5. Azonal climatic geomorphology

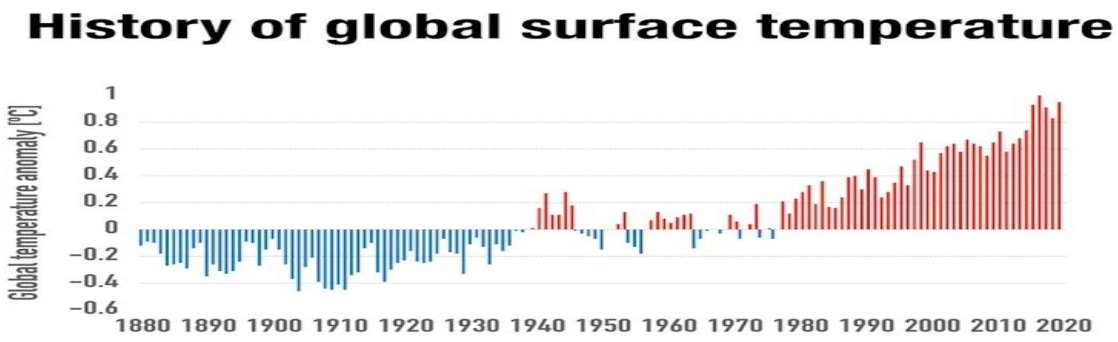
5.1. Climate variations: the Quaternary

Climatology is the science that studies the atmosphere at ground level, in relation to morphological, hydrological, and pedological processes. It is essential for understanding biogeographical realities, particularly vegetation and higher organisms. The main climatic elements considered are temperature, precipitation, winds, and ocean and air currents.

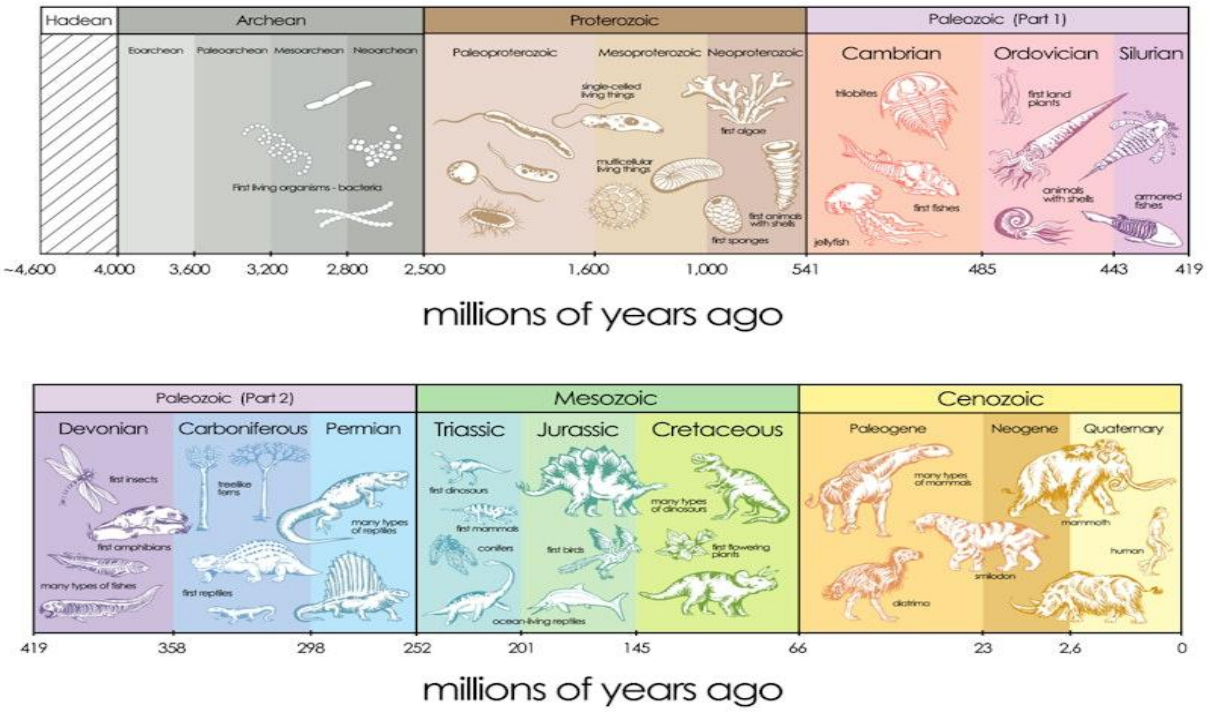
Climate is influenced by several geographical factors: the shape and orientation of the continents, their topography, and vegetation. Continental climates, characterized by high pressure and significant temperature variations, contrast with milder oceanic climates. The oceans also play a crucial role: surface water temperature is essential for meteorological studies and for interpreting isotopic analyses of mollusk shells.

Climatic variations manifest as alternating cold and warm periods, affecting sedimentary deposits, fauna, and flora. Possible causes of ice ages include variations in solar activity, volcanic dust, glaciation and continental deformation, and continental drift.

The Quaternary is a recent geological period, dating back 3 to 4 million years, marked by significant climatic changes. During glacial periods, glaciers covered up to 30% of the continents, reaching thicknesses of 1,500 to 3,000 meters, causing a drop in sea level of 100 to 200 meters. During interglacial periods, sea levels rose, and river valleys deepened into U-shaped valleys, forming alluvial terraces (pebbles, gravel, sand). Powerful winds carried fine particles from moraines and dried mud southward, creating aeolian deposits. Quaternary continental deposits are found primarily in caves, at the bottom of lakes, and in materials transported by glaciers. Marine deposits, on the other hand, are concentrated in a band close to present-day coastlines.



Geochronological scale



5.2. Morphological system of Algeria

The climate is varied because the country has a very large area: the northern part has a Mediterranean climate, while the rest of the country has a desert climate, and in between, the climate is semi-arid (Mediterranean climate with a dry season).

Algeria exhibits a diversity of climatic zones that define its distinct ecological characteristics:

-Humid zone: This area, encompassing Kabylia and the Tell region of Constantine, is characterized by rivers, lakes, dams, and a wide variety of birds.

With a typically Mediterranean climate, it offers hot, dry summers and mild, rainy winters. The vegetation is rich, with over 300 species, nourished by high rainfall and significant humidity. Maritime influences contribute to the mild winters, with an average temperature of 15°C, and biodiversity is enhanced by the presence of rivers, lakes, dams, and salt flats (chotts).

-Arid zone: This region, encompassing the high plains of Algiers and Oran, the Hodna basin, and the Saharan Atlas Mountains, is characterized by its aridity, which promotes salt concentration. Poorly developed soils and the presence of alluvial deposits define this arid zone, where climatic conditions necessitate specific adaptations for vegetation and animal life.

-Desert or Saharan area The Sahara, with its expanses of dunes (Eastern and Western Erg), stony plains (regs), and oases, forms the desert region. The Saharan Atlas Mountains, stretching from the Moroccan border to the Tunisian border, have NE-SW oriented slopes. This desert region is also rich in hydrocarbon resources. Rocky massifs such as the Eglab Massif to the west and the Hoggar Massif to the east mark the southern boundary of the Algerian Sahara.

- Forms common to arid zones Common features of arid zones include landscapes dominated by sand (dunes, ergs), rocky plateaus (hamadas), salt depressions (dayas, vleys, pans), eroded landforms (sifs, gassis), varied mineral soils (gypsum, limestone, saline), wadis (dry riverbeds), oases, and sparse vegetation (bushes, grasses, small adapted trees), with compact human habitats and shaded streets for protection from the sun.

5.3. Evolution of forms in the three areas

The constantly evolving climate dynamics at Earth's surface include warm and cold periods, with particular attention paid to the Quaternary, a geological epoch influenced by variations in Earth's orbit for approximately 2.6 million years.

Dynamic geomorphology, a discipline studying the creation and evolution of landforms at different scales, depends on external agents such as water, temperature, and biogenic factors.

In a cold climate, mechanical weathering due to frost predominates, with limited chemical weathering and a chelation process that enriches the soil with silica. In a temperate climate, various weathering factors are at play, with significant chemical weathering within the soil.

In hot and dry climates, mechanical fragmentation is limited, but chemical weathering intensifies after periods of infrequent rainfall, leading to severe rock disintegration. In hot and humid climates, mechanical disintegration is minimal, but chemical decomposition becomes very active due to consistently high temperatures, promoting the increased presence of H+ ions in groundwater.