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Morphostructural features of the eastern margin of the Bulgarian continental microplate

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Abstract: *The Bulgarian part of the western shelf of the Black Sea corresponds to a part of the passive margin of the Bulgarian continental microplate towards the transition with the Black Sea oceanic microplate. It is probably the only preserved fragment of the passive margin of the Black Sea Gulf of the Tethys Paleocene. The inner (coastal) and outer (seaside) shelf sections are distinctly beached, separated by a shelf slope. A significant difference in the regional morpho-structural situation was found for the two parts of the shelf. On the inner (coastal) shelf, antiforms and synforms are few in number and of impressive size. In contrast, small, short, numerous antiforms and synforms are observed in the outer part of the shelf. The orientation of all morphostructures corresponds to the general direction of the shelf, which in the northern part of the studied area is south-southwest - north-northeast. At the parallel of Burgas Bay, the direction of the shelf changes from north-northeast to south-southeast. The location of the alteration is associated with a bundle of transverse faults. The influence in these two parts of the shelf, respectively the Bulgarian continental microplate from the north and the Strange continental microfragment from the south, is obvious.*

Keywords: Eastern Bulgarian coastal morphostructural belt, the subaquatic part of the Bulgarian continental microplate, morphostructure, plate tectonics

Introduction

The western shelf zone of the Black Sea within Bulgarian territory represents a segment of the passive margin of the Bulgarian continental microplate, transitioning toward the adjacent Black Sea oceanic microplate. This area likely contains the only preserved portion of the passive margin of the Black Sea embayment of the ancient Tethys Ocean. The shelf is clearly divided into two zones – an inner (coastal) and an outer (marine) section – separated by a pronounced shelf break. Notably, these two zones exhibit considerable differences in their regional morpho-structural characteristics.

The article examines the morphostructural relationships between the eastern periphery of the Bulgarian continental microplate and the Black Sea oceanic microplate (Figure 1).

Within the subaerial eastern margin of the Bulgarian continental microplate (Figure 1) fall (from north to south) the eastern peripheral sections of the South Moesian, Stara Planina, Upper Thracian and Strandzha morphostructural zones [1]. These lands form the meridionally oriented, 70 km wide, on average, East Bulgarian coastal morphostructural belt (Figure 1). Its western border is traced along the meridian of the Danube River, east of the town of Tervel, through the town of Devnya to the Luda Kamchia River, continues southwest through its gorge and again follows in a meridional direction, west of the town of Karnobat along the western periphery of the Burgas Depression and through the border strip between the Derventa Heights and the Strandzha Mountains to the East Thracian Lowland (Figure 1). This morphostructural belt includes (from north to south) the Dobrich morphostructural block of the South Moesian morphostructural zone, the Primorsky morphostructural area of the Hemus morphostructural zone, the Elhovo-Karnobat and Burgas morphostructural block (depression) of the Upper Thracian morphostructural zone and the Strandzha morphostructural zone [1].

Morphostructural Features of the East Bulgarian Coastal Morphostructural Belt

The Eastern Bulgarian coastal morphostructural belt is distinguished by the following features:

1/ In the western and middle part of the South Moesian morphostructural zone, the relief decreases towards the north. In the eastern part of the zone - the Dobrich morphostructural block, the general slope of the relief decreases towards the east.

2/ In the Primorsky morphostructural area of the Hemus morphostructural zone, there is a gradual lowering of the majority of the axes of the antiforms in the Kamcha and Emin morphostructural regions east towards the Black Sea.

3/ In contrast to the plain-lowland relief of the middle and western part of the Upper Thracian morphostructural zone, the Burgas depression morphostructure visibly expands and decreases in the eastern direction.

4/ The relief of the Bulgarian coastal part of the Strandzha morphostructural zone gradually decreases towards the northeast. There is a distinct gradual decrease in the morphostructure and relief of the entire eastern Bulgarian coastal morphostructural belt towards the Black Sea (Figure 1).

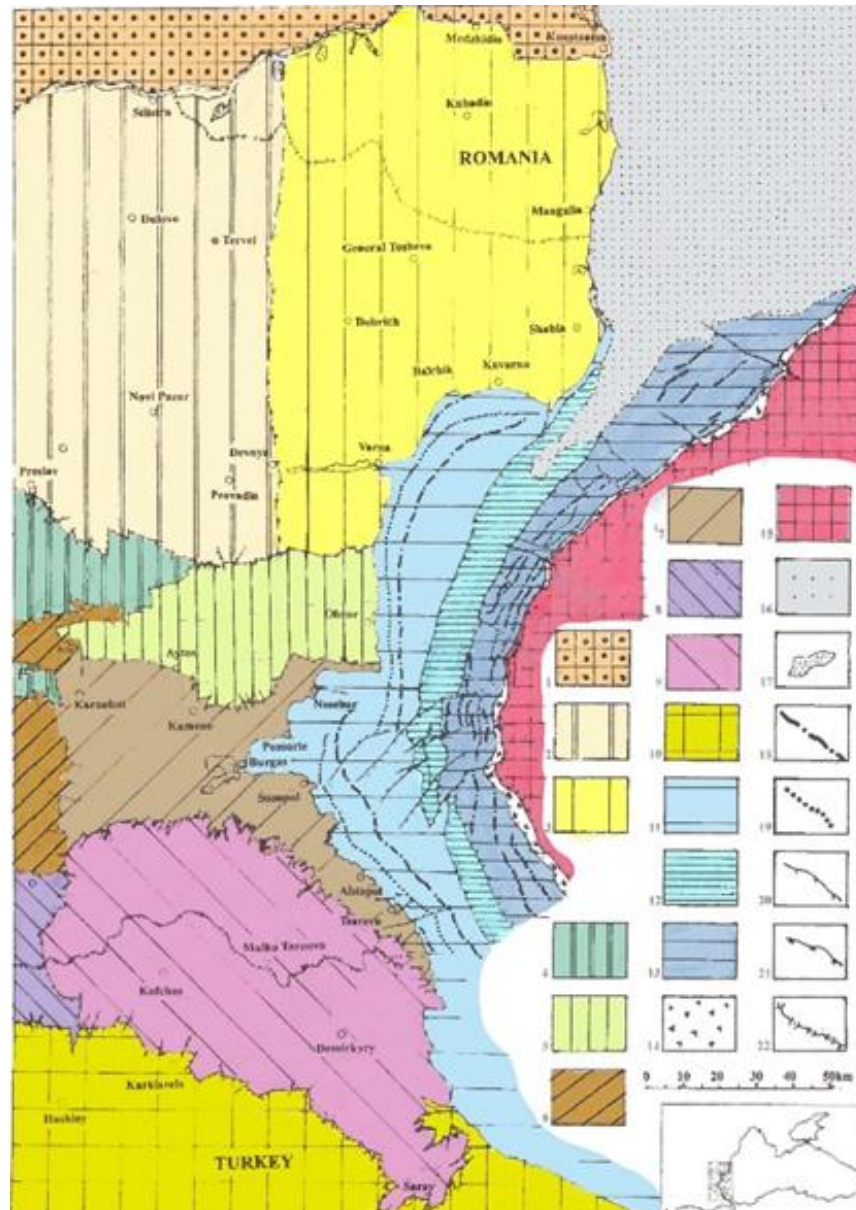


Figure 1. Morphotectonic map of the Eastern Bulgarian coastal morphostructural belt

1 - Moesian continental microplate; 2-9 - Bulgarian continental microplate; 2-3 - South Moesian morphostructural zone: 2 - Shumen morphostructural block, 3 - Dobrich morphostructural block; 4-5 - Primorsky morphostructural

region: 4 - Asparuhovo morphostructural region, 5 - Obzor and Emoni morphostructural region; 6-7 - Upper Thracian morphostructural zone: 6 - Elhovo-Karnobat morphostructural block, 7 - Burgas morphostructural block; 8-9 - Sakaro-Strandzhan morphostructural zone: 8 - Derven morphostructural area, 9 - Strandzhan morphostructural area; 10 - East Thracian morphostructural zone; 11-14 - East Bulgarian coastal morphostructural belt: 11 - internal morphostructural strip, on a continental slope, 12 - outer morphostructural strip, 14 - continental slope foot; 15 - paleo-oceanic floor; 16 - Holocene plume of thick fluvial deposits; 17 - lakes; 18 - antiforms; 19 - synforms; 20 - faults; 21 - presumed fault zones; 22 - state border

The subaquatic part of the eastern margin of the Bulgarian continental microplate corresponds to an average 50 km wide complex morphostructural zone, traced in the middle and southern parts of the microplate (Figure 1). In these places, the East Bulgarian coastal morphostructural belt includes four morphostructural bands from west to east. The westernmost morphostructural band located near the coast is 15 to 25 km wide. It has a weakly pronounced relief, against the background of which two relatively wide-ranging (in length and cross-section) positive morphostructures are outlined. They are separated from the land by subparallel, approximately as long negative morphostructures. To the east, this morphostructural strip borders on faults (faults) that are well traced on the terrain. To the east of it follows a 5 to 15 km wide strip of shelf slope. Here the slope to the seabed is increased. No traces of regional morphostructures are outlined. Even further to the east is a 10 to 20 km wide strip with numerous positive and negative morphostructures with a length of the order of several kilometers.

The easternmost morphostructural strip has the character of a footstep. Its width is on the order of several kilometers. The easternmost morphostructural strip has the character of a footstep. Its width is on the order of several kilometers.

In its northern part, the Eastern Bulgarian subaquatic coastal morphostructural belt is oriented north-northeast. In the region of the Burgas Bay, this morphostructural belt is complicated by a system of faults with a southwest-northeast direction. South of the faulted section, the direction of the morphostructures changes to northwest-southeast.

North of the parallel of the town of Shabla (Figure 1) the morphostructures in the Eastern Bulgarian coastal morphostructural belt are covered by the thick late Quaternary fluvial deposits of the large European rivers Danube and Dnieper. The southernmost part (on Turkish territory) of this morphostructural belt is yet to be explored.

The question of the extent to which the submarine river valleys in the shelf and shelf slope represent transverse fault zones in the East Bulgarian coastal morphostructural belt (Figure 2) is subject to analysis. The

location of the subaquatic river valley systems in the East Bulgarian coastal morphostructural belt can be seen in Figure 2.

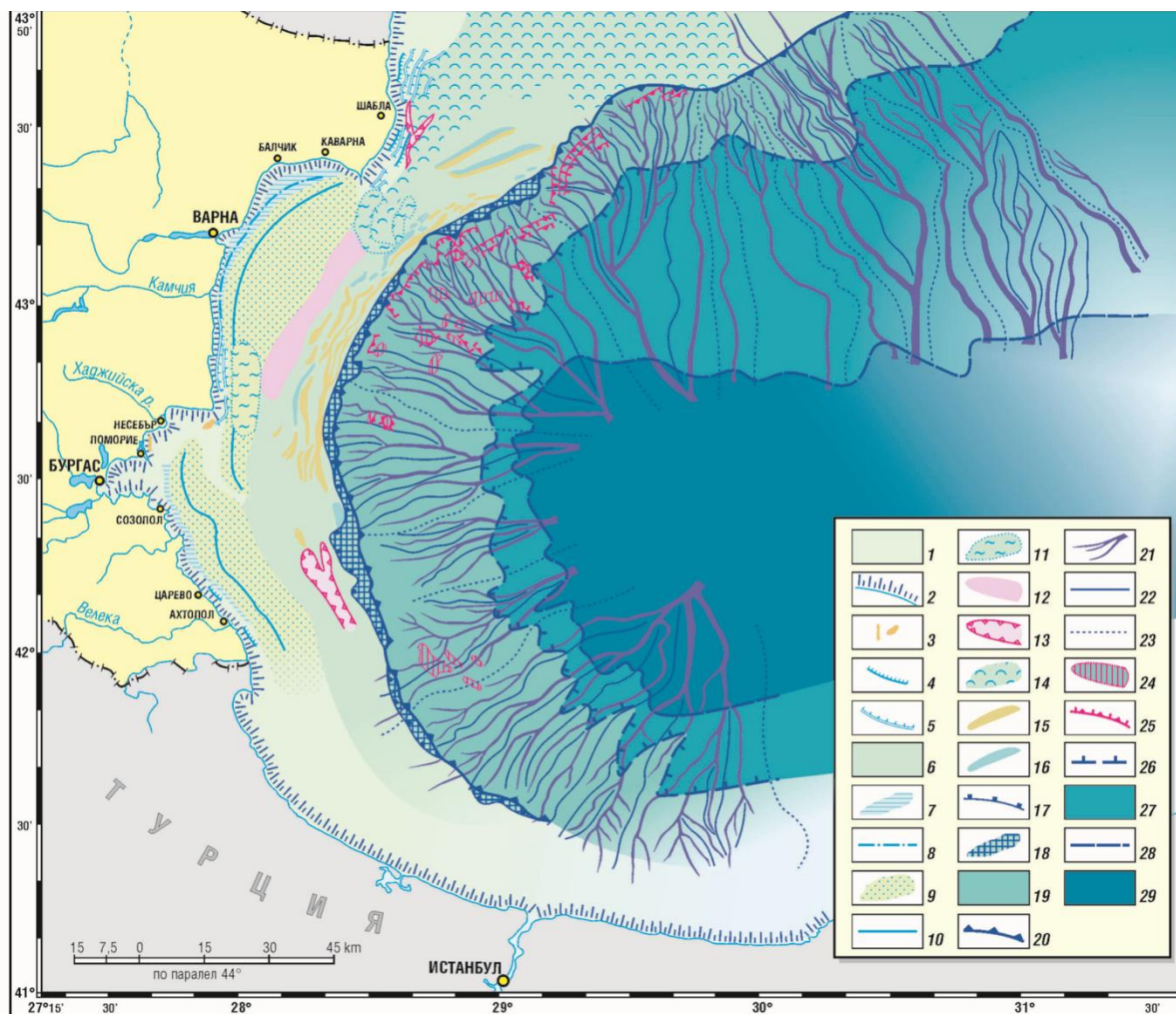


Figure 2. Geomorphological structure of the continental margin of the Bulgarian sector of the Black Sea (according to [6])

The described subaerial and subaquatic eastern margin of the Bulgarian continental microplate is distinguished by an almost complete lack of seismic activity. The situation is similar in the western part of the Black Sea. By its nature, the studied territory between the Bulgarian continental microplate and the Black Sea oceanic microplate bears all the signs of a passive continental margin.

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studied territory between the Bulgarian continental microplate and the Black Sea oceanic microplate bears all the signs of a passive continental margin [2, 3].

The relationships described in the article represent the only location on the planet where part of the passive oceanic margin of a residual fragment of the Paleo-Tethys Ocean has been preserved in relation to the Eurasian continent. These relationships have not been influenced by the effects of the subduction of the dense oceanic crust of the Tethys Ocean and/or the subsequent transcontinental collision between Gondwana and Laurasia in the studied region [4, 5].

Conclusion

The morphostructural differentiation in the East Bulgarian coastal zone reflects the complex geodynamic evolution of the region, which is strongly influenced by the interaction between the Bulgarian continental microplate to the north and the Strandzha continental microfragment to the south. The observed passivity of the margin and the absence of modern seismic activity confirm its classification as part of the passive continental margins of the former Tethys Ocean.

Studies of this zone provide valuable insights for interpreting the geotectonic history of the region and reveal important data regarding the distribution of morphodynamic processes.

Recent studies provide grounds to suggest that, in this particular segment of the Paleotethys Ocean, the subduction processes and the ensuing transcontinental collision were halted as a result of the westward movement of the Anatolian continental microfragment, driven by the pressure of the Arabian continental plate.

The role of the continental block of the Strandzha morphostructural zone in reorienting the direction of the East Bulgarian coastal morphostructural belt south of the Burgas Bay remains to be clarified.

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