APPENDIX 2

*Glossary**

Absorption: The process whereby *visible* or *infrared radiation* passing through a medium is transformed via interactions into another form of energy, often heat.

See also *Optical depth, Extinction, Scattering.*

Absorption coefficient: A physical parameter expressing the efficiency of a medium in absorbing radiation. The absorption coefficient of homogeneous materials depends on the nature of the material and on the wavelength of the incident radiation.

See also *Extinction coefficient.*

Absorption optical depth: The part of the *optical depth* due to the *absorption* process.

See also *Optical depth.*

Activity: The number of nuclear disintegrations per second in a radioactive substance. The *SI* unit of activity is the Becquerel.

See also *Radioactivity.*

Advection: The process of transport of a fluid property as a result of the motion of the fluid itself. Advection refers conventionally to transport mainly by large scale horizontal and vertical winds. Vertical mixing by small scale processes (e.g., clouds) is usually referred to as *convection.*

Aerosol: A suspension of liquid or solid particles in a gas, usually the atmosphere. Most of the particles constituting the aerosols are 10 micrometers or less in diameter. Haze, most *smoke*, and some fogs are aerosols.

See also *Cloud condensation nuclei, Dust, Residence time, Soot.*

Air burst: A nuclear explosion that takes place high enough in the atmosphere that the *fireball* does not reach the surface. As a consequence, air bursts do not raise large quantities of surface materials (e.g., *dust*) in the atmosphere, nor do they give rise to *local fallout.*

See also *Blast wave, Electromagnetic pulse.*

* Any word printed in *italics*, whether in the text or in the 'See also' sections, refers to a concept defined elsewhere in the glossary. When such a cross-reference is indicated in the text, it is *not* repeated in the 'See also' section.

Albedo: The ratio of the reflected to incident radiation flux, usually for *visible radiation*, or *near-infrared radiation*. The *planetary albedo* of the Earth's surface-atmosphere system in the absence of smoke is about 30%.

Amorphous carbon: Small spheres of randomly-arranged crystallites of graphite formed in flames.

See also *Elemental carbon, Soot.*

Anvil: Elevated layer of ice particles produced by outflow at the top of a cumulonimbus cloud.

Atmospheric pressure: The static pressure that results from the weight per unit surface area of the mass of air lying above a location. The atmospheric pressure at sea level is about 100 kilopascals (kPa), equal to 1000 millibars (mb) or 14.7 pounds per square inch (psi).

Atomic bomb: A weapon that derives its destructive power from the energy released by the splitting or *fission* of nuclei such as *uranium* and *plutonium*.

Attenuation: Used either as a synonym of *extinction* of a directed flux of energy resulting from both *absorption* and *scattering*, or as the reduction in a directed flux of energy due to absorption and backscattering only.

Back-scattering: An instance of *scattering* where the change in direction of the *photon* or particle relative to its direction before the interaction is greater than 90°.

See also *Albedo, Forward-scattering.*

Beta particle: A beta particle is an electron emitted in a nuclear disintegration.

Biomass: The amount of carbon stored in the living tissues of an ecosystem. Sometimes also the dry weight of living materials, typically expressed in kg (carbon, or C), or in kg (dry matter), respectively, or kg/m^2 for areal loading.

Black rain: Name given to the dark, smoke-stained rain that fell on some neighborhoods of Hiroshima and Nagasaki shortly after the atomic bombings.

See also *Rainout, Washout.*

Blast wave: An intense *shock wave* created by a nuclear explosion in which the pressure, temperature, and fluid velocity discontinuities are very large.

See also *Peak overpressure.*

Boundary layer: The layer of the atmosphere that is affected by the nature and characteristics of the surface. The atmospheric or planetary boundary layer is typically several hundred meters deep at night, and up to a few km during the day, in the undisturbed atmosphere.

C^3: Acronym for Command, Control, and Communications, three components essential for the management and operation of military forces.

See also *C^3I, Electromagnetic pulse.*

C^3I: Acronym for Command, Control, Communications, and Intelligence.

See also *C^3, Electromagnetic pulse.*

CCN: Acronym for *Cloud Condensation Nuclei.*

Climate: The word climate is used in a number of ways, but usually refers to the state of the atmosphere, oceans and surface averaged over some area and period of time, usually greater than several days.

Cloud Condensation Nuclei [CCN]: Small, usually *hygroscopic*, *aerosols* on which water vapor condenses in clouds. These nuclei are essential for the formation of clouds and precipitation.

See also *Aerosol, Washout.*

CO: The chemical symbol for carbon monoxide, a gas produced in combustion processes, particularly when the availability of oxygen is limited.

Coagulation: Any process which agglomerates small *particles* or aerosols into larger ones.

See also *Residence time, Washout.*

Combustible burden: The amount of fuel available for combustion per unit area of building floor or ground area, expressed in kg/m^2.

See also *Fuel loading.*

Conflagration: A spreading fire driven by winds and *thermal radiation.*

Convection: The process of transport and mixing of a fluid as a result of localized vertical air motions.

Counterforce attack: A strategic attack that aims at destroying the military potential of the adversary, such as *missile silos*, air and naval bases, military depots, etc.

See also *Countervalue attack.*

Countervalue attack: A strategic attack that aims at destroying the industrial and economic base of the adversary.

See also *C^3, Counterforce attack.*

Delayed fallout: See *Radioactive fallout.*

Dose: The energy of *ionizing radiation* absorbed in a medium, per unit mass, integrated over time.

See also *Gray, Rad.*

Dry deposition: The return to the Earth's surface of *particles* in a precipitation-free environment, principally by impaction brought on by mixing of the air in the *boundary layer.*

See also *Radioactive fallout, Precipitation scavenging.*

Dust: Here, mainly small soil particles picked up by winds.

See also *Aerosol, Ground burst*

Dynamic pressure: The *pressure* on a surface produced by a wind.

See also *Overpressure, Peak overpressure.*

Early fallout: See *Radioactive fallout.*

Electromagnetic pulse [EMP]: The sharp and intense pulse of *electromagnetic radiation* within the radio frequency spectrum that is produced by a high altitude nuclear explosion. EMP can damage electrical power distribution systems, and unprotected electrical and electronic equipment, including telecommunications networks and computer systems.

Electromagnetic radiation: A form of energy contained in oscillating electrical and magnetic fields, traveling at the speed of light.

Elemental carbon: An approximately pure form of carbon, composed of either *amorphous carbon* or graphitic carbon, as distinguished from organic carbon or carbonates.

See also *Soot.*

EMP: Abbreviation for *Electromagnetic pulse.*

Entrainment: The process of mixing air from the environment into a cloud, plume or *fireball*, contributing to the dilution of the cloud.

ENUWAR: Acronym for Environmental Consequences of Nuclear War, the name of the *SCOPE* project studying this subject.

Epicenter: The location of the *nuclear weapon* at the time of the explosion.

See also *Ground zero, Hypocenter.*

Extinction: The depletion or reduction of a direct flux of radiation as it penetrates a substance (e.g., aerosols in the atmosphere), due both to *absorption* and *scattering.*

See also *Extinction coefficient.*

Extinction coefficient: A physical parameter expressing the efficiency of a substance in causing extinction. The extinction coefficient depends on the nature of the material and on the wavelength of the incident *radiation.*

See also *Absorption coefficient.*

Extinction cross-section: A measure, in units of area, of the probability of an interaction occurring between a particle and a photon, either by scattering or absorption.

Extinction efficiency: For a particle or molecule, the ratio of the extinction cross-section to the geometric cross-section or projected area (e.g., πr^2 for a spherical particle of radius r) of the particle or molecule.

Extinction optical depth: See *optical depth.*

Fallout: See *Radioactive fallout.*

Fireball: The volume of hot air that forms immediately after the explosion of a *nuclear weapon* in a *surface* or *air burst.* The fireball is luminous due to its high temperature.

See also *Mushroom cloud.*

Firestorm: The severe meteorological conditions resulting from an intense surface heating as a result of extensive and vigorous stationary fires. Firestorms develop a swirling cyclonic inflow of air that limits entrainment and lofts smoke to great heights. They have been observed to occur after intense incendiary bombing in Hamburg and Dresden and may have occurred after the nuclear explosion in Hiroshima.

Fissile material: Material capable of undergoing *fission* by interaction with slow (thermal) neutrons.

See also *Black rain, Conflagration.*

Fission: The process of splitting the nucleus of heavy chemical elements, usually *radionuclides*, into two or more smaller nuclei. This process can be accompanied by the emission of beta particles, gamma rays, and neutrons.

See also *Fusion.*

Fluence: The radiative energy flux per unit surface integrated over a finite period of time, and generally measured in cal/cm^2 (1 cal/cm^2 = 4.2×10^4 J/m^2).

See also *Ignition threshold.*

Forward-scattering: An instance of *scattering* where the change in direction of the incident *photon* or *particle* is less than 90°.

See also *Back-scattering.*

Fuel loading: The mass amount of combustible fuel per unit area.

See also *Combustible burden.*

Fusion: The process of combining the nuclei of light chemical elements, such as deuterium or tritium, into larger nuclei, accompanied by the release of large amounts of energy. *Thermonuclear weapons* rely mainly on the fusion process.

See also *Fission.*

Gamma radiation or gamma ray: Energetic *photons* of *electromagnetic radiation*, with wavelengths nominally shorter than 0.1 nanometers. Gamma rays are emitted by nuclear processes, including explosions.

See also *X-ray.*

GCM: Acronym for *General Circulation Model.*

General Circulation Model [GCM]: Three-dimensional computer model based on the physical equations for fluid flow used to study the evolution of the large-scale features of the atmospheric circulation.

Gray [Gy]: The *SI* unit of *ionizing radiation* absorbed by a medium. It is equivalent to the *absorption* of 1 Joule per kilogram of material.

See also *Rad, Rem.*

Greenhouse effect: The common name for designating several radiative processes where specific atmospheric molecules (such as water vapor and carbon dioxide) allow most of the *solar radiation* to pass through the atmosphere to the surface, while most of the *infrared radiation* emitted by the surface is absorbed by the atmosphere and re-emitted both downward and upward. The downward re-radiation warms the surface, while the upward component is lost to space or absorbed higher up in the atmosphere.

Ground burst: A nuclear explosion on a land surface. Ground bursts raise large quantities of radioactive *dust* in the atmosphere, and produce *local fallout.*

Ground shock: An intense shock or pressure wave travelling in the ground as a result of a nuclear explosion.

See also *Blast wave.*

Ground zero: Synonym of *hypocenter* for an *air* or *ground burst.*

Half-life: The time required for the *radioactivity* of a given material to decrease to half of its initial value due to nuclear disintegrations.

See also *Plutonium, Uranium.*

H-bomb: Synonym of hydrogen or *thermonuclear weapon.*

Height of burst [HOB]: The altitude of a *nuclear weapon* at the time it explodes. The height of burst affects the type of damage generated.

Hertz [Hz]: Unit of frequency equal to 1 cycle per second.

Hydrophobic: The tendency of particles not to attract water vapor or become dissolved in water droplets.

See also *Hygroscopic.*

Hygroscopic: The tendency of particles to be susceptible to condensation of water vapor on them and to be soluble in water droplets.

See also *Hydrophobic.*

Hypocenter: The location at the ground surface immediately below a nuclear explosion, or the site of a surface burst (also called *ground zero*).

ICSU: Acronym for International Council of Scientific Unions.

Ignition threshold: The *fluence* from a nuclear fireball needed to ignite a given material. It is dependent on the type, size, dryness, and orientation of the material as well as on the yield of the *nuclear weapon.*

Incendiary efficiency: The area on the ground subject to fire ignition by a nuclear explosion per *kiloton* of *yield.*

Infrared radiation: The band of *electromagnetic radiation* in the wavelength interval 0.8 to 100 micrometers. About half the *solar energy* available at the Earth's surface is contained in the radiation band from 0.8 to 5 micrometers: this is often called the *near-infrared.* In contrast, *radiation* at longer wavelengths is called *thermal radiation*, or the thermal infrared.

See also *Greenhouse effect, Visible radiation.*

Ionizing Radiation: A high energy *photon* (such as an *X* or *gamma ray*) or particle (such as electrons or alpha particles) capable of ionizing an atom or molecule by stripping off electrons.

Isotope: Isotopes of a given chemical element differ in the number of neutrons present in the nucleus of the atom. Isotopes have similar, but not identical, physical and chemical properties.

Kiloton [kt]: An amount of energy equal to 4.2×10^{12} J. This is approximately the amount of energy that would be released by the simultaneous explosion of roughly a thousand tons of *TNT.*

See also *Hiroshima, Megaton, Yield.*

Local fallout: See *Radioactive fallout.*

Mass fire: A moving or stationary fire involving a large area.

See also *Conflagration, Firestorm.*

Megaton [Mt]: An amount of energy equal to 4.2×10^{15} J. This is approximately the amount of energy that would be released by the simultaneous explosion of roughly a million tons of *TNT*.

See also *Kiloton, Yield.*

Mesoscale: Term applied to atmospheric features on horizontal scales ranging from a one to several hundred kilometers and temporal scales from about an hour to a day.

Mesosphere: The atmospheric layer between the stratopause and the mesopause, i.e. roughly from 50 to 80 km above the surface.

Microwave radiation: The band of the *radio frequency spectrum* with a wavelength in the interval 0.1 to 500 millimeters, used in telecommunication and radar systems.

See also *Infrared radiation.*

Missile silo: A hardened concrete structure, usually totally buried, that contains a nuclear missile.

Mushroom cloud: The rising cloud formed just after a nuclear *air* or *ground burst* by convective winds that entrain and carry upward dust debris, and condensed water.

Near-infrared radiation: See *Infrared radiation.*

NO_x: A generic chemical symbol to designate a nonspecific mixture of the oxides of nitrogen, mainly NO and NO_2.

Nuclear fuel cycle facilities: All facilities involving nuclear fuel, from mining through to waste storage facilities, including nuclear reactors, spent fuel storage facilities, reprocessing plants, and waste depositories.

Nuclear radiation: A general term designating all of the ionizing radiation of a nuclear explosion; e.g., gamma rays, neutrons, electrons (or beta particles) and alpha particles.

Nuclear weapon: A generic name for a device that derives its explosive energy from *fission*, *fusion*, or both.

See also *Atomic bomb, Thermonuclear weapon.*

Nuclear winter: A phrase used to refer mainly to the sharp and widespread cooling and near-darkness that could result from the emission of massive amounts of *smoke* and other materials as a result of widespread fires induced by extensive nuclear attacks on urban areas, oil and gas storage facilities, and other developed and wildland areas. The extent of the cooling and associated reduction in precipitation would vary strongly

with latitude, season, and proximity to coastlines. A wide range of perturbations is possible because of necessary assumptions and remaining uncertainties.

In its broadest usage, the term "nuclear winter" is sometimes considered to include the entire set of adverse environmental consequences following a nuclear war, including the additional effects of lofted *dust* (which could prolong or augment the cooling) and of *radioactive fallout.*

By extension, the term is sometimes used to refer to the consequent effects on ecosystems, agriculture, and human health and welfare.

Optical depth: A non-dimensional number used to describe the cumulative depletion, or extinction (due to both *absorption* and *scattering*) that a direct beam of *visible* or *infrared radiation* experiences as it travels through a medium. An extinction optical depth of 1 reduces the direct beam to 37% of its original value.

Overpressure: The excess of the local static pressure above the normal atmospheric pressure.

See also *Peak overpressure, Dynamic pressure.*

Ozone [O_3]: A molecule composed of three atoms of oxygen. In the unperturbed atmosphere, ozone is concentrated mainly in the lower *stratosphere* (20–50 km).

Peak overpressure: The maximum value, above the normal atmospheric pressure, of the static pressure attained during the passage of a *shock* or *blast wave.*

See also *Dynamic pressure, Overpressure.*

Photon: The quantized unit of electromagnetic energy. The energy carried by a photon is proportional to the electromagnetic wave frequency.

See also *Electromagnetic radiation.*

Planetary albedo: The average *albedo* of the planet Earth, as seen from space, about 0.3 or 30% for solar radiation under present conditions.

Plutonium [Pu]: A fissionable chemical element produced by nuclear reactions and used in *nuclear weapons.*

Precipitation scavenging: A term to designate the removal of gases, *aerosols* or nuclear debris from the atmosphere by precipitation processes. Precipitation scavenging includes both *rainout* and *washout* processes.

See also *Fallout, Scavenging.*

Primary ignition: The fires ignited as a direct result of the *thermal radiation* or *thermal flash* of a nuclear explosion.

Prompt Radiation: The ionizing *radiation* emitted during, and in the first minute or so after, a nuclear explosion, as opposed to that emitted later by the *radioactive fallout*. The prompt radiation contains about 5% of the total energy liberated by the explosion.

Protection factor: The attenuation factor of ionizing radiation due to the shielding provided by a structure or material.

Psi [psi]: A non-*SI* unit of pressure equal to one pound per square inch. The *SI* unit of pressure is the Pascal (1 psi = 6894 Pa).

Pyrotoxin: A term to designate toxic chemicals released during combustion, particularly from plastics and industrial chemicals.

Rad [rad]: A non-*SI* unit of absorbed energy from *ionizing radiation*, equivalent to the absorption of 100 ergs per gram, or 10^{-2} Joule per kilogram. The corresponding *SI* unit is the *Gray*, and 1 Gy = 100 rads. The name of this unit derives from the abbreviation for Radiation Absorbed Dose.

See also *Rem.*

Radioactive fallout: The radioactive debris (particles) generated by a nuclear explosion that is deposited on the surface at various times by dry deposition or in precipitation. *Early* or *local fallout* refers to the surface deposition within one day in the vicinity of the explosion. Global or *delayed fallout* refers to the settling or washout of radioactivity after the first day. Intermediate timescale fallout is deposited generally within the first month after the explosion, while long term fallout is deposited over times of months to years.

See also *Air burst, Black rain, Ground burst, Residence time, Scavenging, Washout.*

Radioactivity: The property of unstable chemical elements or isotopes to decay by emitting *nuclear radiation.*

See also *Activity, Fission, Plutonium, Radionuclide, Uranium.*

Radio frequency spectrum: The band of *electromagnetic radiation* with wavelengths between 1 millimeter (300 GHz) and 10^6 m (300 Hz).

See also *Infrared radiation.*

Radionuclide: A radioactive element or isotope.

See also *Plutonium, Radioactivity, Uranium.*

Rainout: The in-cloud removal of *aerosols* by incorporation into cloud water and subsequent precipitation.

See also *Black rain, Fallout, Precipitation scavenging, Scavenging, Washout.*

Rayleigh scattering or absorption: A particular type of scattering or absorption that occurs in cases where the wavelength of the incident radiation is much larger than a typical dimension of the particle.

Rem: A non-*SI* unit for absorbed radiation *dose*, defined as the *dose* that will produce the same biological effect as the *absorption* of 1 roentgen of X-rays or *gamma rays*. For *gamma rays*, 1 *rad* is equivalent to 1 rem. The name of this unit derives from the abbreviation for Roentgen Equivalent Man.

Residence time: The average length of time that material is expected to remain within a given system before being removed (e.g., the atmosphere).

See also *Scavenging, Washout.*

Scattering: The interaction of electromagnetic radiation with a particle, resulting in the deflection of the radiation.

See also *Absorption, Forward-scattering, Back-scattering, Rayleigh scattering.*

Scattering optical depth: The fraction of the *optical depth* due to the *scattering* process.

See also *Absorption optical depth.*

Scavenging: A general term referring to the processes of particle or gas collection, agglomeration and/or removal from the atmosphere, particularly by clouds and precipitation.

See also *Black rain, Rainout, Washout.*

Scenario: A description of the hypothetical development of a nuclear war, with specific assumptions about the number, yield, and space and time distribution of nuclear explosions.

SCOPE: Acronym for Scientific Committee on Problems of the Environment. SCOPE was established in 1969 by *ICSU* to identify interdisciplinary environmental issues requiring the most urgent attention.

Shock wave: A supersonic pressure wave in a medium, such as air, associated with nuclear detonations.

See also *Blast wave*

SI: Acronym for Système International of units. SI is a coherent system of units based on the meter, the kilogram, the second, the ampere, the kelvin, the mole, and the candela. A large number of derived units can be created by combining these 7 base units.

The SI system defines standard prefixes to designate multiples and fractions of the standard units, including:

Multiplication Factors			Prefix	SI Symbol
1 000 000 000 000	=	10^{12}	tera	T
1 000 000 000	=	10^{9}	giga	G
1 000 000	=	10^{6}	mega	M
1 000	=	10^{3}	kilo	k
100	=	10^{2}	hecto	h
10	=	10^{1}	deka	da
0.1	=	10^{-1}	deci	d
0.01	=	10^{-2}	centi	c
0.001	=	10^{-3}	milli	m
0.000 001	=	10^{-6}	micro	μ
0.000 000 001	=	10^{-9}	nano	n
0.000 000 000 001	=	10^{-12}	pico	p

Silo: See *missile silo.*

Single scattering albedo: The ratio of the *scattering* coefficient and the *extinction* coefficient for a given particle or medium.

Smoke: A suspension of solid and/or liquid particles and gases produced by combustion processes as well as wind blown debris and ash. Smoke is typically a heterogeneous mixture of particles of different sizes, structures, and composition, and may vary from white and oily (from smoldering combustion) to black and sooty (from flaming combustion).

See also *Black rain, Soot.*

Smoldering: A process of low temperature combustion in the absence of open flames.

Soot: A *smoke* component composed largely of *amorphous* or *elemental carbon.* Soot is particularly effective in absorbing *solar radiation.*

Strategic nuclear weapons: Weapons, generally of high yield, placed on intercontinental missiles (ICBMs) and other long range delivery systems (SLBMs, bombers with intercontinental range).

See also *Tactical nuclear weapons, Theater nuclear weapons.*

Stratosphere: The atmospheric layer between the *tropopause* and the stratopause, roughly between 12 and 50 km above the surface, characterized by a general increase in temperature with increasing altitude. The *residence time* of gases and particles in the stratosphere is much longer than in the troposphere.

See *Temperature inversion.*

Surface burst: A nuclear explosion occurring at or very close to the surface, either over water or land, so that the *fireball* intercepts the surface.

Synoptic: Organized atmospheric motions on spatial scales of about one to ten thousand kilometers and lasting one to several days.

Tactical nuclear weapons: Generally speaking, low yield nuclear weapons mounted on short range (less than 200 km) delivery systems, and built to be used on the battlefield.

See also *Strategic nuclear weapons, Theater nuclear weapons.*

Temperature inversion: A layer of the atmosphere in which the temperature is constant or increases with height. Such layers are usually stable against convection and mixing from below.

Theater nuclear weapons: Generally speaking, medium or large *yield nuclear weapons* carried by intermediate range missiles and aircraft for use in continental-size geographical regions.

See also *Strategic nuclear weapons, Tactical nuclear weapons.*

Thermal radiation: The radiation emitted by any body or substance as a result of its heat content (as measured by its temperature). For substances at normal temperatures (250 to 320 K), the thermal radiation is in the thermal-*infrared*. For the Sun and a nuclear fireball ($\sim$6000 K), the radiation is in the visible and near-infrared parts of the spectrum.

Thermal pulse or thermal flash: The intense but brief emission of heat and light in a nuclear explosion.

Thermonuclear weapons: A *nuclear weapon* that derives a substantial part of its explosive energy from nuclear *fusion*. Such weapons are sometimes called *H-bombs*, because they use hydrogen *isotopes* (typically a few kg of deuterium and tritium) as the fuel for the *fusion* process. Thermonuclear weapons use *fission* devices as a trigger. The energy *yield* of a thermonuclear weapon can be much larger than that of an *atomic bomb* of comparable size.

TNT: Trinitrotoluene, a conventional high intensity explosive, also known as dynamite. The explosive power of *nuclear weapons* is expressed in equivalents of *kilotons* or *megatons* of TNT.

Troposphere: The lowest layer of the *atmosphere*, from the surface to about 12 kilometers, characterized by a general decrease of temperature with increasing altitude. The troposphere contains 90% of the total mass of air, and most of the water vapor in the atmosphere; thus, most precipitation originates in this layer.

See also *Stratosphere, Tropopause.*

Tropopause: The boundary between the *troposphere* and the *stratosphere*.

Ultraviolet radiation: The band of *electromagnetic radiation* with wavelengths in the interval 100 to 400 nanometers. This *radiation* band is further divided into three other regions: UV-A (320–400 nanometers), UV-B (290–320 nanometers), and UV-C (200–290 nanometers). The UV-B radiation has the greatest biological significance.

Underground burst: A nuclear explosion that takes place below the surface of the Earth.

Underwater burst: A nuclear explosion that takes place below the surface of the water, in a sea or ocean.

Uranium [U]: A heavy fissionable chemical element found in nature. Its *isotopes* ^{235}U and ^{238}U are used to build *nuclear weapons*, as well as to operate nuclear power stations.

UV-B: See *Ultraviolet radiation.*

Visible radiation: The band of *electromagnetic radiation* with wavelength in the interval 0.4 to 0.8 micrometers. About half of the solar energy received at the surface is in the visible radiation band.

See also *Infrared radiation, Ultraviolet radiation.*

Washout: The process of *aerosol* removal from the atmosphere through capture by precipitation, particularly below the cloud base.

See also *Fallout, Rainout, Scavenging.*

Wind shear: A situation in which the winds at a location vary in speed and direction at different heights.

X-ray: The band of *electromagnetic radiation* with wavelengths nominally in the interval 0.1 to 10 nanometers. X-rays are emitted by nuclear explosions, but are relatively ineffective at penetrating air.

Yield: The amount of energy released by a nuclear explosion. The yield of a *nuclear weapon* is often expressed in terms of *kilotons (kt)* or *megatons (Mt)*. The energy released by *delayed radioactive fallout* is not usually counted in the yield of a nuclear weapon.

See also *Atomic bomb, Thermonuclear weapon.*