PHYSICAL – GEOGRAPHICAL CONDITIONS INFLUENCE ON THE BLACK SEA CLIMATIC FACTORS EVOLUTION

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Abstract

Climate is the weather multiannual regime resulting from the interaction between radiative factors, general circulation of the atmosphere and the complex physical and geographical conditions for a 30 year period. The Black Sea climate is strongly influenced by the physical-geographical characteristics of its basin. This study presents the specific Black Sea shorelines climatic factors over a long period of time in relation to their geography.

Key words: Black Sea; physical-geographical conditions; climatic factors

Introduction

Climatology is the branch of meteorology that studies weather multiannual regime depending on the locality, zone, country, region, continent specific geographical or even the world. Climatology is the science that deals with climate study (Romanian ANM, 2015).

In accordance with WMO-100/2011 climatology is the study of climate, its variations and extremes, and its influences on a variety of activities including (but far from limited to) human health, safety and welfare. Climate, in a narrow sense, can be defined as the average weather conditions for a particular location and period of time. Climate can be described in terms of statistical descriptions of the central tendencies and variability of relevant elements such as temperature, precipitation, atmospheric pressure, humidity and winds, or through combinations of elements, such as weather types and phenomena, that are typical of a location or region, or of the world as a whole, for any time period (WMO-100/2011).

Climate is the weather multiannual regime resulting from the interaction between radiative factors, general circulation of the atmosphere and the complex physical and geographical conditions. Studies usually used an average of 30 years (1961-1990, reference recommended by the World Meteorological Organization) or more recently, the period from 1971 to 2000, to define a normal climate for the region. The aim of these studies was to identify the impact of climate change on human activities and society in general. Climatic data is used to analyze the tendency of the time, at a time. Climate is defined as multiannual meteorological parameters generated by radiative, dynamic, physical-geographic, anthropic factors action, etc.

According to dexonline.ro, climate is defined as the annual average regime and meteorological phenomena processes (characteristic of a certain region), caused by solar radiation and the general circulation of air masses that vary with position relative to Earth, with absolute altitude and relief configuration region, having as main components: mean air temperature, cloud cover, precipitation and wind. Maritime climate is characteristic of
the oceans, seas and continental regions under the direct influence of marine air masses, wet climate, with annual and diurnal thermal small variations.

Also in dexonline.ro, climate is defined as all the processes and meteorological phenomena characteristic of a geographical area.

The main genetic factor for climate is the astronomical one (shape and movements of the Earth, depending on distance from the Sun, the tilt poles axis to the plane of the ecliptic) that influenced the radiative conditions (change in the angle of incidence of sunlight causes unequal distribution of radiant energy on land area, reflected in the geographical latitude depending on the height of the Sun, the length of day and night, radiative - caloric balance of the earth's surface).

Depending on geographic latitude, and the amount of heat received by the Earth from the Sun there are three major climatic zones: hot, temperate and cold. In this climate zones there are several specific types, mainly determined by physical-geographical factors, but also the atmospheric dynamics at the regional level, with different characteristics, influenced by the nature of the active surface (land and water), the geographical position region (within continents or near oceans and seas), air supply, and the presence of various major forms of relief. This paper is interested in the Black Sea climate.

Data and methods

The Black Sea, the third largest European sea, although a semi-enclosed sea, is regarded as the biggest of the big components of the Mediterranean Sea basin and has developed both continental crust and the oceanic crust. The Black Sea basin morphology is similar to a continental bordered basin and also, to abyssal oceanic plains.

The Black Sea is situated in the eastern part of the south-east, between 40°55’N and 46°32’N parallels and between 27°27’E and 41°42’E meridians. By its latitudinal placing the Black Sea is in the central temperate zone and by its longitudinal placing the Black Sea is affected by the main air masses barometric centers (Azores anticyclone, Eurasian anticyclone, North Atlantic cyclones and the Mediterranean ones. The Black Sea is a deep tectonic depression divided into two compartments (basins): western and eastern.

The Black Sea is connected to the Atlantic Ocean by the Bosporus (which emerges from the sea’s southwestern corner), the Sea of Marmara, the Dardanelles, the Aegean Sea, and the Mediterranean Sea. The Crimean Peninsula thrusts into the Black Sea from the north, and just to its east the narrow Kerch Strait links to the Sea of Azov. The Black Sea coastline is otherwise fairly regular. The maximum east-west extent of the sea is about 730 miles (1,175 km), and the shortest distance between the tip of Crimea and Cape Kerempe to the south is about 160 miles (260 km). The surface area, excluding the Sea of Marmara but including the Sea of Azov, is about 461,000 square km. The Black Sea proper occupies about 422,000 square km. A maximum depth of more than 2,210 meters is reached in the south-central sector of the sea (Britanica, 1996).

The coastline of the Black Sea (4340 km) is only mildly indented, except for the northwestern and northern shores, which are low and furrowed by numerous ravines, valleys, and rivers, the mouths of which are often impeded by sandy spits. The mountains of southern Crimea form the only precipitous cliff areas. In the east and south, the coasts are steep and mountainous. Spurs of the Greater and Lesser Caucasus ranges, separated by the Kolkhida lowland, confine the Black Sea in the east, while the Pontic Mountains run along the southern coast. Near the Bosporus outlet, the shoreline relief is moderate though still steep. Farther north, in the Burgaski Bay area, low mountains emerge where the Balkan Mountains of Bulgaria extend eastward. Continuing northward along the western shore, a
flatter plateau region gives way to the great Danube River delta, which thrusts its mass out into the sea (Britanica, 1996).

The Black Sea climate is influenced by the geographical position of the sea, the movement of air masses, the wind regime etc. During the cold season are highlighted in the northern sector winds, very strong along the coast, weaker at large. The prevailing summer winds are the northwest, west and southwest, in the west of the Black Sea and from the sea to coast, in other parts of the sea. As regards the distribution of wind speeds, 40-50% of the speeds are between 1 and 5 m/s.

The types of wind Black Sea wind movement, according to wind directions (determined based on the baric field distribution on the sea and surroundings) are: northeast, east, southeast, southwest, west, northwest, north and week movement. The most probable average length for these types of movement is 6 ... 24 hours at a rate of 67% of cases (for cyclonic circulation the interval of 6 .. 12 hours represents 77% of all cases).

The Black Sea Basin is located in the temperate zone, so the development of its maritime climatic factors is influenced decisively by the main barometric centers that govern the general atmospheric circulation in southeastern Europe.

The climate of the Black Sea are, for the most part of his basin, a semiarid character, evaporation is greater than precipitation. The appearance continental of the landscape shores of the Black Sea causes very uneven distribution of dynamic factors of climate over the entire basin. Black Sea position has a large opening on the largest part of the northern side, to the Pontic steppes where easily penetrate dry and cold continental air masses. Carpathian Mountains greatly reduce the penetration of oceanic influences from the west and the Caucasus creates an effective shelter to excessive continental influences in the Northeast. The Pontic Mountains and southern Anatolia Plateau determine a specific model of spatial distribution of climatic parameters.

Depending on the specific geography of the area (spatial distribution of openings and continental barriers), according to references, there are three different climate zones differentiated in the Black Sea: the western, eastern and central.

The Western Basin is wide open to the north and northeast, where they come from excessive continental influences specific to Pontic steppes. The northern section of this area is characterized by cold and dry winters, with strong winds. The average yearly temperature of January increases from -0.6° to -0.7° C in the Gulf, 3° C, near the Bosphorus. Winter precipitation has monthly averages between 38 and 50 mm and between 30 and 80 mm evaporation. Summers are moderately warm. In July, the temperature is distributed more evenly, with a temperature gradient of only 0.5° ... 0.6° C. Summer rainfall moderate values, monthly averages ranging between 25 and 35 mm, evaporation showing values between 80 and 130 mm. Average annual rainfall varies between 350 and 600 mm, and evaporation of between 800 and 975 mm.

The Eastern Basin, located in the Caucasus Mountains shelter, has a specific climate with average annual temperatures of 14°...15° C, with warm winters and relatively mild summers and wet wipes. This section is more homogeneous in terms of distribution of temperatures, but well differentiated in relation to the distribution of precipitation and evaporation. Thus, in the north of this area, monthly average rainfall recorded between 25 and 100 mm and 200 mm evaporation and 35, whereas in the southern area, the average monthly rainfall values are between 80 and 200 mm and evaporation between 70 and 110 mm. The annual precipitation average is 600 mm in the northern area and 1700 mm in the south area. The annual evaporation average is 1290 mm and 785 mm from the north to the south. Local there is subtropical climatic conditions similar to those due solely shelter of the Caucasus, as well as relief with deep valleys oriented southwest and depressions housed.
Central Basin reveals transition climate aspects. The most significant differences are registered in precipitation in the northwest and the southeast, which expresses the essential role of the Caucasus barrier. The annual precipitation average is 370-380 mm in the north-east (46°28' N, 30°10' E), 340-350 mm in the central part of the Black Sea (43°50' N, 33°27' E), and 1700-1900 mm in the southeast (41°55'N, 41°15'E).

Results

The climatic factors variation in the Black Sea basin is analyzed for the period 1968-2000, on the basis of meteorological data processed from several reliable sources for a period of over 30 years. 1968 .. 2010.

Air temperature regime is as follows: the average annual temperature is set on the Black Sea from 10,0°C to 15,2°C, with very hot summers and poor rainfall, and relatively warm and humid winters, except for the southeast area with a near subtropical climate.

The lowest air temperatures at sea are between January and February, and the highest are in July and August.

Atmospheric humidity follows the variation in air temperature. The thermohygrometric regime causes atmospheric instability, decreased visibility and a wide range of weather phenomena. The hygrometric regime is determined by the sea’s own evaporation and by the Mediterranean and oceanic air advection. The annual value of atmospheric circulation over the sea basin is about 3,600 km³ of water.

The relative humidity average has an inverse variation like temperature variation. The nebulosity annual average in the Black Sea basin is about 5.6 tenths.

The presence and wind speed (Figure 1) and storms (average annual number of days with thunderstorm is 20-40).

![Figure 1. The presence and speed of wind on the Black Sea coasts.](image)

Air temperature

In winter, the average temperature ranges between -2°C in north and 9°C in south, in summer, between 20°C to 24°C in the whole basin of the Black Sea (maximum monthly average - figure 2 and minimum monthly average - figure 3);
Figure 2. Air temperature on the Black Sea coasts - maximum monthly average.

Figure 3. Air temperature on the Black Sea coasts - minimum monthly average.

**Humidity**
Relative humidity varies between 70-85%, rarely exceeding the limit of thermal comfort.

**Visibility**
Visibility is lower in transitional seasons (average of days with zero visibility is 7 to 10 days on the Romanian seaside).
Nebulosity
Nebulosity is higher in winter (average of days with maximum cloudiness on the Romanian coastline is 10 to 15 days per year).

Fog
Foggy days average is 30 in the west (Figure 4).

![Figure 4. The number of days with fog on the Black Sea coasts.](image)

Precipitation
Precipitation is moderate, with an annual average of 300-500 mm (Figure 5).

![Figure 5. Total precipitations on the Black Sea coasts.](image)
Conclusions

Climatology has become a dynamic branch of science with a broad range of functions and applications. New techniques are being developed and investigations are being undertaken to study the application of climate in many fields, including agriculture, forestry, ecosystems, energy, industry, production and distribution of goods, engineering design and construction, human well-being, transportation, tourism, insurance, water resources and disaster management, fisheries, and coastal development.

Bibliography

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