

Glossary for Climate Day 2010

COSEE-West

many glossary terms are from <http://waterontheweb.org/resources/glossary.html>

A acclimatization – the gradual adjustment of the body to new climatic or other environmental conditions, for example, the adjustment to low levels of oxygen at high altitudes.

acid: A solution that is a proton (H^+) donor and has a pH less than 7 on a scale of 0-14. The lower the pH the greater the acidity of the solution.

acidity: A measure of how acid a solution may be. A solution with a pH of less than 7.0 is considered acidic. Solutions with a pH of less than 4.5 contain mineral acidity (due to strong inorganic acids), while a solution having a pH greater than 8.3 contains no acidity.

acidification: The process by which acids are added to a water body, causing a decrease in its buffering capacity (also referred to as *alkalinity* or *acid neutralizing capacity*), and ultimately a significant decrease in pH that may lead to the water body becoming acidic ($pH < 7$).

aerosols – a suspension of solid or liquid particles in a gas, for example sulfate molecules (SO_4^-) found in the earth atmosphere.

air pressure – the cumulative force exerted on any surface by the molecules composing air

albedo – the percentage of solar radiation that is reflected relative to the total incoming radiation.

alkalinity: Acid neutralizing or buffering capacity of water; a measure of the ability of water to resist changes in pH caused by the addition of acids or bases. Therefore, alkalinity is the main indicator of susceptibility to acid rain. In natural waters it is due primarily to the presence of bicarbonates, carbonates and to a much lesser extent occasionally borates, silicates and phosphates. It is expressed in units of milligrams per liter (mg/l) of $CaCO_3$ (calcium carbonate) or as microequivalents per liter ($\mu eq/l$) where $20 \mu eq/l = 1 mg/l$ of $CaCO_3$. A solution having a pH below about 5 contains no alkalinity.

altimeter – an instrument that indicates the altitude of an object above a fixed level. Pressure altimeters use an aneroid barometer with a scale graduated in altitude instead of pressure

anemometer – an instrument designed to measure wind speed

anomalies – departures of temperature, precipitation, or other weather elements from long-term averages at a given location.

anthropogenic – generated by the actions of humans.

atmosphere – entire mass of gases surrounding the earth or other celestial bodies. Today's atmosphere is made up primarily of nitrogen (78%), free oxygen (21%) and greenhouse gases

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many glossary terms are from <http://waterontheweb.org/resources/glossary.html> which can capture solar radiation: water vapor, which ranges from less than 1% in arid regions to over 3% in moist areas, carbon dioxide (0.035%) and methane (0.00018%).

B baseline – measurable quantities from which an alternative outcome can be measured.

Beaufort scale – scale of wind strength based on visual assessment of the effects of wind on seas and vegetation.

buffer: A substance which tends to keep pH levels fairly constant when acids or bases are added.

buffering capacity: Ability of a solution to resist changes in pH when acids or bases are added.

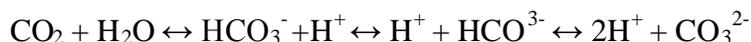
C calcium carbonate (CaCO₃) – molecule consisting of calcium, carbon and oxygen; secreted by corals, forming their skeleton; it also secreted by mollusks (clams, oysters, etc.), forming their protective shells

carbon cycle: The circulation of carbon atoms through the earth's whole ecosystem.

carbon dioxide: A gas which is colorless and odorless; when dissolved in water it becomes carbonic acid; CO₂ is assimilated by plants for photosynthesis in the "dark" cycles of photosynthesis.

carbonate ion: The CO₃⁻² ion in the Carbonate Buffer System; the collective term for the natural inorganic chemical compounds related to carbon dioxide that exists in natural waterways. Combined with one proton, it becomes Bicarbonate, HCO₃⁻, and with two protons, Carbonic Acid.

carbonate buffering system: The most important buffer system in natural surface waters and wastewater treatment, consisting of a carbon dioxide, water, carbonic acid, *Bicarbonate*, and *Carbonate* ion equilibrium that resists changes in the water's pH. If acid (hydrogen ions) is added to this buffer solution, the equilibrium is shifted and carbonate ions combine with the hydrogen ions to form bicarbonate. Subsequently, the bicarbonate then combines with hydrogen ions to form carbonic acid, which can dissociate into carbon dioxide and water. Thus the system pH is unaltered (buffered) even though acid was introduced.



chemical equilibrium: Concentrations of reactants and products at which a reaction is in balance; there is no net exchange because the rate of the forward reaction is taking place at the same rate of the reverse reaction.

climate – the prevailing or normal pattern of weather at a place, or in a region, averaged over a long period of time; in contrast to weather, which is the state of the atmosphere at a particular time.

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climate change – refers to the variation in the Earth's global climate or in regional climates over time. It describes changes in the variability or average state of the atmosphere (or average weather) over time scales ranging from decades to millions of years.

climatic feedback mechanisms – an enhancement (positive feedback) or a damping (negative feedback) of an initial change, in this case in the climate system. For example, when less energy reaches the earth, temperature decreases and the area covered by snow increases. The albedo of the planet increases, reflecting more solar energy back into space. Consequently less energy is absorbed at the surface, and temperature further decreases. The whole "cycle" from the initial cooling to the further cooling is a feedback. It is a positive feedback in this example.

climatology – quantitative description of climate showing the characteristic values of climate variables over a region. Climate refers to the statistical collection of weather conditions over a specified period of time. Note that the climate taken over different periods of time (30 years, 1000 years) may be different.

cloud cover – amount of the sky obscured by clouds when observed at a particular location.

condensation – process by which water changes phase from a vapor to a liquid.

convection – motions in a fluid that result in the transport and mixing of the fluid's properties. In meteorology, convection usually refers to atmospheric motions that are predominantly vertical, such as rising air currents due to surface heating.

coral bleaching – if conditions for corals are not optimum, the corals will expel the algae that live among the living polyps, therefore giving the colony a bleached appearance. □ a stress indicator for coral

Coriolis effect – deflective force arising from the rotation of the earth on its axis; affects principally synoptic-scale and global-scale winds. Winds are deflected to the right of the initial direction in the Northern Hemisphere, and to the left in the Southern Hemisphere. The Coriolis effect, caused by the rotation of the Earth; is responsible for the direction of rotation of cyclones and ocean currents.

cryosphere - the component of the climate system consisting of all snow, ice and frozen ground on and beneath the surface of the Earth and ocean.

D density – is the quantity of something per unit measure, especially per unit length, area, or volume; the mass per unit volume of a substance under specified conditions of pressure and temperature.

E earth's energy budget – A measure of all the inputs and outputs of radiative energy to and from the Earth's system. <http://earthobservatory.nasa.gov/Features/EnergyBalance/>

eddy – small volume of air (or any fluid) that behaves differently from the larger flow in which it exists.

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El Niño - is the condition when the warm mass of water in the western equatorial Pacific Ocean travels to the central and eastern Pacific Ocean. The warm water replaces the cold, nutrient rich upwelled waters along the west coasts of North and South America that are present during non-El Niño conditions. An El Niño event typically last about 12 months, but can last up to 18 months.

El Niño Southern Oscillation (ENSO) - the interaction between the movement of Pacific Ocean water (El Niño /La Niña) and the see-sawing atmospheric pressure between the eastern and western equatorial Pacific (southern oscillation). ENSO occurs when the easterly equatorial surface winds weaken, or reverse, and the warm water in the western equatorial Pacific Ocean moves to the central and eastern Pacific Ocean. This flow of water is accompanied by heavy rainfall along the coast of Peru, Mexico, and California.

eutrophication - when water becomes rich in dissolved nutrients resulting in oxygen deficiency.

evaporation - process by which a liquid changes into a gas.

evapotranspiration - vaporization of water through direct evaporation from wet surfaces and the release of water vapor by vegetation.

F ferrel cell - the middle atmospheric circulation cell in each hemisphere. Air in these cells rises at 60degrees latitude and sinks back toward the earth at 30 degrees latitude.

fossil fuels - include coal, petroleum and natural gas.

G gas solubility: The ability of a gas to dissolve into another substance.

general circulation models - complex computer simulations of climate and its various components used by researchers and policy analysts to predict climate change. Typically run on "super computers," these models can approximate future climates and give some clues to how climate has changed or might change over time.

global warming - an increase in the average temperature of the Earth's atmosphere, especially a sustained increase great enough to cause changes in the global climate. The Earth has experienced numerous episodes of global warming through its history, and currently appears to be undergoing such warming. The present warming is generally attributed to an increased *greenhouse effect*, brought about by increased levels of greenhouse gases, largely due to effects of human industry and agriculture. Expected long-term effects are rising sea levels, flooding, melting of polar ice caps and glaciers, fluctuations in temperature and precipitation, more frequent and stronger El Niños and La Niñas, drought, heat waves, and forest fires. "global warming." *The American Heritage® Science Dictionary*

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greenhouse effect – the progressive, gradual warming of the earth's atmospheric temperature, caused by the insulating effect of carbon dioxide and other greenhouse gases that have proportionately increased in the atmosphere. The sun's energy, mostly in the form of short-wavelength visible radiation penetrates the atmosphere and is absorbed by the Earth's surface. The heated surface then radiates some of the energy into the atmosphere in the form of longer-wavelength infrared radiation. Much of the radiation is absorbed by greenhouse gases in the lower atmosphere, which in turn radiates some of it back to earth. The greenhouse effect is essential to life on Earth; however, its intensification due to increased levels of greenhouse gases in the atmosphere is considered to be the main contributing factor to global warming.

greenhouse gases (GHG) – include the common gases of carbon dioxide and water vapor, but also rarer gases such as methane and chlorofluorocarbons (CFCs) whose properties relate to the transmission or reflection of different types of radiation. The increase in such gases in the atmosphere, which contributes to global warming, is a result of the burning of fossil fuels, the emissions of pollutants into the atmosphere, and deforestation. The greenhouse gases found in the atmosphere (including CO₂, H₂O, CH₄) that act to allow short wave radiation from the sun to reach the earth, but which absorbs outgoing long wave radiation from the earth surface. □

greenhouse effect – process by which the equilibrium temperature of the earth is increased due to presence of gases in the atmosphere that absorb outgoing longwave radiation. □□

growth band – secretion of CaCO₃ by coral forms yearly growth bands; one yearly growth band contains two smaller bands representing winter growth and summer growth.

H hadley cells – the atmospheric circulation cell nearest the equator in each hemisphere. Air in these cells rises near the equator because of strong solar heating there and sinks back towards the earth because of cooling at about 30 degrees latitude.

haze – fine dry or wet dust or salt particles dispersed through a portion of the atmosphere. Individually these are not visible but cumulatively they will diminish visibility.

hydrologic cycle – movement of water between the oceans, ground surface and atmosphere by evaporation, precipitation and the activity of living organisms, as one of the mayor biogeochemical cycles.

J jet stream – strong winds concentrated within a narrow zone in the atmosphere. Often used in reference to the axis of maximum mid-latitude westerlies located in the high troposphere.

Joint Implementation (JI), or *activities implemented jointly*, is a concept where industrialized countries meet their obligations for reducing their greenhouse gas emissions by receiving credits for investing in emissions reductions in developing countries. Proponents of joint implementation argue that such an international trade in emissions credits would achieve greenhouse gas reductions in industrialized countries at much lower costs while providing foreign investment benefits to developing countries.

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K Keeling curve: A graph of the continuous measurements of atmospheric carbon dioxide concentrations collected on Mauna Loa, Hawaii since 1958 under the supervision of scientist Charles David Keeling. The measurements continue to be taken today...

The Kyoto Protocol – an international agreement struck by 159 nations attending the Third Conference of Parties (COP-3) to the United Nations Framework Convention on Climate Change (held in December 1997 in Kyoto, Japan) to reduce worldwide emissions of greenhouse gases. Delegates to COP-3 agreed to the following specific provisions:

- *Developed Countries* -- Thirty-eight developed countries agreed to reduce their emissions of six greenhouse gases. Collectively, developed countries agreed to cut back their emissions by a total of 5.2 percent between 2008 and 2012 from 1990 levels. The six gases include carbon dioxide, methane, nitrous oxide, and three ozone-damaging fluorocarbons not covered by the Montreal Protocol that banned global chlorofluorocarbons (hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride). The European Union agreed to reduce their emissions by 8 percent below 1990 levels; the United States signed on to a 7 percent reduction; and Japan agreed to a 6 percent reduction. Some countries, including Russia and Ukraine, are not bound to make any reductions while countries with smaller economies such as Iceland, Norway and New Zealand are allowed to actually increase their emissions. Australia was also allowed to increase greenhouse gas emissions.
- *Countries with Economies in Transition* -- Countries undergoing the process of transition to a market economy but that are also classified along with the EU, Japan and the U.S. as Annex I parties to the Convention – including the Czech Republic, Hungary, and Poland, among others - face smaller reductions.
- *Developing Countries* -- Countries which are in the process of becoming industrialized but have constrained resources with which to combat their environmental problems -- which include China and India -- have no formal binding targets, but have the option to set voluntary reduction targets.

L La Niña – the counterpart to El Niño, recognized by colder than normal water temperatures in the eastern equatorial Pacific Ocean. It usually follows an El Niño event, but not always. La Niña typically lasts about 12 months, but can last up to 18 months.

longwave radiation – term most often used to describe the infrared energy emitted by the earth and the atmosphere.

M marine climate – climate dominated by the ocean, because of the moderating effect of water, sites having this climate are considered relatively mild.

mesosphere - The layer of the [atmosphere](#) located between the [stratosphere](#) and the [ionosphere](#), where [temperatures](#) drop rapidly with increasing height. It extends between 31 and 50 miles (17 to 80 kilometers) above the earth's surface. (weather.com)

meteorology – the study of the atmosphere and atmospheric phenomena as well as the atmosphere's interaction with the earth's surface, oceans, and life in general.

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methane (CH₄) – an odorless, colorless, flammable gas, the major constituent of natural gas, and produced by a variety of natural sources.

N natural climate record – record of climatic events found by examining the natural environment (tree rings, coral growth bands, layers of ice in glaciers).

nitrogen dioxide (NO₂) – a form of air pollution that is a brownish gas produced when nitric oxide emitted from power plants combines with oxygen already in the atmosphere. It can damage trees and lead to acid rain, which can harm lakes and streams and also corrode exposed materials. In the presence of sunlight and volatile organic compounds, NO₂ can contribute to the formation of ground-level ozone, or smog.

O ocean acidification: The name given to the ongoing decrease of the pH of the Earth's ocean caused by its uptake of anthropogenic carbon dioxide from the atmosphere.
http://en.wikipedia.org/wiki/Ocean_acidification

oxidation – relative loss of electrons in a chemical reaction; usually associated with the liberation of energy.

Ozone (O₃)– at the ground level is a form of air pollution that is produced when nitrogen oxides and hydrocarbons react in sunlight. It is not to be confused with stratospheric ozone, which is found 9 to 18 miles high in the Earth's atmosphere and protects people from harmful radiation from the sun. Ground-level ozone pollution, or smog, is mainly a problem during hot summer days.

P Pacific Decadal Oscillation (PDO) – a long lived El Niño like pattern of Pacific climate variability. In the 20th Century the PDO events persisted for 20 – 30 years while ENSO events last 6 – 18 month.

particulate matter (PM) – a form of air pollution that includes soot, dust, dirt and aerosols. It has readily apparent effects on visibility and exposed surfaces, and can create or intensify breathing and heart problems and lead to cancer and premature death.

paleoclimate – past or ancient climates.

paleoclimatologist – one who studies ancient (paleo-) climate.

paleoenvironmental proxy – environmental remnant of the past (pollen grains, tree rings, lake sediments, pack rat middens, ice cores, coral skeletons) that assist researchers in deciphering past climate conditions through the use of scientifically proven dating techniques.

pH: measure of acidity of any solution. Water has a pH of 7. Acidic solutions <7, basic solutions >7. pH is measured in a logarithmic scale with a 10 fold increase for each unit.

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pH scale: A scale used to determine the alkaline or acidic nature of a substance. The scale ranges from 0-14 with 0 being the most acidic and 14 the most basic. Pure water is neutral with a pH of 7.

precipitation – any form of water particles-liquid or solid-that falls from the atmosphere and reaches the ground.

prevailing wind – wind direction most frequently observed during a given period.

proxy signals – A general term for paleoclimate evidence that can be used to indirectly infer or estimate some aspect of the environment such as precipitation or temperature.

R radar – an instrument useful for remote sensing of meteorological phenomena; operates by sending radio waves and monitoring returning wave by such reflecting objects as raindrops within clouds.

reflection – process whereby a surface turns back a portion of the radiation that strikes it.

refraction - bending of light as it passes from one medium to another

relative dating – dating methods that determine time with respect to stratigraphic position, for example deeper layers being older, or with respect to some changing quantity or property, such as magnetic polarity.

relative humidity – the ratio of the amount of water vapor actually in the air compared to the amount of water vapor the air can hold at the particular temperature and pressure. The ratio of the air's actual vapor pressure to its saturation vapor pressure.

renewable resources – energy sources that do not use exhaustible fuels. Sources of renewable energy include water, wind, solar energy and geothermal energy, as well as some combustible materials, such as landfill gas, biomass, and municipal solid waste.

rock varnish – dark, manganese coating that forms on top of rocks, usually paper-thin. The amount of moisture affects the amount of manganese, so the thicker the varnish the wetter the climate was.

S satellite – remote sensing is the collection of data on land use, industrial activity, weather, climate, geology and other processes through Earth observations from satellites in outer space.

sea surface temperature (sst) – temperature of the ocean's surface used in collaboration with other data to predict an El Nino occurrence.

sea level rise – is the long term increase in the mean sea level resulting from a combination of local or regional geological movements and global climate change, such as sinking of the land, increased volume of the ocean due to thermal expansion, or addition of water to the ocean from melting glaciers.

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sink - process, activity or mechanism which removes greenhouse gas from the atmosphere.

smog - originally meant a mixture of smoke and fog. Today, smog means air that has restricted visibility due to pollution, or pollution formed in the presence of sunlight-photochemical smog.

solar variability - changes in the sun's radiation due to the sun's internal dynamics.

Southern Oscillation (ENSO) - shifting of pressure zones in the Pacific during an El Nino event.

stakeholder - person or organization that has a legitimate interest in a project or policy.

storm surge - abnormal rise of the sea along a shore; primarily due to the winds of a storm, especially a hurricane.

stratosphere - The layer of the atmosphere located between the troposphere and the mesosphere, characterized by a slight temperature increase and absence of clouds. It extends between 11 and 31 miles (17 to 50 kilometers) above the earth's surface. It is the location of the earth's ozone layer. (weather.com)

sublimation - process whereby ice changes directly into water vapor without melting. In meteorology, sublimation can also mean the transformation of water vapor into ice.

sulfur dioxide (SO₂) - a form of air pollution that is a gas. It results from the combustion of fuels that contain sulfur. SO₂ is most prevalent in the combustion of coal.

T thermal expansion - refers to the increase in volume that results from the warming of water.

Thermohaline Circulation - a term for the global density-driven circulation of the oceans. Seawater density depends on both temperature and salinity, hence the name *thermohaline*. The salinity and temperature differences arise from heating/cooling at the sea surface and from surface freshwater fluxes (evaporation and sea ice formation increase salinity; precipitation, runoff and ice-melt decrease salinity).

trade winds - winds that occupy most of the tropics and blow from the subtropical highs to the equatorial low; blow from the northeast to the equator in the Northern Hemisphere and from the southeast to the equator in the Southern Hemisphere.

transpiration - release of water vapor to the atmosphere by plants.

tropopause - The boundary zone or transition layer between the troposphere and the stratosphere. This is characterized by little or no increase or decrease in temperature or change in lapse rate with increasing altitude. (weather.com)

troposphere - The lowest layer of the atmosphere located between the earth's surface to

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approximately 11 miles (17 kilometers) into the atmosphere. Characterized by clouds and weather, temperature generally decreases with increasing altitude. (weather.com)

U ultraviolet radiation – electromagnetic radiation with wave-lengths longer than X-rays but shorter than visible light.

V visibility – greatest distance an observer can see and identify prominent objects.

visible light – visible portion of the electromagnetic spectrum from 0.4 to 0.7 μm wavelengths.

visual stratigraphy – the process of identifying different layers in ice, rock, sediment, or another paleo deposit, based on visually apparent distinctions such as color or other properties.

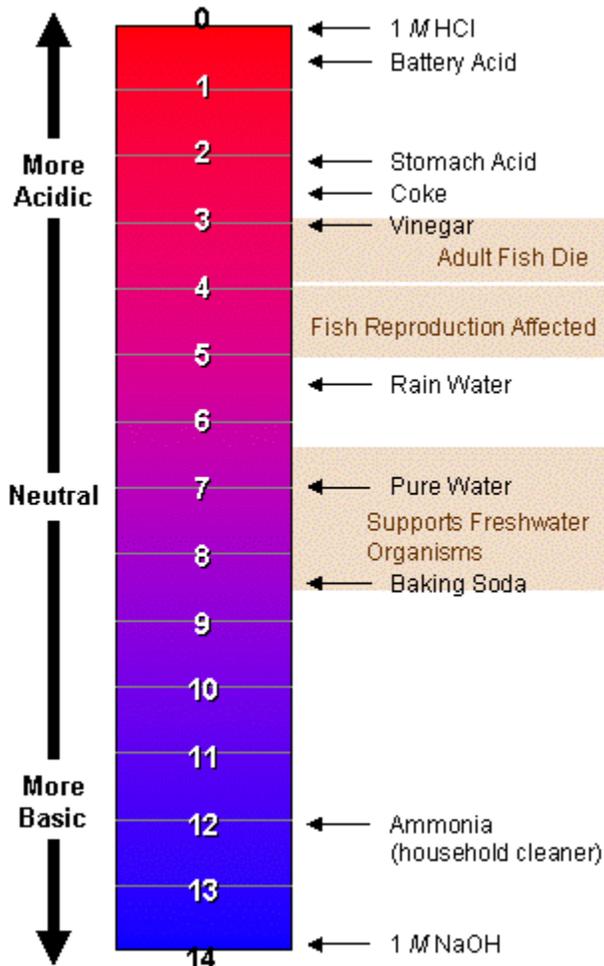
W weather – the state of the atmosphere at a given time and place, with respect to variables such as temperature, moisture, wind velocity, and barometric pressure.

wind shear – difference in wind speed or direction between two wind currents in the atmosphere.

windsock – large, conical, open bag designed to indicate wind direction and relative speed; usually used at small airports.

What is pH?

pH is a unit of measurement used to express the degree of acidity of a product. The pH scale runs from 0, meaning very acidic, to 14, which is very basic. You can actually taste the difference in many cases. An acid food will taste very sour while a basic (alkaline) food will taste bitter. Here is a pH scale example:



From pH 0-6 is acidic, from pH 8-14 is basic, and pH 7 is neutral, between the two extremes, so it is neither acidic nor basic (alkaline).

The scale is actually referring to the concentration of hydrogen (H^+) ions in the product being tested. The more H^+ ions that are present, the more acidic the product will be. The scale is logarithmic, meaning that each pH unit has 10 times more H^+ ions than the one above it.