The interpretation of sedimentary sequence of Dorood formation in North West of Tabriz

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Abstract: The significant expansion of Permian sediments in Morrow Mountain is exposed in North of Tabriz. Dorood formation is the first unit of these deposits. This formation is consists of clastic facies that its thickness is about 102 meters, which are lied discontinuous on Devonian igneous rocks and are covered with discontinuities by Ruteh (Middle Permian)limestones.The Permian red facies in the North West of Tabriz are included para-conglomerate, micro- conglomerate, and quartz arenite, sublitharenite, litharenite and shale. Sedimentary structures that formed in these beds and geometry. shape and lateral and vertical expansion of sedimentary strata, associate river depositional environments . Dorood formation deposits in the North West of Tabriz has been created one part of the sedimentary sequence of type 1 with the upper and lower discontinuities bounds of type SB-1. So that the facies of LST part created sedimentary sequences and the sequence is completed with a mixture of carbonate facies TST, mfs, HST of younger formation (Ruteh formation). Interpretation of the depositional environments of these deposits along with similar investigations for younger Permian units in the area could be the basis of deposit basin analysis and ancient geological conditions of North of Tabriz.
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1. Introduction

Permian clastic deposits with red-brown color in parts of North, East and West of Morrow Mountains, outcropted considerable expansion. Access to the site of this study is possible through the transit road of Tabriz - Marand and North Fork asphalt road in the city of Sufiyan with distances of about 35 km of Tabriz (see Figure 1). In the western part of Geroos village and in the first mountain slopes of West of Moro Mountain, these deposits created smooth morphology and dale hills. In this area and along with the main valley of Geross village, clastic beds of Dorood formation provided the possibility of studying. The starting point of Dorood formation is located at longitude 46 1 17 of eastern and latitude 36 16 17 of Northen.

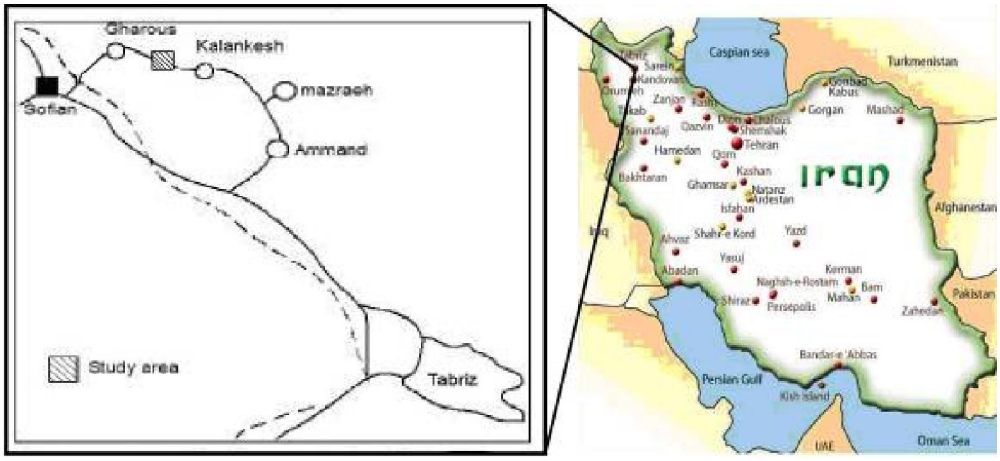

Figure 1: Location map of the area and access to it

2. Regional Geology

Azerbaijan that is located in the North West of Iran has a complex geological history. Formations include Precambrian, Paleozoic, and Mesozoic in this region shows similarities with considerable areas of Central Iran but Cenozoic magmatism and changes of it has affected on regional geological of the area (Aga-Nabati, 2006). A series of old and young formations in the North West of Tabriz along with some igneous rocks is created mountains Moro. In parts of the Northeast and West of the mountains, surface facies of Permian Paleozoic formations can

be seen that has taken place in igneous rocks of Devonian and Triassic marine deposits (Mahari, 2012). The first unit of the set is Doroud Formation with red clastic facies has specialized in the study.

3. Doroud Formation stratigraphy in the North West of Tabriz

Doroud Formation facies in North West of Tabriz has been started in relatively steep slopes with basal conglomerate. The main formation of this unit is the dark red to white and pink sandstone with the layers of conglomerate and micro- conglomerate. The sandstones in the new broken level are pink. The few thin Shale layers can be seen among sandstone. Sedimentary structure of cross and parallel laminations fine upward grading is observed well in layers of facies. Any fossil effect can be seen in sandstones. Sandstones are extremely varnishes. Since this environment has diagenesis oxidant, divalent iron has become to goethite and hematite. The sandstone unit has been located discontinuity on the andesite dacite type, lower volcanic series of upper devonian and itself is covered by upper Permian limestone and its thickness is 102 m. (Figure 2).

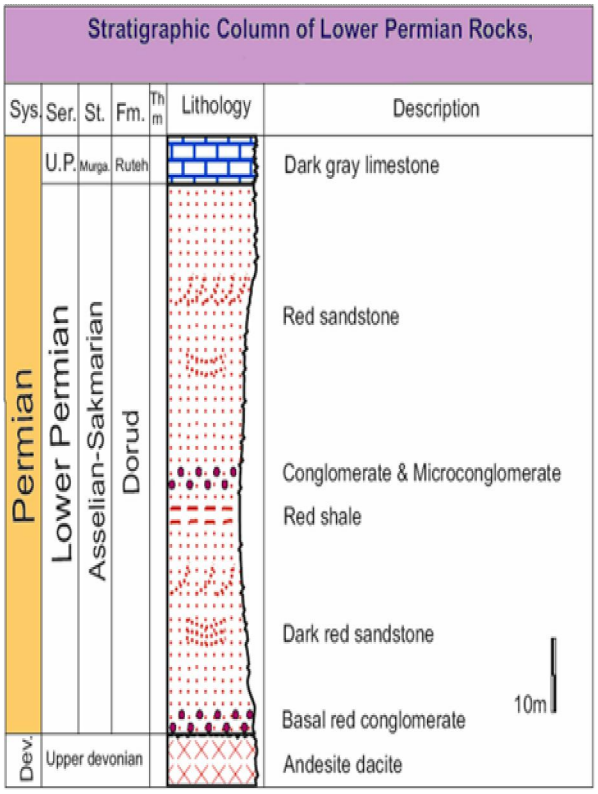

Figure 2: Doroud Formation stratigraphic column in the North West region of Tabriz

Interpretation of formation facies of Dorood

Field and microscopic studies and analysis of information obtained from examples of Doroud formation made clear that siliciclastic facies are consisted of conglomerate, sandstone and shale. The carbonate facies of Doroud formation are not formed in this area. One of important features of this beds is being fine the finning upward cycles.

Conglomerate facies

Theese facies are para-conglomerate that is composed of very coarse grained sand, gravel, pebbles and coarse grains and more than 30% of the original grains are larger than sands (Figure 3). This depositional is red that indicates diagenesis oxidant environment and becoming divalent iron to hematite and goethite. In most parts, the matrix of of this facies is sand. The effects of secondary chert can also be seen in the facies. Conglomerate facies often show the masive beding. This facies is poorly sorted grains forming and main gains of the facies are subangular and sometimes subrounded and rounded. In some part, this facies can be seen as the layers of micro-conglomerate among other clastic facies. Para-conglomerate grains are often subrounded to rounded. The facies doesn't have very side extension and becomes thinner laterally facies and changed to sandstone (Fig. 4). Maximum thickness of the facies in the North West of Tabriz is 75 cm. The fossil has been found in the deposits.

Sandstone facies

The facies can be seen in the north of Tabriz on steep slopes with thin to medium beded layers with brown to red color. The sandstones are often pink willing to cream.

Figure 3: scattered grains of Para- conglomerate with sandy mayrix

Figure 4: Development lateral limited in thin layer Para- conglomerate and lateral conversion into sandstone facies

These sediments are in form of sedimentary cycles finning upward and deposits structure of cross and parallel laminations (Figure 5) and ripple marks in the surface layers is evident. This facies is composed of sub-facies of quartz arenite, sublitharenite and litheareniteِ (Folk, 1974) and is compared with facies Sl, Sp Miall (1996).

Quartzarenite sandstone sub-facies

This facies with main grained quartz formed is fine to coarse grain sands. A very little amount of rock fragments and hematite cement matrix can be seen in this micro-facies (Figure A-6). The grains in this microfacies are subrounded and their sorting is pretty good. Quartz grains and more compact touch-line, and contact sections of convex and concave (Figure B-6) and most of the quartz grains are straight extinction.

Sublitharenite sandstone sub-facies

In this facies, there are lots of quartz grains apart from quartz grains and a small amount of feldspar and cement and matrix (Figure C-6).

Quartz grains have straight extinction and grain stones have formed of slumber rubble, silt stone and shale. Cement is divided into three types of silica, hematite and goethite. Siliceous cement can be seen around the grains as periphery cement of Syntaxial. The constituent grains of the facies are often angular to subrounded and show poorly to moderate sorting.

Litharenite sandstone sub-facies

Components of this facies are quartz grains and rock fragments and a small amount of cement and feldspar. The sands are fine to coarse grain size. lithices are consisted of slumber, stony silt and shale grains (Figure D-6).

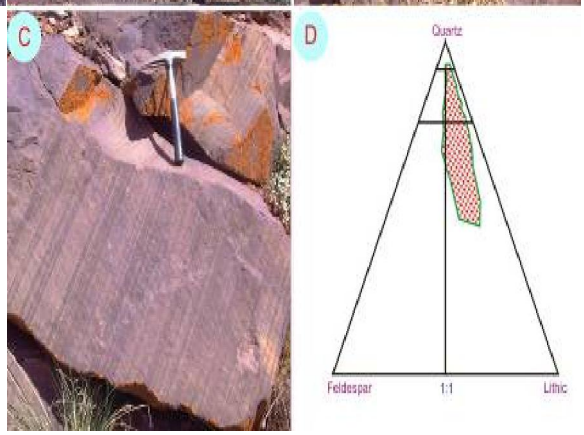

Figure 5: A and C – the structure of flat laminated in sandstone that is the most abundant sedimentary rocks in the study area in Permian stones. B- Cross beding in the lower part of the sandstone. D- Sandstone samples place on the triangle classification of Folk (Folk, 1974).

Most of quartz grains have straight extinction and a few of them have wave extinction. This facies has hematite and goethite cement along with marginal silica cement. This facies has a higher percentage of matrix than the two earlier facies. This grains constituent facies are angular to subrounded and poorly sorted.

4-1-3- shale facies

These facies that can be seen in the study area have bright pink to red color and most are weathered. The shales are final part of sedimentary sequence and the red color can be pointed to forming outside of water and in a continental and dry environment.

4-2-3 - sedimentary environment of Doroud formation

Since Dorood formation is located in North West of Tabriz, has para-conglomerate, sandstone and shale facies and according to its characteristics, evokes sedimentary environment of Meander Rivers (Visher, 1969, Allen, 1982). At the bottom of the

channel para-conglomerate and micro-conglomerate facies with low lateral expansion are composed that are as Lag in the channel bed deposition and in deeper parts of the channel (1996, Collinson). This facies is covered and preseverved by finer grained sediments and has lateral limited expansion and erosion lower surface. Low lateral and limited expansion of conglomerate show channel environment (Reineck & Singh, 1986).

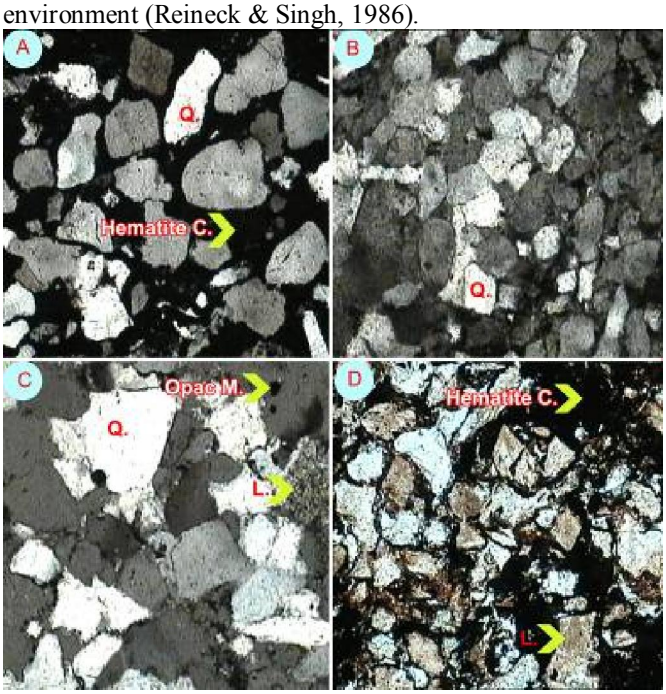

Figure 6- A- microscopic facies of quartzarenite, quartz grains (Q) are seen in the background of hematite cement. B- Microscopic section of quartz arenite with a variety of linear and convex-concave contacts. C- Microscopic section of sub quartz arenite, rockfragments (L), quartz (Q) and opaque minerals (Opac M.) D- Microscopic facies of Litearenite with lots of rockfragments (L) in a background of hematite cement. Scale: 40X.

Point bar sandstones with finning upward cycles are formed in Meander Rivers. Processes of erosion and destruction are conducted in the concave part of Meander River and sedimentation processes is conducted in the convex part of it (Point Load) (Collinson, 1996). Because of reduce of water depth and water energy, finer grains are laid on the coarser grained sediments in the lower parts of channels. The asymmetrical ripple marks and inclined laminations in the sandstone indicates river environment for sandstones. Floodplain sediments including shale are placed above the sandstone. This sequence repeated several times in the Doroud Formation deposits of Alborz (Lasemi, 2001).

Figure 7 shows proposed sedimentary model for the formation of facies of Doroud Formation in the North West of Tabriz.

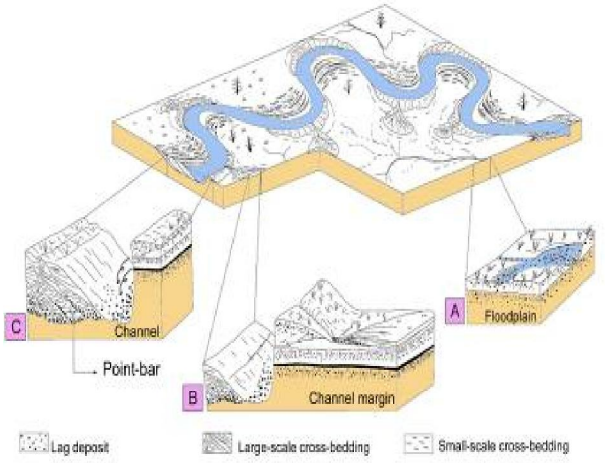

Figure 7: Model of a Meander River environment of Doroud Formation in the Northern region of Tabriz

Sedimentary cycles and sequence stratigraphy

Upper and lower boundary of sedimentary sequences of Doroud Formation in North of Tabriz is characterized using discontinuity erosion type SB1 (Sloss, 1963). Clastic deposits of the formation with a sedimentary bunch of LST are dependent on Meander river environment that LST part of it is sequence type 1. Mentioned sequence with erosional boundary (transgressive conglomerate) has been laid on the Denonian stones and carbonate stones of Ruteh formation with erosional boundary (red marl) with discontinuity type 1 (SB1) has been deposited on the formation (Fig. 8).

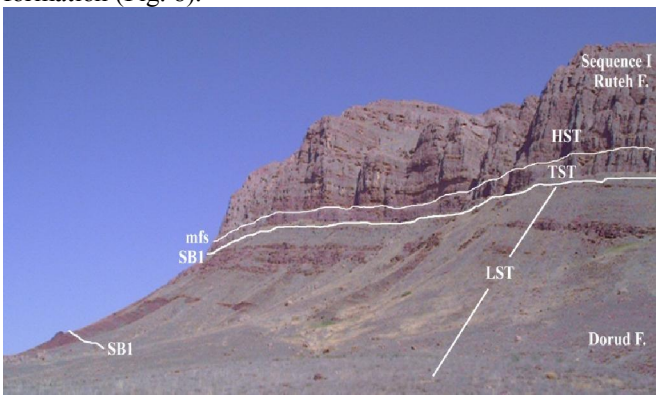

Figure 8: The upper and lower parts of LST sequence of Doroud Formation has discontinuity (SB1) and Doroud Formation is located on the Devonian stones and under the limestones of Ruteh formation and the first sequence of Ruteh formation can seen in above part (view toward North-West).

Conclusion

- Doroud Formation that is consisted of clastic facies has significant exposure in the North of Tabriz.
- Deposits of Dorood formation in the North of Tabriz with 102 m thickness are located discontinuity in the slope of the on the Devonian igneous units and are covered by middle Permian carbonate deposits (Ruteh formation).
- Constituent facies of Dorood formation in the North of Tabriz are include para-conglomerate, micro-conglomerate, quartzarenite sandstone, sublitheranite , litheranite and shale.
- Layering sedimentary structures, laminate, lens-shaped layers, cross-bedding and graded bedding has been founded in Dorood formation in the North of Tabriz.
- Considering to vertical and lateral expansion of facies and sedimentary structures formed, depositional environment of Doroud Formation in the north of Tabriz was determined as Meander River so that facies related to channel, point bar and floodplain are separable in it.
- Clastic deposits of Doroud formation in the North of Tabriz in the form of a LST part of a sedimentary sequence type 1 with the lower and upper discontinuity boundary type SB-1 has the first stratigraphic unit of Permian sedimentary sequence of the region.

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