obliquity

The angle between the plane of the Earth’s orbit and the plane of the Earth’s equator; the “tilt” of the Earth.

occluded front (occlusion)

A composite of two fronts formed as a cold front overtakes a warm front. A cold occlusion results when the coldest air is behind the cold front. The cold front undercuts the warm front and, at the Earth's surface, coldest air replaces less-cold air.

A warm occlusion occurs when the coldest air lies ahead of the warm front. Because the cold front can not lift the colder air mass, it rides piggyback up on the warm front over the coldest air.

ocean

The salt water surrounding the great land masses. The land masses divide the ocean into several distinct portions, each of which also is called an ocean. The oceans include the Pacific Ocean, the Atlantic Ocean, the Indian Ocean, and the Arctic Ocean.

ocean color

A change in the color of the ocean surface as a result of sediment, organic matter, or phytoplankton, all of which can change how the ocean surface reflects and absorbs sunlight. In a natural-color (photo-like) image from space, the clear waters of the open ocean look dark blue. Chlorophyll and other pigments in phytoplankton can color the water bright blue, green, and even reddish-brownish. Sediment can turn the water milky blue. Organic matter can turn the water tea-colored.

In calculating the transfer of radiant energy, the mass of an absorbing or emitting material lying in a vertical column of unit cross-sectional area and extending between two specified levels. Also, the degree to which a cloud prevents light from passing through it; the optical thickness then depends on the physical constitution (crystals, drops, and/or droplets), the form, the concentration, and the vertical extent of the cloud.

Optical Transient Detector (OTD)

The world's first space-based sensor capable of detecting and locating lightning events in the daytime as well as during the nighttime with high detection efficiency was designed and built at the NASA Marshall Space Flight Center (MSFC). The concept for this instrument was developed at MSFC in the 1980's, and was selected for development as part of NASA's Earth Observing System (EOS). The purpose of the sensor is to detect the full spectrum of lightning events in the daytime as well as during the nighttime with high detection efficiency. OTD is designed to aid scientists in determining the global distribution of lightning activity and thunderstorms and the characteristics of the Earth's oceans. OTD is designed to aid scientists in determining the global distribution of lightning activity and thunderstorms and the characteristics of the Earth's oceans.

orbit

The path described by a heavenly body in its periodic revolution. Earth satellite orbits with inclinations near 0 degrees are called equatorial orbits because the satellite stays nearly over the equator. Orbits with inclinations near 90 degrees are called polar orbits because the satellite crosses over (or nearly over) the north and south poles. See orbital inclination.

orbital plane

An imaginary gigantic flat plate containing an Earth satellite's orbit. The orbital plane passes through the center of the Earth.

organic

Chemistry: of or relating to any covalently bonded compound containing carbon atoms. Biology: relating to or involving an organism or organisms.

ozone

An almost colorless, gaseous form of oxygen with an odor similar to weak chlorine. A relatively unstable compound of three atoms of oxygen, ozone constitutes--on the average--less than one part per million (ppm) of the gases in the atmosphere (peak ozone concentration in the stratosphere can get as high as 10 ppm). Yet ozone in the stratosphere absorbs nearly all of the biologically damaging solar ultraviolet radiation before it reaches the Earth's surface where it can cause skin cancer, cataracts, and immune deficiencies, and can harm crops and aquatic ecosystems. See ozone layer.

Ozone is produced naturally in the middle and upper stratosphere through dissociation of molecular oxygen by sunlight. In the absence of chemical species produced by human activity, a number of competing chemical reactions among naturally occurring species—primarily atomic oxygen, molecular oxygen, and oxides of hydrogen and nitrogen—maintains the proper ozone balance. In the present-day stratosphere, this natural balance has been altered, particularly by the introduction of man-made chlorofluorocarbons. If the ozone decreases, the ultraviolet radiation at the Earth's surface will increase. See greenhouse gas

Tropospheric ozone is a by-product of the photochemical (light-induced)
processes associated with air pollution. See photochemical smog. Ozone in the troposphere can damage plants and humans. A large area of intense stratospheric ozone depletion over the Antarctic continent that typically occurs annually between late August and early October, and generally ends in mid-November. This severe ozone thinning has increased conspicuously since the late seventies and early eighties. This phenomenon is the result of chemical mechanisms initiated by man-made chlorofluorocarbons (see CFCs). Continued buildup of CFCs is expected to lead to additional ozone loss worldwide.

The thinning is focused in the Antarctic because of particular meteorological conditions there. During Austral spring (September and October in the Southern Hemisphere) a belt of stratospheric winds encircles Antarctica essentially isolating the cold stratospheric air there from the warmer air of the middle latitudes. The frigid air permits the formation of ice clouds that facilitate chemical interactions among nitrogen, hydrogen, and chlorine (elevated from CFCs) atoms, the end product of which is the destruction of ozone.

The layer of ozone that begins approximately 15 km above Earth and thins to an almost negligible amount at about 50 km, shields the Earth from harmful ultraviolet radiation from the sun. The highest natural concentration of ozone (approximately 10 parts per million by volume) occurs in the stratosphere at approximately 25 km above Earth. The stratospheric ozone concentration changes throughout the year as stratospheric circulation changes with the seasons. Natural events such as volcanoes and solar flares can produce changes in ozone concentration, but man-made changes are of the greatest concern.

Rapid, transient, polar-ozone depletion. These depletions, which take place over a 50-kilometer squared area, are caused by weather patterns in the upper troposphere. The decrease in ozone during a mini-hole event is caused by transport, with no chemical depletion of ozone. However, the cold stratospheric temperatures associated with weather systems can cause clouds to form that can lead to the conversion of chlorine compound from inert to reactive forms. These chlorine compounds can then produce longer-term ozone reductions after the mini-hole has passed.

Satellite-based ozone-measuring instruments can measure ozone by looking at the amount of ultraviolet absorption reflected from the Earth’s surface and clouds. Some instruments provide data within the different levels of the atmosphere. The Total Ozone Mapping Spectrometer (TOMS) maps the total amount of ozone between ground and the top of the atmosphere.

The amount and distribution of ozone molecules in the stratosphere varies greatly over the globe, changing in response to natural cycles such as seasons, sun cycles, and winds. Utilizing satellites has enabled scientists to assess ozone levels simultaneously over the entire Earth, and has led them to conclude that global ozone levels are being depleted.