Glossary

This Glossary section of the Urban Climate Development Portal (UCDP) has been adopted mainly from Glossary of Meteorology by American Meteorological Society (https://glossary.ametsoc.org/wiki/Welcome), Intergovernmental Panel on Climate Change (IPCC) (https://www.ipcc-data.org/guidelines/pages/glossary/glossary_c.html), Earth 103: Earth in the future by The Pennsylvania State University (https://www.e-education.psu.edu/earth103/node/990) and Global Change Course by Iowa State University (https://meteor.geol.iastate.edu/gccourse/units01.html). The glossary is still under development.

Term	Definition/Meaning
Atmosphere	A layer or set of layers of gas surrounding a planet, held in place by the gravitational force of the rest of the planet. Earth's atmosphere has different layers: Troposphere, Stratosphere, Mesosphere, Thermosphere, and Exosphere
Atmospheric pressure	The pressure exerted by the atmosphere as a result of the gravitational force exerted upon the column of air lying directly above the surface of the earth
Biosphere	A global ecosystem that acts a transition zone between earth and atmosphere which holds the biotic (living things) and abiotic (non-living) things
Boundary Conditions	Boundary conditions are conditions/ restrictions to an existing problem, in the form of mathematical equations, that needs to be satisfied to solve a differential equation at the edges or physical boundaries (including fluid boundaries) of the area under consideration
Climate	Average behaviour of weather for a long period of time, more accurately the statistical description of weather in terms of the mean and variability of relevant parameters over a period of time. The classical period for averaging the variables is 30 years, as defined by the World Meteorological Organization. The parameters involved are surface variables, such as temperature, precipitation and wind.
Climate anomaly	The difference between the average climate over a period of several decades or more, and the climate during a particular month or season.
Climate Change	Systematic change of any naturte in the long-term statistics of climate elements. It is important to understand that climate is average of weather over time, so when we are talking about climate change, we are not talking about weather experienced on a daily or seasonal basis. Just one heat wave is not an evidence of global climate warming, but repeated unusual heat waves will increase the average temperature ofa tregion which is a result of a warming climate
Climate prediction	The prediction of various aspects of the climate of a region for the future.
Climate system	A highly complex system consisting of 5 major components: the atmosphere, hydrosphere, lithosphere, and biosphere and their interactions that determines the earth's climate.

Climate Variability	It is the deviation in the mean and other statistics of the climate for any temporal and spatial extent, excluding the odd weather events. Climate variabilties are fluctuations or anomalous climate behaviour within shorter time scales. It can be internal or external, depending on the factors causing it. Eg: EL Nino Southern oscillation (ENSO) and North Atlantic Oscillation (NAO) are examples of internal climate variability. Short term cooling of climate due to volcanic eruption (eruption of Mount Pinatubo in the Philippines in June 1991) is an example of external climate variability.
Cloud cover	The portion of sky occupied by clouds when observed from a particular location. Cloud cover is an important component in understanding and predicting the weather. It impacts the atmospheric conditions as it regulates the temperature of a region.
Condensation	The process by which a vapor becomes a liquid or solid.
Cyclone	An atmospheric closed circulation.
Dependent variable	A variable which is a function of other variables.
Diurnal	Diurnal refers to daily, that is processes that are completed within 24 hours ot that recur every 24 hours.
Drag	The friction or resistance offered by air to the motion of objects passing through it or the aerodynamic force parallel to the direction of mean flow.
Dynamical system	A system in which a process or a group of processes evolves in time, which are governed by a set of physical laws.
Evaporation	The physical process by which a liquid or solid is converted to its gaseous state
Evapotranspiration	The processes through which water is transferred to the atmosphere from open water and ice surfaces, bare soil, and vegetation that make up the earth's surface.
Exosphere	The outermost, or topmost portion of the atmosphere.
External forcings	Boundary conditions and body forcings imposed on the atmosphere from outside the domain of interest.
Extratropical cyclone	Any cyclonic-scale storm that is not a tropical cyclone, usually referring only to the migratory frontal cyclones of middle and high latitudes.

General Circulation Models	General Circulation Models (GCMs) are tools designed to simulate time series of climate variables and operate on a global scale, to understand climate, forecast weather, and project climate change. They use quantitative methods to simulate the interactions of the atmosphere, oceans, land surface, and ice. These models predict an upward trend in the surface temperature, on a global scale and uses a large number of mathematical equations to describe physical, chemical, and biological processes such as wind, vapor movement, atmospheric circulation, ocean currents, and plant growth.
Geomorphology	It is the study of the surface configuration, i.e., landforms, their processes, form, and sediments at the surface of the earth.
Geosphere	The portion of the earth including the lithosphere and the hydrosphere.
Greenhouse effect	The warming of Earth's surface and troposphere by the presence of water vapour, carbon dioxide, methane, and other gases in the air collectively known as greenhouse gases. Among the greenhouse gases, water vapour has the largest effect.
Hydrodynamics	The study of fluid motion.
Hydrologic cycle	The cyclic process on earth's atmosphere, where water evaporates from the oceans and the land surface, is carried over the earth in atmospheric circulation as water vapor, precipitates again as rain or snow, is intercepted by trees and vegetation, provides runoff on the land surface, infiltrates into soils, recharges groundwater, discharges into streams, and ultimately, flows out into the oceans, from which it will eventually evaporate again.
Hydrosphere	The portion of the earth with water, distinguished from the solid part, lithosphere, and from the gaseous outer envelope, the atmosphere.
Independent variable	An arbitrarily variable, and that then determines the other dependent variables of the problem.
Initial Conditions	Conditions or value of a variable at an initial time, t_o, from which a given set of physical system or mathematical equation evolves. The initial conditions affect the value of the variable at any future time in both continuou time and discrete time.
Lithosphere	The solid part of earth, excluding the water part, hydrosphere, and the gaseous envelope, atmosphere.

Meteorology	Study of the atmosphere that focuses on weather processes and forecasting. Meteorological phenomena are observable weather events explained by the science of meteorology. Those events are bound by the variables that exist in Earth's atmosphere.
Model	A tool used to simulate or predict the behavior of a system.
Non- Stationary Time Series	A time series is non-stationary if it follows a trend or has seasonality. The trend and seasonality will affect the value of time series at different time.
Non-recording rain gauge	The rain guage in which only the amount of rainfall is recorded. Rainfall is not recorded as a function of time.
Numerical forecasting	The integration of governing equations of hydrodynamics by numerical methods subject to specified initial conditions. Numerical forecast uses mathematical models to predict the weather based on current weather conditions. The forecasting is carried out with the help of super computers as it requires complex calculations.
Orography	It is the branch of geomorphology dealing with the formation and feature of mountains. The term is also used to define a region with respect to its elevated terrain.
Population	Any definite class of individuals or objects.
Precipitation	Precipitation refers to any product of condensation of atmospheric water vapor that is released from the clouds. The different forms of precipitation are drizzle, rain, sleet, snow, ice, pellets, and hail. Major form of precipitation in earth is in the form of rain.
Probability	The chance of occurence of an event. The probability of an impossible event is 0 and an inevitable event is 1. Thus it can be represented as: p } $0 \leq p \leq 1$ p = (Number of occurence of an event/ Total events in the class considered)
Probability Distribution	A function that describes the probability of getting the possible values a random variable can assume. The value of the variable depends on the probability distribution.
Radar	An instrument used for the detection and ranging of distant objects using the scattered or reflected radio energy.
Rain Gauge	Instrument used to measure the amount of rainfall received. The rain gauges can be recording, non-recording, and rain-intensity gauges.
Rain intensity gauge	Rain-intensity gauges measure the rate of rainfall.
Random variable	A variable that can take up possible values from a raindom experiment.

Real Time	Data or computing for which reporting or recording are nearly simulataneous with their occurence.
Reanalysis	A scientific method for developing a comprehensive record of how weather and climate are changing over time. A synthesized estimate of the state of a system is generated by using observations and a numerical model that simulates one or more aspects of the earth system. A reanalysis can extend over several decades or longer and it covers all of the earth's surface uptill the stratosphere. Reanalysis products are used extensively in climate research and services including climate change projection.
Recording rain gauge	The rain gauge that records the amount of rainfall with respect to time. Eg: Tipping bucket rain gauge, Weighing rain gauge, Capacitance rain gauge, Optical rain gauge
Regional Climate Models	Regional Climate Models (RCMs) are numerical climatye prediction models forced by specified lateral and ocean conditions from a GCM or observation based dataset (reanalysis) that simulates atmospheric and land surface processes, while accounting for high resolution topographical data, land-sea contrasts, surface characteristics and other components of earth's system.
Relative humidity	The ratio of the vapor pressure to the saturation vapor pressure with respect to water.
Resolution	It is the smallest measurable change in a quantity, or the least value of a measured quantity that can be distinguished.
Sample	A group of observations selected from a population, by a set procedure.
Sea Surface Temperature	Temperature of ocean surface, representative of upper few metres of the ocean.
Snowfall	The snow accumulated over a period of time. It is measured as snow depth in centimeters or inches per six hourly period.
Snow depth	The depth of snow on the ground from the time of the incident snow fall or since the previous observation.
Soil Moisture	The total amount of water stored in soil, including water vapour in unsaturated soil, affected by precipitation, temperature, soil characteristics, etc.
Solar radiation	Solar radiation is radiant electromagnetic energy emitted by the sun. The spectrum of solar radiation is close to that of a black body with a temperature of about 5800 K. About half of the radiation is in the visible short-wave part of the electromagnetic spectrum.
Specific humidity	The ratio of the mass of water vapor to the total mass of the system.

Stationary Time Series	Time series whose properties does not depend on the time at which the series is observed. Time series is stationary if they do not have trend or seasonal effects. Summary statistics calculated on the time series are consistent over time, like the mean and variance of observations. Stationary time series allows for easier modeling.
Statistics	Statistics is the systematic analysis of a random phenomena. It includes the collection, organization, analysis, interpolation, and presentation of data.
Storm	Any disturbed state of the atmosphere, which affects the earth's surface, indicating a possibly destructive weather.
Surface Temperature	The temperature of the air near the surface of the earth. In case of oceans, it is the temperature of the layer of the sea water nearest to the atmosphere.
Thermodynamics	Thermodynamics is the branch of physics that deals with the relationships between heat and other forms of energy. It describes how thermal energy is converted to and from other forms of energy and how it affects matter.
Time Series	Values of a variable generated succesively in time. Time series is used to predict the future values of a variable based on previously observed values.
Tropical cyclone	Tropical cycones are hurricanes of the Western Hemisphere and their typhoon and cyclone equivalents elsewhere. At maturity, the TC is one of the most intense and feared storms in the world, winds exceeding 90 m s$_{-1}$ (175 knots) have been measured, and both its rains and storm surge can cause great loss of life and damage.
Vapor pressure	The pressure exerted by the molecules of a vapor.
Water vapor	Water in the gaseous form. It is one of the most important constituents of the atmosphere.
Weather	Weather refers to short term events that happen in atmosphere. Weather is different in different parts of the world and changes over minutes, hours, days and weeks.
Weather Forecast	Prediction of future state of the atmosphere with respect to precipitation, clouds, winds, and temperature.