Oxygen fluctuations during depositional period of the Sarcheshmeh Formation in Anjirbolagh section, East of Kopet Dagh (Accordingly palynology observation)

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Abstract
The Sarcheshmeh Formation is one of the lower Cretaceous Formations that located Kopet Dagh basin in NE Iran. Anjirbolagh section next to Mazdavand village was collected in order to determine oxygen variation during the course deposition of Sarcheshmeh formation then it was studied. In order to estimate the amount of oxygen in palaeonvironmental, statistical studies is worked on three main groups of palynological ingredient, as well as depositional rate is determined by some of the ecological factors, too. In this research, four main factors that they preserve organic matter were studied in order to estimate the amount of oxygen. With regard to non or very little appearance of brown palynomesral, lability factor is very low that indicated the condition was far from beach and environment had low oxygen. With regard to ratio of translate SOM to opaque SOM in samples that it always was more than one and confirm that the condition was low oxygen or non-oxygen during deposition. In majority samples ratio of translate SOM to marine palynomorphs is exceeded that indicate the condition was non-oxygen and the rate of deposition was low. In majority samples also low ratio opaque SOM to marine palynomorph show that the condition was low oxygen or non-oxygen.

Keywords: *Sarcheshm Formation , Palaeoenvironment, Palynomorph*

Introduction
Studied section is loceted in the northeast city of Mashhad in Khorasan Razavi province between "38` 39 ° 60 E and "35 5 ° 36 N (Figure 1). This section is available in Mashhad – Mozdoran way, in 9 kilometers East Mozduran and next to Anjir bolagh village. This section is measured 413 m, and mainly is composed of the shale and marl with limeston interbeds. This Formation overlies Tirgan Formation and underlies Sangane Formation conformably, respectively (Afsharhrb, 1994).

Discussion
Statistical study of elements in each sample of Palynological slides, 2 or 3 slides were prepared and each slide randomly selected 20 visual field and were studied. Palynological elements were separated, counted and calculated to determine more accurately the environment. Factors affecting the degree of organic materials are factors maintaining protect organic materials (Lability) and ratio of marine Palynomorphs to translate SOM, marine Palynomorphs to opaque SOM and also opaque SOM to translate SOM. Evaluation and Comparative Study show quantity of oxygen, sedimentaion rate and paleoenvironment energy rate (table 1).

Lability Factor

Factor protecting organic material (Lability), is defined as ratio of brown Maseral to dark Maseral (BP/OP). Brown Palynvmsral is depended of land plants and show environment is nearshore and opaque Palynvmasral has a dark coloure that show sub oxic, semi quiet and the offshore environment ,also show that the degree of preserved organic material and indicate rate of sea level changes.

Study of Lability factor in Sarcheshme section (fig.2) shows that the ratio of brown Palynvmasral to opaqu Palynvmasral is low.

However, for increased confidence and accuracy, Lability factor must be evaluated with other factors. This factor represents the sub oxic conditions (fig.)

The ratio of translate SOM to opaqu SOM

If oxygen levels and the rhythm of sedimentaion become low, it is lead to convert palynomorphs into translate SOM, and if oxygen levels become high and sedimentaion rhythm become low, marine palynomorphs turn into opaque SOM. If ratio of translate SOM to opaque SOM become more than one, this shows none oxygen conditions and if this ratio is less than one indicates oxygen conditions.

Review and calculation of these factors in samples of Sarcheshme Formation show that translate SOM to opaque SOM is more than one in stratigraphy column (fig.3).

It represents low-oxygen or lack of oxygen conditions during depositional period of the Sarcheshmeh Formation in Anjirbolagh section.

The ratio of translate SOM to Marin palynorph and opaque SOM to Marin palynomorph

Palynomorphs especially Dinolagellata have most preservation in non-oxygen conditions with high sedimentaion reate. Increased ratio of translate SOM to Marin palynomrphs show non-oxygen conditions and low sedimentaion rate (fig.4). Increased opaque SOM to marine Palynomorphs indicate oxic conditions. Increased marine palynomorphs indicate non-oxygen conditions and high sedimentaion rhythm. As in this Formation, measured percentage of translate SOM to Marine Palynomorphs was more than one that represent low-oxygen conditions. The Opaque SOM to Marine Palynomorph is less than one which indicate non- oxygen conditions (fig.5).

Conclusion

Study of paleoenvironment in Sarcheshme Formation (Anjirbolagh section) based on Palynomorphs and by using statistical studies on factors such as ratio of translate SOM to opaque SOM , ratio of translate SOM to marine palynomorphs and opaque SOM to marine palynomorphs. Lability factor shows that depositional condition is a low-oxygen environment with low sedimentation rate**.**

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Table 1: % frequency of Organic materials

	SOM T/SOM Op	BP / OP	SOM T/ Mp	SOM Op/ Mp
101	**100**	**0.013**	**1.98**	**0**
105	**100**	**0.27**	**0.55**	**0**
106	**1**	**0.28**	**12.59**	**0.082**
107	**1.41**	**0.43**	**0.63**	**0.45**
111c	**5.22**	**0.067**	**0.82**	**0.16**
113	**27.98**	**0.05**	**2.33**	**0.083**
117	**100**	**0.014**	**0.54**	**0**
119	**5.75**	**0.07**	**0.38**	**0.064**
121	**1.8**	**0.038**	**1.38**	**0.77**
123	**100**	**0.027**	**1.93**	**0**
125	**7.85**	**0.06**	**0.73**	**0.093**
127	**100**	**0.025**	**1.16**	**0**
130	**41.92**	**0.0095**	**100**	**100**
132	**9.75**	**0.0078**	**19.9**	**2**
135	**3.36**	**0.013**	**3.08**	**0.92**
137	**100**	**0.007**	**14**	**0**
138	**20.01**	**0.026**	**1.2**	**0.06**
141	**1.2**	**0.03**	**100**	**100**
145	**100**	**0.025**	**64.79**	**0**
147	**100**	**0.18**	**2**	**0**
148	**24.84**	**0.043**	**5.73**	**0.23**
150	**100**	**0.3**	**14.67**	**0**
153	**0**	**0**	**0**	**0**
156	**100**	**0.027**	**7.4**	**0**
159	**0**	**0**	**0**	**0**
161	**0**	**0**	**0**	**0**
163	**26.03**	**0.025**	**26.02**	**1**
166	**2.7**	**0**	**100**	**100**
170	**38.52**	**0.0095**	**19.24**	**0.5**
172	**1**	**0**	**100**	**100**
174	**100**	**0.23**	**4.27**	**0**
176	**100**	**0**	**100**	**0**
178	**3.11**	**0.053**	**1.75**	**0.56**
180	**3.39**	**0.026**	**3.6**	**1.06**
188	**5**	**0.11**	**3.38**	**0.68**
189	**73.62**	**0.086**	**6.31**	**0.086**
190	**8.75**	**0.012**	**34.97**	**4**
193	**100**	**0.053**	**10.39**	**0.024**
199	**100**	**0.007**	**36.04**	**0**
202	**100**	**0.091**	**4.21**	**0**
203	**100**	**0.046**	**6.64**	**0**

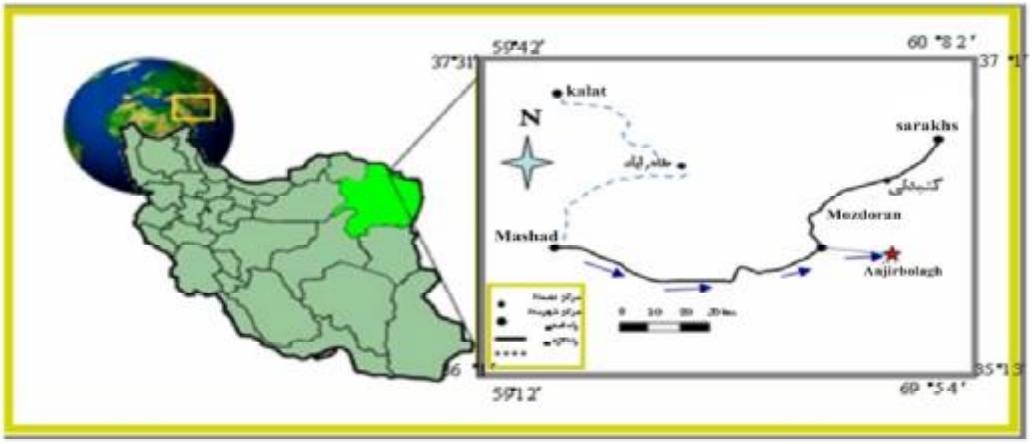

Figure 1. Location of studied section

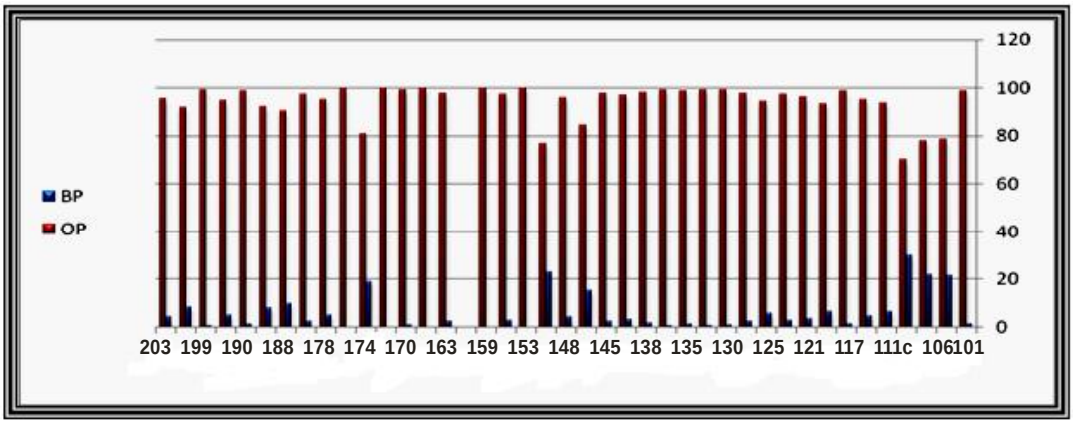

Figure 2: BP/OP

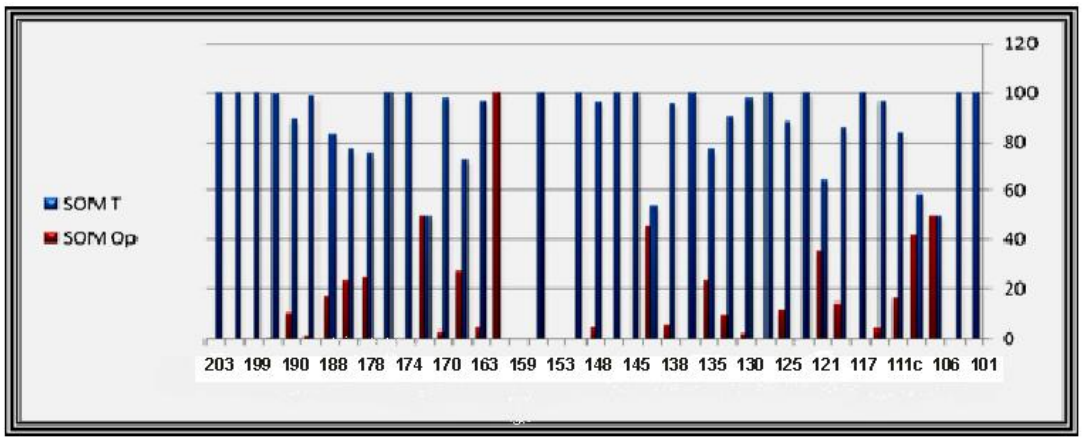

Figure 3: SOM T/SOM Op

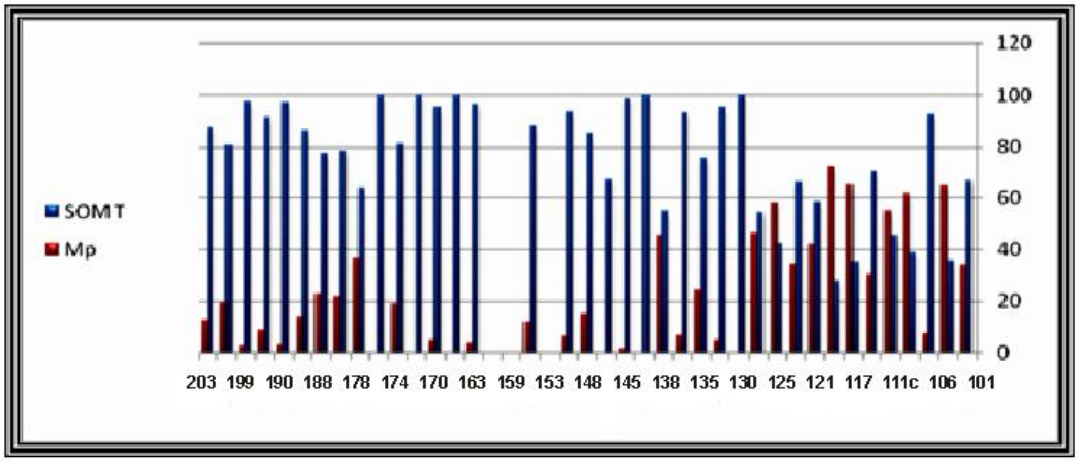

Figure 4: SOM T/Mp

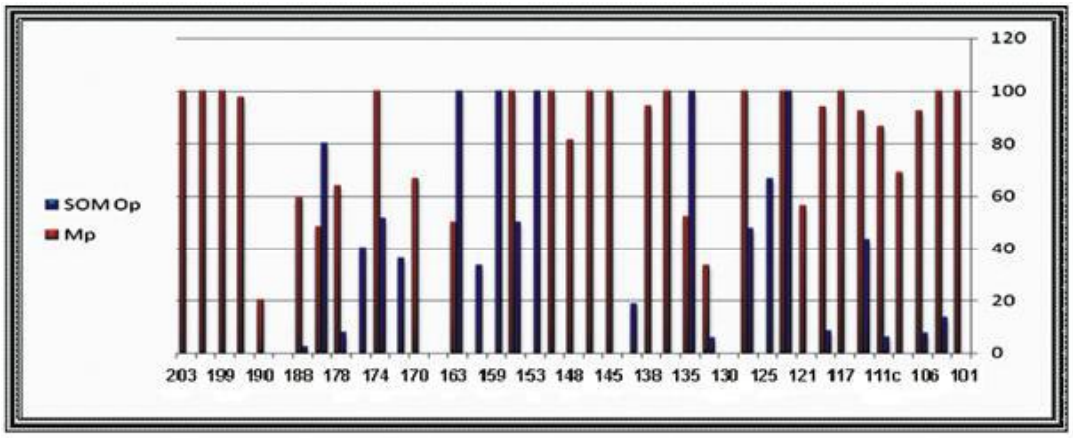

Figure 5:SOM Op/Mp