

AERMOD Modeling System Data Resources

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National Land Cover Database (NLCD)

AERMET, the meteorological preprocessor for AERMOD, requires surface characteristics for surface roughness length, albedo, and Bowen ratio. These are derived using the AERSURFACE program and land cover data from the National Land Cover Database (NLCD). The primary site where you can get the most up-to-date information is the Multi-Resolution Land Characteristics (MRLC) Consortium website. Recent changes that have taken place with the MRLC resulted in difficulty getting the data in the format compatible with AERSURFACE and the availability of the older 1992 NLCD. As a solution, EPA now provides a snapshot of the NLCD products that are compatible with AERSURFACE, on a public facing FTP site. The MRLC NLCD Viewer, linked below, currently provides NLCD products (land cover, percent impervious, and percent canopy data) as GeoTIFFs compatible with AERSURFACE. Also provided below is a link to additional information on downloading data from the MRLC and the data currently archived by EPA.

1. Multi-Resolution Land Characteristics (MRLC) Consortium
<https://www.mrlc.gov/>
2. Multi-Resolution Land Characteristics (MRLC) Consortium NLCD Viewer
<https://www.mrlc.gov/viewer/>
3. EPA FTP Site

Web browser access:

<https://gaftp.epa.gov/Air/aqmg/nlcd/>

Anonymous FTP:

<sftp://newftp.epa.gov/aqmg/nlcd>

The data on the EPA FTP site will be refreshed occasionally; however, *note that the data archived on the EPA FTP site may not be the most update date. The MRLC should be consulted for the most up-to-date land cover products.*

4. Additional information on downloading data from the MRLC and EPA FTP sites.
https://gaftp.epa.gov/Air/aqmg/SCRAM/models/related/aersurface/nlcd_sources_for_aersurface_september_2024.pdf

Elevation Data

AERMAP is the terrain preprocessor for AERMOD that extracts terrain elevations for source and receptor locations. AERMAP also determines hill heights for each receptor location. AERMAP processes elevation data from the 3D Elevation Program (3DEP), formerly the National Elevation Dataset (NED). The primary site for accessing the most up-to-date elevation data is the USGS National Map. However, *note that while the USGS National Map provides the 3DEP data in GeoTiff format, the data are compressed within the GeoTiff file and are not directly compatible with AERMAP without converting the files to remove the data compression.* Included in the links below is a link to additional on elevation data resources including instructions for converting GeoTIFFs downloaded from the USGS National Map to a GeoTIFF that is compatible with AERMAP.

The USGS National Map provides the 3DEP data at different resolutions. EPA has converted a snapshot of the 1-arcsecond and 2-arcsecond (AK) 3DEP data to be compatible with AERMAP and archived this data on a public facing FTP site.

1. USGS National Map
<https://www.usgs.gov/core-science-systems/national-geospatial-program/national-map>
2. USGS National Map – Data Download Map
<https://apps.nationalmap.gov/downloader/>
3. EPA FTP Site

Web browser access:

<https://gaftp.epa.gov/Air/aqmg/3dep/>

Anonymous FTP:

<sftp://newftp.epa.gov/aqmg/3dep>

The data on the EPA FTP site will be refreshed occasionally; however, *note that the data archived on the EPA FTP site may not be the most up-to-date data. The USGS National Map should be consulted for the most up-to-date elevation data.*

4. Data Sources and Conversion of Elevation Data for AERMAP (PDF)
[https://gaftp.epa.gov/Air/aqmg/SCRAM/models/related/aermap/Access and Conversion of Elevation Data for AERMAP.pdf](https://gaftp.epa.gov/Air/aqmg/SCRAM/models/related/aermap/Access_and_Conversion_of_Elevation_Data_for_AERMAP.pdf)

Observed Meteorological Data

When observed meteorological measurements are supplied, AERMET generally requires hourly surface observations and upper air sounding data. These data typically provided to AERMET as a combination of surface data collected at airports, upper air sounding data, and site-specific observations that may include data collected at various levels at or near the surface. AERMET can read several older storage formats previously used to archive meteorological observations collected by the National Weather Service (NWS) at U.S. airports. However, the current and more preferable format for hourly surface data is the Integrated Surface Dataset (ISD) format used to archive the ISD Global database provided by the National Centers for Environmental Information (NCEI), formerly the National Climatic Data Center (NCDC). AERMET can also read hourly observations stored in a user-defined format such that would be used to store site-specific data collected through a state or private monitoring program or network.

When using ISD data collected by the NWS or FAA using an Automated Surface Observing System (ASOS), 1-minute ASOS wind data in the DSI-6405 format are also needed to replace the hourly wind observations in the ISD dataset. 1-minute ASOS wind data can also be downloaded from the NCEI website. The ISD hourly wind data use an unrealistic minimum threshold to assume zero knots for data storage which can lead to an excessive number of calm hours. 1-minute ASOS wind data are actually overlapping 2-minute averages, every minute of the hour. These data are processed with the AERMINUTE program which generates hourly averages from the 1-minute data. 5-minute ASOS data in the DSI-6401 format can also be provided to AERMINUTE to supplement the 1-minute data for hours when data are missing from the 1-minute data files. Refer to the AERMINUTE User's Guide for more details about the 1-minute ASOS data.

Upper air sounding data are required by AERMET to derive mixing height information, unless site-specific data are supplied that includes mixing heights. Upper air data are provided in 2 formats that compatible with AERMET – FSL and the Integrated Global Radiosonde Archive (IGRA).

Surface Data

1. Integrated Surface Dataset (ISD) – NOAA/NCEI

Web browser access:

<https://www.ncei.noaa.gov/pub/data/noaa/>

Anonymous FTP access:

<ftp://ftp.ncei.noaa.gov/pub/data/noaa/>

2. 1-Minute ASOS Wind Data – NOAA/NCEI

Download 6405 format (pg 1)

Web browser access:

<https://www.ncei.noaa.gov/data/automated-surface-observing-system-one-minute-pg1/access/>

Anonymous FTP access:

<ftp://ftp.ncei.noaa.gov/pub/data/asos-onemin/>

3. 5-Minute ASOS Wind Data – NOAA/NCEI

Web browser access:

<https://www.ncei.noaa.gov/data/automated-surface-observing-system-five-minute/access/>

Anonymous FTP access:

<ftp://ftp.ncei.noaa.gov/pub/data/asos-fivemin/>

Upper Air Data

1. Integrated Global Radiosonde Archive (IGRA) – NOAA/NCEI

Web browser access:

<https://www.ncei.noaa.gov/data/integrated-global-radiosonde-archive/access/data-por/>

Anonymous FTP access:

<ftp://ftp.ncei.noaa.gov/pub/data/igra/data/data-por>

Documentation on the IGRA format:

<https://www.ncei.noaa.gov/data/integrated-global-radiosonde-archive/doc/>

Note: As of Autumn 2024, upper air sounding data in FSL format from the NOAA/ESRL Radiosonde Database at <https://ruc.noaa.gov/raobs/> is no longer available.

Prognostic Meteorological Data

When providing prognostic meteorology to AERMET, the primary meteorological model used to generate these data is the Weather Research and Forecasting (WRF) model. This model is developed across a broad community and maintained by the National Center for Atmospheric Research (NCAR). WRF utilizes a variety of inputs which the NCAR site is better suited to provide than to list here.

EPA's Air Quality Modeling Group (AQMG) in the Air Quality Assessment Division (AQAD) provides an annual simulation of meteorological data at 12km resolution across the continental United States (CONUS), and its surrounding waters (Atlantic and Pacific Oceans, Gulf of Mexico, etc.). These datasets have been created dating back several years (to 2013) and are updated annually. These datasets are available upon request and are not available for direct download at this time.

EPA also makes available software to evaluate the suitability of prognostic meteorological data for use in dispersion applications (as well as other applications). The Atmospheric Model Evaluation Tool (AMET) combines observed and simulated meteorological data to provide statistics and other information on the model's performance of a specific time period. This information can then be used to make inferences on the model's representativeness of an area.

Finally, EPA maintains the Mesoscale Model Interface (MMIF) tool that reads in prognostic data from WRF and translates it into the necessary formats for AERMET, AERMOD, etc. AQMG has provided guidance on the use of MMIF for both regulatory and non-regulatory applications. The code and guidance are available by EPA's SCRAM website.

1. WRF Model Information and Code
<https://www2.mmm.ucar.edu/wrf/users/>
2. AMET
<https://www.cmascenter.org/help/documentation.cfm?MODEL=amet> (requires a free account for access)
3. MMIF
<https://www.epa.gov/scram/air-quality-dispersion-modeling-related-model-support-programs#mmif>

Nitrogen Dioxide/Nitrogen Oxide In-Stack Ratio (ISR) Database

The use of the Tier 3 PVMRM and OLM options in AERMOD requires the specification of an in-stack ratio (ISR) of NO₂/NO_x for each source (using the CO NO2STACK and/or SO NO2RATIO keywords). There is no model default ratio for either of these two options, and a ratio must be specified by the user. Additional Clarification Regarding Applicability of Appendix W Modeling Guidance for the 1-hour NO₂ NAAQS (PDF)(27 pp, 453 K, 03-01-2011), issued on March 1, 2011 allowed for an ISR of 0.5 in the absence of more appropriate source-specific information. However, the 0.5 may be too conservative for many applications such that there is a need significant need for a widely available and well-documented database of ISRs. EPA maintains an NO₂ ISR database of values provided to EPA from various sources including data collected by various Regional, State, and Local air permitting offices prior to the formal collection initiated by OAQPS, data submitted via the formal collection initiated by OAQPS that meets specific data requirements, and data collected by industry trade groups. Provided below are direct links to the NO₂ ISR database and to EPA's SCRAM website page that contains more detail about the use of these data.

1. EPA NO₂/NO_x ISR Database
https://www.epa.gov/sites/production/files/2020-11/no2_isr_database.xlsx
2. EPA NO₂/NO_x ISR Database Information Website
<https://www.epa.gov/scram/nitrogen-dioxidenitrogen-oxide-stack-ratio-isr-database>