

Appendix

Meanings of Uncommon Words/Terms Used in the Book

[In compiling this appendix, the author has relied to a considerable extent on the meanings of the terms, as given in two well-known publications: (1) Concise Dictionary of Physics and Related Subjects (1973) published by the Pergamon Press, Oxford, and (2) The Meteorological Glossary (2nd edition) of the American Meteorological Society (2000). However, complicated mathematical expressions, especially vector notations, have been avoided in order to make the meanings given easily intelligible to an average reader]

Words/terms	Meanings
Adiabatic change	Change occurring in a moving parcel of air which is not allowed to exchange properties with its environment
Angular momentum	When a body revolves in a circle about an axis perpendicular to the plane of its motion in a fixed frame of reference, it has an angular momentum given by the product of its mass, velocity and radius of the circle. Angular momentum can also be expressed in terms of the moment of inertia of the body by multiplying it with the angular velocity
Absolute angular momentum	It is the angular momentum of a body in an absolute frame of reference and is obtained by adding the angular momentum of the body relative to the earth's surface to the angular momentum of the earth's surface relative to the absolute frame of reference
Anticyclonic circulation	A clockwise circulation around a high pressure area in the northern hemisphere The direction reverses in the southern hemisphere
Baroclinic atmosphere	An atmosphere in which density varies along an isobaric surface (surface of equal pressure) due to horizontal temperature gradient

Baroclinic instability	Instability of flow in a baroclinic atmosphere, which may allow growth of a perturbation if the wavelength of the perturbation and the horizontal temperature gradient meet certain critical conditions
Barotropic	A state of the atmosphere in which density remains constant along an isobaric surface.
Barotropic instability	Hydrodynamic instability of a barotropic atmosphere which may allow growth of a perturbation in a region across which the absolute vorticity changes sign. This is an inertial instability in which kinetic energy is the only form of energy transferred between the current and the perturbation.
Blackbody	A body which absorbs all heat radiation incident on it, remains in equilibrium with the radiation reaching and leaving it, and at a given steady temperature emits radiation with a flux density and spectral energy distribution characteristic of that temperature
Boundary layer	In meteorology, it is a thin layer of the atmosphere in contact with the earth's surface in which the airflow strongly experiences the effects of the earth's surface friction and vertical stability of the atmosphere
Carnot's cycle	A reversible working cycle of an ideal heat engine with maximum thermal efficiency in which the sequence of the cycle consists of isothermal expansion, adiabatic expansion, isothermal compression, and adiabatic compression to the initial state.
Circulation	It is the line integral of a fluid motion around the boundary of a closed surface
Cold surge	A sudden outbreak of strong cold winds at low levels of the atmosphere
Conditional instability	A state of instability of the atmosphere in which the lower layer (below about 3 km above surface) holding a lot of water vapour is vertically unstable, but the upper layer is stable, or vice versa
Conduction	Transport of heat energy in a medium by molecular vibration inside the medium when a temperature gradient exists between its two sides, usually in solids
Convection	Process of heat transfer by actual physical movement of fluid elements in contact with a heated body
Convergence	In atmospheric motion, the coming closer of streamlines, which leads to an accumulation of atmospheric mass and rise of pressure

Coriolis force	An apparent force (so called in honour of its discoverer, G.G. de Coriolis) exerted on a wind by the rotation of the earth. This force is always to the right of the wind direction in the northern hemisphere and to the left in the southern hemisphere
Cyclonic motion	Anticlockwise motion around a low pressure center in the northern hemisphere; clockwise in the southern hemisphere
Cyclogenesis	Process tending to generate cyclonic motion
Depression	A low pressure area with a tangential windspeed of about 17 ms^{-1} at the top of the earth's frictional layer
Diabatic change	Change in a parcel of air free to exchange properties with its environment
Direct circulation	A kinetic energy producing vertical circulation in which warm air rises and cold air sinks
Divergence	Separating out of streamlines leading to depletion of mass and fall of pressure
Dry adiabatic lapse rate	Rate of fall of temperature or pressure with height in a parcel of dry air, rising adiabatically in a dry atmosphere. Its value in the case of temperature is about $-10^\circ\text{C}/\text{km}$.
Dynamic instability	Instability of a flow structure when its horizontal and vertical shear exceeds a certain critical limit
ECMWF	European Center for Medium-Range Weather Forecasts, located in UK
ENSO	Abbreviation of El-Nino Southern Oscillation. An oscillation between sea surface temperature and pressure changes in the equatorial Eastern Pacific and corresponding changes in the equatorial Western Pacific and adjoining Eastern Indian Ocean
Entropy	A quantity characteristic of the thermodynamic state of a system. Mathematically, it may be expressed by the relation, $dS = \int \delta Q/T$, where S denotes entropy, Q a quantity of heat and T absolute temperature. Note that 'dS' denotes a total differential, while ' δQ ' is simply a quantity of heat, not a total differential. In all naturally-occurring processes, entropy increases, except in cases which are reversible where it remains constant. An increase in the value of entropy signifies unavailability of useful energy
Equatorial circulation	Circulation along the equator
Equatorial heat source	A heat source characterized by warm, low pressure over the equatorial belt. It oscillates about its annual mean location following the seasonal movement of the sun

Equatorial trough	The trough of low pressure of the equatorial heat source
Easterly wave	A westward-propagating wave in the tropical easterly tradewinds
Extratropics	The latitudinal belts outside the boundary of the tropics
FGGE	First GARP (Global Atmospheric Research Program) Global Experiment, 1979
Flux	Rate of flow of some atmospheric property, such as heat, momentum, energy, etc.
Gale	An unusually strong sustained wind of 14–23 ms ⁻¹
GARP	Global Atmospheric Research Program
General circulation	Zonally – averaged annual – mean circulation of the earth's atmosphere
GCM	General Circulation Model
Geopotential meter (gpm)	Height in meter above the earth's surface, taking into account the variation of the earth's gravity with latitude
Geostrophic wind	It is a quasi-balanced wind between the pressure gradient force and the Coriolis force, blowing along the isobar
Heat source	A body becomes a heat source when it gets hotter than its immediate environment
Heat sink	Reverse of a heat source; that is, a body becomes a heat sink when it gets colder than its immediate environment. It may be called a Cold Source
Hadley circulation	Originally, the pole-to-equator direct circulation; now, the circulation between the subtropical ridge of high pressure and the equatorial trough of low pressure
High pressure area	Area where pressure is higher than over its surroundings
Hurricane	A deep tropical cyclone with central pressure (<980 mb) and tangential windspeed exceeding 32 ms ⁻¹ in the tropical Atlantic and Eastern Pacific Oceans
Hydrostatic approximation	An approximation made in the equation for vertical acceleration in a rotating fluid by balancing the vertical component of the pressure gradient force against the force due to gravity
Indirect circulation	A circulation which generates available potential with warm air sinking and cold air rising; needed to drive a secondary kinetic energy – producing direct circulation in which warm air rises and cold air sinks
Infrared	In the frequency distribution of radiant energy from a blackbody, the part of the spectrum at frequencies shorter than the red line

In-phase	Being in the same phase
Isentropic surface	Surface of equal entropy
Instability	A conditionally unstable state of the atmosphere which, if perturbed, will allow an amplification of the perturbation with time
IIOE	International Indian Ocean Expedition, 1962–1966
Intraseasonal oscillation	Oscillations within a seasonal oscillation
Intertropical Convergence Zone (ITCZ)	A zone where the tradewinds of the two hemispheres converge, producing penetrative convection, clouding and precipitation
Isobar	A line joining places of equal barometric pressure
Isohyets	A line joining places of equal amounts of rainfall
Isotherm	A line joining places of equal temperature
Jetstream	A narrow concentrated beam of strong winds with strong horizontal and vertical shear
Kinetic energy	Energy of a body due to its motion
Lagrangian time	Time counted with reference to a moving co-ordinate system
Latent heat	Heat absorbed, or given up, by a solid, liquid, or vapour, at a fixed temperature during a change of phase
Longwave radiation	Radiation emitted or absorbed by a body at the earth's temperature at wavelengths longer than the visual range
Low pressure area	An area where pressure is lower than its surroundings
Meridional wind	Component of a wind along a meridian
Meridional circulation	Component of a vertical circulation in a meridional plane
Midlatitudes	Middle latitudes, usually between 30 and 60° latitudes
Midtroposphere	Middle part of the troposphere, usually between 5 and 9 km above sea level
Monsoon	A divergent tradewind circulation which converges into the seasonally-migrating equatorial heat source, producing cloud and rain along the convergence zones and several other effects on prevailing air mass properties during advance and retreat
Nucleus	The core or central part of a body
Potential energy	Energy of a body by virtue of its position above a reference surface, or configuration of a system; usually measured by the work done in bringing the body from some reference level to the level of interest

Available potential energy	The amount of potential energy available to do useful work out of the total potential energy stored in a body
Potential temperature	Temperature attained by a parcel of air at a given pressure surface, when it is lowered dry adiabatically to a reference surface, usually 1000 mb
Equivalent potential temperature	It is the temperature of a parcel of moist air at a pressure surface which is first lifted from its existing level to a level where all its moisture is precipitated out and the heat of condensation added to it, and then the air so warmed-up brought down dry adiabatically to a standard pressure surface, usually 1000 mb
Quasi-stationary	Stationary, or nearly so, usually applied to a wave, or front, etc.
Radiation	Radiant energy emitted by a heated body at a given temperature which travels through a medium without heating it
Ridge	Axis of maximum height in a height field. Also applicable to fields of pressure, temperature, etc.
Saturated adiabatic lapse rate of temperature	Rate of decrease of temperature of a parcel of saturated air when it is lifted or lowered from its existing level moist adiabatically
Shortwave radiation	Radiation at wavelengths shorter than those in visual range in the energy spectrum
Streamline	A line which is tangent to the instantaneous wind direction at any point in a wind field
Subtropics	Belt of latitudes between the tropics and midlatitudes, approximately between 25 and 40° of latitude
Subtropical jet	An upper-level jetstream along the boundary between the tropics and the subtropics
Topography	Physical features and contours of elevation of the earth's surface over a terrain
Tradewinds	The winds blowing over the tropical belt of the earth's surface between the ridge of the subtropical high pressure and the equatorial trough of low pressure at low levels; so called, because they were used by early sailors while trading with tropical countries
Tropics	The warm equatorial belt of the earth's surface, approximately between the 30° parallels of latitude
Tropical circulation	Circulation over the tropical belt with tradewinds at low levels, and antitrades at high levels

Tropical Convergence Zone (TCZ)	The zone where the NE tradewinds converge into the circulation around the equatorial heat source on its poleward side in the Northern Hemisphere
Troposphere	The radiatively-convectively controlled lowest layer of the earth's atmosphere in which temperature decreases with height
Tropopause	The level where the troposphere ceases and the temperature instead of decreasing with height remains either constant or increases with height
Trough	A line joining the lowest values in the distribution of an atmospheric property, such as pressure, temperature, etc.
Vortex	An intense cyclonic circulation about an axis perpendicular to the plane of the circulation
Vorticity	Tendency of a fluid element in a circulating surface to rotate about an axis normal to the surface in the same direction as the circulation. In solid body rotation, vorticity is a measure of circulation per unit area
Relative vorticity	Vorticity relative to the earth's surface
Absolute vorticity	Total vorticity of a fluid element obtained by adding relative vorticity to the vorticity of the rotating earth
Potential vorticity	In the absence of friction and heat sources and sinks, the potential vorticity is a materially conservative property of a fluid particle and a function of absolute vorticity divided by the pressure depth between two adjacent potential temperature surfaces
Walker circulation	Steady forced atmospheric circulation between a heat source and a heat sink placed alternately along the equator

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