The Köppen's Classification

The Köppen classification of the climates (Figure 1) is one of the oldest empirical classifications, established between 1900 and 1936. Although very old, it is still widely used; sometimes in a modified form [1]. A botanist by training, Köppen always sought to establish the link between the types of climates and the distribution of vegetation on the globe.
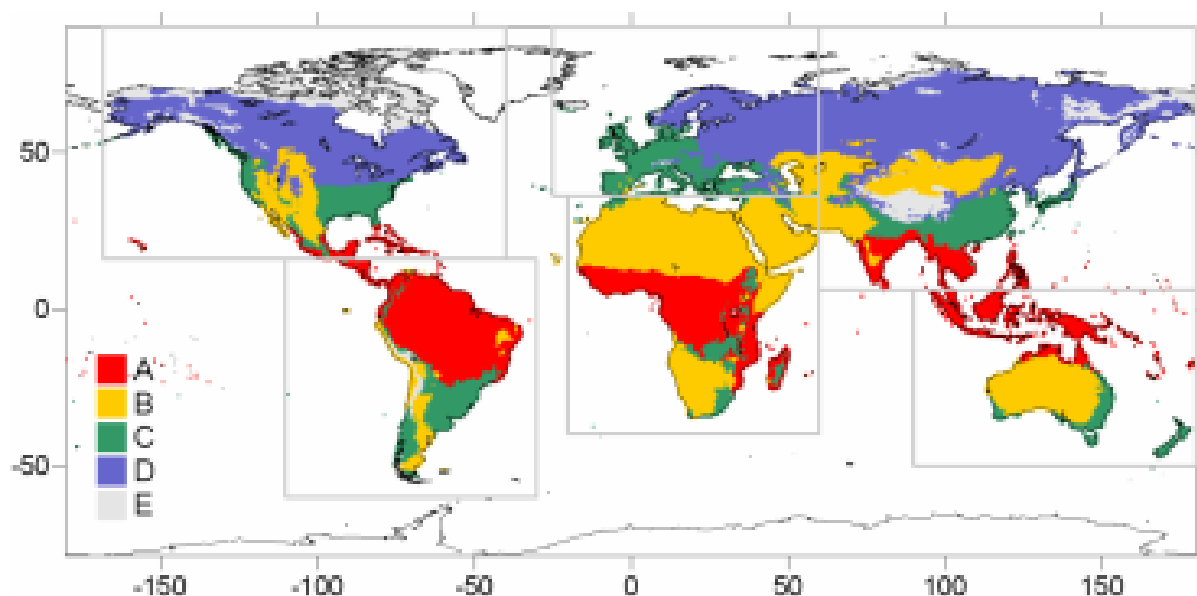

Figure 1. Distribution of the earth's climate types according to the Köppen classification. (Adapted from Beck et al., 2005). (Source : http://bit.ly/3OrqPM9).

This classification uses 3 criteria of decreasing importance and designated, for each category, by 3 successive letters [2]:

- The **first letter,** from A to E, represents the main attribute of the climatic category and consequently the main types of climate according to a zonal distribution that takes into account a distribution according to latitudes from the equator to the poles: A: Rainy tropical climates; B: Dry climates; C: Temperate humid climates; D: Subarctic boreal climates; E.: Snowy climates.
- The **second letter** is mainly associated with the rainfall system, sometimes with temperature. This letter, which can be uppercase or lowercase, corresponds to the first letters of a German word: F: Frost (frost), f: feucht (wet), m: Monsunregen (monsoon rains), S: Steppe, s: Sommertrockenzeit (summer droughts), T: Tundra, W: Wüste (deserts), w: Wintertrockenzeit (winter droughts).
- The **third letter** refers only to the average temperature: a, b, c, d, h (trocken-heiss: hot and dry) and k (trocken-kalt: cold and dry).

Tableau 1. *Major types of Köppen-Geiger climates according to Kottek et al (2006) [Source: Foucault, 2009]*

Climate types	Climate subtypes	Characteristics (see legend below)
A: equatorial climates (Tmin ≥ +18 °C)	Af: equatorial rainforest	Pmin ≥ 60 mm
	Am: equatorial monsoon	Pann ≥ 25(100 Pmin)
	As: equatorial savannah with dry summer	Pmin < 60 mm in summer
	Aw: equatorial savannah with humid summer	Pmin > 60 mm in summer
B: arid climates Pann < 10 Pth	BS: steppe climate	Pann > 5 Pth
	BW: desert climate	Pann ≤ 5 Pth
C: temperate climates –3 °C < Tmin < +18 °C	Cs: temperate climates with dry summer	Psmin < Pwmin, Pwmax > 3 Psmin and Psmin < 40 mm
	Cw: temperate climates with dry winters	Pwmin < Psmin and Psmax >10 Pwmin
	Cf: temperate climates that are always humid (neither Cs nor Cw)	
D: snowy climates Tmin ≤ –3 °C	Ds: snowy climates with dry summers	Psmin < Pwmin, Pwmax > 3 Psmin and Psmin < 40 mm
	Dw: snowy climates with dry	Winters Pwmin < Psmin and Psmax > 10 Pwmin
	Df: snowy climates that are always humid (neither Ds nor Dw)	
E: polar climates Tmax < +10 °C	ET: tundra climate	0 °C ≤ Tmax < +10 °C
	EF: ice climate	

Abbreviations. P: precipitation in mm, with Pmin (precipitation of the driest month), Pann (annual accumulation), Psmin (precipitation of the driest month of the summer semester), Pwmin (same for the winter semester), Psmax (precipitation of the wettest month of the summer semester), Pwmax (same for the winter semester); T: temperatures in °C, with Tann (annual mean temperature), Tmax: mean temperature of the warmest month, Tmin: mean temperature of the coldest month. Pth (th for threshold) is equal to 2 * Tann if at least 2/3 of the annual precipitation occurs in winter, 2 * Tann + 28 if at least 2/3 of the annual precipitation occurs in summer, 2 * Tann + 14 in other cases.

Notes & references

[1] Beck, H. E., *et al.* (2018). *Present and future Köppen-Geiger climate classification maps at 1-km resolution*. Scientific data, 5(1), 1-12. https://www.nature.com/articles/sdata2018214

[2] Foucault, A. (2009). *Climatology and paleoclimatology*. Ed. Dunod (France). 323 p.

L'Encyclopédie de l'environnement est publiée par l'Université Grenoble Alpes.