

Climatic Classification after Koppen
Part II (1+1+1 System) Geography Hons.
Paper: IV
Module: V
Topic: 4.3

Climatic Classification

As a fundamental tool of science, classification has three interrelated objectives:

- to bring order to large quantities of information
- to speed retrieval of information
- to facilitate communication

Classification of climate shares these objectives. It is concerned with

- organization of climatic data in such a way that both descriptive and analytical generalizations can be made
- attempts to store information in an orderly manner for easy reference and communication, often in the form of maps

The value of a systematic arrangement of climates is determined largely by its intended use; a system that suits one purpose is not necessarily useful for another.

There are two fundamental approaches to classification of climates: the genetic approach and the generic or empiric approach. In the first approach, classification is based on the climatic controls. These are the factors that determine or cause the different climates. Examples include air circulation patterns, net radiation, and moisture fluxes. In the second approach, classification is based on the observed climatic elements themselves or their effects on other phenomena, usually vegetation or man. Those climatic classifications based on the influence of climate on man are really bio-meteorological in nature and are therefore specialized classifications. Examples include those based on human physiological comfort, building types to maintain optimum physiological comfort or clothing requirements.

Koppen's Classification

The most widely used system of climatic classification in its various modified forms is that of W. Koppen (1846-1940), a Russian-born meteorologist and climatologist of German descent who devoted most of his life to a scientific career in Germany. Koppen aimed for an applied scheme that would relate climate to vegetation but provide an objective, numerical definition of climate types in terms of climatic elements. He devised his first classification (1900) largely on the basis of vegetation zones and later (1918) revised it with greater attention to temperature, rainfall, and their seasonal characteristics.

The Koppen system includes five major categories which are designated by capital letters as follows.

1st Letter Symbol (Five major climate categories)

- A Tropical forest climates; hot all seasons
- B Dry climates
- C Warm temperature rainy climates; mild winters
- D Cool forest climates; severe winters

E Polar climates

To these is added a group undifferentiated highland climates represented by the symbol H.

2nd Letter Symbol (Seasonal distribution of precipitation)

- | | | |
|---|--|--------------------------------|
| S | Tropical forest climates; hot all seasons | } subdivision of dry climate |
| W | Dry climates | |
| T | Tundra | } subdivision of polar climate |
| F | Icecap | |
| f | No dry season | |
| s | Dry season in summer | |
| w | Dry season in winter | |
| m | Monsoonal with a short dry season and heavy rain during the rest of the year | |

3rd Letter Symbol (Additional temperature characteristics)

- a Hot summer, warmest month over 22°C
- b Warm summer, warmest month below 22°C
- c Cool, hot summer, fewer than 4 months over 10°C
- d Very cold winter, coldest month below -38°C
- h Dry hot, mean annual temperature over 18°C
- k Dry cool, mean annual temperature under 18°C

Main Climatic Types of the Koppen Classification

A	<ul style="list-style-type: none">• Average temperature of every month is above 18°C.• These climates have no winter season.• Annual rainfall is large and exceeds annual precipitation.
Af	Tropical rain forest. Hot; rainy all seasons
Am	Tropical monsoon. Hot; seasonally excessive rainfall
Aw	Tropical savanna. Hot; seasonally dry (usually winter)
B	<ul style="list-style-type: none">• Potential evaporation exceeds precipitation on the average throughout the year.• No water surplus; hence no permanent streams originate here.
BSh	Tropical steppe. Semiarid; hot
BSk	Mid-latitude steppe. Semiarid; cool or cold
BWh	Tropical desert. Arid; hot
BWk	Mid-latitude desert. Arid; cool or cold
C	<ul style="list-style-type: none">• Coldest month has an average temperature under 18°C, but above -3°C• These climates have both a summer and winter season.
Cfa	Humid subtropical. Mild winter; moist all seasons; long hot summer
Cfb	Marine. Mild winter; moist all seasons; warm summer
Cfc	Marine. Mild winter; moist all seasons; short cool summer
Csa	Interior Mediterranean. Mild winter; dry summer; hot summer
Csb	Coastal Mediterranean. Mild winter; dry summer; short warm summer
Cwa	Subtropical monsoon. Mild winter; dry winter; hot summer
Cwb	Tropical upland. Mild winter; dry winter; short warm summer
D	<ul style="list-style-type: none">• Coldest month average temperature under -3°C• Average temperature of warmest month above 10°C

Dfa	Humid continental. Severe winter; moist all seasons; long, hot summer
Dfb	Humid continental. Severe winter; moist all seasons; short warm summer
Dfc	Subarctic. Severe winter; moist all seasons; short cool summer
Dfd	Subarctic. Extremely cold winter; moist all seasons; short summer
Dwa	Humid continental. Severe winter; dry winter; long hot summer
Dwb	Humid continental. Severe winter; dry winter; warm summer
Dwc	Subarctic. Severe winter; dry winter; short cool summer
Dwd	Subarctic. Extremely cold winter; dry winter; short cool summer
E	<ul style="list-style-type: none"> • Average temperature of warmest month below 10°C • These climates have no true summer
ET	Tundra. Very short summer
EF	Perpetual ice and snow
H	Undifferentiated highland climates

Advantages:

- I. Koppen used the temperature and precipitation statistics in his classification of the climate. These two weather elements are easy to measure. Because of this quality, these elements are most widely and most frequently used. Since Koppen's classification is based on statistical parameters, each climatic region can be precisely defined.
- II. Besides, the temperature and precipitation are the two most effective weather elements that exhibit the effects of climatic controls more clearly than any other weather elements.
- III. These elements affect other aspects of our physical environment more directly than any other element. Obviously, the system of classification devised by Koppen is directly related to those aspects of environment which are clearly visible to us.
- IV. His climatic classification system is based on the relationship between the types of plants at a particular place and the climatic characteristics of the place. Thus, his scheme is not a mere abstraction.

Limitations:

- I. There are, of course, certain drawbacks from which this classification scheme suffers. Despite the fact that the author himself revised and modified his system several times, he always felt it to be imperfect.
- II. Koppen based his classification on the mean monthly values of temperature and precipitation. By these statistics the most potent factor of precipitation can only be estimated, rather than measured accurately.
- III. This makes comparison from one locality to another rather difficult. Further, Koppen did not take into account such weather elements as winds, precipitation intensity, amount of cloudiness, and daily temperature extremes only for the sake of making his classification generalized and simple.
- IV. Another major drawback is that it is empirical and, therefore, is based on facts and observations. The causative factors of climate have been totally ignored. Thus, the air masses, which form the very basis of modern climatology, could not find any place in Koppen's classification.
- V. Lastly, the letter symbols used by Koppen in his climatic classification provide international shorthand describing climatic regions that are rather difficult to characterize in words.