

Definitions and Acronyms

This section provides definitions of terms and acronyms used in this workbook.



Definitions and Acronyms (1 of 10)

AAS Atomic absorption spectrophotometry. An analytical method used to identify and quantify metals in particulate matter samples.

Absorption The process by which incident light is removed from the atmosphere and retained by a particle or gas.

Absorption coefficient A number that is proportional to the “amount” of light removed from a sight path by absorption per unit distance.

Aerosol A particle of solid and/or liquid matter that can remain suspended in the air because of its small size (generally under one micron).

AIRNow The U.S. EPA, NOAA, tribal, state, and local agencies developed the AIRNow web site to provide the public with easy access to national air quality information. The web site offers daily air quality index (AQI) forecasts as well as real-time AQI conditions for over 300 cities across the United States, and provides links to more detailed state and local air quality web sites (<http://airnow.gov/>).

Airshed A geographic area that, because of topography, meteorology, and/or climate, is frequently affected by the same air mass.

AQS Air Quality System; the EPA's repository of ambient air quality data
<http://www.epa.gov/ttn/airs/airsaqs/>.

Anthropogenic Caused or produced by human activities.

Anthropogenic emissions Emissions from man-made sources as opposed to natural (biogenic) sources.

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Attainment Area A geographic area in which levels of a criteria air pollutant meet the health-based primary standard (National Ambient Air Quality Standard, or NAAQS) for the pollutant. An area may have an acceptable level for one criteria air pollutant but may have unacceptable levels for others. Thus, an area could be both attainment and non-attainment at the same time. Attainment areas are defined using federal pollutant limits set by the EPA.

b_{abs} Light absorption coefficient.

Back trajectory A trace backwards in time showing where an air mass has been.

BC Black carbon measured using light absorption, typically with an aethalometer

Bootstrapping Resampling method where “new” datasets are generated that are consistent with original data.

CALPUFF An advanced non-steady-state meteorological and air quality modeling system.

CASTNET Clean Air Status and Trends Network; source for data on dry acidic deposition and rural, ground-level ozone (<http://www.epa.gov/castnet/>).

Cd Cadmium.

Cluster analysis A multivariate procedure for grouping data by similarity among samples (i.e., samples with similar chemical compound concentrations are grouped).

CMAQ Community Multiscale Air Quality system. An air quality simulation model of tropospheric ozone, acid deposition, visibility, and fine particulate matter from urban to regional scales.

CMB Chemical mass balance model. A receptor model.

Coefficient of Correlation, r A statistic representing how closely two variables co-vary; they can vary from -1 (perfect negative correlation) through 0 (no correlation) to +1 (perfect positive correlation).

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Colinearity A situation in which a near perfect linear relationship exists among some or all of the independent variables in a regression model. In practical terms, this means there is some degree of redundancy or overlap among the variables.

Conditional probability function (CPF) A method that analyzes local source impacts from varying wind directions using the source contribution estimates from PMF coupled with the corresponding wind directions.

Convergence The end-point of any algorithm that uses iteration or recursion to guide a series of data processing steps. An algorithm is usually said to have reached convergence when the difference between the computed and observed steps falls below a pre-defined threshold.

Covariance A statistical measure of correlation of the fluctuations of two different quantities.

Cr Chromium.

Dispersion model A source-oriented approach in which a pollutant emission rate and meteorological information are input into a mathematical model that disperses (and may also chemically transform) the emitted pollutant, generating a prediction of the resulting pollutant concentration at a point in space and time.

Edge A line that defines the boundary of the relationship between two parameters on a scatter plot.

Elemental carbon (EC) Black carbon material with little or no hydrogen; non-volatile carbon material; often called black carbon or soot.

Emission Inventory (EI) A list of air pollutants emitted into a community's atmosphere in amounts (commonly tons) per day or year, by type of source.

EPA United States Environmental Protection Agency.

EPA PMF A standalone version of PMF created by the EPA in 2005.

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Exceedance A measured level of an air pollutant higher than the national or state ambient air quality standard.

Factor Analysis A procedure for grouping data by similarity among variables (i.e., variables that are highly correlated are grouped).

Factor Strength (Source Strength). See Source Contribution.

Federal Reference Method (FRM) Provides for the measurement of the mass concentration of fine particulate matter having an aerodynamic diameter less than or equal to a nominal 2.5 micrometers ($PM_{2.5}$) in ambient air over a 24-hr period for purposes of determining whether the primary and secondary national ambient air quality standards for fine particulate matter are met. Designation of a particle sampler as a Federal Reference Method (FRM) is based on a demonstration that a vendor's instrument meets the design specifications, performance requirements, and quality control standards specified in the regulation.

Fine particles Particulate matter with diameter less than 2.5 microns; $PM_{2.5}$.

HYSPLIT HYbrid Single-Particle Lagrangian Integrated Trajectory model; a system for computing simple air parcel trajectories (<http://www.arl.noaa.gov/ready/hysplit4.html>).

IMPROVE Interagency Monitoring of Protected Visual Environments. A collaborative monitoring program to establish present visibility levels and trends, and to identify sources of man-made impairment (<http://vista.cira.colostate.edu/improve/Default.htm>).

Intercept Measure of bias between predicted and measured concentrations of a species; an intercept of 0 indicates no bias. This is especially important for mass, as a large intercept suggests there may be problems with blank corrections and the model has not accounted well for the mass

Interquartile range The difference between the 75th percentile and 25th percentile of a dataset.

Ion chromatography (IC) Method used to quantify soluble ions in PM.

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Level 0 validation Routine checks made during the initial data processing and generation of data, including proper data file identification, review of unusual events, review of field data sheets and result reports, instrument performance checks, and deterministic relationships.

Level I validation Tests for internal consistency to identify values in the data that appear atypical when compared to values of the entire data set.

Level II validation Comparison of the current data set with historical data to verify consistency over time. This level can be considered a part of the data interpretation or analysis process.

Level III validation Tests for parallel consistency with data sets from the same population (i.e., region, period of time, air mass, etc.) to identify systematic bias. This level can also be considered a part of the data interpretation or analysis process.

LC local conditions. Refers to ambient PM measurements

MDL Minimum detection limit. Also known as method detection limit.

Mean The sum of all values divided by the number of samples.

Median The middle value in a sorted list of samples if there is an odd number of samples, or the average of the two middle values if there is an even number of samples.

Mobile sources Motor vehicles and other moving objects that release pollution; mobile sources include cars, trucks, buses, planes, trains, motorcycles, and gasoline-powered lawn mowers. Mobile sources are divided into two groups: road vehicles, which includes cars, trucks, and buses, and non-road vehicles, which includes trains, planes, and lawn mowers.

National Ambient Air Quality Standards (NAAQS) Health-based pollutant concentration limits established by the EPA that apply to outside air.

NH₃ Ammonia; forms as a product of decomposition of animal and vegetable matter. Important in the atmospheric nitrogen cycle.

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NH₄NO₃ Ammonium nitrate; formed in the atmosphere from the reaction of nitric acid with ammonia.

(NH₄)₂SO₄ Ammonium sulfate.

Nitrates (NO₃⁻) Gases and aerosols that have origins in the gas-to-aerosol conversion of nitrogen oxides, e.g., NO₂; ammonium nitrate is the predominant aerosol species.

Nitrogen oxides (NO_x) Gases formed from atmospheric nitrogen and oxygen when combustion takes place under conditions of high temperature and high pressure; considered a major air pollutant and precursor of ozone.

NO_x NO + NO₂ + poorly defined fraction of other NO_y species (given conventional analyzers).

NOAA National Oceanic and Atmospheric Administration.

OH Hydroxyl radical; the driving force behind the daytime reactions of hydrocarbons in the troposphere.

O₃ Ozone; a major component of smog. Ozone is not emitted directly into the air but is formed by the reaction of VOCs and NO_x in the presence of heat and sunlight.

Organic carbon (OC) Consists of hundreds of separate semi-volatile and particulate compounds.

Organic mass by carbon (OMC) The organic mass is the sum of the low temperature organics and pyrolyzed organics multiplied by a factor of 1.4: $OMC = 1.4 * (OC1 + OC2 + OC3 + OC4 + OP)$ where the factor 1.4 is used to adjust the organic carbon mass (OC) for other elements assumed to be associated with the organic carbon molecule.

Outliers Data physically, spatially, or temporally inconsistent.

Particulate matter (PM) A generic term referring to liquid and/or solid particles suspended in the air.

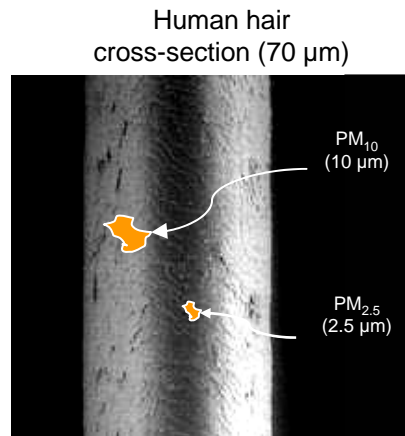
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Percentile The p th percentile of a data set is the number such that $p\%$ of the data is less than that number.

PIXE Proton Induced X-ray Emission spectroscopy. A method used to quantify particulate metals.

PM_{2.5} Particulate matter less than 2.5 microns. Tiny solid and/or liquid particles, generally soot and aerosols. The size of the particles (2.5 microns or smaller, about 0.0001 inches or less) allows them to easily enter the air sacs deep in the lungs where they may cause adverse health effects; PM_{2.5} also causes visibility reduction.

PM₁₀ Particulate matter less than 10 microns. Tiny solid and/or liquid particles of soot, dust, smoke, fumes, and aerosols. The size of the particles (10 microns or smaller, about 0.0004 inches or less) allows them to easily enter the air sacs in the lungs where they may be deposited, resulting in adverse health effects. PM₁₀ also causes visibility reduction and is a criteria air pollutant.



PMF Positive matrix factorization; a receptor model. PMF can be used to determine source profiles and source contributions based on the ambient data.

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Point Source Point sources include industrial and nonindustrial stationary equipment or processes considered significant sources of air pollution emissions. A facility is considered to have significant emissions if it emits about one ton or more in a calendar year. Examples of point sources include industrial and commercial boilers, electric utility boilers, turbine engines, industrial surface coating facilities, refinery and chemical processing operations, and petroleum storage tanks.

Potential Source Contribution Function (PSCF) A method that combines the source contribution estimates from PMF with the air parcel backward trajectories to identify possible source areas and pathways that give rise to the observed high particulate mass concentrations from the potential sources.

Precursor Compounds that change chemically or physically after being emitted into the air and eventually produce air pollutants. For example, sulfur and nitrogen oxides are precursors for particulate matter.

Primary Particles The fraction of PM_{10} and $PM_{2.5}$ that is directly emitted from combustion and fugitive dust sources.

Q (χ^2) Goodness-of-fit parameter for PMF.

QA Quality assurance; a set of external tasks to provide certainty that the quality control system is satisfactory. These tasks include independent performance audits, on-site system audits, interlaboratory comparisons, and periodic evaluations of internal quality control data.

QC Quality control; a set of internal tasks performed to provide accurate and precise measured ambient air quality data. These tasks address sample collection, handling, analysis, and reporting (e.g., periodic calibrations, routine service checks, instrument-specific monthly quality control maintenance checks, and duplicate analyses on split and spiked samples).

R-squared, r^2 Statistical measure of how well a regression line approximates real data points; an r-squared of 1.0 (100%) indicates a perfect fit.

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Receptor model A receptor-oriented approach for identifying and quantifying the sources of ambient air contaminants at a receptor primarily on the basis of concentration measurements at that receptor.

Residuals Measured concentrations minus modeled concentrations.

Robust mode In PMF, in the robust mode, the standard deviations used for weighting the residuals are dynamically readjusted through an iterative process. This process prevents excessively large values in the data set from disproportionately affecting the results.

Se Selenium; tracer for coal combustion.

Secondary Particle The fraction of PM₁₀ and PM_{2.5} that is formed in the atmosphere. Secondary particles are products of the chemical reactions between gases, such as nitrates, sulfur oxides, ammonia, and organic products.

Signal-to-noise ratio (S/N) An index to determine weak and bad species. A species is “weak” if it contains signal and noise in comparable amounts and “bad” if it contains more noise than signal.

Slope Statistical measure of the average ratio of the predicted to measured concentrations of a species; a slope closer to 1.0 demonstrates a perfect fit

SO₂ Sulfur dioxide.

Source apportionment The process of apportioning ambient pollutants to an emissions source.

Source contribution Total mass of material from a source measured in a sample.

Source-dispersion model See Dispersion model.

Source profile Listing of individual chemical species emitted by a specific source category.

Speciation Trends Network (STN) A network of sampling locations established by the EPA in 2001 to characterize PM_{2.5} composition in urban areas. Roughly 300 sites nationwide are part of this network.

Standard Deviation a measure of how much the average varies. The square root of the average squared deviation of the observations from their mean.

Standardized residual Ratio of the residual to the uncertainty of a species in a specific sample determined by the user.

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State implementation plan (SIP) A detailed description of the programs a state will use to carry out its responsibilities under the Clean Air Act. State implementation plans are collections of the regulations used by a state to reduce air pollution. The Clean Air Act requires that the EPA approve each state implementation plan.

Sulfate (SO_4^{-2}) Sulfate ion. Virtually all ambient sulfate (99%) is secondary, formed within the atmosphere from SO_2 .

Sulfur dioxide (SO_2) A pungent, colorless gas formed primarily by combustion of fossil fuels.

Total carbon (TC) The sum of the elemental carbon and organic carbon associated with airborne particulate matter.

Thermal Optical Reflectance (TOR) A Thermal Optical Analysis (TOA) technique. The change in optical absorbance of a sample during thermal heating is monitored by reflectance (off the sample surface) of infrared (IR) monochromatic light.

Thermal Optical Transmittance (TOT) A Thermal Optical Analysis (TOA) technique. The change in optical absorbance of a sample during thermal heating is monitored by transmittance (through the sample).

Unmix A multivariate receptor modeling package that inputs observations of particulate composition and seeks to find the number, composition, and contributions to mass of sources or source types.

Variance The square of the standard deviation.

VOC Volatile organic compound.

WD Wind direction.

WS Wind speed.

XRF Energy dispersive X-ray fluorescence. Method used to quantify particulate metals.

References

- Bay Area Air Quality Management District (2005) Air quality glossary. Available on the Internet at <<http://www.baaqmd.gov/dst/glossary.htm>> last accessed September 1, 2005.
- California Air Resources Board (2003) Glossary of air pollution terms. Available on the Internet at <<http://arbis.arb.ca.gov/html/gloss.htm>> last accessed September 1, 2005.
- Minnesota Pollution Control Agency (2005) General glossary. Available on the Internet at <<http://www.pca.state.mn.us/gloss/>> last accessed September 1, 2005.
- National Park Service (2005) Glossary of terms used by the NPS Inventory and Monitoring Program. Available on the Internet at <<http://science.nature.nps.gov/im//monitor/glossary.htm>> last accessed September 1, 2005.
- Sam Houston State University (2005) Atmospheric chemistry glossary. Web site prepared for the Sam Houston State University, Huntsville, TX, by the Department of Chemistry.
- U.S. Environmental Protection Agency (2002) The plain English guide to the Clean Air Act: Glossary. Available on the Internet at <http://www.epa.gov/oar/oaqps/peg_caa/pegcaa10.html#topic10> last accessed September 1, 2005.
- U.S. Environmental Protection Agency (2005) AIRTrends 1997 report: list of acronyms. Available on the Internet at <<http://www.epa.gov/air/airtrends/aqtrnd97/acron.html>> last accessed September 1, 2005.