Impact of neotectonic processes of Shkumbin valley, "Xibrake-Librazhd area" on existing and future civil engineering works

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ABSTRACT

The rock type contacts on both sides of Shkumbin river valley indicate that the neotectonic movements from west to east are not uniform. This has been verified through continuous field investigations in both sides of the Shkumbin valley (Xibrake-Librazhd area). This paper aims to show the results of these field investigations followed by geological and geotechnical assessments on the impact of these neotectonic processes on the civil engineering works.

Based on this verified neotectonic movement as well as the results of the analysis of this study, recommendations will be given that should be taken into account in the maintenance of existing works as well as the construction of future works of national interest (roads, tunnels, residential centers, etc.).

Keywords: geological investigations, petrographic contact, tectonic movement

INTRODUCTION

Field surveys on both sides of the Shkumbin River "Xibrake-Librazhd area" point fields shown in Figure 1, in the framework of previous research [1-2] on complex relations between the western part of the Shebenik ophiolitic massif and the eastern part of the ophiolitic massif of Kuturmanit have identified:

a) Tectonic zone of shale type extending in the valley Shkumbin south-west (Labinot- Xibrakë area) to the northeast (Murrash-Librazhd area.) [3-4]
b) Movement in general of the massif ophiolitic Shpat- Kuturmavit from west to east, creating morphologically from the Shkumbin valley and geologically from the Shkumbin syncline. (Mokerr-Gurakuq)
c) The intensity of this neotectonic movement (west-east) was not uniform, as in a distance - 800 ml from Cesmja e Myftarit- parallel to the highway that leads to the village of Babje, we have an overflow of the older formations over the newer ones.
d) The main amplitude of neotectonic movements from west to east in the area "Xibrake-Librazhd" is different on both sides of the river Shkumbin.[5]
e) Given that this area passes the railway line Elbasan-Librazhd with several tunnels and bridges, the existing national road Elbasan-Librazhd and what is planned to be built, the evidence of these neotectonic movements, their amplitude is important in the maintenance of existing facilities and construction of works in the most stable areas.

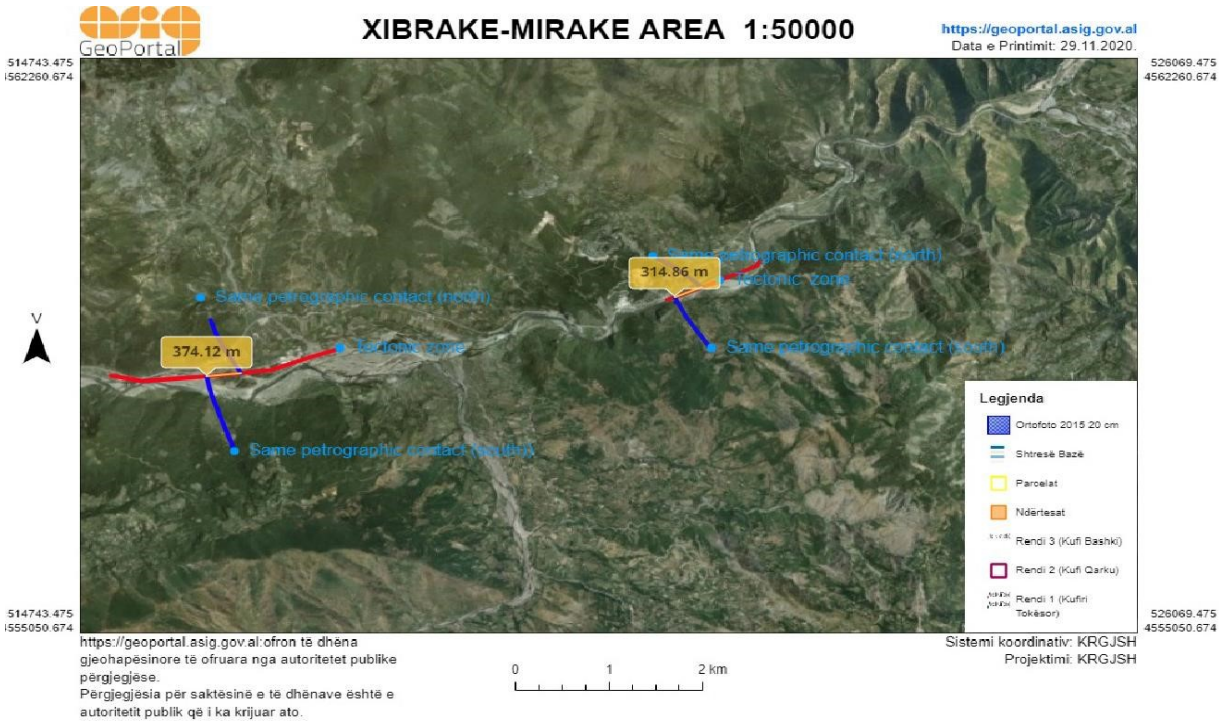

Figure 1. The point fields in Xibrake-Librazhd Area.

During field observations it was noticed that these two masses move towards each other, the one of Shpat-K towards the east and that of Shebenik towards the west. As a result of this movement, the Librazhd intermountain pit was created with molasses deposits. The city of Librazhd was built on these deposits created by these neotectonic movements, as well as many inhabited centers from Librazhd to Qukes shown in Figures 2 and 3. During the field studies of the Shkumbini river [6] it was noticed that it represents a strong tectonic zone which emerges in the village of Babje and continues towards the SW being covered with alluvial deposits of the Shkumbin River.

This powerful tectonic zone at a length of 10 kml clearly shows: that the movement of rock blocks on both sides of it, in time and space was not uniform.

The north arm is moving and is moving 300-400ml more advanced towards the east compared to the west.

Given that in this length of 10 km (according to the Shkumbin River) is built the national road, railway line and the construction of Corridor-8 (Durres-Skopje-Sofia-Istanbul) is necessary that the constructions carried out in the northern part of the river of Shkumbin to be reviewed in the framework of this phenomenon to be improved and new constructions to be concentrated on the western side of the river Shkumbit in this area of 10 kml (XlbrakeLibrazhd).

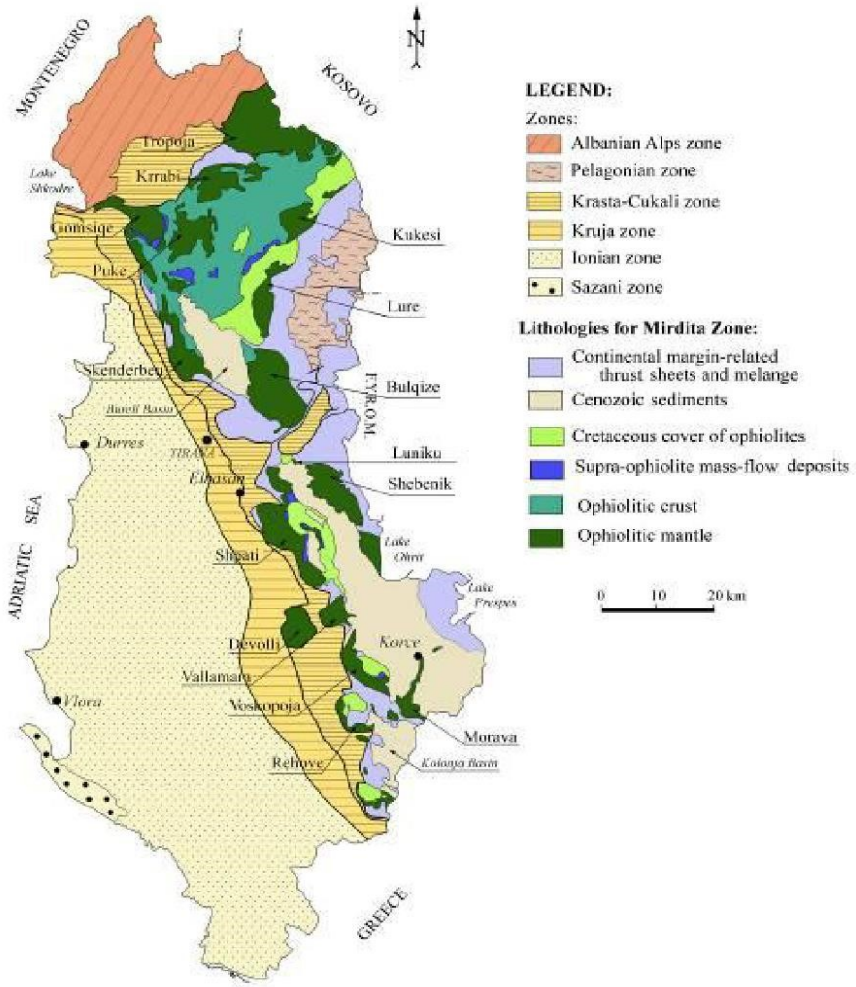

Figure 2. Geological map of Albania

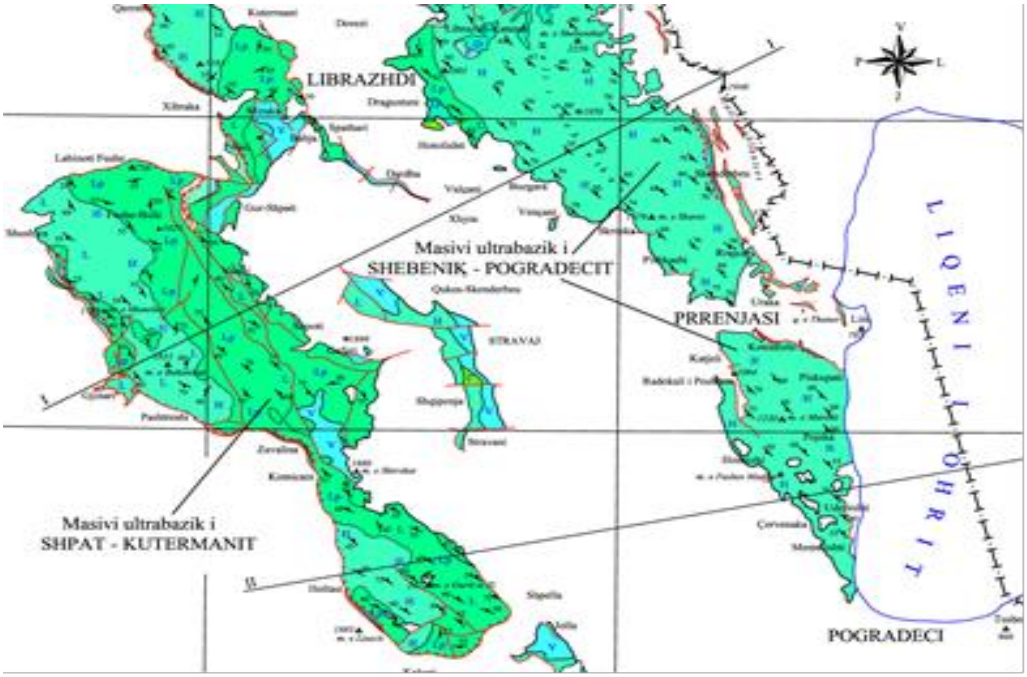

Figure 3. Ophiolitic complexes of Shpat-Kuterman and Shebenik-Pogradec

METHODOLOGY

This tectonic and neotectonic phenomenon was studied by petrographic [7-11] rock contacts in the section "Xibrake-Mirake-Librazhd". In Xibrake at the very end of the national road Elbasan Librazhd, we have the petrographic contact between the carbonate deposits of the Cretaceous and the crushed flysch of (Pg-2Eocene) with coordinates: N-41º09'43 "; E-20º11'40" are shown in Figures 4 and 5.

This petrographic contact in the southern part of the Shkumbin River with coordinates: N-41º09'33 "; E-20º11'30" is shifted towards the west with a horizontal amplitude = 370ml. (Fig-). Continuing eastwards in the village of Mirake, the petrographic contact between the massive limestones of the Upper Triassic and the thick flysch (melange) is found on the other side of the Shkumbin River.

This petrographic contact in the eastern part emerges on the right side of the highway at the point with coordinates: 41º10'10 "; E-20º15'05, while in the southern part it emerges at the point with coordinates N-41º10'03"; E-20º15'06 "with a displacement of 315 meters. Evidence of the tectonic zone in the village of Babje and its pursuit towards the SW for

10 kml (photo-) along the Shkumbin river shows that the Shkumbin river in its studied length Librazhd-Kraste Elbasan represents a tectonic zone with two wings, the northern and ate South.

Both blocks move eastwards, towards the city of Librazhd, where in its vicinity they overlap with an angle of up to 60º shown in Figures 6 and 7. But what is special and distinct is that the northern side of the Shkumbin River moves faster than the western one. From today's measurements according to the petrographic contacts on both sides of it we have a movement difference of 320-350ml.

The west side is less stable as it moves less. A part of the railway tunnels of the Elbasan Librazhd line have been built on this side.

A part of the national road Elbasan Librazhd passes on the northern side of the Shkumbin river and has had engineering problems at certain times.

Evidence of non-uniform movements of the rocky wings (north and south) of the Shkumbin River requires that in the future in the constructions to be carried out be taken into account the tectonic laws, which occurred at different geological times, and neotectonic that continue and days today giving the appropriate recommendations in the protection of works built and those to be built.

Since human activity is much later than the creation of the Shkumbin syncline, we need to recognize today's neotectonic movements that continue and affect the constructions that have been carried out and those that will be carried out. Evidence of benchmarks (identical rock contacts) on both sides of the Shkumbin River from the Xibrake-Librazhd area, allows us to assess the heterogeneity of movement and the solution of areas that move less or take additional engineering measures in areas that move more.

Figure 4. The direction of movement (Shebenik Massiv)

Figure 5. The direction of movement (Kuturmani-Shpat Massiv)

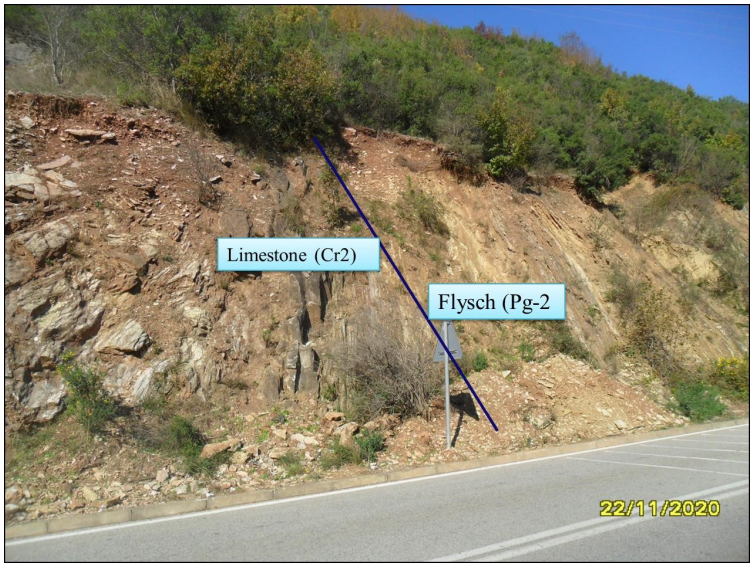

Figure 6. The petrographic contact (limestone-flysch) in the north of Shkumbin river.

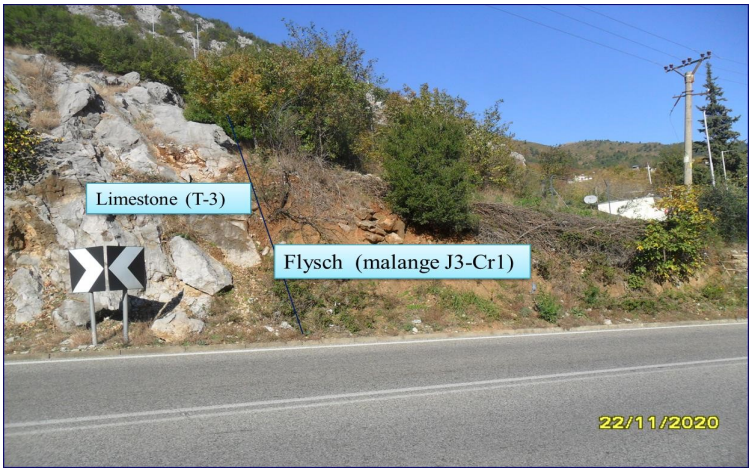

Figure 7. The petrographic contact [massive limestone (T-3) -flysch (J3-Cr1)] in the north of Shkumbin river.

CONCLUSIONS

The study of two ophiolitic massifs, Shebenik in the east of Shkumbin valley and Shpat-Kuturman in the west identified:

- The movements of the Shebenik massif along its entire length from east to west and that of Shpat-Kuturman from the west to the east, creating the mountain pits where then formed the molasses that we meet today from the south (Pishkash) to Funares in the north.
- The continuation of this movement created the Shkumbin syncline with its two wings, the eastern one that meets the east and the western meeting in the west.
- According to the Elbasan-Librazhd axis, a tectonic zone developed according to which the Shkumbi River flows today. This tectonic zone met in Babje and covered to the south east by alluvial deposits has a considerable length over 10kml.
- Movements to the east on both sides of this tectonic zone that runs along the course of the Shkumbin River are not uniform in time and space. The north wing moves faster in time than the south.
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- During the observations, the same petrographic benchmarks were fixed on both sides of the river. Future monitoring of the amplitude of movement of these petrographic benchmarks would be a data on the intensity of movement in time.
- Making measurements every 10 years, in the reference points reflected above we would design accurate projects on the works that are expected to be built in
  this area. On this basis the construction of major infrastructure works in the future on the axis Elbasan - Librazhd would be well we build in the southern part of the Shkumbin river.
- Their construction in the northern part would require additional engineering measures, significantly increasing their cost.
- The engineering works built in the northern part (especially the railway bridges) must be repaired in time, given that the movements are not homogeneous.
- Monitoring of horizontal movements in the time unit (most suitable 10-year unit) would provide data on the lifespan of the constructed objects and the engineering measures to be taken.

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