 26.

3.3 Variables Reported

All variables reported from the field or laboratory technician (L0 data) are listed in the file, NEON Raw Data Validation for Particulate Mass (NEON.DP0.00101) (AD[03]). All variables reported in the published data (L1 data) are also provided separately in the file, NEON Data Variables for Particulate Mass (NEON.DP0.00101) (AD[04]).

NEON TIS spatial data employs the World Geodetic System 1984 (WGS84) for its fundamental reference datum and Earth Gravitational Model 96 (EGM96) for its reference gravitational ellipsoid. Latitudes and longitudes are denoted in decimal notation to six decimal places, with longitudes indicated as negative west of the Greenwich meridian.

Some variables described in this document may be for NEON internal use only and will not appear in downloaded data.

3.4 Spatial Resolution and Extent

The finest resolution at which spatial data are reported is the point location of the collector.

The basic spatial data included in the data downloaded include the latitude, longitude, and elevation of the collector, plus associated uncertainty due to GPS error. Sampling at terrestrial sites always occurs at the tower top, while aquatic sampling occurs at a collector co-located with the meteorologic station at the site.

During NEON construction, spatial data may not be available yet for some locations, and the spatial fields in downloaded data may be blank.

3.5 Temporal Resolution and Extent

The finest resolution at which temporal data are reported is the approximately bi-weekly range between **setDate** and **collectDate**.

The NEON Data Portal provides data in monthly files for query and download efficiency. Queries including any part of a month will return data from the entire month. Code to stack files across months is available here: <https://github.com/NEONScience/NEON-utilities>

3.6 Associated Data Streams

The Dust and Particulate Size Distribution data product (DP1.00017.001) is closely related to Particulate Mass, as Dust and Particulate Size Distribution measurements are taken in parallel with Particulate Mass sampling at the same six NEON terrestrial sites. Data from this instrument may be correlated with Particulate Mass sensor data (in `dpm_sensor`) (from the 'expanded' package) based on the timestamps from both instruments.

3.7 Product Instances

Collection of samples occurs on a bi-weekly basis, with an estimated maximum of 26 sampling events per year per site. Factors such as periods without precipitation or delays in sample collection may limit the number of collection events.

3.8 Data Relationships

The protocol dictates that each sample collection event corresponds to one record **sampleID** in `dpm_field`. A record from `dpm_field` will have a corresponding (and identical) `samplesID` in `dpm_lab`, even when no sample is collected.

`dpm_field` -> One record per **sampleID** for all time.

`dpm_lab` -> One record per **sampleID** for all time.

In each table, a **filterID** may also be present. This represents the manufacturer-produced ID stamped on each filter, and may be used to identify an individual sample, though these IDs may not always be present in a record.

4 DATA ENTRY CONSTRAINT AND VALIDATION

Many quality control measures are implemented at the point of data entry within a mobile data entry application or web user interface (UI). For example, data formats are constrained and data values controlled through the provision of dropdown options, which reduces the number of processing steps necessary to prepare the raw data for publication. An additional set of constraints are implemented during the process of ingest into the NEON database. The product-specific data constraint and validation requirements built into data entry applications and database ingest are described in the document NEON Raw Data Validation for Particulate Mass (NEON.DP0.00101), provided with every download of this data product. Contained within this file is a field named 'entryValidationRulesForm', which describes syntactically the validation rules for each field built into the data entry application. Data entry constraints are described in Nicl syntax in the validation file provided with every data download, and the Nicl language is described in NEON's Ingest Conversion Language (NICL) specifications ([AD[08]).

5 REFERENCES