

# REFERENCE MATERIAL

# Glossary of Weather Terms

Bureau of Meteorology › Weather Services › Aviation

## A

**ACCRETION** The process of supercooled water droplets freezing on impact with snow-flakes, ice particles or other cold objects including aircraft.

**ADIABATIC COOLING** Cooling of a parcel of gas by expansion, with no heat exchange between the parcel and the surrounding air.

**ADIABATIC HEATING** Warming of a parcel of gas by compression, with no heat exchange between the parcel and the surrounding air.

**ADIABATIC PROCESS** A process where a parcel of air cools or warms due to a change in pressure and volume (expansion or compression), with no heat exchange between the parcel and the surrounding air.

**ADVECTION** The horizontal transport of any property in the atmosphere by the movement of air.

**ADVECTION FOG** Fog resulting from the movement of moist air over a colder surface and the consequent cooling of the air to saturation.

**ADVECTED FOG** Fog transported by local winds from one locality to another.

**AIR DENSITY** The mass of air per unit volume.

**AIR MASS** An extensive body of air with approximately uniform temperature and moisture characteristics.

**ALTIMETER** An instrument used to determine altitude using atmospheric pressure (QNH).

**ALTITUDE** The vertical distance from mean sea level to an object aloft.

**ALTOCUMULUS** A principal cloud type, forming in the middle levels of the troposphere, and appearing as a white and/or grey layer or patch with a wavy aspect. In aviation forecasts and reports it is coded as AC.

**ALTOSTRATUS** A principal cloud type, forming in the middle levels of the troposphere, and appearing as a grey or bluish sheet. In aviation forecasts and reports it is coded as AS.

**ANABATIC WIND** An uphill wind generated by the heating of a sloping surface.

**ANEMOMETER** An instrument used to measure wind speed and direction.

**ANEROID BAROMETER** A non-liquid instrument used to measure atmospheric pressure.

**ANOMALOUS PROPAGATION** The non-standard propagation of a beam of energy (radio or radar) under certain atmospheric conditions, which results in false echoes (i.e. non-precipitation) on a radar image. Usually caused by unusual rates of refraction in the atmosphere.

**ANTI-ICING EQUIPMENT** Aircraft equipment, such as heating elements and flexible rubber strips, used to prevent or clear structural icing.

**ANTICYCLONE** An extensive horizontal spiral movement of the atmosphere around and away from a central region of high pressure. The spiral motion is anticlockwise in the southern hemisphere and clockwise in the northern hemisphere.

**ANVIL** The upper portion of a cumulonimbus cloud that spreads out under the tropopause, often in the shape of a blacksmith's anvil, sometimes for hundreds of kilometres downstream from the parent cloud. It

indicates the mature or decaying stage of a thunderstorm.

**AIRCRAFT ICING** Any deposit of ice forming on an aircraft.

**ATMOSPHERE** The gaseous portion of the physical environment that encircles the earth. The divisions of the atmosphere are the troposphere, the stratosphere, the mesosphere, the ionosphere, and the exosphere.

**ATMOSPHERIC PRESSURE** The total weight of the atmosphere above the point of measurement.

## B

**BACKING** A counter clockwise shift in the wind direction.

**BAROMETER** An instrument for measuring atmospheric pressure. Two types of barometer are the aneroid barometer and the mercury barometer.

**BLOWING DUST** Dust that is raised locally by the wind to a height of at least two metres above the ground. In aviation forecasts and reports it is coded as BLDU.

**BLOWING SNOW** Snow that is raised locally by the wind to a height of at least two metres above the ground. In aviation forecasts and reports it is coded as BLSN.

**BOILING POINT** The temperature at which the vapour pressure of a liquid is equal to that of the surrounding atmosphere. The boiling point of pure water at the standard sea-level pressure of 1013.25 hPa is 100°C (373°K).

**BROKEN CLOUD** Used to describe an amount of cloud covering the sky of between five and seven oktas (eighths). In aviation forecasts and reports it is coded as BKN

**BUOYANCY** In meteorology, it is the vertical force acting upon an air



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parcel as a result of a difference in density between the air parcel and its surrounding environment.

**BUYS BALLOT'S LAW** Describes the relationship of the wind direction to the pressure distribution. In the southern hemisphere, if one stands with one's back to the wind, lower pressure is to the right. Lower pressure will be to the left in the northern hemisphere.

## C

**CARBURETTOR ICING** Occurs when air (including warm air) with a high water vapour content is drawn into an aircraft's carburettor (which is chilled by the fuel evaporation process coupled with the pressure reduction in the carburettor's venturi) causing the water vapour to condense and then, if the temperature has dropped below 0°C, form ice on the surfaces of the carburettor. The ice may gradually block the venturi or cause jamming of the mechanical parts of the carburettor.

**CEILOMETER** An instrument for estimating cloud amount and height.

**CELSIUS TEMPERATURE SCALE** (°C) A temperature scale, named after the Swedish astronomer Anders Celsius, where water at the standard sea-level pressure of 1013.25 hPa has a freezing point of 0°C and a boiling point of 100°C.

**CHANGE OF STATE** A change in the form of water, e.g. liquid to vapour, ice to liquid, ice to vapour.

**CIRROCUMULUS** A principal cloud type, forming in the high levels of the troposphere, composed of ice crystals which appear from the ground as very small elements in the form of grains or small ripples. In aviation forecasts and reports it is coded as CC.

**CIRROSTRATUS** A principal cloud type, forming in the high levels of the troposphere, composed of ice crystals which appear from the ground as a transparent sheet or veil, often creating a halo phenomenon around the sun or

moon. In aviation forecasts and reports it is coded as CS.

**CIRRUS** A principal cloud type, forming in the high levels of the troposphere, composed of ice crystals which appear from the ground as white tufts or filaments. In aviation forecasts and reports it is coded as CI.

**CLEAR AIR TURBULENCE (CAT)** A form of turbulence occurring in regions of marked wind shear, particularly at the boundaries of jet streams, but may also be found in strong lee waves. It occurs in the absence of any visual clues (i.e. clouds).

**CLEAR ICE** A sheet of transparent ice formed by the relatively slow freezing of large supercooled water droplets, i.e. rain. Does not seriously distort aerofoil shape but does add appreciably to aircraft weight and drag.

**COLD AIR ADVECTION** The horizontal movement of colder air into a location of warmer air.

**COLD FRONT** The leading edge of an advancing cold air mass that is replacing warmer air.

**CONDENSATION** Change of state from vapour to liquid.

**CONDENSATION NUCLEI** Tiny particles upon which water vapour condenses.

**CONDENSATION LEVEL** The height at which an adiabatically lifted air parcel will become saturated, whereupon condensation occurs. Corresponds to cloud base level.

**CONDITIONAL INSTABILITY** Stable unsaturated air that will become unstable if saturated.

**CONDUCTION** The transfer of heat in response to a temperature gradient within an object or between objects that are in physical contact with one another. Transfer is from warmer to colder regions.

**CONSTANT PRESSURE CHART** A weather chart representing conditions on a constant pressure surface, e.g. 500 hPa.

**CONTACT COOLING** The process whereby heat is conducted away from warmer air to a colder surface.

**CONTINENTAL AIR MASS** An extensive body of air, with a more-or-less uniform temperature and moisture profile, which has originated over a large land mass.

**CONTOUR** A line joining points of equal value on a surface.

**CONTRAIL** A condensation trail may form behind an aircraft when hot humid air from the a jet exhaust mixes with environmental air of low water vapour and low temperature. If the increased vapour leads to saturation, the vapour will condense into water droplets and/or deposit into ice.

**CONVECTION** In meteorology, it is the vertical transport of heat and moisture, especially by updrafts and downdrafts in an unstable atmosphere.

**CONVECTIVE CLOUD** A cloud that owes its vertical development, and possibly its origination, to convection.

**CONVECTIVE CONDENSATION LEVEL** The lowest height at which condensation will occur as a result of convection due to surface heating.

**CONVERGENCE** The condition that exists as a result of a net horizontal inflow of air into a region. Convergent winds at lower levels are associated with upward motion.

**COORDINATED UNIVERSAL TIME (UTC)** The primary time standard by which the world regulates clocks and time. In aviation forecasts and reports it is signified by the letter Z.

**CORIOLIS FORCE (EFFECT)** An apparent force on a moving particle that arises solely from the earth's rotation acting as a deflecting force. It acts to the left in the southern hemisphere and to the right in the northern hemisphere. It is greatest at the poles and nonexistent at the equator.

**CUMULONIMBUS** A principal cloud type, with bases forming in the low levels of the troposphere, characterised by a large vertical extent, and often

capped by an anvil-shaped cirrus cloud. It is often accompanied by rain showers, turbulence, icing and gusty surface winds; and sometimes also by lightning, thunder, hail, microbursts and/or tornadoes. In aviation forecasts and reports it is coded as CB

**CUMULUS** A principal cloud type, forming in the low levels of the troposphere, characterised by flat bases and dome or cauliflower-shaped upper surfaces. Small, separate cumulus are associated with fair weather, but may grow into towering cumulus or cumulonimbus. In aviation forecasts and reports it is coded as CU.

## D

**DENSITY** The weight of air per unit volume.

**DENSITY ALTITUDE** The altitude in the International Standard Atmosphere at which a given air density is found.

**DEPOSITION** A process in which a gas transforms into a solid, e.g. the process by which water vapour, in sub-freezing air, changes directly to ice without first becoming a liquid.

**DEW** Water in the form of small liquid drops that form on grass and other objects near the ground when the air temperature falls below its dew point, usually overnight.

**DEW POINT** The temperature to which air must be cooled, at constant pressure and water vapour content, in order for saturation to occur. If the air is cooled further, some of the water vapour will condense to liquid.

**DIURNAL** Pertaining to actions that are completed within twenty four hours, and recur every twenty four hours.

**DIVERGENCE** Horizontal outflow of air from a particular region. Divergence at lower levels is associated with a downward movement of air.

**DOLDRUMS** A nautical term for the equatorial trough, an area which typically has calm or light and variable winds.

**DOWNBURST** A severe localised downdraft of wind from a

cumulonimbus or towering cumulus cloud. The outward burst of air creates damaging winds at or near the earth's surface. The term microburst is used to describe a downburst which causes damage over an area with horizontal dimensions of less than four kilometres.

**DOWNDRAFT** A descent of cool air associated with convective cloud.

**DOWNSLOPE WIND** A wind directed down a slope, often used to describe winds produced by processes larger in scale than the slope.

**DRIFTING SNOW** Snow blown from the ground by the wind to a height of less than two metres.

**DRIZZLE** Slow-falling and uniformly distributed precipitation in the form of tiny water droplets (diameters less than 0.5 millimeters), usually from stratus or stratocumulus clouds. In aviation forecasts and reports it is coded as DZ.

**DRY ADIABAT** A line of constant potential temperature on a thermodynamic diagram. Meteorologically, the dry adiabat represents the meteorological processes that occur with the adiabatic ascent or descent of a parcel of dry air (where no liquid water is present and no condensation of water vapour occurs). As an air parcel ascends adiabatically, its pressure decreases and its temperature falls due to the expansion of the air parcel; as it descends, its temperature will rise due to compression of the air parcel.

**DRY ADIABATIC LAPSE RATE** The rate of change in temperature for dry air ascending or descending adiabatically. The rate is approximately 3°C per 1000 feet.

**DRY LINE** The boundary between dry and moist air masses.

**DUST** Small particles of earth or other matter suspended in the air. In aviation forecasts and reports it is coded as DU.

**DUST DEVIL** A small and rapidly rotating column of wind made visible by the dust, dirt or debris picked up by the wind. It usually occurs in arid or

semi-arid areas and is most likely to develop on clear, dry, hot afternoons in response to surface heating. In aviation forecasts and reports it is coded as PO.

**DUSTSTORM** A phenomenon characterized by strong winds and dust-filled air over a large area, and reducing visibility to below 1000 metres. In aviation forecasts and reports it is coded as DS.

## E

**ECHO** In meteorology, it is used to refer to the appearance on a radar display of the radio signal reflected from a target (e.g. cloud).

**EDDY** A small disturbance in the wind that can produce turbulence.

**ELEVATION** The distance between mean sea level and a point on the earth's surface.

**EQUATOR** The geographic circle at 0° latitude on the earth's surface.

**EQUILIBRIUM LEVEL** The height at which a rising parcel of air will become equal in temperature to that of the environment, at which point it is no longer buoyant and thus will cease to rise in the atmosphere without forcing.

**EQUATORIAL TROUGH** The quasi-continuous area of low pressure located between the subtropical high pressure belts of the northern and southern hemispheres, and moving north and south with the seasons.

**EVAPORATION** The physical process by which a liquid, such as water, is transformed into its gaseous state.

**EYE** An area of clear skies that develops in the centre of a tropical cyclone. It is characterised by light winds and no rainfall.

**EYE WALL** An organized band of cumulonimbus clouds that surrounds the eye of a tropical cyclone.

## F

**FAHRENHEIT TEMPERATURE SCALE** (°F) The temperature scale, developed by the German physicist Daniel Gabriel Fahrenheit in 1714, where water at the standard sea-level pressure of 1013.25

hPa has a freezing point of +32°F and a boiling point of +212°F.

**FEEDER BANDS** The lines or bands of cumulonimbus clouds that spiral into and around the centre of a tropical cyclone.

**FEW** Used to describe an amount of cloud covering the sky of one or two oktas (eighths). In aviation forecasts and reports it is given as FEW.

**FOEHN** A warm and dry downslope wind descending the lee side of a mountain range.

**FOG** A suspension in the air, at or near the earth's surface, of microscopic water droplets, or wet hygroscopic particles, reducing horizontal visibility to less than 1000 metres. In aviation forecasts and reports it is coded as FG.

**FREEZING DRIZZLE** Supercooled drizzle (i.e. drizzle existing at a temperature below 0°C) that freezes upon impact with surfaces to form glaze. In aviation forecasts and reports it is coded as FZDZ.

**FREEZING POINT** The temperature at which a liquid solidifies under any given set of conditions. Pure water under the standard sea-level pressure of 1013.25 hPa freezes at 0°C (32°F).

**FREEZING PRECIPITATION** Any form of supercooled precipitation that freezes upon impact with surfaces to form glaze.

**FREEZING RAIN** Supercooled rain that falls as liquid but freezes upon impact with surfaces to form glaze. In aviation forecasts and reports it is coded as FZRA

**FRICTION** The mechanical resistive force offered by one medium or body to the relative motion of another medium or body in contact with the first. In meteorology, it is the drag or resistance of the earth on the atmosphere.

**FRICTION LAYER (BOUNDARY LAYER, SURFACE LAYER)** The thin layer of the lower atmosphere within which wind direction and speed is subject to frictional effects caused by contact with the earth's surface. It's

depth is variable, ranging from tens of metres in a stable environment, to several kilometres in convective conditions over deserts.

**FRONT** The transition zone or interface between two air masses of different densities.

**FRONTAL PASSAGE** The passage of a front over a specific point on the earth's surface. Changes in temperature, dew point, wind and atmospheric pressure occur with a frontal passage.

**FUNNEL CLOUD** A violent, rotating column of air visibly extending toward the earth's surface from the base of a towering cumulus or cumulonimbus cloud. A funnel cloud reaching the ground is called a tornado if over land, and a waterspout if over water. In aviation forecasts and reports it is coded as FC.

## G

**GEOSTATIONARY SATELLITE** A weather satellite, in a west to east orbit at an altitude of 35 786 km, that maintains the same position over the equator.

**GESTROPHIC WIND** A wind that blows parallel to straight isobars above the friction layer, wherein the coriolis force exactly balances the horizontal pressure gradient force.

**GLAZE** A coating of ice, generally clear and smooth, formed on surfaces by the freezing of supercooled rain, drizzle or fog.

**GRADIENT WIND** A wind that blows parallel to curved isobars above the friction layer, wherein the wind direction is determined by the balance of three forces, i.e. the coriolis force, the centrifugal force and the horizontal pressure gradient force.

**GREENWICH MEAN TIME (GMT).** Was used to refer to the primary time standard, but now replaced by Coordinated Universal Time (UTC).

**GROUND CLUTTER** A pattern of radar echoes from fixed ground objects such as buildings, hills or other objects on or close to the ground.

**GUST** A sudden and brief increase in wind speed.

**GUST FRONT** The leading edge of cool air rushing down and out from a thunderstorm cloud. Is usually accompanied by a drop in temperature, a wind shift and a pressure jump

**HAIL** Precipitation that originates in convective clouds, such as cumulonimbus, in the form of balls or irregular pieces of ice. In aviation forecasts and reports it is coded as GR, with small hail coded as GS.

## H

**HAZE** Dust and/or smoke particles suspended in the air, and reducing the visibility to 5000 metres or less. In aviation forecasts and reports it is coded as HZ.

**HIGH PRESSURE SYSTEM** An area of pressure maximum with diverging and anti-clockwise winds in the southern hemisphere and clockwise in the northern hemisphere.

**HOARFROST** A deposit of interlocking ice crystals formed by direct deposition on objects such as tree branches, leaf edges, wires and poles.

## I

**ICING** The formation of ice, rime or hoarfrost on an aircraft.

**INFRARED** Long-wave electromagnetic radiation which is emitted by all objects.

**INSOLATION** Solar radiation or heating received at the earth's surface. The name is derived from INcoming SOLar radiATION.

**INSTABILITY** A state of the atmosphere where an air parcel lifted vertically will freely accelerate upward once the lifting mechanism ceases. The air parcel will form cumulus-type clouds if sufficient moisture is present.

**INSTRUMENT FLIGHT RULES** A set of regulations governing all aspects of civil aviation aircraft operations when a flight is conducted using instruments rather than outside visual reference.

## **INTERNATIONAL STANDARD**

**ATMOSPHERE (ISA)** A hypothetical vertical distribution of atmospheric temperature, pressure and density that by international agreement is taken to be representative of the atmosphere for purposes of pressure altimeter calibrations, aircraft performance calculations, ballistic tables, etc.

## **INTERTROPICAL CONVERGENCE**

**ZONE** The region where southeast and northeast trade winds meet, usually located between 10 degrees north and south of the equator. It is a broad area of low pressure, located in the southern hemisphere during our summer, and in the northern hemisphere during its summer.

**INVERSION** An increase in temperature with increasing altitude, which is opposite to the usual decrease of temperature with increasing altitude.

**ISOBAR** A line on a chart connecting points of equal pressure.

**ISOTACH** A line on a chart connecting points of equal wind speed

**ISOTHERM** A line on a chart connecting points of equal temperature.

## **J**

**JET STREAM** An area of strong winds concentrated in a relatively narrow band. Is most commonly used to refer to a stream of maximum winds embedded in the mid-latitude westerlies concentrated in the upper troposphere.

## **K**

**KATABATIC WIND** A drainage wind generated by air being cooled by conduction along a slope. The cooled air flows downhill as a katabatic wind.

**KELVIN-HELMHOLTZ WAVE** A wave-form disturbance that arises from Kelvin-Helmholtz instability. Named after Lord Kelvin and Hermann von Helmholtz.

**KELVIN-HELMHOLTZ INSTABILITY** Occurs when velocity shear is present within a continuous fluid, or when there is sufficient velocity difference across the interface between two fluids.

**KELVIN-HELMHOLTZ CLOUD** Cloud that forms in Kelvin-Helmholtz waves. The clouds, sometimes referred to as billows, are in the shape of breaking waves. These clouds are often good indicators of instability and the presence of turbulence.

## **KELVIN TEMPERATURE SCALE**

(°K) A temperature scale, designed by Lord Kelvin of Scotland in 1848, where 0°K is defined as absolute zero (where all molecular movement stops). Water freezes at 273°K, and boils at 373°K. It is used primarily for scientific purposes.

**KNOT** A unit of speed equivalent to 1.852 kilometers per hour. In aviation forecasts and reports it is signified by KT.

## **L**

**LAND BREEZE** A diurnal coastal or lake breeze that blows offshore. It is caused by the temperature differences between a water surface and adjacent land.

**LAPSE RATE** The rate of change of temperature with height in the atmosphere.

**LATENT HEAT** The energy absorbed or released during a change of state. Evaporation, melting and sublimation (a change from solid to gas) absorb heat from the surrounding air as energy is needed to weaken the individual hydrogen bonds between the water molecules. Condensation, freezing and deposition (gas to solid) release the latent heat, thus adding heat to the surrounding air.

**LATITUDE** A geographic coordinate that specifies the north-south position of a point on the earth's surface. It is measured as the angular distance, subtended at the earth's center, along a meridian from a point on the earth to the equator. The equator is designated as zero degrees and the poles as 90 degrees.

**LEE (LEESIDE/LEEWARD)** The side of an obstacle that is furthest away from the wind.

**LENTICULAR CLOUD** A more-or-less isolated cloud, downwind of a barrier,

resembling a smooth lense with sharp outlines. They mostly occur in mountain waves, and thus indicate possible severe turbulence and icing.

**LEVEL OF FREE CONVECTION** The height at which a parcel of saturated air becomes warmer than the surrounding air and thus begins to rise freely until it reaches its equilibrium level.

**LIFTING CONDENSATION LEVEL** The height at which a parcel of moist air becomes saturated when it is cooled by adiabatic lifting.

**LIGHTNING** A visible electrical discharge produced by a cumulonimbus cloud. It can occur between cloud and ground, between clouds, within a single cloud, or between a cloud and surrounding air.

**LONGITUDE** A geographic coordinate that specifies the east-west position of a point on the earth's surface. It is measured as an angle in reference to the Prime Meridian, which is designated as zero degrees longitude.

**LOW LATITUDES** The latitude belt between the equator and 30 degrees north and south of the equator.

**LOW LEVEL JET** A transient strong wind concentrated in relatively narrow bands near the earth's surface.

**LOW PRESSURE SYSTEM** An area of pressure minimum with converging winds rotating clockwise in the southern hemisphere and anticlockwise in the northern hemisphere.

## **M**

**MARITIME AIR MASS** An air mass that has originated over an extensive water surface.

**MEAN SEA LEVEL** The height of the sea surface, measured with respect to land-based benchmarks, after averaging out variations due to tides and waves. In aviation it is used as a measurement reference for altitude at flight levels.

**MEAN SEA LEVEL PRESSURE (MSLP)** The atmospheric pressure at mean sea level.

### **MECHANICAL TURBULENCE**

Disrupted air-flow resulting from wind flowing over or around terrain or man-made obstructions, whereby normal horizontal wind flow is disturbed and transformed into eddies and other irregular movements.

**MERIDIONAL FLOW** Atmospheric circulation in which the north and south component of motion is pronounced.

**METAR** A French acronym for a meteorological report from an aerodrome at a routine time (1/2 hourly) when conditions are better than specified thresholds. It is the primary format in aeronautical meteorology for reports of surface meteorological information at an aerodrome.

**MICROBURST** Used to refer to a severe downburst of wind, usually from a thunderstorm, over an area of less than four kilometers in diameter. The term downburst is used to refer to larger diameters.

**MIST** A suspension in the air, at or near the earth's surface, of microscopic water droplets or wet hygroscopic particles which reduce the horizontal visibility to less than 5000 metres but not less than 1000 metres. In aviation forecasts and reports it is coded as BR.

**MIXING RATIO** The ratio of the mass of a variable atmospheric constituent to the mass of dry air. In meteorology, the term normally refers to water vapour.

**MONSOON** The seasonal shift of winds caused by the much greater annual variation of temperature over large land areas compared with neighbouring ocean surfaces, which results in an excess of air pressure over the land areas in winter and a deficit in summer. The monsoon is strongest on the southern and eastern sides of Asia.

**MOUNTAIN WAVE** An oscillation above and downwind of a mountain caused by a disturbance in the horizontal air flow due to the high ground. They usually occur in groups, and aircraft can expect to encounter severe turbulence and icing if flying through them. In aviation forecasts it is coded as MTW.

**MULTICELL STORM** A storm system composed of two or more convective cells at various stages of their life-cycle.

## **N**

**NIMBOSTRATUS** Low or middle-level thick dark cloud with with more or less continuously falling rain, snow or sleet. In aviation forecasts and reports it is coded as NS.

## **O**

**OCCLUDED FRONT** A front formed when a cold front overtakes a warm front.

**OROGRAPHIC LIFTING** Occurs where the flow of air is forced up and over physical barriers such as mountains.

## **P**

**PARCEL** A theoretical small and self-contained volume of air responding to meteorological processes as a single entity.

**PILOT REPORT** A report of in-flight weather by an aircraft pilot. Referred to as an AIREP.

**POLAR AIR MASS** An air mass that forms over a high latitude region. Continental polar air is formed over cold land surfaces and is typically very stable with low moisture.

**POLAR FRONT** A semi-continuous, semi-permanent boundary between polar and subtropical air masses.

**POLAR-FRONT JET** A jet stream associated with the polar front, occurring at around 23-39,000 feet above the earth's surface. It is depicted on analysis and forecast charts when the wind is 80 knots or more.

**POLAR-ORBITING SATELLITE** A satellite whose orbit passes over both of the earth's poles.

**POTENTIAL TEMPERATURE** The temperature that an unsaturated parcel of dry air would have if it is brought adiabatically from its initial state to a standard pressure, typically 1000 hPa.

**PRECIPITATION** In meteorology it is any product of the condensation of atmospheric water vapour that falls under gravity.

**PRE-FRONTAL SQUALL LINE** A line of thunderstorms that may develop ahead of an advancing cold front, and having an orientation more or less parallel to the cold front.

**PRE-FRONTAL TROUGH** An elongated area of relatively low pressure that may develop ahead of an advancing cold front.

**PRESSURE ALTIMETER** An aneroid barometer calibrated to indicate altitude by measuring atmospheric pressure and using the standard atmosphere pressure/height relations. The indicated altitude will only equal the actual altitude if the actual atmosphere is equivalent to the International Standard Atmosphere.

**PRESSURE ALTITUDE** The altitude in the International Standard Atmosphere at which a given atmospheric pressure will be observed.

**PRESSURE GRADIENT** The pressure change that occurs over a fixed distance.

**PREVAILING WIND** A wind that blows from one direction more frequently than any other during a given period.

**PROGNOSTIC CHART** A forecast weather chart. Commonly known as a prog chart.

## **Q**

**QUASI-STATIONARY FRONT** A front which is nearly stationary or moving very slowly.

## **R**

**RADAR** Acronym for RAdio Detection And Ranging. An electronic instrument used to detect distant objects and measure their range by detecting scattered or reflected radio energy.

**RADIATION** The process by which energy is propagated through any medium by virtue of the wave motion in that medium. Electromagnetic radiation, which emits heat and light, is one form.

**RADIATIONAL COOLING** The cooling of the earth's surface and the adjacent air which occurs at night when the earth's surface suffers a net loss of

heat due to outgoing radiation being greater than incoming radiation.

**RADIATION FOG** Fog that forms when radiational cooling at the earth's surface lowers the temperature of the air near the ground to, or below, its dew-point.

**RAIN** Precipitation in the form of liquid water droplets greater than 0.5 mm diameter. In aviation forecasts and reports it is coded as RA.

**RELATIVE HUMIDITY** The ratio of the vapour pressure to the saturation vapour pressure with respect to water. Also known as the ratio of the existing amount of water vapour to that which could be held by a parcel of air. It is usually expressed as a percentage.

**RESOLUTION** In relation to radar, it is the ability to read two distinct targets separately. The clearer the resolution, the nearer the two objects can be to each other and still be distinguishable.

**RIDGE** An elongated area of high pressure.

**RIME** Ice formed by the rapid freezing of supercooled water droplets when they contact an exposed object, such as an aircraft frame, forming a white and opaque granular deposit of ice.

**ROLL CLOUD** A low-level, horizontal, tube-shaped cloud. Usually associated with a thunderstorm gust front, where the roll cloud is completely detached from the base of the cumulonimbus cloud. It will sometimes form with a cold front.

**ROTOR CLOUD** A cloud formation found in the lee of a mountain or similar barrier. The air rotates around a horizontal axis parallel to the barrier, causing a hazard to aircraft.

**RUNWAY VISUAL RANGE (RVR)**  
The maximum distance at which the runway, or lights or markers delineating it, can be seen from a position above a specified point on its centerline.

## S

**ST. ELMO'S FIRE** A luminous and sometimes audible electric discharge that occurs from objects, especially pointed ones, when the local electrical

field (voltage) attains a strength of near 1000 volts per centimeter. It often occurs during the latter phases of a violent thunderstorm. It typically appears on the extremities of aircraft, lightning rods and steeples.

**SANDSTORM** A strong wind carrying sand through the air and reducing visibility to less than 1000 metres. In aviation observations and forecasts it is coded as SS.

**SATURATE** To add something to the point where no more can be absorbed, dissolved, or retained. In meteorology, it is used when discussing the amount of water vapor in a volume of air.

**SATURATED ADIABAT** The line on a thermodynamic diagram that depicts the change in temperature of a saturated air parcel as it rises or falls and undergoes cooling or heating due to adiabatic expansion or compression.

**SATURATED ADIABATIC LAPSE RATE** The rate of change in temperature of a saturated air parcel as it adiabatically ascends or descends through the atmosphere. The rate varies, from approximately 1.5 to 3°C per 1,000 feet, e.g., the more water vapour present in a rising parcel of air, the greater the condensation, and thus the greater is the latent heat released, reducing the rate of cooling.

**SCATTERED** Used to describe an amount of cloud covering the sky of three or four oktas (eighths). In aviation forecasts and reports it is coded as SCT.

**SEA-BREEZE** A diurnal coastal breeze that blows onshore due a temperature differential between the land and the water.

**SEA-BREEZE FRONT** The discontinuity in temperature and humidity that marks the leading edge of the intrusion of cool and moist marine air associated with a sea-breeze.

**SEA FOG** A type of advection fog that forms when warm moist air advects over water with a cooler temperature, and the consequent cooling of that air to below its dewpoint by the underlying cooler water.

**SEVERE THUNDERSTORM** The Bureau defines a severe thunderstorm as one with winds of 48 knots or greater, or hail of diameter 2 cm or larger, or tornadoes or flash floods.

**SHOWER** Precipitation from a convective cloud that is characterised by its sudden beginning and ending, changes in intensity, and rapid changes in the appearance of the sky. It occurs in the form of rain (SHRA), snow (SHSN), or hail (SHGR).

**SKEWT-LOG P DIAGRAM** A thermodynamic diagram with a skewed temperature scale on the horizontal axis and a logarithmic scale of pressure on the vertical axis. It is used to plot radiosonde soundings which give a vertical profile of air temperature and dew point temperature through the atmosphere. Forecasters use it to evaluate and forecast air parcel behaviour. Some values that can be determined are the Convective Condensation Level, the Lifting Condensation Level, and the Level of Free Convection.

**SMOKE** Small particles produced by combustion that are suspended in the air (a transition to haze may occur when the smoke particles have traveled great distance and when the larger particles have settled out, the remaining haze particles become widely scattered through the atmosphere). In aviation observations and forecasts it is coded as FU .

**SNOW** Frozen precipitation in the form of ice crystals that combine in a complex branched hexagonal form as they fall towards the earth's surface. It most often falls from stratiform clouds, but can fall as snow showers from cumuliform cloud. In aviation forecasts and reports it is coded as SN, or SHSN for snow showers.

**SPECI** A special report of surface meteorological information at an aerodrome. They are only issued when specific criteria are met. Has the same format as a METAR, except for the name.

**SQUALL** A sudden onset of strong winds with speeds increasing by at least 16 knots and sustained at 22 or

more knots for at least one minute. The intensity and duration is longer than that of a gust. In aviation forecasts and reports it is coded as SQ.

### **SQUALL LINE THUNDERSTORMS**

A continuous line of thunderstorms accompanied by a surface gust front at the line's leading edge. In aviation forecasts it is coded as SQL TS.

**STABLE ATMOSPHERE** A state of the atmosphere in which a lifted air parcel will sink to its equilibrium level once the lifting mechanism ceases, due to the air parcel being denser (cooler) than the surrounding air.

### **STANDARD ATMOSPHERE**

A mathematical model of the atmosphere which is standardised so that predictable calculations can be made.

**STANDING WAVE** An atmospheric wave that is stationary with respect to the earth's surface.

**STEAM FOG** Fog that forms when cool air, passing over warm water, reaches its saturation point due to water evaporating from the warm water into the cooler air. Fog rising in the convection currents above the water give rise to a steaming appearance.

**STRATIFORM** Clouds that exhibit extensive horizontal development (in contrast to the vertical development of cumuliform clouds).

**STRATOCUMULUS** A principal cloud type, forming in the low levels of the troposphere and existing in a relatively flat layer but having individual elements, from which drizzle can fall. It can form from cumulus clouds becoming more stratified when they push up into a stable atmospheric layer. In aviation forecasts and reports it is coded as SC.

**STRATOPAUSE** The boundary zone between the stratosphere and the mesosphere. In the stratosphere the temperature increases with height, with the stratopause being the point of maximum temperature, prior to a decrease in temperature in the mesosphere.

**STRATOSPHERE** The layer of the atmosphere located between the troposphere and the mesosphere. It is characterized by an increase in temperature with height and an absence of convective clouds and associated turbulence.

**STRATUS** A principal cloud type, forming in the low levels of the troposphere and normally existing as a flat layer that does not exhibit individual elements. In aviation forecasts and reports it is coded as ST.

**SUBLIMATION** The process of an ice changing directly into water vapour.

**SUBSIDENCE** A descending motion of air in the atmosphere, usually with the implication that it extends over a broad area such as occurs with a high-pressure system.

**SUBTROPICAL JET** A band of relatively strong winds found between 20 and 40° latitude in the middle and upper troposphere. Jet streams form near boundaries of adjacent air masses with significant differences in temperature.

**SUPERCCELL** A cumulonimbus cloud characterised by a rotating and long-lived, intense updraft. They can potentially result in the most severe thunderstorms, capable of producing extremely large hail, damaging winds and violent tornadoes.

**SUPERCOOLING** The reduction of the temperature of a liquid below its freezing point without it becoming a solid.

**SYNOPTIC CHART** Any chart that depicts meteorological or atmospheric conditions over a large area at a given time.

## **T**

**THERMOSPHERE** The layer of the atmosphere located between the mesosphere and outer space. It is a region of increasing temperature with height, and includes all of the exosphere and most of the ionosphere.

**THUNDER** The sound emitted by rapidly expanding gases along the channel of a lightning discharge.

**THUNDERSTORM** A cumulonimbus cloud characterized by thunder and lightning and associated gusty surface winds, hail, rain, turbulence, icing and, under the most severe conditions, microbursts and/or tornadoes. In aviation forecasts and reports it is coded as TS.

**TORNADO** A rotating column of air extending between a cumulonimbus cloud and the ground. It is the most destructive of all storm-scale atmospheric phenomena (microbursts can be just as severe but they occur over a shorter time period).

**TOWERING CUMULUS** A vertically developed cumulus cloud, often a precursor to cumulonimbus. In aviation forecasts and reports it is coded as TCU.

**TRADE WINDS** Two belts of prevailing wind that blow easterly from the subtropical high pressure centres in each hemisphere towards the equatorial trough. Primarily lower-level winds, they are characterised by their great consistency of direction. To the north of the trough they blow from the northeast, and to the south of the trough they blow from the southeast.

**TROPICS** The region of the earth located between the Tropic of Cancer, at 23.5 degrees north and the Tropic of Capricorn, at 23.5 degrees south.

**TROPICAL AIR MASS** An air mass that forms in the tropics or subtropics. Maritime tropical air is produced over oceans and is warm and humid, while continental tropical air is formed over arid land and is very hot and dry.

**TROPICAL CYCLONE** A non-frontal low pressure system that develops over tropical waters with winds of 34 knots or more. In Australia, the term severe tropical cyclone is used when winds reach or exceed 64 knots.

**TROPICAL DISTURBANCE** An area of organized convection, originating in the tropics or occasionally the subtropics, that maintains its identity for 24 hours or more, but has no closed wind circulation. It is often the first developmental stage of a tropical cyclone.

**TROPIC OF CANCER** Located at 23.5 degrees north, it is the most northern point on the earth where the sun is directly overhead (on 21 June).

**TROPIC OF CAPRICORN** Located at 23.5 degrees south, it is the most southern point on the earth where the sun is directly overhead (on 22 December).

**TROPOPAUSE** The boundary zone or transition layer between the troposphere and the stratosphere.

**TROPOSPHERE** The lowest layer of the atmosphere. Is characterised by clouds, weather and a decrease in temperature with increasing altitude.

**TROUGH** An elongated area of low atmospheric pressure.

**TURBULENCE** Irregular fluctuations occurring in fluid motions.

## U

**UNSTABLE ATMOSPHERE** An atmosphere in which air parcels rise buoyantly due to the rising air parcel being less dense (warmer) than the surrounding air.

**UPDRAFT** A small-scale current of air with marked vertical motion.

## V

**VALLEY BREEZE** An anabatic wind which forms during the day by heating of the valley floor. As the ground becomes warmer than the

surrounding atmosphere, the lower levels of air heat and rise, flowing up mountain slopes.

**VAPOUR PRESSURE** The pressure exerted by gaseous molecules. In meteorology, it is that part of total atmospheric pressure due to water vapour content.

**VEERING** A clockwise shift in the wind direction.

**VIRGA** Precipitation that falls from clouds but evaporates before reaching the ground.

**VISIBILITY** A measure of the opacity of the atmosphere. It is the greatest distance one can see prominent objects with unaided normal eyesight.

**VISUAL FLIGHT RULES (VFR)** Rules that govern civil aircraft flight under conditions that allow navigation by visual reference to the earth's surface.

## W

**WAKE TURBULENCE** A disruption of the airflow behind a moving aircraft that produces turbulence.

**WALKER CIRCULATION** A deep east-west circulation induced by the contrast between the warm waters of the western Pacific and the cooler waters of the eastern Pacific.

**WARM AIR ADVECTION** The horizontal movement of warmer air into a location.

**WARM FRONT** The leading edge of an advancing warm air mass that is replacing a relatively colder air mass.

**WATER VAPOUR** Water in its gaseous form.

**WAVE LENGTH** The distance between two successive wave crests separated by a trough.

**WHIRLY WIND** A small-scale, rapidly rotating column of wind, formed thermally and thus most likely to develop on clear, dry and hot afternoons. Often called a dust devil when made visible by the dust, dirt or debris it picks up.

**WHITEOUT** Occurs when clouds and the earth's surface seem to blend, resulting in the horizon becoming erased.

**WIND DIRECTION** The direction from which the wind is blowing.

**WIND SHEAR** A wind direction and/or speed change over a vertical or horizontal distance.



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