Sustainable Earth Review 1(3) 2021 1-11

Shahid Beheshti University

Sustainable Earth Review

Journal homepage: http://sustainearth.sbu.ac.ir

Comparison of stratigraphic rock and sedimentary environment of Shemshak formation in Central Alborz: sections Glendrood - Lavij – Vaz, Iran

Vida Osanlu[a], Davod Jahani[b*], Ali Solgi[a]

[a] Department of Geology, Faculty of Science, Islamic Azad University, Science and Research Unit, Tehran, Iran
[b] Department of Geology, Faculty of Science, Islamic Azad University, North Tehran Unit, Tehran, Iran

ABSTRACT

The study area lockated in the central Allborz whch is in accordance with U shape Caspian Sea. In this Research Shemshak Formtion in the Glandrud region has been Studid and compared in three Section A, B, C in therm Litology Effective Tectonice prossesing in the Formation,Sedementary Environment and Squence of Calasses. These Sections are consisting of sedementry Layer of shemshak Formation, the layer bandray (Elika Formtion & older Formtion) and upper bandray(Lar-Dalichai) in the type section desegnation of shemshak 4 litozone the litilogy of this intity is much more diverse. Sedementry rocks in the studied area are based on desert traps including sandeston types such as quartzit conglomerent, laterite, sub liticarenait, shaillean thin layers and Coal which are Generally Paraconformity or angular unconformity with dolomitic – calcrus cross. on the due to the earlier Cimmerian orogeny phse, carbonate sedimentary environment changed to coal depasetis formation.the UPPER Triassic carbonat rocks in the study area are somtime contain oroganic matte and iron oxide hidroxid of shemshak which formed in the sedementry Environment tidal flats or lagoon. In addition the lateritic section at the base of shemshak formation shows the sedementry discontinuity of the earlier cimmirian land tenure phase.In the section **A** at the base of shemshak formation is on the part of Laterit Hoeizon but at the upper part bordered Dalichai formation. At th section of **B** on the in the hillside of Sordar the Lower boundray of Shemshak Formation contain Laterit Hoeizon the form of Paraconformity and is located on Elika Formation but the upper boundary in the form of angular unconformity bordered Dalichai formation. At th section of **C** lower boundary of shemshak formation does not contain bauxite- laterit and is located on the Elika formation and the upper bandray ends in direction of Dalichai Formation. in term sedimentary environment Dolomit–Limeston formed in the Tidal Flats, Sandeston in the shallow coastal or condition open River and Coal has been depasited castal marsh and sowamp. The bauxite – Laterit horizon are of peneplain type.

ARTICLE INFO

Keywords:
Forland
Lagoon
Quartzarenit
Shemshak
Stratigraphy

Article history:
Received: 04 Mar 2021
Accepted: 10 Apr 2021

*corresponding author.
E-mail address:
d_jahani@iau-tnb-ac.ir
(D. Jahani)

1. Introduction

Alborz mountains is a series of winding heights with an east-west trend in northern Iran. The middle part of Alborz is connected to Qom from the south and to the Caspian Sea pit from the north. This area corresponds to the U-shaped part of the Caspian Sea. Alborz mountains is divided into three parts: western Alborz, central Alborz and eastern Alborz.

Central Alborz can be divided into northern and southern zones according to geological characteristics (Stoklin, 1974). The study area is located in the northern zone of Central Alborz (Fig. 1). At the end of the Triassic, the carbonate sedimentary basin in Alborz has changed its nature to phonetic and destructive sediments. The amount of carbonate formation mainly depends on the reduction of the influx of destructive volatile substances into the basin (Adabi, 2011).

The Forland Basin was formed in the late Triassic by the collision of the Iran-Turan plateau of the Alborz Mountains, and as a result, the lithosphere collided and bent (Ghaemi, 2014). The Samirin incident in northern Iran is the result of a continental collision that is accompanied by regional discontinuities and drastic changes in sedimentation (Shahidi, 2010).

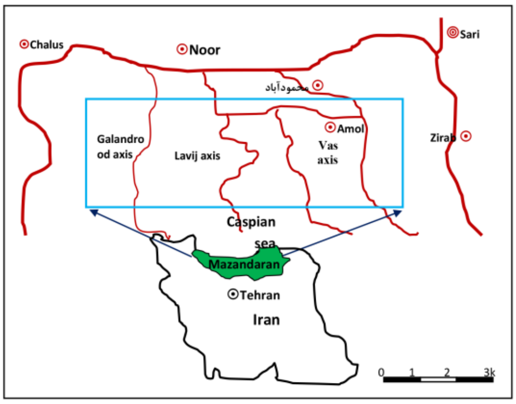

Fig. 1. Sketch and location of ways to access the study area of Glendrud, Lavij and Vaz

2. Material and Methods

In this study, the Shemshak Formation in the northern Alborz Central Zone, between the Harazta Valley and the Chalous River, has been studied. Shemshak Formation in Central Alborz has a wide geographical spread and includes various tectonic events, sediments and processes geologically. The objectives of this study are stratigraphic studies, including stratigraphic analysis, detection and classification of facies, interpretation of sedimentary environment and drawing its changes and providing appropriate sedimentary models. Shemshak Formation in three sections of Glendrud, Lavij and Vaz sections (A, B, C) has been studied (Fig. 2). The geological sections were prepared from the above sections and stone samples were taken from the studied sections, including the layers of Shemshak formations and the lower and upper borders of the sample and geographical locations of the samples were taken. The above 50 samples were sent to Binalood Minerals Laboratory for preparation of thin section and after preparation, they were studied by Zeiss ARC polarizing microscope made in Germany. Robert Fulk's (1980) classification has been used to name sandstones. After analyzing the laboratory samples, the field data were matched and concluded. Also, in order to investigate tectonic and climatological events from the lattice horizon of Shemshak base, 5 samples were collected and studied for X-ray mineralogy by XRD method in the laboratory of the Geological Survey of Iran.

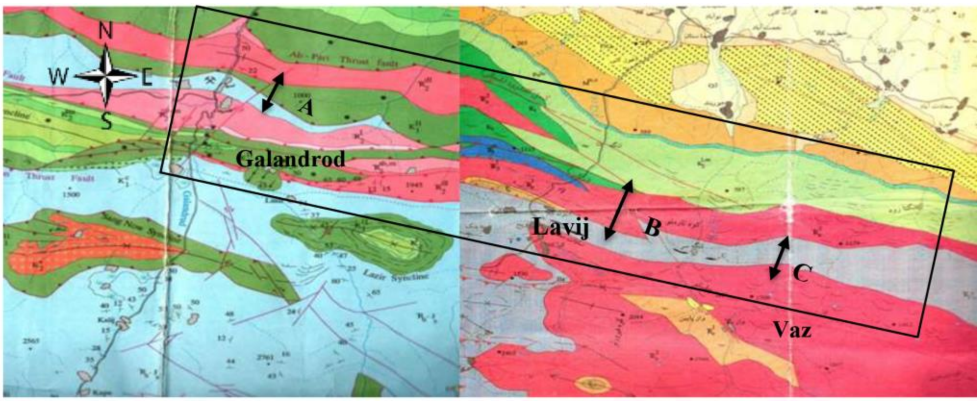

Fig. 2. The study area on the geological map of Amol and Baladeh with a scale of 1/100000
(Adapted from Vahdati Daneshmand & saidi, 1999)

Table 1. Comparison of A, B, C sections in terms of lithology and thickness (Osanloo, 2018)

Rock unit	Glendrud section(A)	Lavij section(B)	Vaz section (C)
High carbon deposits	Siltstone, small to medium sandstone shale, abundant plant debris with charcoal layers 100 meters thick	There is no section in the northern part In the southern part of the shale section, the thin carbon layer of part of these sediments is not visible due to faults. 70 meters thick	Flood column, fine-grained sandstone with wooden utensils, poor charcoal effects, shale with middle layer of chert and silica Thickness 150 meters
High sandstone	Fine-grained to medium-grained sandstone, siltstone, with plant fossils 200 to 300 meters thick	There is no section in the northern part Fine-grained sandstone section to medium-grained in southern part Siltstone Approximate thickness, 400 meters	Sandstone Mudstone Thin layers of silica inside the shales Thickness 200 meters
Low carbon sediments	Siltstone and shale with workable charcoal layers Fine-grained to medium-grained sandstone Plant remains 250m	Siltstone of fine-grained sandstone to coarse-grained, workable charcoal layers containing Marcasite 300 Abundant plant residues Total thickness of the charcoal layer is 8 meters	Alternate fine-grained sandstone, mudstone, siltstone and coal layers Thickness 300 meters The total thickness of the coal layer is 5 meters
Low sandstone	lateritic horizon (6 meters) Silica fine sandstone, fine sandstone, coarse-grained sandstone siltstone - shale 300 meters thick	Southern siltstone section, cream to buff colored fine-grained siltstone, muscovite mudstone and claystone Northern section of the lateritic horizon (6 m) Silica sandstone, fine-grained sandstone with muscovite	Here the section has disappeared due to tectonic function
Thickness	- lower contact also conformity with Elika formation - The upper contact disconformity with Tizkuh Formation - Thickness 850 meters	- lower contact also conformity with Elika formation - The upper contact disconformity with Delichai formation and for southern part, lower contact also conformity with Elika formation - The upper contact disconformity with Tizkuh and Nesen Formation - Thickness 500-850 meters	- Discontinuous lower contact also disconformity with elika formation - The upper contact formation disconformity with Delichai - Thickness 700 meters

2.1. Glendrud Section (A):

Shemshak Formation in Glendrud Section is the result of geological studies from the coal region of Rudba-Kadir and the western and eastern slopes of Glendrud river. Ascerto (1966) divided the sedimentary rocks of Shemshak Formation in the study area into four rocky zones, including the lower sandstone, the lower coal sediments, and the high and coarse-grained sandstone of the upper part. The interpretations of the samples taken in section A are as followed. Example no. Vg-96-5, the components of the rock, quartz grains, are often presented singly and sometimes polycrystalline in the rock (Fig. 3). A number of quartz show undulatory extinction. The texture of the stone is composed of grains the size of a coarse-grained silt, often very fine-grained sand, and in terms of maturity, the tissue is immature to semi-mature. Sodium and potassium feldspars are rarely found in rocks. Mica blades are often relatively abundant in rock and show some directional orientation. The seeds of tourmaline and zircon are scattered throughout the sample. Lithium components, including cherts and volcanic glass, are less common in rock. Clay, along with iron oxide, forms the cement of stone. With the above description, the name of the immature gravel sandstone was determined with immature cement and laminate iron oxide (Glendrud village, western slope of the valley).

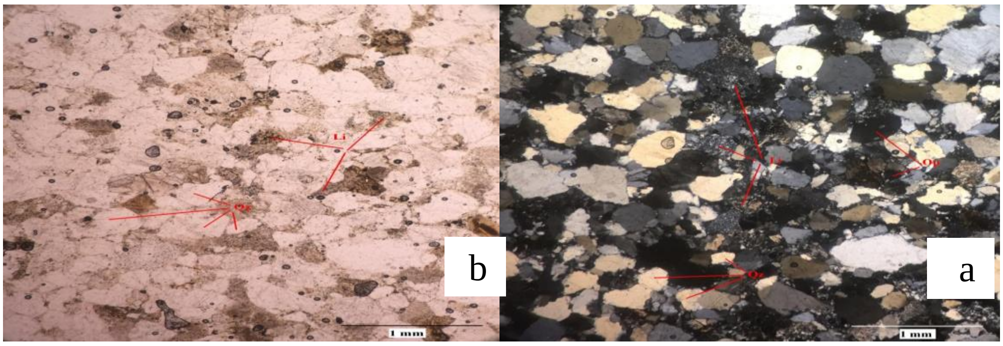

Fig. 3. Sample no. Vg-96-5 with 4x magnification in XPL light and b Vg-96-5b in PPL light
OP mineral O.P.E.C, Qz Quartz, Li

Sample No. Vg-96-31: This is a coal sample with a plastic texture, in which the components of the sample, including plant residues (humic) with dimensions larger than 0.4 mm can be seen. In these parts, honeycomb cavities and elongated cavities can be seen, which probably indicates the wooden vessel system of the previous plant parts (Fig. 4). The walls of these parts are made of organic matters and the inside of the cells is filled with calcium carbonate. These pieces range from dark colors and OPEC to orange and yellow to orange. Coal is usually studied with strong, light-reflecting microscopes using an oil-immersed object lens. Based on the analysis of 5 samples of coal ash in the region, the available elements include calcium, aluminum, germanium and beryllium.

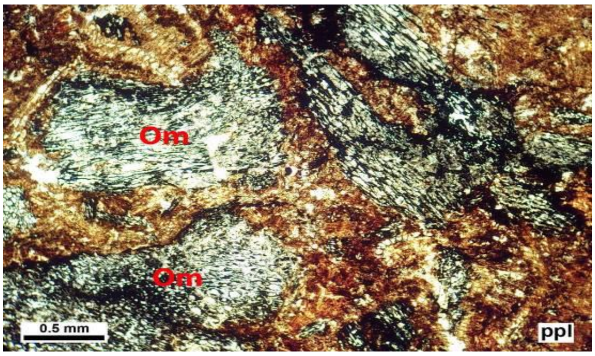

Fig. 4. Sample Vg-96-31: Coal (Vitrinite) 4 x magnification in XPL Om light, (organic materials)

2.2. Lavij section (B):

Section B is parallel to Section A and at a distance of 13 km (Fig. 1). In this section, there is a sequence of layers of Shemshak Formation in both areas. In the northern part, Shemshak Section is located on the lateral part of the Elika formation (VL-96-28). In the southern part, section B is located on the Nesen Formation. Based on field evidence (stratigraphy), the lower contact of the first and second eras (permutriasis) appears to be continuous. The certainty of this view in B-section of the Lavij Road requires more detailed biochemical studies. From the samples taken, 10 samples were selected and studied for petrographic studies. Example No. VL-96-28: DoloMicroSparite with microsparaite to sparite and microcurrent tissue, most of the rock is composed of dolomite, which shows heterogeneous texture from microcyte to microsparaite and sparite due to recrystallization. Examples of irregular effects include microbial activity. In these sections, the carbonate crystals are microscopic. In rock fractures and streaks, spare carbonate crystals with opaque iron oxides are seen.

Example VL-95-6 is a fine-grained sandstone (Lit arenite) (Fig. 5) and due to the presence of volcanic parts, Volcanic arenaite has semi-mature iron with calcite cement. In rock texture, the size of the grains is very small to very fine sand, and in terms of tissue maturity it's semi-mature, the grains are often semi-angular to semi-rounded and have moderate sorting. The components of quartz granules are single and polycrystalline in the rock, some of which show undulatory extinction. Quartz accounts for about 55% of the total volume of rock. Feldspars account for more than 7% of the total rock volume, with sodium and potassium. Mica is often a type of muscovite and is sometimes deformed in stone. Lithic parts mainly include parts of chert and very fine sedimentary parts of metamorphic grains with less frequency of igneous parts and volcanic glass, which account for about 25% of the rock volume. Sample No VL-96-18 is Fossil limestone shale containing organic matter. Alokem and Bioclast (5-7)% (Fig. 6)

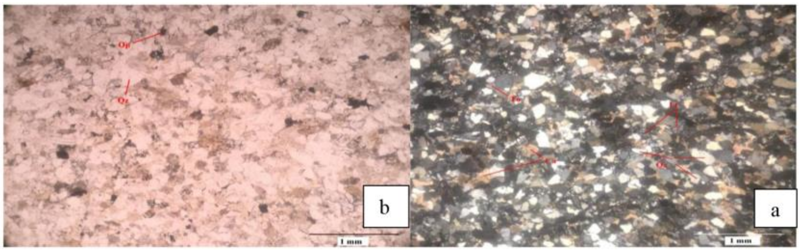

Fig. 5. Sample no. VL-95-6-a 4x magnification in XPL light and VL-95-6-b in PPL light

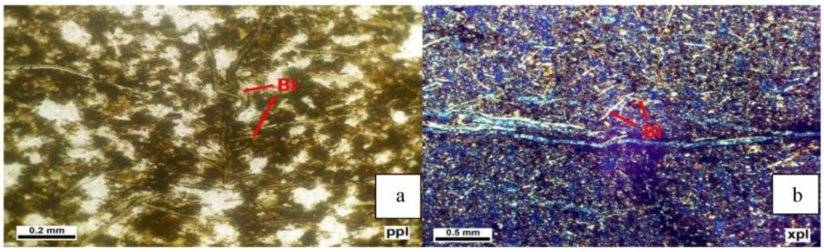

Fig. 6. sample VL-96-18 - Fossil limestone shale containing organic matter. 4x Magnification in XPL light, b in PPL light
Bi stands for Bioclast

2.3. Vaz section (C):

Sample No. V-96-23 is taken from the rocks of the lower part of Shemshak (Elika). Sample name: Poorly washed biosparite to biosparudite containing organic matter and iron oxides, alloyed with asparagus to microcrystalline, reconstituted rock texture (Fig. 7). The constituents include orthochems in the rock field of microcrystalline calcium carbonate crystals, aspartite crystals and microsparite crystals. Microsparite crystals are the result of recrystallization of microcrystalline crystals in the rock. Allochems in the form of bioclasts with a frequency of about 35-40% mainly include parts of echinoderms, mollusks (gastropods and bivalves) and non-skeletal components of iodine. Benthic foraminiferas with a thin, glassy shell (hyaline) are also seen. Impurities in the form of iron oxides are seen as spots with a frequency of 3-4% in the rock.

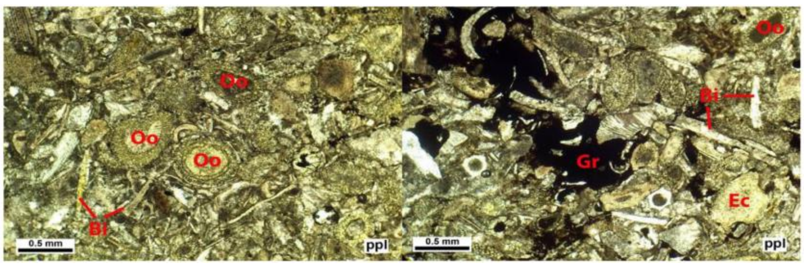

Fig. 7. Sample V-96-23- Biosparite to biosparudite containing organic matter and turbid iron hydroxides
Oo stands for Ooid, Ec for Acnoderm, Gr for Graffiti

Sample No. V-96-16, the medium coarse-grained arrhythmic sandstone has O.P.E.C components (Fig.8) which in terms of rock texture, grains less than 0.3 mm, good sorting, semi-angled to semi-rounded grains, medium compaction, components including quartz with a frequency of 35-35%, mainly in the form of monocrystalline with direct extinction up to slightly undulatory to completely undulatory. Polycrystalline quartz are also visible. Some monocrystalline quartz shows a margin cove (volcanic quartz) and secondary growth silica cement can be seen around some of them. Feldspars are found with a frequency of 3-4%, which are potassium feldspar, plagioclase with acidic composition (albite) and microcline. Very opaque parts consisting of very fine silica crystals, rich in organic matter, iron sulfides and clay minerals can also be seen. Rarely, volcanic fragments of plagioclase microlites are observed in an altered glass background. The delicate razor blades of Muscovite are seldom seen. Heavy minerals include tourmaline with a variety of brown to green colors. In general, it seems that this specimen has originated from acidic volcanic rocks to volcanic rocks and fine-grained sedimentary rocks such as mudstone and siltstone. Due to the good sorting it seems to have been deposited in a coastal environment. Around the grains is a thin layer of clay-chlorite minerals. Around some quartz, quartz cement is formed with secondary growth.

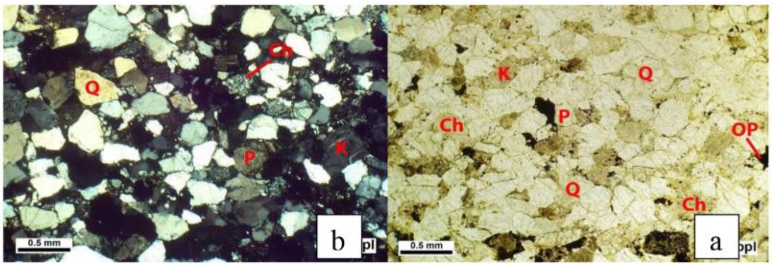

Fig. 8. Sample No. V-96-16-a; 4x magnification in XPL light and Sample V-96-16-b in PPL light
Ch Chert, Op Minerals Op, Q Quartz, K Potassium Feldspar, P Plagioclase

Sample No. V-96-25; sample name: silica stone, chert with micro to cryptocrystalline texture, radial, sphaerolitic, cauliflower components. This stone is basically composed of Chalksilicat and shows a variety of textures,sand are located on the upper border of Shemshak Formation in the C section. Silica is mainly found in micro-crystals to cryptocrystalline quartz. In rock cavities where there is enough space for crystals to grow, silica in the form of radial to sphaerolitic crystals is cauliflower-shaped. In the center of the cavities, coarse-grained quartz is observed. It is also cauliflower-shaped in some parts and due to the presence of liquid inclusions and impurities (possibly clay minerals), it is dusty and sometimes brown. Calcium carbonate is seen in the center of some cavities.

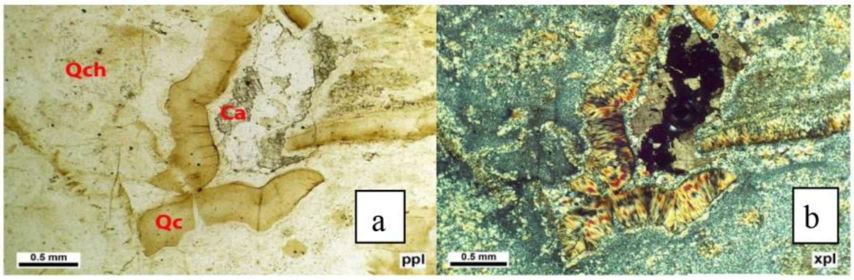

Fig. 8. Sample No. V-96-25; a; XPL. silica stone, chert with micro to cryptocrystalline texture, radial, sphaerolitic, cauliflower components
b; PPL

3. Results and discussion

Based on stratigraphic observations from the seismic stratigraphic point of view, in the studied sections, a thick sequence of geological classes with diverse lithology and complex tectonics are exposed. The complete disappearance of the Elika Formation and the placement of sandy limestone and brass shale of the Nesen Formation next to the Shemshak Formation according to the laterite in its base, indicates important tectonic events. On the other hand, petrographic studies show that low-grade metamorphic rocks, sedimentary rocks with high quartz and a small amount of volcanic rocks existed in the region before forming Shemshak Formation. Also, the presence of highly airborne feldspars and organic matter indicates the humid weather conditions during the sedimentation of these rocks. In the case of a number of samples, the parts are filled with OPEC minerals, iron oxides, pyrite, organic matter and clay minerals. Humid climate with uneven topography leads to the formation of coarse-grained angular feldspars and is severely aerated. Quartz makes up 35 to 50% of the detrital particles of destructive rocks and is obtained by re-transport of older sandstones or sand limestone (Folk 1980). Sandstones are mainly derived from low-grade metamorphic rocks such as slate and phyllite and chert sedimentary rocks. (Zanchi et al., 2009). Shemshak group is divided into four parts: Lalle Band (Triassic) of Akrasar, Kalariz of Javaherdeh to the Lower Jurassic Tonian period (Rhaetian - Hettangian) (Ardebili, 2008). The sediments of the marine part of Akrasar are part of the marsh-delta section and the Kalariz section is related to the river and marine-swamp environment. (Moein Sadat, 1993). Sandstones from quartz arenite to sublitharenite and litharenite, mudstone, madstone are thin chilian layers (Table 1). Following the mountaineering of the former Samirin Mountains, the fossil deposits of the Shemshak group with the middle-to-late San Triassic to the lower bajocian form in a continental-marine basin (Fursich et al., 2008 and Assereto, 1966). According to Alavi (1966), the geosuture of site ancient Tethys is located in the northeastern Iran in eastern Binalood, eastern Alborz, central-western Alborz, and the Talesh region. Of course, the existence of this geosuture in new studies has been questioned (Nazari, 2011). The previous Simrin event in central Iran is characterized by an angular change (Solgi, 2015). The sediments of Shemshak group in North Alborz have been deposited in the continuation of Elika carbonate formation without any interruption and stoppage of sedimentation (Aghanbati, 2004). In the studied sections in Central Alborz, Elika Formation is located in the lower contact of Shemshak Formation and in the distance between these two deposits, it is affected by the former Siberian orogenic phase of the bauxite-laterite horizon. The presence of this horizon is a sign of sedimentation but is also sloping. The Upper Triassic and Lower-Middle Jurassic destructive deposits belong to the Forland Basin (Alavi, 1996). The stratigraphy of the pre-ecological basin is the result of interaction of the three processes of deformation, sedimentation, and regeneration of the shell (Sinclari et al., 1991). Landslides in the pre-ecological basin often indicate tectonic factors and erosion of the basin by erosive sediments (Peter, 1990). There are two stages in the formation of pre-ecological basin: in the rapid subsidence phase, when the basin is filled with asymmetric and proximal sediments, and in the uplift phase, the aerated sediments formed by the distal subsidence (Paul, 1988). The presence of a mollusk at the base of the Shemshak Formation indicates the traction phase that occurred after the intermediate Triassic pressure phase (1966, Alenbach). Petrography of Malafiri section of Qaed Shemshak in Alborz Alkaline shows the magma in the intercontinental tectonic position (Shahrabi, 2017). In addition, the presence of iron and aluminum oxides can be affected by sedimentary basin conditions, including the climate at the time of its formation. The presence of palynological elements such as spores, acrylics and fungi and preserved plant trunks in the sandstones and coal fields in the Anarestan Lavij coal mine indicate the continental environment close to the coast-delta. In addition, the diversity of ferns and lithophytes indicates warm and humid climatic conditions (Esmaeili, 2014). Based on ten species of plant macrofossils of different orders of follicles, Bennettitales and Ginkgoites in NargesChal region of San Retin has been proposed (Vaez Javadi, 2003). Comparing the studied sections, it has been determined that Section A on Ab-e-Pari road in the eastern and western slopes of Glendrood valley (Kodir crossroads) Shemshak Formation is located on the laterite horizon with homogeneous discontinuity and obvious color change. Then the lower sandstones of Shemshak Formation, the lower coal section, the upper sandstones and then the upper coal sediments are formed. Tectonic events caused the Lar-Delichai Formation to disappear, and part of this section (the upper coal seams) was buried under construction in Tizkuh due to the expulsion of marl limestone. The lithology of this formation is green to gray marls and marl limestones that have three informal sub-sections that are located on the Shemshak Formation with a heterogeneous discontinuity and in some areas are associated with a gradual boundary with the Lar Formation (Jahani et al., 2005). In Lavij section (B) in the sequence of Shemshak and Elika floors, in the northern part of the section in Lavij road, the base of Shemshak Formation is located on the bauxite-laterite horizon at the same slope and then the sandstone part is below Shemshak. The lower coal section of the Shemshak Formation is located next to the Dalichai Formation. In the southern part of section B (Lavij spa) with the repetition of Shemshak layers, as a result of the function of the former Semirin orogenic phase, the Shemshak formation has been driven on the Nesen Formation (sandy lime and shale containing abundant brachiopods). In section C (VAZ), there is no Shemshak Formation, no laterite section, no lower sandstones and no lower coal section In the north of Mazar. Shemshak sediments and other sediments are located on the calcareous-dolomitic with micrite to asparagus and dolomicrit texture of Elika Formation (Upper Triassic). The upper boundary of Shemshak coal formation in section C according to the slope of the upper sandstones of the Shemshak Formation to the limestones of the Delichai Formation (Late Bajosin) without changing the slope and without obvious lithology (Table 2). Sample V-96-13 with microbial structures, high porosity of the sample and the effects of gastropods and its severe crystallization and due to the presence of thorns and bivalve parts are probably related to areas close to the reefs (Sample No. V-96-21, Tangeh River and the range East). The presence of orientation in the fossil parts and the background indicates the existence of tensile currents in the environment. In sample V-96-23, the variety and type of allochems indicate suitable biological conditions and good water circulation. Also, the presence of iodides and echinoderms indicates that they are formed in high-energy parts and sand dunes, but the poor sorting and the presence of microcrystals indicate that sedimentation has taken place in calm conditions. Therefore, this sample is probably related to the parts behind the reefs and sand dunes. In section A of the Vg-96-20 sample, the presence of micrite and mud impregnated with turbid iron oxides and organic matter indicates that the sample belongs to low-energy, possibly shallow sections. The presence of Miliolids indicates the limited conditions of water rotation. Therefore, these samples appear to be related to the low energy parts of the lagoon. The Vg-96-28 sample, due to the presence of microbial and algae effects and activities in the sample is probably the primary dolomite and is formed in the upper tidal to tidal sections. In C-section, sample number V-96-16, cream and pea stones, which are sublitharenite, and sample number V-96-17, lithium arenite, which is a single quartz material and sometimes polycrystalline in the stone, which sometimes show a undulatory extinction. These samples make up 1 to 60% of the quartzes in the rock, and tourmaline, zircon, and rarely apatite are present. The cement composition of these stones is siliceous and ferrous. Shemshak Formation in three sections affected by the tectonics of the region has variable thicknesses and the lattices of the Shemshak base show a stage of uplift in the form of up dip block. After that, due to subsidence, a shallow marine-river-delta basin has been formed in which destructive sediments have been formed in the pre-ecosystem (sandstone section below Shemshak). With the retreat of the sea and the shallowing of the basin, it has led to the growth of plants, which has led to the formation of the underground coal sector in Alborz (Figure 6). As the sedimentary basin deepens, more fine-grained sediments such as shales are formed (Figure 5). It seems that the base of Shemshak in all of the above sections has a bauxite-laterite horizon and is also sloping intermittently. The sedimentary environment of the sandstone parts of the Shemshak shaft is shallow from the coast to the river, and for the coal-bearing parts of the swamp and the bauxite-lateral horizon.

Table 2. Lithological matching in the central Alborz sections of the Haraz Valley (1974 Suessli), the pattern section (Aserto, 1966) and the study area

Rock Unit	Pattern Section (Aserto, 1966)	Haraz Valley (1974 Suessli)	Glendrood region (Osanloo, 1397)
High carbon deposits	- Siltstone, marl, shale, medium to coarse-grained sandstone with abundant plant debris - Thickness 80 meters	-	- Siltstone, fine-grained sandstone to pea-colored and muscovite siltstone and claystone - Ratio of sandstone to siltstone is 7% - Thickness 80-100 meters
High sandstone	- Fine-grained to medium-grained sandstone, siltstone, with plant and animal fossils, ratio of sandstone to shale and siltstone is 1.6 - 500 to 600 meters thick	- Fine-grained to medium-grained sandstone - Siltstone and conglomerate - The ratio of sandstone to siltstone is 2.7 - Approximate thickness 250 meters	- Sandstone - Mudstone - Thin coal layers - 200 meters thick
Low carbon sediments	- Siltstone and charcoal shales - Fine-grained to medium-grained sandstone, the ratio of sandstone to shale and siltstone is 0.6 - Abundant plant residues - Abundant charcoal	- Siltstone and charcoal shales - Fine-grained to medium-grained, conglomerate in the lower part, the ratio of sandstone to shale and siltstone is 0.8 - Abundant plant residues	- Alternation of fine-grained sandstones, mudstones, siltstone and coal layers - Thickness 300 meters - Total thickness of the coal layer 5 meters
Low sandstone	- Fine-grained to medium-grained sandstone - Siltstone with a bit of charcoal shale - The ratio of sand to shale is 3/2 - Abundant plant debris - Low charcoal - Thickness 70 to 100 meters	- Fine-grained to medium-grained - Charcoal shales - The ratio of sandstone to shale and Siltstone is 2/2 - Abundant plant debris - Thickness 55 meters	- Laterite horizon (6 meters) - Fine-grained silica sandstone, fine-grained sandstone, coarse-grained sandstone - Siltstone - Shale - Thickness 400 m
thickness	- Fault Lower contact (part D of Jeiroud Formation) - Upper contact of Delichai Formation - Total thickness 1000 meters	- Elika lower contact - Upper contact of Tizkooh Formation - Thickness 1200 meters	- Discontinuous lower contact also disconformity with Elika formation - The upper contact formation Disconformity with Delichai, - 750 m

4. Conclusion

From the total geological surveys in this study, the following results were obtained:

-In terms of geological age, the oldest geological formations in the area of Nessen Formation (brachiopod shales) and the newest formations of river sediments are related to the present era.

-Lower contact of Shemshak Formation is located in the study area of Boxit-Lotrit on the upper part of Elyka Formation, which has no fossils and is based on the stratigraphic position of the Middle San Triassic.

-After residual laterity deposit (trophic part), there are ruined facies of Lalehband and Akrasar (lower sandstone). Statistical studies on palynomorphs have a Middle Norean age and have begun to decline in the late Norean Sea and has left coal sediments in the retina of deltaic-fluvial and Columbian sediments of the Clariz section.

-Lavij section (north and south ridge) has the most complete sedimentary layers of the second period (Triassic border), Elika Formation (Triassic), bauxite horizon - Shemshak base laterite, Shemshak Formation (Lower - Middle Jurassic) and Sazand Delichai (Upper Jurassic) in terms of stratigraphy in the studied sections.

-From the lithological point of view, important changes have occurred in the area of Shemshak Formation and the rocks of that region include siliceous conglomerate (in some areas with pyrite), Muscovite sandstone (quartz arenite, sublitharenite), cream colored sandstone,

claystone, siltstone, shale, marl (locally), charcoal lenses and layrers and siliceous lenses.
-Tectonically, the former and middle Samirin orogenic zones were both influential in the study area, so that the compressive force resulting from the occurrence of former Semirin in the upper Triassic of the carbonate marine basin of Elika Formation, as a result of sea retreat and complete cessation of sedimentation (lateritic part), it has become a destructive-detrital environment of Shemshak Formation. And as a result of the middle Samirin phase the sedimentary basin has deepened on the upper contact of Shemshak Formation and the shale limestone sediments have left Delichai Formation. Therefore, Shemshak Formation is located between these two important tectonic events.
-The faults and folds formed in the region can be explained as a result of the compressive consequences of these two important zones that their slope is mostly in the direction of the main Alborz fault (north side). Among the faults of Kandovan, Caspian, Haraz, Kojoor, Glendrud, Lavij can be mentioned. In addition to local folds such as Taqdis, Vaz and Surdar, Taqdis Emarat is studied in the east of the region. Field evidence of the origin of carbonate-remnant and detrital-destructive and coal-bearing Triassic-Jurassic sediments in Central Alborz shows that the above sediments were deposited in the forland basin. Towards the end of the Triassic, due to orogenic zone of the former Semirin Mountains, the sedimentary basin came out of the water as a result of compressive force (Shemshak base latrines) and then the erosive sedimentary sediments eroded. Then, the result of erosion of destructive detrital sediments of Shemshak Formation was left in a shallow environment and after that, the sedimentary environment became a river-swamp state, which resulted in vegetation and coal deposits (Clariz section).
The results show that the sedimentary environment of carbonate rocks (lime-dolomite) of Elika Formation (lower contact); laterite bauxite deposits in tropical climates; lower sandstone section of Shemshak in shallow marine environment; coal section in deltaic-fluvial-paludal environment and lime marl Delichai Formation (upper boundary) is deposited in a deep to semi-deep sea.

References

Adabi, M.H., 2011. *Sedementry Geology*, Centeral research of Iran Zamin, 530 p (In Persian).

Aghanabati, A., Ghasemi-Nejad, E., Saidi, A., Ahmadzadeh Heravi, M. & Dabiri, O., 2004. Palinozonation of basal part of the Shemshak Group in north of Alborz Mountains, *Geosciences Journal*, 52, 36-45 (In Persian).

Alavi, M., 1996. Tectonostratigraphic synthesis and structure style of the Alborz mountain system in Northern Iran. *Jornal of Geodynamics*, 21,1-33 (In Persian).

Alenbach, P., 1966. *Geology und Petrography des Damavand und-seiner umgeburg* (Central-Elburz), Iran.mitteilung Nr.63, Geologists' Institute, ETH-Zürich, 145 p.

Armaghani, M. & Moensadat, H., 1372. *Geology of Iran – Coal Mineral. Geological*, Survey of Mineral Exploration of Iran, 286 p (In Persian).

Ardbili, L. & Navi, B., 1995. The Stydi of petography coal mineral in the Centeral Alborz *Proceedings of the Twelfth Conference of the Geological Society 0f Iran*. 342 p (In Persian).

Assereto, R., 1966. The jurassic Shemshak formation in Central Elburz (Iran) flore – Stratigraphie-paleogeodraphie. *Geobios*, 10(4), 509-571.

Esmaeili, J. & Osanloo, V., 2014. Reserch of bauxite Laterite horizon of Shemshak & Elika in the Central Aalborz. *Research Progect*, Noor Branch of Azad Univercity, 54 p (In Persian).

Folk, R.L., 1980. Petrology of sedimentary rocks (p. 26-27). Austin, *Texas: Hemphill.*

Fürich, A. & Majidifar, M.R., 2008. Lithostratigraphy of the upper Triassic- Middle Jurassic Shemshak Group of northern Iran. *Geological society London Special Publication*, 312(1), 129-160.

Ghaemi, F. & Rahimi, B., 2014. Sedementary associated with drift tectonic in the Binalood Montains. *Jornal of Sedimentary Facies*, 7(2), 218-235 (In Persian).

Vaziri, S.H., Majidifard, M.R., Jahani, D. & Jamshidi, E., 2005. Litho-and biostratigraphy of the Dalichai Formation in-northwestern Emamzadeh Hashem (File-Zamin section), Central Alborz. *Journal of The Earth*, 3(4), 83-96 (In Persian).

Nazari, H. & Shahidi, A., 2011. *Iranian Tectonics Alborz*. Earth sciences Research Institute, Geological Survey of Mineral Exploration of Iran, 97 p (In Persian).

Stoklin, J., 1974. Northern Iran: Alborz Mountains, Mesozoic-Cenozoic Orogenic Belt, Data for Orogenic Studies: Geological Society London.

Heller, P.L., Angevine, C.L., Winslow, N.S. & Paola, C., 1988. Two-phase stratigraphic model of foreland-basin sequences. *Geology*, 16(6), 501-504.

Flemings, P.B. & Jordan, T.E., 1990. Stratigraphic modeling of foreland basins: interpreting thrust deformation and lithosphere rheology. *Geology*, 18(5), 430-434.

Saidi, A. & Ghassemi, M.R., 2003. Geologycal map of Baladeh (Noor) Scale; 100.000. Geological Survey Iran.

Shahidi, A., Barrier, E., Brunet, M.F. & Saidi, A., 2010. Tectonic Evolution of the Alborz in Mesozoic and Cenozoic. *Scientific Quartely Journal Geoscinces*, 21(81), 201-216 (In Persian).

Shahrabi, A., 2017. Petrogeaphyic study and tectonic position of shemshak formation base in the Centeral

Allborz. *The 1st International Congress on Jurassic of Iran and Neighbouring Countries*, 141 p (In Persian).

Solgi, A., 2015. Study of the Geological Structure of Centeral Alborz region (Emamzadeh Hashem) University Jahad Scientific Detabase, 78 p (In Persian).

Sussly, P.E., 1976. The geology of the Lower Haraz Valley area. Central Alborz, Iran.

Vaez javadi, F., 2012. Introduction of plant macrofossils of Narges Chal region, Central Alborz, *22nd Earth Sciences Conference*. Tehran - Ministry of Industries and Mines (In Persian).

Vahdati, D.C., 1991. Geologycal map of Amol. Scale1; 250.000. Geological Survev Iran.

Zanchi, A., Zanchetta, S., Berra, F., Mattei, M., Garzanti, E., Molyneux, S., Nawab, A. & Sabouri, J., 2009. The Eo-Cimmerian (Late Triassic) orogeny in North Iran. *Geological Society, London, Special Publications*, 312(1), 31-55.