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Biostratigraphy of Eocene Sedimentary Rocks Based on Alveolina in East Lut Block, Iran

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Abstract

The various species of *Alveolina* for biostratigraphy of Eocene sedimentary rocks are very important. In this research, the species of *Alveolina* are reported for the first time in three cross sections: Chalonak, Kalaterood and East Beinabad. These sections are attributes to Early-Middle Eocene age. The 55 samples collected from Chalonak section and the thickness is reached to 245 m. In this section, four biozones are distinguished. They are following: *Alveolina globula-Alveolina solida* interval range zone, *Alveolina solida-A .globosa* interval range zone, *Alveolina globusa* total range zone and *Alveolina aragonesis* total range zone. On the basis of index fossils such as *Alveolinana avellana, A. aragonensis,A. globula, A. leupoldi, A. globusa, A. elliptica nutalli, A. rotundata, A. corbarica, A.solida,* which are existing in these biozones, the age of this section is attributed to Early Eocene. Of course two species of *Nummulites (Nummulites globulus, N. atacicus)* and *Cuvilierina valensis* are determined in Chalonak section. The 80 samples are collected from Kalaterood section and the thickness is reached to 242 m. In this section, four biozones are distinguished. They are following: *Alveolina solida- A. globosa* interval range zone, *Alveolina globosa* total range zone, *Alveolina aragonensis-A. canavarii* interval range zone and *A. canavarii* total range zone. The several index fossils are found in this section following: *Alveolina aragonensis, A. decipiens, A. Avellana, A. laxa, A. pasticillata, A. canavari, A . globosa* and *A. solida.* The age of this section is Early Eocene. The 150 samples are collected from East Binabad section and the thickness is reached to 900 m. In this section, four biozones are presented. They are *Glomalveolina lepidula – Alveolina solida* interval rage zone. *Alveolina elliptica nutali- Alveolina corbarica* interval range zone, *Alveolina corbarica* total range zone and *Alveolina ruetimeyeri-Alveolina levantina assemblage zone.* There are several index fossils such as *Alveolina corbarica, A. elliptica nuttalli, A.levantina, A. roetimeyeri and A. decipiens, Glomalveolina lepidula*. The age of this section is early Eocene.

Keywords: Biostratigraphy, Eocene, Lut,Foraminifera

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Deformation Evidences and Shear Zone in Marziyan Granitic Pluton, Azna, Sanandaj-Sirjan Zone

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Abstract

Marziyan granitic pluton is one of the numerous intrusive bodies in Sanandaj-Sirjan structural zone. The pluton is composed of locogranite, granite and granodiorite and its contact metamorphic rocks are consisting of cordierite and andalusite schist. Tourmaline and garnet bearing locogranite, aplite, pegmatite, mylonite and injected migmatite are exposed in the metamorphic halo. The major minerals include quartz, plagioclase, K-feldspar, biotite as well as muscovite, tourmaline and garnet. Structural studies indicate the presence of shear zones, especially in the southeastern parts with NNW-SSE trend. Four types of microstructures are present in the region; 1) magmatic microstructures, 2) high temperature solid state microstructure, 3) low temperature solid state microstructure and 4) sub-mylonitic and mylonitic microstructure. All rocks of the region have been subjected to shear deformation which led the formation of S-C foliations and other sense of shear markers. The presence of asymmetric porphyroclasts and porphyroblast, biotite and feldspar kink bands, mica-fish mica and andalusite and domino and boudinaged structures of feldspar and tourmaline are evidences of ductile deformation in a contractional and dextral shear regime. All evidences indicate that high temperature solid state zones in greenschist facies to lower amphibolite conditions (300-500°C) have formed simultaneously with emplacement of granitic bodies. Low temperature solid state, sub-mylonitic and mylonitic zones developed following the emplacement of granitic bodies.

Keywords: *Granite, Marzyian, Deformation Evidence, Shear Zone, Sanandaj-Sirjan Zone*

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Deformation Evidence for Regional, Contact and Dynamic Metamorphism in Aliabad Damagh Shear Zone (Hamadan)

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Abstract

Aliabad Damagh region in southern Hamadan, is located NW of Sanandaj Sirjan Zone. In this region, different metamorphic rocks with a variety of fabric elements are exposed. In this research, metamorphic rocks were investigated based on the microfabric and temperature. In the area deformation occurred along the temperature variations path. Three generations of foliation and four deformation phases are present in the region. Porphyroblasts growth in foliation and microfabric evidence reveal that deformation began during regional metamorphism, while mica and chlorite crystallized as post tectonic minerals compare to S_3 during retrograde metamorphism. The highest grade of this metamorphism is green schist to amphibolite facies.

Deformation elements in granite mylonite and metamorphic rocks in Aliabad Damagh region imply occurrence of regional metamorphism followed by a dynamic metamorphism which cause a widespread ductile shear zone. Deformation elements in carbonate mylonites, confirm the presence of a right lateral shear zone. Based on calcite twinning in mylonitize marbles the temperature of dynamic metamorphism is higher than 200 ˚C. Based on the effect of temperature on lithology, fabric and strain rate, the shear zone in Aliabad Damagh region is ductile to brittle.

Keywords: Hamadan, Shear zone, Regional metamorphism, Dynamic metamorphism, Temperature of the deformation.

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Spatial Variation of Fractal Parameters in Central Alborz, Iran

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Abstract

Baladeh-Kojour earthquake of May 28th, 2004 is one of the largest earthquakes in vicinity of Tehran, occurred in the northern part of the Alborz range. In this research, spatial variation of fractal parameters has been studied to estimate the seismic pattern of the study area. In order to draw the spatial variation maps, *b-value*, correlation dimension of epicentral and temporal distribution of earthquakes, D_e and D_t have been calculated for the data sets of before and after the mainshock, separately. The results show that before the earthquake, these parameters have low values in the eastern side of the mainshock epicenter. It seems that these low values before the earthquake may arise due to clusters of events with larger magnitude and small events after it. Seismic rate has decreased in the surroundings of the mainshock (seismic quiescence). After the mainshock, the lowest values of *b-value* and D_t is seen in the epicentral and western part of the mainshock. These low values are due to aftershock clustering and stress release, took placed just after the mainshock and during the aftershock sequence. Intensity increasing is observed in the shake map of earthquake. The D_e parameter is low after the mainshock occurrence. Low *b-value* and high D_e indicate high level of seismic activity in the region. The obtained results show the fractal parameters sensitivity to spatial and temporal clustering of earthquakes. Therefore, these parameters can be used as an indicator for seismic precursory patterns of major earthquakes.

Keywords: Fractal Parameters, Baladeh-Kojour, Cetral Alborz, Aftershock Cluster, Seismic Quiescence.

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Mica chemistry and metamorphism in garnet-micaschists of Haji-Qara high, North of Golpayegan

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Abstract

Garnet-micaschists from Haji Qara high, north of Golpayegan, are part of the metamorphic rocks of the Sanandaj-Sirjan Zone (SSZ). Lepidoporphyroblastic and porphyropoikiloblastic are the main textures and the mineral assemblages consist dominantly of Fe-biotite, muscovite and ferriphengite, metamorphic Fe-Mg chlorites (I-type and IIb), garnet and quartz. Staurolite, andalusite, plagioclase carbon, Fe-oxides and tourmaline are present as accessories. Petrographic evidences as well as mica chemistry along with other paragenesis and thermometric estimations indicate a path change from amphibolites facies to lower pressure and higher temperature gradient suggesting the presence of a local pluton which led to garnet porphyroblast, biotite and muscovite (overprinted in different orientation) and andalusite crystallization. The occurrence of chlorite, ferriphengite and Fe-oxides demonstrate a retrograde metamorphism during uplift and decompressional cooling path in the area.

Keywords: Mica, Metamorphism, Metapelite, Golpayegan, Sanandaj-Sirjan Zone (SSZ)

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Simulation of Nitrate Transport in Groundwater: Lenjanat Plain, Isfahan

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Abstract

The present study aimed at identifying the nitrate transport in the groundwater of Lenjanat plain, Isfahan. Nitrate concentrations were measured seasonally and groundwater flow was modeled for nitrate transport simulation using MODFLOW and MT3DMS codes. The nitrate concentrations were compared with the human and livestock drinking water and irrigation water standards. The results show that nitrate concentrations are higher than the guidelines limits in groundwaters. The flow modeling reveals that the groundwater flow system of the study aquifer has been influenced by the aquifer hydrogeological characteristics. The falling watertable and reduce aquifer storage are due to the anthropogenic stresses on flow system. The transport model calibration and sensitivity analysis shows that nitrate leaching from agricultural land, first–order irreversible rate reaction, effective porosity and precipitation are the major factors affecting the entry and retention of nitrate in Lenjanat groundwater. Denitrification rate in the aquifer has been decreased due to high concentration of dissolved oxygen in groundwater and low extent of organic carbon. Half-life of nitrate in Lenjanat aquifer is more than 2.5 years. Nitrate transport in the aquifer is mainly by convection. Considering the calculated mass with transport model, the nitrogen leaching to groundwater of study area is 108 kg N ha^{-1} yr^{-1}.

Keywords: Groundwater flow modeling, Nitrate transport simulation, MT3DMS code, Lenjanat aquifer

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The rodingitization of gabbroic bodies in the southeast of Sahneh (west of Iran) with emphasis on mineral reaction and isotope geochemistry

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Abstract

Gabbroic bodies with NW-SE trend outcropped in the southwest of Sahneh in the north of Gamassiab River, W. Iran are part of Zagros ophiolite . This complex is separated from the other geological units by deep faults and cut by pyroxenitic dikes. The field evidences, petrographic, geochemical and mineral paragenesis of these rocks are completely different from the fresh and un-altered gabbroic rocks. Furthermore; the high ratios of $^{143}Nd/^{144}Nd$ (0.512945-0.513021) and low ratios of $^{87}Sr/^{86}Sr$ (0.70334-0.70656) indicate the sub-oceanic depleted mantle source for the origin of these rocks. Low variation of $^{143}Nd/^{144}Nd$ ratios, increasing of $^{87}Sr/^{86}Sr$ ratios, decreasing of SiO_2 and increasing of CaO and Al_2O_3 mainly concludes the high reaction of gabbroic rocks with seawater. The pargenetic assemblages of altered gabbros are grossular/hydrogrossular, anderadite, epidote, idocrase (vesuvianite) and diopside. The mineral paragenesis reveals that the rodingitization was occurred by reaction of gabbroic bodies with high alkali water at a shallow depth.

Keywords: Zagros, Rodingite, Sr-Nd Isotopic ratios, Depleted mantle.

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