

Glossary and Acronyms

This section provides definitions of terms and acronyms used in the workbook. A list of on-line glossaries is also provided in the references at the end of this section.



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

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

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 or liquid matter that can remain suspended in the air because of its small size (generally under one micron).

Aerometric Information Retrieval System (AIRS) A computer-based repository of U.S. air pollution information administered by the EPA Office of Air Quality Planning and Standards

Air Parcel A volume of air that tends to be transported as a single entity

Air Pollution Degradation of air quality resulting from unwanted chemicals or other materials occurring in the air

AIRS See Aerometric Information Retrieval System

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

Air Quality Index (AQI) Reports levels of ozone and other common air pollutants. The higher the AQI rating for a pollutant, the greater the change. For guidance on how to compute the AQI, see <<http://www.epa.gov/ttn/oarpg/t1/memoranda/rg701.pdf>>.

Al Aluminum

Ammonium ion (NH₄⁺)

Anthropogenic Produced by human activities

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

As Arsenic; tracer for smelter emissions

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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 nonattainment at the same time. Attainment areas are defined using federal pollutant limits set by the U.S. Environmental Protection Agency.

Attenuation The diminution of quantity. In the case of visibility, attenuation or extinction refers to the loss of image-forming light as it passes from an object to the observer.

B_{abs} Light absorption coefficient

b_{ext} Light extinction coefficient

b_{ag} Light absorption by gases

b_{ap} Light absorption by particles; the coefficient of haze is a measure of this

b_{sp} Light scattering by particles

b_{sg} Light scattering by gases

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

Bottom-up emission inventory evaluation Method of assessing emissions data using census information and emissions activity data combined with emission factors to generate emissions estimates

Ca Calcium; tracer for soil

Carbon monoxide (CO) A colorless, odorless, poisonous gas, produced by incomplete burning of carbon based fuels

CART Classification and regression tree; useful for classifying days on the basis of the ozone formation potential of meteorological conditions

Cd Cadmium

Clean Air Act (CAA) The original Clean Air Act was passed in 1963, but our national air pollution control program is actually based on the 1970 version of the law. The 1990 Clean Air Act Amendments are the most far-reaching versions of the 1970 law. The 1990 amendments are commonly referred to as the 1990 Clean Air Act.

CBIV Carbon bond IV chemical reaction mechanism scheme

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CI Confidence interval. Provides a range of plausible values for the true population mean based on a sample taken from the population. An approximate 95% CI for a single mean is $\bar{x} \pm 2se$ where the standard error (se) of a single mean is estimated as s/\sqrt{n} where s is the standard deviation and n is the number of samples.

CMB Chemical mass balance model

CO See Carbon monoxide

Coarse particles Particulate matter with diameter between 2.5 and 10 microns (PM₁₀ - PM_{2.5})

Coagulation The process by which small particles collide with and adhere to one another to form larger particles

Coefficient of haze (COH) A measurement of visibility interference in the atmosphere

Condensation The process by which molecules in the atmosphere collide and adhere to small particles

Cu Copper

CV Coefficient of variation; the standard deviation divided by the sample mean

Deciview is a visibility metric. A deciview is a haze index derived from calculated light extinction, such that uniform incremental changes in perception across the entire range of conditions, from pristine to highly impaired. The deciview haze index is calculated based on the following equation (for the purposes of calculating deciview, the atmospheric light extinction coefficient must be calculated from aerosol measurements): Deciview haze index = $10 \ln_c (b_{ext}/10 \text{ Mm}^{-1})$. Where b_{ext} = the atmospheric light extinction coefficient, expressed in inverse megameters (Mm⁻¹). Higher deciview values indicate greater levels of visibility impairment.

Design Value The monitored reading used by EPA to determine an area's air quality status; for example, for ozone, the fourth highest reading measured over the most recent three years is the design value

Dry deposition Delivery of air pollutants in the gaseous or particle phase to surfaces

Elemental carbon (EC) Black; often called soot

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

Emission Factor A measure of an average rate of emission of a pollutant for a defined activity rate

EPS2.0 Emissions Processing System version 2.0

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EPA Environmental Protection Agency

Eulerian models solve the advection-diffusion equation. In an Eulerian framework the solution is obtained relative to a fixed grid, at which both the pollutant concentrations and meteorological variables are defined. Eulerian approaches are most suitable when complex emission and non-linear chemical conversions are involved. Eulerian Dispersion Model: $dC/dt =$

[advection] + [diffusion] + [source] + [sinks]

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

Extinction The attenuation of light due to scattering and absorption as it passes through a medium

Extinction coefficient A measure of the ability of particles or gases to absorb and scatter photons from a beam of light; a number that is proportional to the number of photons removed from the light path per unit length. See absorption.

Fe Iron; tracer for soil

Federal Equivalent Method (FEM)

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-hour 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; $PM_{2.5}$

H₂O₂ Hydrogen peroxide; formed in the atmosphere by reaction of ozone and water vapor

H₂SO₄ Sulfuric acid

Hazardous air pollutants (HAPs) Toxic chemicals that cause serious health and environmental effects

Haze (hazy) An atmospheric aerosol of sufficient concentration to be visible. The particles are so small that they cannot be seen individually but are still effective attenuating light and reducing visual range.

HDDT Heavy-duty diesel truck

HNO₃ Nitric acid; formed in the atmosphere by reaction of NO₂ and water droplets

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Hygroscopic Readily absorbing moisture, as from the atmosphere

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

Inspection and maintenance program (I/M program) Auto inspection programs are required for some polluted areas. These periodic inspections, usually done once a year or once every two years, check whether a car is being maintained to keep pollution down and whether emission control systems are working properly. Vehicles which do not pass inspection must be repaired.

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

K Potassium; tracer for vegetative combustion and fireworks

Lagrangian models solve the advection-diffusion equation. In the Lagrangian frame, the advection diffusion equation is rewritten in terms of the total derivative, such that the change of concentration is computed following the parcel as it is advected by the wind. Lagrangian models are most applicable to point-source simulations. Lagrangian Dispersion

Model: $DC/Dt = [\text{diffusion}] + [\text{source}] + [\text{sinks}]$

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 which 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.

LQL Lower quantifiable limit

LT Local time

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MDL Minimum detection limit

Mean The total of all values divided by the number of samples

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

MISTT Midwest Interstate Sulfur Transport and Transformation Study

Mn Manganese

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.

MOHAVE Measurement of Haze and Visual Effects. The project MOHAVE was established to determine what contributions the Mohave Power Plant and other sources make to haze at the Grand Canyon National Park and other mandatory Class I areas.

MSA Metropolitan statistical area

Multivariate analyses Statistical procedures that can be used to infer a mix of emission sources impacting a receptor location

MW Molecular weight

NaCl Sodium chloride, salt

NAMS National air monitoring stations

NAPS National Air Pollution Surveillance Network. NAPS was established to monitor and assess the air quality in Canadian urban regions.

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

NBL Nocturnal boundary layer (the boundary layer from sunset to sunrise)

Nephelometer An instrument that measures the amount of light scattered

NESCAUM Northeast States for Coordinated Air Use Management

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

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

NH₄HSO₄ Ammonium bisulfate

(NH₄)₂SO₄ Ammonium sulfate

Ni Nickel; tracer for oil combustion.

Nitrates (NO₃⁻) Those gases and aerosols that have origins in the gas-to-aerosol conversion of nitrogen oxides, e.g., NO₂; of primary interest are nitric acid and ammonium nitrate

Nitric oxide (NO) Precursor of ozone, NO₂, and nitrate; usually emitted from combustion processes. Converted to nitrogen dioxide (NO₂) in the atmosphere, it then becomes involved in the photochemical process and/or particulate formation.

Nitrogen oxides (NO_x) Gases formed in great part 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)

NO_y NO_x + HNO₃ + organic nitrates + inorganic nitrates = NO_x + NO_z

NO_z Oxidation products of NO_x = NO_y x (1 - NO_x/NO_y)

NPS National Park Service

NWS National Weather Service

OAQPS Office of Air Quality Planning and Standards

OH Hydroxyl radical; the main 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 compounds that contain > C₂₀

Outliers Data physically, spatially, or temporally inconsistent

PAH Polycyclic aromatic hydrocarbon

PAMS Photochemical Assessment Monitoring Stations; EPA program to expand and strengthen ambient air monitoring of VOCs and other ozone precursors

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

Pb Lead

PCA Principal component analysis

PFA Type of Teflon coating

Photon A bundle of electromagnetic energy that exhibits both wave-like and particle-like characteristics

PM_{2.5} (Particulate matter less than 2.5 microns) Tiny solid 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.

PM_{2.5} Federal Equivalent Method (FEM) Samplers FRM regulations tabulate the aerodynamic size selection curve of the impactor and require that any “equivalent” PM_{2.5} sampling device must have a 50% penetration value (or cut-point) of $2.5 \pm 0.2 \mu\text{m}$, and sampling bias for PM_{2.5} concentrations less than $\pm 5\%$. Further tests are required to establish that the candidate sampler (a) continues to meet the standard after loading with dust and (b) gives comparable results to a reference sampler under field conditions.

PM₁₀ (Particulate matter less than 10 microns) Tiny solid 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; PMF can be used to determine source profiles based on the ambient data

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.

PREVENT Pacific Northwest Regional Visibility Experiment Using Natural Tracers. The PREVENT network was established to study visibility causes and effects in Washington state, west of the Cascades.

Primary Particles The fraction of PM₁₀ and PM_{2.5} that is directly emitted from combustion and fugitive dust sources

PTFE Plastic tubing

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.

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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).

Rayleigh scattering The scattering of light by particles much smaller than the wavelength of the light, e.g., molecular scattering in the natural atmosphere

Receptor model Statistics-based software tools that equate empirical relationships between ambient data and emissions sources

Reconstructed extinction Extinction estimate that results from summing up the product of the mass of each measured particle species and the appropriate absorption or extinction coefficient

Reformulated gasoline (RFG) Specially refined gasoline with low levels of smog-forming volatile organic compounds (VOCs) and low levels of hazardous air pollutants. The 1990 Clean Air Act requires sale of reformulated gasoline in the nine smoggiest areas. Reformulated gasolines were sold in several smoggy areas even before the 1990 Clean Air Act was passed.

Regional haze A cloud of aerosols extending up to hundreds of miles across a region and promoting noticeably hazy conditions

Relative humidity The ratio of the partial pressure of water to the saturation vapor pressure, also called saturation ratio; often expressed as a percentage

Scattering An interaction of light with an object (e.g., a fine particle) that causes the light to be redirected in its path

Scattering coefficient Measure of the ability of particles to scatter light; measured in number proportional to the “amount” of light scattered per unit distance

SCE Source contribution estimate (CMB model output)

Se Selenium; tracer for coal combustion

Secondary Particle The fraction of PM_{10} 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.

SMOKE Sparse Matrix Operator Kernel Emissions (SMOKE), an emissions processing tool

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SOA Secondary organic aerosol

SO₂ Sulfur dioxide

Source apportionment Process of apportioning ambient pollutants to an emissions source

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

Stagnant Referring to meteorological conditions that are not conducive to atmospheric mixing

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 EPA approve each state implementation plan.

Stationary source A place or object from which pollutants are released and which does not move around. Stationary sources include power plants, gas stations, incinerators, houses, etc.

Sulfate (SO₄²⁻) Sulfate ion. Virtually all the ambient sulfate (99%) is secondary, formed within the atmosphere from SO₂.

Sulfur dioxide (SO₂) A pungent, colorless gas formed primarily by combustion of fossil fuels

TEOM Tapered element oscillating microbalance. A method for the continuous measurement of PM.

Thermal optical analysis (TOA) Method used to quantify PM organic and elemental carbon

Ti Titanium

Top-down emission inventory evaluation Method of assessing emissions data by comparing relative pollutant compositions in the inventory to pollutant compositions in the ambient air

TSP Total suspended particulates

UAM Urban Airshed Model IV = EPA regulations version using CBIV; Urban Airshed Model V = with variable grid

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

V Vanadium

Variance The square of the standard deviation

VOC Volatile organic compound; often used synonymously with NMHC, TNMOC

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WD Wind direction

WHITEX Winter Haze Intensive Tracer Experiment. WHITEX was established to study the visibility impacts of emissions from the Navajo Generating Station.

WRAC Wide range aerosol classifier, a PM collector designed to capture particles up to 100 microns in diameter

WS Wind speed

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

Zn Zinc

References

Minnesota Pollution Control Agency glossary at <http://www.pca.state.mn.us/gloss/>

Bay Area Air Pollution Control District glossary at <http://www.baaqmd.gov/pie/aqgloss.htm>

California Air Resources Board glossary at <http://arbis.arb.ca.gov/html/gloss.htm>

Chemistry Department of Sam Houston State University glossary at <http://www.shsu.edu/~chemistry/Glossary/glos.html>

National Park Service glossary at <http://www2.nature.nps.gov/ard/glossary.htm>

US EPA glossary at http://www.epa.gov/oar/oaqps/peg_caa/pegcaa10.html#topic10

1997 National Air Quality and Emissions Trends report List of acronyms at <http://www.epa.gov/oar/aqtrnd97/acron.html>