S

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S-band A nominal frequency range from 4 to 2 GHz (7 to 20 cm wavelength) within the microwave (radar) portion of the electromagnetic spectrum. S-band radars are used for medium-range meteorological applications, for example rainfall measurements, as well as airport surveillance and specialized tracking tasks.

sahel The transition zone in Africa between the Sahara Desert to the north and tropical forests to the south. This dryland belt stretches across Africa and is under stress from land use and climate variability.

salinity The degree of salt in water. The rise in sea level due to global warming would result in increased salinity of rivers, bays and aquifers. This would affect drinking water, agriculture and wildlife.

sampling The process of obtaining a sequence of discrete digital values from a continuous sequence of analog data.

satellite A free-flying object that orbits the Earth, another planet, or the sun.

satellite revolution The time from one perigee (the point of an elliptical orbit path where a satellite is closest to Earth) to the next.

savanna One of the Earth's biomes characterized by an extensive cover of grasses with scattered trees. The savanna biome is a transitional biome between those dominated by forests and those dominated by grasses and is associated with climates having seasonal precipitation accompanied with a seasonal drought.

scanning radiometer An imaging system consisting of lenses, moving mirrors, and solid-state image sensors used to obtain observations of the Earth and its atmosphere. Scanning radiometers, which are the sole imaging systems on all current operational weather satellites, have far better long-term performance than the vidicon TV camera tubes used with earlier spacecraft.

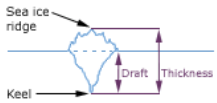
scattering The process by which electromagnetic radiation interacts with and is redirected by the molecules of the atmosphere, ocean, or land surface. The term is frequently applied to the interaction of the atmosphere on sunlight, which causes the sky to appear blue (since light near the blue end of the spectrum is scattered much more than light near the red end).

scatterometer A high-frequency radar instrument that transmits pulses of energy towards the ocean and measures the backscatter from the ocean surface. It detects wind speed and direction over the oceans by analyzing the backscatter from the small wind-induced ripples on the surface of the water.

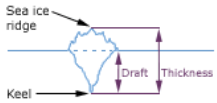
scene Object space illuminated by a sensor.

sea breeze Local coastal wind that blows from the ocean to land. Sea breezes usually occur during the day, because the heating differences of land and sea cause pressure differences. Cooler, heavier air from the sea moves in to replace rising warm air on the coastline. See land breeze

sea ice draft The height of sea ice from the keel (the lowest point underwater) to the water surface.



sea ice thickness The height of sea ice from the keel (the lowest point underwater) to the ridge (the highest point above water).



sea level The datum against which land elevation and sea depth are measured. Mean sea level is the average of high and low tides.

sea surface temperature (SST) The temperature of the layer of seawater (approximately 0.5 m deep) nearest the atmosphere.

sea surface temperature anomaly Temperature of emitted energy from the sea surface. SST anomaly = (SST - SST mean), where SST = sea surface temperature.

Sea-viewing Wide Field-of-View Sensor (SeaWiFS) SeaWiFS is an ocean color sensor to study ocean productivity and interactions between the ocean ecosystems and the atmosphere. See SeaWIFS Web Site.

sensible heat The excess radiative energy that has passed from the Earth's surface to the atmosphere through advection, conduction, and convection processes.

sensor Device that produces an output (usually electrical) in response to stimulus such as incident radiation. Sensors aboard satellites obtain information about features and objects on Earth by detecting radiation reflected or emitted in different bands of the electromagnetic spectrum. Analyzing the transmitted data provides valuable scientific information about Earth.

Weather satellites commonly carry radiometers, which measure radiation from snow, ice, clouds, and bodies of water. Spaceborne radars are used for Earth

observations, bouncing radar waves off land and ocean surfaces to study sea-surface conditions, ice thickness, and land surface features. A wind scatterometer is a special type of radar designed to measure ocean surface winds indirectly by bouncing signals off the water and measuring them from various angles. Infrared (IR) detectors measure heat generated by Earth features in the IR band of the spectrum.

Photographic reconnaissance sensors in their simplest form are large telescope-camera systems used to view objects on Earth's surface. The bigger the lens, the smaller the object that can be detected. Camera-telescope systems now incorporate all sorts of sophisticated electronics to produce better images, but even these systems need cloudless skies, excellent lighting, and good color contrast between objects and their surroundings to detect objects the size of a basketball. Some of the satellites produce film images that must be returned to Earth, but a more convenient method is to record the image as a series of digital code numbers, then reconstruct the image from the electronic code using a computer at a ground station.

sensor calibration The relationship between input and output for a given measurement.

shortwave radiation The radiation received from the sun and emitted in the spectral wavelengths less than 4 microns. It is also called 'solar radiation'.

Shuttle Radar Topography Mission (SRTM) A NASA Space Shuttle mission that used C-band and X-band interferometric synthetic aperture radars (IFSARs) to acquire topographic data over 80% of Earth's land mass (between 60degN and 56degS) between February 11-22, 2000. SRTM web site

sine wave A smoothly varying wave that repeats itself; its frequency is the rate at which the fundamental shape repeats itself. Any waveform can be distilled into a combination of pure sine waves of varying frequencies and amplitudes.

sink The process of providing storage for a substance. For example, plants--through photosynthesis--transform carbon dioxide in the air into organic matter, which either stays in the plants or is stored in the soils. The plants are a sink for carbon dioxide.

smog This is a term used to describe a mixture of smoke and fog. Smog occurs when high concentrations of moisture is combined with smoke (often containing oxides of sulfur and nitrogen) in the presence of high temperatures or thermal inversions and the absence of wind. These conditions cause polluted air to stagnate over industrial areas and can create a respiratory health hazard. Large coastal industrial centers with surrounding high ground are more prone to smog. There is often a diurnal (over a day) variation in the process of smog formation because one of the necessary components for its formation is sunlight.

solar backscatter ultraviolet radiometer (SBUV) Instrument that measures the vertical distribution and total ozone in the Earth's atmosphere. Data is used for the continuous monitoring of ozone distribution to estimate long-term trends. SBUV instruments are flown on *NOAA polar-orbiting satellites.*

solar constant Aka total solar irradiance. The constant expressing the amount of solar radiation reaching the Earth from the sun, approximately 1370 watts per square meter. It is not, in fact, truly constant and variations are detectable.

solar cycle Eleven-year cycle of sunspots and solar flares that affects other solar indexes such as the solar output of ultraviolet radiation and the solar wind. The Earth's magnetic field, temperature, and ozone levels are affected by this cycle.

solar maximum The point in the 11-year solar cycle at which sunspot activity is highest.

solar minimum The point in the 11-year solar cycle at which sunspot activity is lowest.

solar radiation Energy received from the sun is solar radiation. The energy comes in many forms, such as visible light (that which we can see with our eyes). Other forms of radiation include radio waves, heat (infrared), ultraviolet waves, and x-rays. These forms are categorized within the electromagnetic spectrum.

solar wind A continuous stream of charged solar particles (mainly hydrogen ions) and magnetic fields from the Sun. This continuous stream of ionized gas, or plasma, expands into interplanetary space from the Sun's corona. After escaping from the gravitational field of the sun, this gas flows outward at a typical speed of 400 kilometers per second to distances known to be beyond the orbit of Pluto.

Besides affecting Earth's weather, solar activity gives rise to a dramatic visual phenomena in our atmosphere. The streams of charged particles from the Sun interact with Earth's own magnetic field like a generator to create current systems with electric potentials of as much as 100,000 volts. Charged electrons are energized by this process, sent along the magnetic field lines towards Earth's upper atmosphere, excite the gases present in the upper atmosphere, and cause them to emit light which we call the auroras. The auroras are the northern (aurora borealis) and southern (aurora Australis) lights.

sounder A special kind of radiometer that measures changes in atmospheric temperature with height, as well as the content of various chemical species in the atmosphere at various levels. The High Resolution Infrared Radiation Sounder (HIRS), found on NOAA polar-orbiting satellites, is a passive instrument. See passive system.

southern oscillation A large-scale atmospheric and hydrospheric fluctuation centered in the equatorial

Pacific Ocean. It exhibits a nearly annual pressure anomaly, alternatively high over the Indian Ocean and high over the South Pacific. Its period is slightly variable, averaging 2.33 years. The variation in pressure is accompanied by variations in wind strengths, ocean currents, sea-surface temperatures, and precipitation in the surrounding areas. El Niño and La Niña occurrences are associated with the phenomenon.

spatial A characteristic that refers to a location (which may be a specific location on the Earth's surface, or relative to an arbitrary point).

spectral band A finite segment of wavelengths in the electromagnetic spectrum.

spectral signature This refers to the particular form or shape evinced by the power spectrum calculated from the data comprising the time series of a process.

spectrophotometer A device for measuring the relative amounts of radiant energy or radiant flux as a function of wavelength.

spectrum 1. The series of colored bands diffracted and arranged in the order of their respective wave lengths by the passage of white light through a prism or other diffracting medium and shading continuously from red (produced by the longest visible wave) to violet (produced by the shortest visible wave).

2. Any of various arrangements of colored bands or lines, together with invisible components at both ends of the spectrum, similarly formed by light from incandescent gases or other sources of radiant energy, which can be studied by a spectrograph.

3. In radio, the range of wave lengths of radio waves, from 3 centimeters to 30,000 meters, or of frequencies of radio waves, from 10 to 10,000,000 kilocycles. Also radio spectrum.

4. The entire range of radiant energies. See electromagnetic spectrum.

SPOT Systeme Pour l'Observation de la Terre. French, polar-orbiting Earth observation satellite(s) with ground resolution of 10 meters. SPOT images are available commercially and are intended for such purposes as environmental research and monitoring, ecology management, and for use by the media, environmentalists, legislators, etc.

Stennis Space Center (SSC) The John C. Stennis Space Center (SSC), located on Mississippi's Gulf Coast, is NASA's prime test facility for large liquid propellant rocket engines and propulsion systems. The main mission of the Center is to support testing, on a regular basis, of the Space Shuttle's main propulsion system. SSC is responsible for a variety of research programs in the environmental sciences and the remote-sensing of Earth resources, weather, and oceans, and is the lead NASA Center for the commercialization of space remote sensing. SSC Web Site

stratocumulus Low altitude gray colored clouds composed of water droplets that have a patchy appearance. Each cloud patch consists of a rounded mass. This cloud has a somewhat uniform base and normally covers the entire sky. Between the patches blue sky can be seen.

stratosphere Region of the atmosphere between the troposphere and mesosphere, having a lower boundary of approximately 8 km at the poles to 15 km at the equator and an upper boundary of approximately 50 km. Depending upon latitude and season, the temperature in the lower stratosphere can increase, be isothermal, or even decrease with altitude, but the temperature in the upper stratosphere generally increases with height due to absorption of solar radiation by ozone.

Stratospheric Aerosol & Gas Experiment (SAGE) A NASA experiment to determine the vertical distribution of stratospheric aerosols, ozone, nitrogen oxide, and water vapor on a global scale and to develop a viable, satellite-based, remote sensing technique to measure these gases. SAGE III web site

subduction a process in which one lithospheric plate descends beneath another, often as a result of folding or faulting

subsatellite point Point where a straight line drawn from a satellite to the center of the Earth intersects the Earth's surface.

subsidence In weather forecasting terminology, this term refers to sinking motions of air masses. It could also refer to sinking motions within fluids or bodies of water.

subtropical Generally the part of the Earth's surface between the tropics and the temperate regions, or between about 40 degrees N. and S.

sulfate aerosol Particulate matter that consists of compounds of sulfur formed by the interaction of sulfur dioxide and sulfur trioxide with other compounds in the atmosphere. Sulfate aerosols are injected into the atmosphere from the combustion of fossil fuels and the eruption of volcanoes like Mt. Pinatubo. Recent theory suggests that sulfate aerosols may lower the Earth's temperature by reflecting away solar radiation (negative radiative forcing). Global Climate Models which incorporate the effects of sulfate aerosols more accurately predict global temperature variations.

sulfur dioxide (SO2) A compound composed of one sulfur and two oxygen molecules. Sulfur dioxide emitted into the atmosphere through natural and anthropogenic processes is changed in a complex series of chemical reactions in the atmosphere to sulfate aerosols. These aerosols result in negative radiative forcing (i.e., tending to cool

the Earth's surface).

Sun
The closest star to Earth (149,599,000 km away on average). The sun dwarfs the other bodies in the solar system, representing approximately 99.86 percent of all the mass in the solar system. One hundred and nine Earths would be required to fit across the Sun's disk, its interior could hold over 1.3 million Earths.

The source of the Sun's energy is the nuclear reactions that occur in its core. There, at temperatures of 15 million degrees Celsius (27 million degrees Fahrenheit) hydrogen atom nuclei, called protons, are fused and become helium atom nuclei. The energy produced through fusion at the core moves outward, first in the form of electromagnetic radiation called photons. Next, energy moves upward in photon heated solar gas--this type of energy transport is called convection. Convective motions within the solar interior generate magnetic fields that emerge at the surface as sunspots and loops of hot gas called prominences. Most solar energy finally escapes from a thin layer of the Sun's atmosphere called the photosphere--the part of the Sun observable to the naked eye.

The sun appears to have been active for 4.6 billion years and has enough fuel for another 5 billion years or so. At the end of its life, the Sun will start to fuse helium into heavier elements and begin to swell up, ultimately growing so large that it will swallow Earth. After a billion years as a 'red giant,' it will suddenly collapse into a 'white dwarf.' It may take a trillion years to cool off completely.

sun-synchronous
Describes the orbit of a satellite that provides consistent lighting of the Earth-scan view. The satellite passes the equator and each latitude at the same time each day. For example, a satellite's sun-synchronous orbit might cross the equator twelve times a day, each time at 3:00 p.m. local time. The orbital plane of a sun-synchronous orbit must also precess (rotate) approximately one degree each day, eastward, to keep pace with the Earth's revolution around the sun.

sunphotometer
A device that measures the properties of light emanating from the sun.

sunspot
A region on the surface (photosphere) of the sun that is temporarily cool and dark compared to surrounding areas. See Sunspots and the Solar Max and ACRIMSAT fact sheet

surface air temperature
The temperature of the air near the surface of the Earth, usually determined by a thermometer in an instrument shelter about 2 m above the ground. The true daily mean, obtained from a thermograph, is approximated by the mean of 24 hourly readings and may differ by 1.0 degrees C from the average based on minimum and maximum readings. The global average surface air temperature is 15 degrees C.

swath
The area observed by a satellite as it orbits the Earth.

synoptic chart
Chart showing meteorological conditions over a region at a given time; weather map.

synoptic view
The ability to see large areas at the same time.

synthetic aperture radar (SAR)
A high-resolution ground-mapping technique that effectively synthesizes a large receiving antenna by processing the phase of the reflected radar return. The along-track resolution is obtained by timing the radar return (time-gating) as for ordinary radar. The cross-track (azimuthal) resolution is obtained by processing the Doppler phase of the radar return. The cross-track 'dimension' of the antenna is a function of the length of time over which the Doppler phase is collected. See Doppler effect.

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