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The Mesozoic Stratigraphy and Ammonite Fauna of Ladik-Akdag (Samsun) Territory

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Abstract

This paper presents , it is aimed to reveal Mesozoic stratigraphy of Ladik-Akdag region in detail. In the study area, rocks formed in various facies which are different from each other are observed. On the basis of the region, Permo-Triassic aged limestones and Permian aged limestones, mostly in the block, are located in the north, although they have basal rocks in the ages of Permo-Triassic and autochthonous in the south. The cover rocks begin with Liassic aged clastics covering the base rocks and the Dogger aged rocks consisting of metamorphic and volcanic conglomerates and recrystallized limestones. Upper Jurassic-Lower Cretaceous aged shallow marine and Tithonic facies-developed limestones are unconformably overlying Dogger rocks. In the study area, whereas the lower levels of the Upper Cretaceous are composed of sandstone-marly intercalated flysch and limestones, Maastrichtian consists of rocks in the volcano-flysch facies. Within the pelagic mudstones belonging to the unit, *Pseudocyclammina liasica* Hottinger, *Triloculina* sp., *Involutina* sp., *Quinqueloculina* sp., and *Pentacirinus* sp. Fossils have been also identified in addition to such ammonites as *Phylloceras* sp., *Calliphylloceras* sp. *Ameltheus* sp., *Oxycerites* sp., *Juraphyllites* sp. Taken the relationship of the rocks in the region to each other into consideration, the presence of a gradual transgression along the Mesozoic is remarkable. Tertiary consists of Quaternary aged terrestrial formations and alluviums.

Keywords: "Stratigraphy, Biostratigraphy, Ammonodia"

1. Introduction

The study area covers specific parts of the Ladik-Akdag (Samsun, Turkey) region in the Middle Black Sea Region, which is defined as the Central Pontide Tectonic Belt. Geological studies have been conducted by various researchers since 1947 in the study area and its vicinity. [1], [2], [3], [4], [6], [7], [8], [9] ,[10], [11], [12], [13], [15], [19], [20], [21], [22], [25], [26], [28], [29], [31], [32], [33], [35], [36] and [38] have conducted studies on general geology, [19] and [31] have conducted a tectonic research, [34], [38] and [39] have carried out a study for petrografical purposes , [15], [20], [37] have conducted studies for mining geology purposes.

This study aims to reveal the paleontology and stratigraphy of the Mesozoic units in the Ladik-Akdag (Samsun) region, to investigate the ammonite fossils which are known as the index fossil for dating the Mesozoic units in the region, to study the paleontology of the covering units, which are mostly Mesozoic, and to elaborate the stratigraphy of the region in detail.

Figure 1. Location map of the study area

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2. General Geology

Rocks formed in different facies at different ages are observed in the Ladik-Akdag region. Although they look like Permo-Triassic basal rocks and autochthonous on the south, northern faces mostly accommodate Permian limestones, which are mostly in the block form. The cover rocks begin with Liassic clastics covering the base rocks and the Dogger aged rocks consisting of metamorphic and volcanic conglomerates and recrystallized limestones. Limestones formed in Upper Jurassic-Lower Cretaceous aged shallow marine and Tithonic facies are found over the Dogger rocks unconformably. In the study area, the lower levels of Upper Cretaceous consist of sandstone-marl alternation flysch and limestones, and the Maastrichtian level consist of rocks in the volcano-flysch facies. Considering the relationship between the rocks in the region, the presence of a gradual transgression along the Mesozoic is noteworthy. Tertiary consists of Quaternary aged terrestrial formations and alluvium (Figure 2).

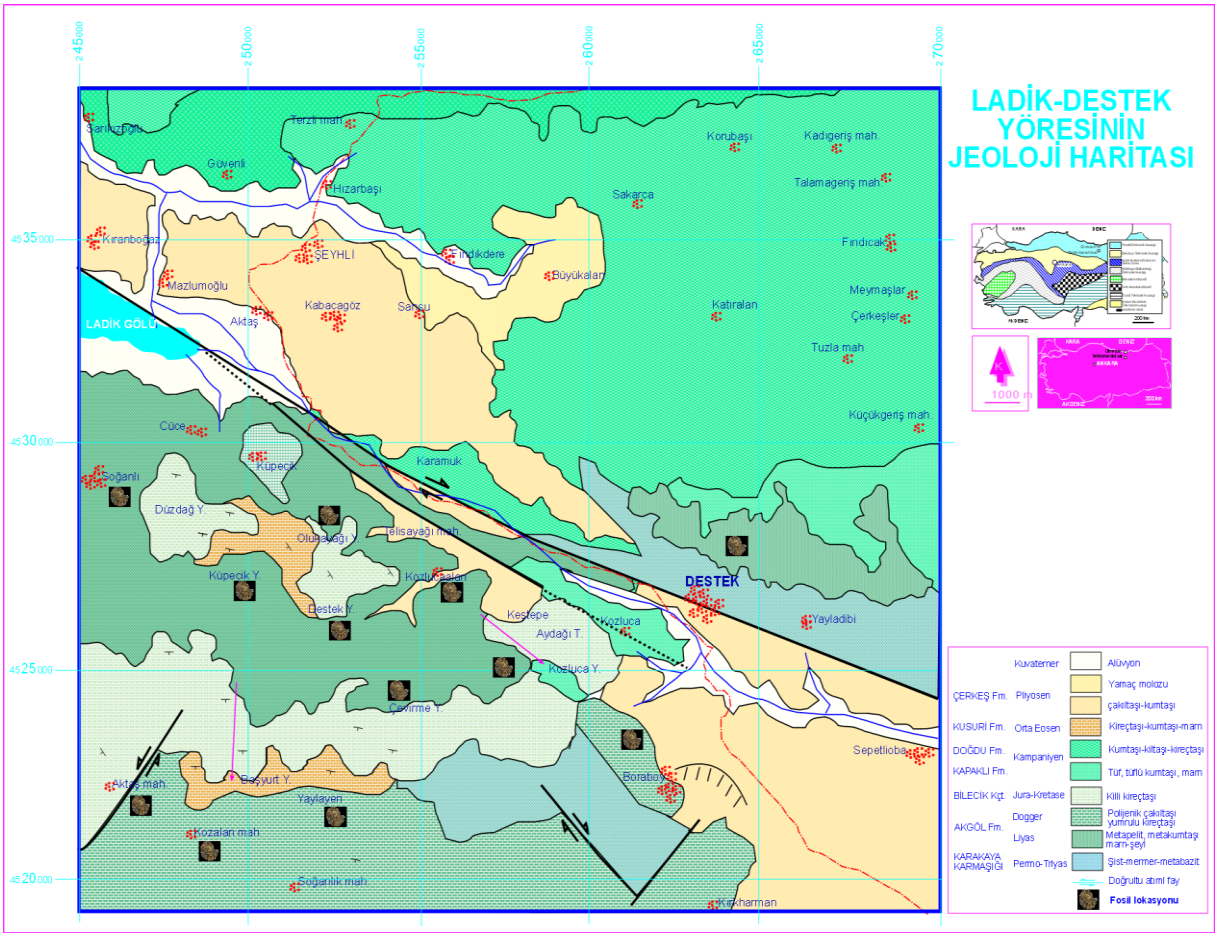

Figure 2. Geological map of Ladik-Akdag (Samsun) region (modifiedafter Akyazı, 2017)

3. Mesozoic Stratigraphy of Ladik Akdag Region

It is noteworthy that there is a clear base-cover distinction between Permo-Triassic basement rocks on different facies located on the base in the region and Mesozoic aged cover rocks covering them unconformably. The cover rocks are products of a gradual transgression and consist of shallow and deep marine units. The Mesozoic units, unconformably overlying the basal rocks with a fine bottom conglomerate level, begin with Liassic units consisting of gray, black colored conglomerates, sandstones and low-grade metamorphosed dark colored marls and shales. The Middle Jurassic-aged clastics are unconformably overlain on the Liassic units. The Upper Jurassic-Lower Cretaceous aged Mesozoic rocks continuing with the units developed on the Tithonic facies are terminated by Santonian -Campanian aged pelagic sediments and Maastrichtian volcano-flysch (Figure 3).

Liassic: Consists of gray, black colored conglomerates, sandstones and low-grade metamorphosed dark colored marls and shales, unconformably overlying the basal rocks with a fine bottom conglomerate level in the research area. The unit begins with polygenic conglomerates containing metasedimentary-metavolcanic pebbles consisting of variegated colored carbonate-cemented, quartzite, calcschist, gneiss, muscovite schist, marble, marl, partial mudstone and Permian aged limestone pebbles, and continues to the upper parts by dark gray-blackish colored, fine-medium grained, and partially coarse-grained, medium-bedded, tightly bonded carbonated sandstones. At the top of the unit, a thin limestone band containing mudstone plaster was

observed. Depending on the submarine volcanic activities in line with the sedimentation, pebbles, sandstones and fine mudstones on the upper part were observed to be accompanied by dark colored, thick bedded agglomerate, andesitic lava flows and pillow lavas and light cream colored thin-to-medium bedded tuffs . Albeit rare, agglomeratic levels, andesitic lava flows and pillow lava observations indicate that the unit sedimented during an active submarine volcanism (Figure 3).

In the sandstones and limestones of the unit, in addition to P*seudocyclammina liasica Hottinger, Triloculina sp., Involutina sp., Quinqueloculina sp.* and *Pentacrinus sp.* fossils [4], *Calliphylloceras sp.* (Plate I, Figures 4, 5, 6), *Amelethus sp.* (Plate I, Figure 7), *Phylloceras sp.* (Plate I, Figures 1, 2, 3), *Oxycerites sp.* (Plate I, Figure 8) *Juraphyllites sp.* (Plate I, Figure 9), and ammonite fossils were identified. According to the fossils discovered, the unit was found to be Liassic aged.

The unit was constructed by [29] by Seyfe, [8] and [25] by Karatepe and [7], Mudurnu, [28] are described and named as Karakese formations.

Dogger: The unit unconformably overlying the Liassic aged units consists of polygenic conglomerates of dark red colored, shale, marl, quartzite, granite, and volcanic and metamorphic gravels mature at different sizes, and gray-dark gray colored nodular limestones at the lower levels. And it consists of recrystallized limestones with thin to medium beddings at upper levels. *Andersenolina elongata* (Leupold), *Protopeneroplis sp., Trocholina sp., Nodosaria sp., Ammodiscus sp.,* and *Aptychus sp.* fossils were discovered in the nodular limestones and recrystallized limestones which form the upper levels [5].

The unit was constructed by [29] by Seyfe and [8], by [25] and by Karatepe and [7] by Bayırköy and [26] by İnözü, [27] Mudurnu, [28] Karakese Formations.

Titonian-Berriasian: The unit which begins with an ungraded carbonate-cemented conglomerate containing reddish colored, obscure-angled metamorphic aggregate, has an oolitic pelsparite texture at lower levels and consists of gray colored limestones containing abundant pellet and oolite having an algae kernel (Figure 13). The unit continues to the top with beige-cream and partially pink-colored, medium-bedded and folded limestones. The upper levels of these limestones have biomicrite with calpionel texture and contains abundant pellets, biogenic granules and abundant calpionel and radiolaria. *Pseudotextulariella* sp., *Textularia* sp., *Quinqueloculina* sp., Miliolide fossils were observed in the lower levels of the limestones of the unit, and Tithonian-Berriasian aged *Tintinnopsella carpathica* (Murgeanui & Filipescu), *Calpionella alpina Lorenz, Crassicollaria parvula Remane, Crassicollaria massutiniana* (Colom), *Calpionella elliptica Cadisch, Crassicollaria intermedia* (Durand Delga), abundant radiolaria and sponge spicules were observed in the thin-middle layer levels developed especially at the upper levels of biomicrite with calpionel microfacies ([5], [35]).

Santonian-Campanian: Gray marl intercalations at the base level of the unit consisting of clayey limestones in the variegated, partially gray, globotruncan biomicrite microbiofacies were observed in a small exposed area in the Bağlarüstü region in the west of the study area (Figure 3). In the fossiliferous clayey limestones belonging to the unit of the product of a calm and deep sea, Santonian-Campanian aged *Marginotruncana pseudolinneiana Pessagno, Rosita fornicata* (Plummer), *Globotruncana tricarinata* (Quereau), *Globotruncana bulloides Vogler, Globotruncana lapparenti lapparenti* (Brotzen) and *Globotruncana linneiana D'Orbigny* planktonic foraminifera were detected [5].

Maastrichtian: The Maastrichtian units, which are exposed to the north of the study area, begin with a base conglomerate. The unit is developed in the volcano-flysch facies and passes over to the sandstones having abundant muscovite on top, and continues with a variegated colored sandstone-marl alternation. The presence of basalt, andesite, tuff and agglomerates of the same age with the sedimentation in the region indicates that submarine volcanism played an active role during the sedimentation (Figure 3). Maastrichtian *Globotruncana arca Cushman, Rosita contusa* (Cushman), *Rosita ventricosa* White, *Globotruncanita conica* (White), *Globotruncana* sp., *Globigerina* sp. were detected in the samples obtained from marl layers found in intermediate layers with lavas, tuffs and agglomerates ([5], [35]). The rocks of the units are deposited in a very active sea. The widespread submarine volcanism has increased this movement even further.

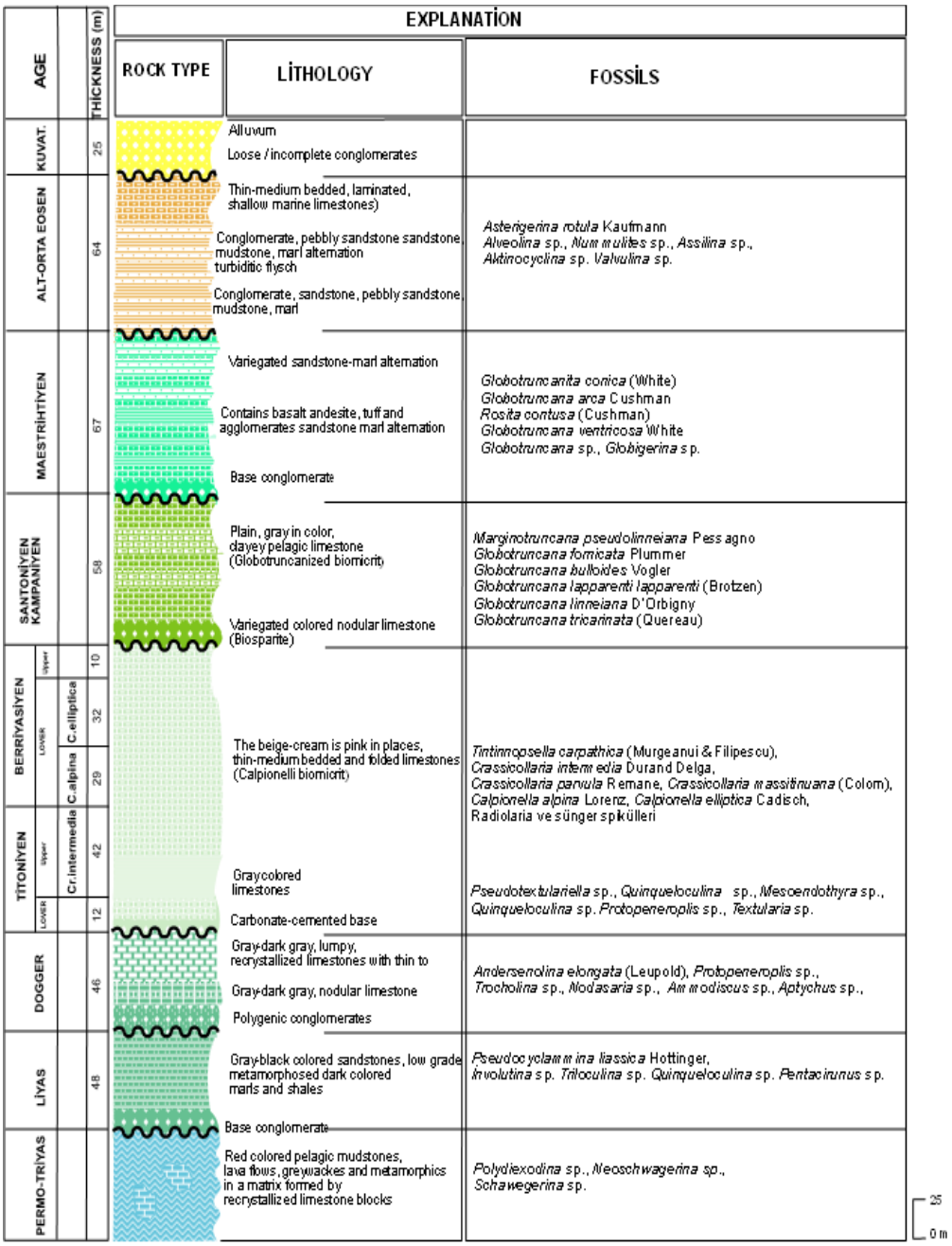

Figure 3. Stratigraphic section of . Ladik-Akdag (Amasya) region (modifiedafter Akyazı, 2017)

4. Conclusion

The presence of a distinctive separation between the Permo-Triassic basal complex and the Mesozoic marine cover units is remarkable in the study area. In the study area, the primary marine cover units from Liassic to the end of Eocene and the terrestrial secondary cover units from Miocene period were observed. Oligocene was not observed in the study area and Oligocene was accepted as the erosion period. In the Ladik-Akdag (Amasya) region, the stack is missing from the top. Although there are deficiencies in some fossil finds, there is no deficiency in the lower part. The sea which seeps into the region in an increasingly gradual manner in the Upper Cretaceous period, undergone severe transgression at the end of the Maastrichtian period, under the severe influence of Laramian Orogeny which affects all of Anatolia. It was determined that the distinct C/T boundary is unconformably separated in the region. It was observed that recrystallized limestones of Upper Mesozoic age in the region form reliefs in the study area, especially recrystallized limestones form floating hills in the alluvial cover, which is quite common on the basis of the region.

Acknowledgements

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Plate I

Phylloceras sp. (Liyas)

Figurel 1. Ladik-Akdag yöresi-Çevirme Tepe x 1/2

Figurel 2. Ladik-Akdag yöresi-Kozlucaalan Mvk. x 1/2

Figurel 3. Ladik-Akdag yöresi-Küpecik Yaylası x 1/2

Calliphylloceras sp. (Liyas-Dogger)

Figurel 4. Ladik-Akdag yöresi-Borabay Mvk. x 1/2

Figurel 5. Ladik-Akdag yöresi-Yaylayeri Mvk. x 1/2

Figurel 6. Ladik-Akdag yöresi-Kozalan Mah. x 1/2

Ameltheus sp. (Liyas)

Figurel 7. Ladik-Akdag yöresi-Soğanlı Mahallesi x 1/2

Oxycerites sp. (Liyas)

Figurel 8.. Ladik-Akdag yöresi-Destek Yaylası x 1/2

Juraphyllites sp. (Liyas)

Figurel 9. Ladik-Akdag yöresi-Olukayağı mahallesi x 1/2

Plate I

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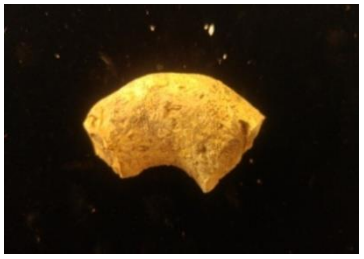

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