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E-mail: Payrowan@scwmri.ac.ir

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() Riley .

Melloul .(()

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Anzawa .(()

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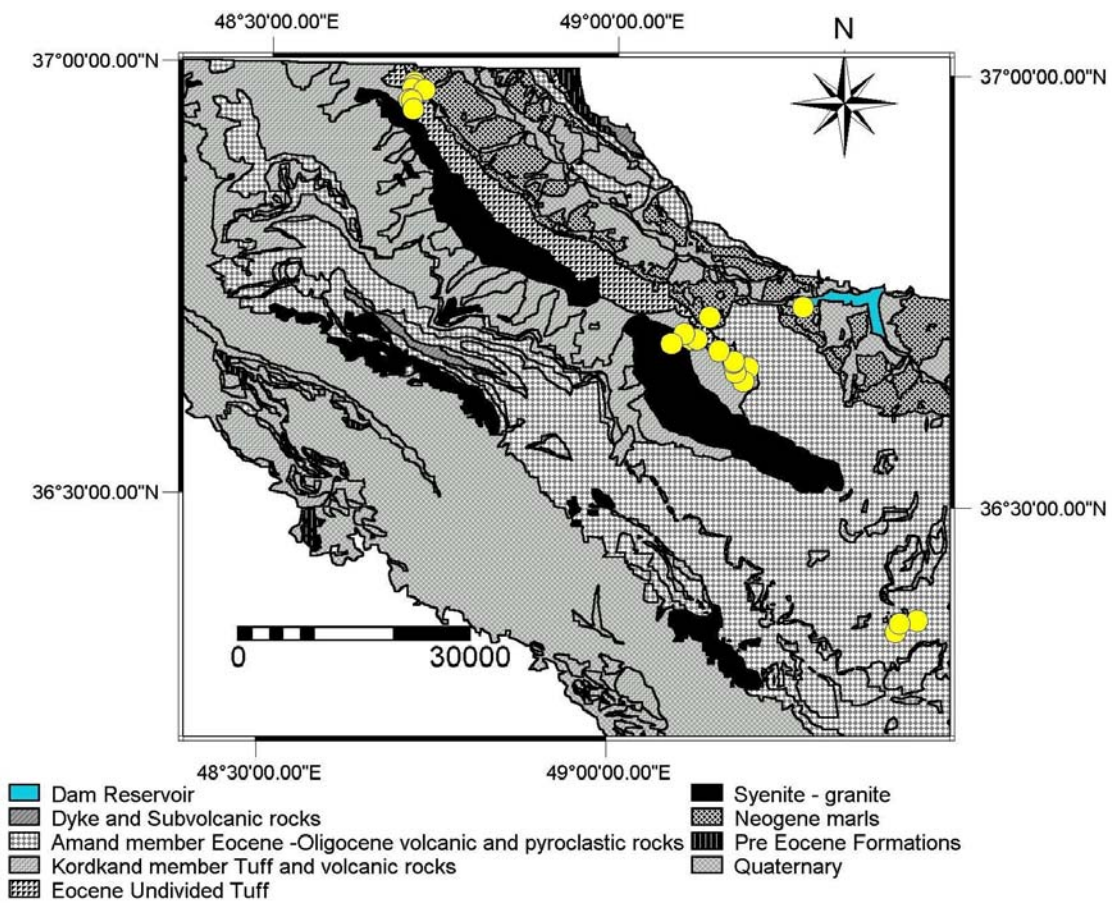
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- Principal Components Analysis

- Multivariate Analysis
- Discriminant Analysis
- Cluster Analysis
- Factor Analysis



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Wards

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(Chebychev)

TH TDS pH EC

Ca Fe Al Si

Pb Ni Cd Cu Cr Co Be Ag Ti Mn Mg

Zn V Sr Sn Mo

Li Fe Pb Cd Mo

E D C

B A

Hierarchical Cluster Analysis

Inductively Coupled Plasma

Atomic Absorption

E D C

W₂₂₅

SO₄⁻²

W₂₀₂ W₁₈₂ W₂₄ W₁₄

W₂₇₂ W₂₆₂ W₂₄₄

B A

) W₂₂₅

C B A

A

W₂₂₅

F E D

B

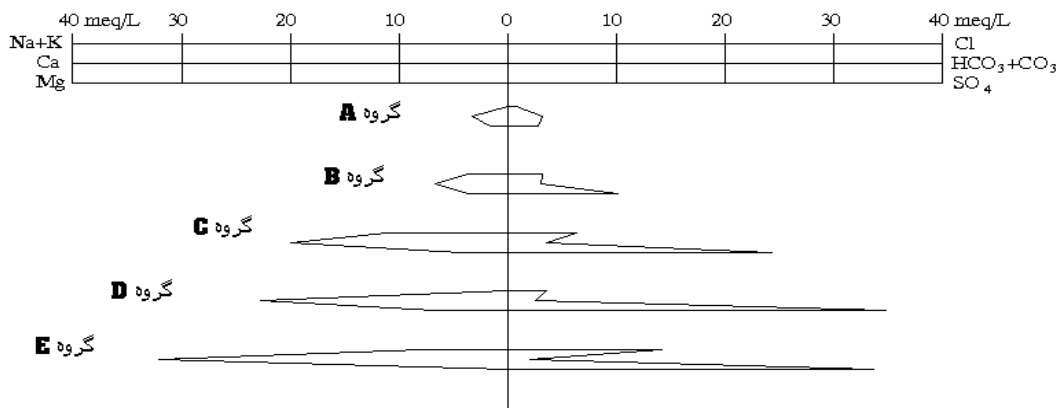
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C

B A

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EC L

	A			B			C			D			E		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
EC	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
PH	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
CO ₃	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
HCO ₃	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
Cl	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
SO ₄	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
Ca	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
Mg	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
Na	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
K	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
TDS	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
TH	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/



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- Group Sizes

Within Group Covariance

Original Grouped Cases

Cross Validated Grouped Cases

C A S E	0	5	10	15	20	25
Label	Num	+-----+-----+-----+-----+-----+				
w93	9	0				
w191	19	0				
w63	6	0				
w113	11	0				
w301	30	0				
w311	31	0	A			
w121	12	0				
w213	21	0				
w133	13	0				
w104	10	0				
w153	15	0				
w142	14	0				
w272	27	0				
w82	8	0				
w34	3	0				
w73	7	0				
w164	16	0	B			
w174	17	0				
w54	5	0				
w234	23	0				
w44	4	0				
w284	28	0				
w294	29	0				
w255	25	0				
w225	22	0				C

C A S E	0	5	10	15	20	25
Label	Num	+-----+-----+-----+-----+-----+				
w82	8	0				
w104	10	0				
w153	15	0	A			
w133	13	0				
w272	27	0				
w121	12	0	B			
w113	11	0				
w191	19	0				
w142	14	0				
w311	31	0				
w63	6	0	C			
w93	9	0				
w213	21	0				
w301	30	0				
w54	5	0				
w234	23	0	D			
w73	7	0				
w294	29	0				
w34	3	0	E			
w44	4	0				
w164	16	0				
w174	17	0	F			
w284	28	0				

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(TDS)

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(Eigenvalues)				
	Eigenvalue	(Variance %)		
	/	/	/	/
	/	/	/	/
	/	/	/	/
	/	/	/	/
Wilks Lambda				
	Wilks Lambda		df	Sig.
	/	/		/
	/	/		/
	/	/		/
	/	/		/

(Eigenvalues)				
	Eigenvalue	(Variance %)		
	/	/	/	/
	/	/	/	/
	/	/	/	/
	/	/	/	/
	/	/	/	/
Wilks Lambda				
	Wilks Lambda		df	Sig.
	/	/		/
	/	/		/
	/	/		/
	/	/		/
	/	/		/

EC	/	/	/	/
pH	/	/	/	/
CO ₃	/	/	/	/
HCO ₃	/	/	/	/
Cl	/	/	/	/
SO ₄	/	/	/	/
Ca	/	/	/	/
Mg	/	/	/	/
Na	/	/	/	/
K	/	/	/	/
TDS	/	/	/	/

Mg ^a	/	/	/	/	/
Mn ^a	/	/	/	/	/
Mo ^a	/	/	/	/	/
CO ₃ ^b	/	/	/	/	/
HCO ₃ ^b	/	/	/	/	/
SO ₄ ^b	/	/	/	/	/
Ca ^b	/	/	/	/	/
Mg ^b	/	/	/	/	/
TDS	/	/	/	/	/

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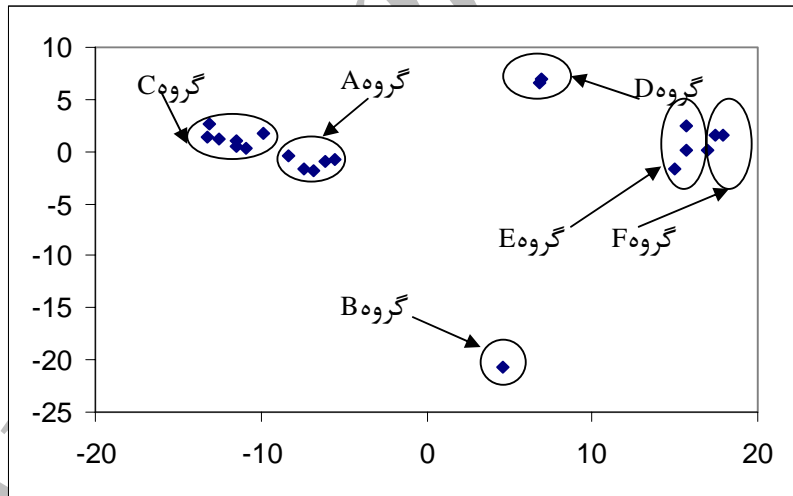
ICP

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() ()	F A :		
() ()	C: (B A): (F E) : D:		/

C₄S₂ : C₄S₂: C₄S₁: C₃S₁: C₂S₁::

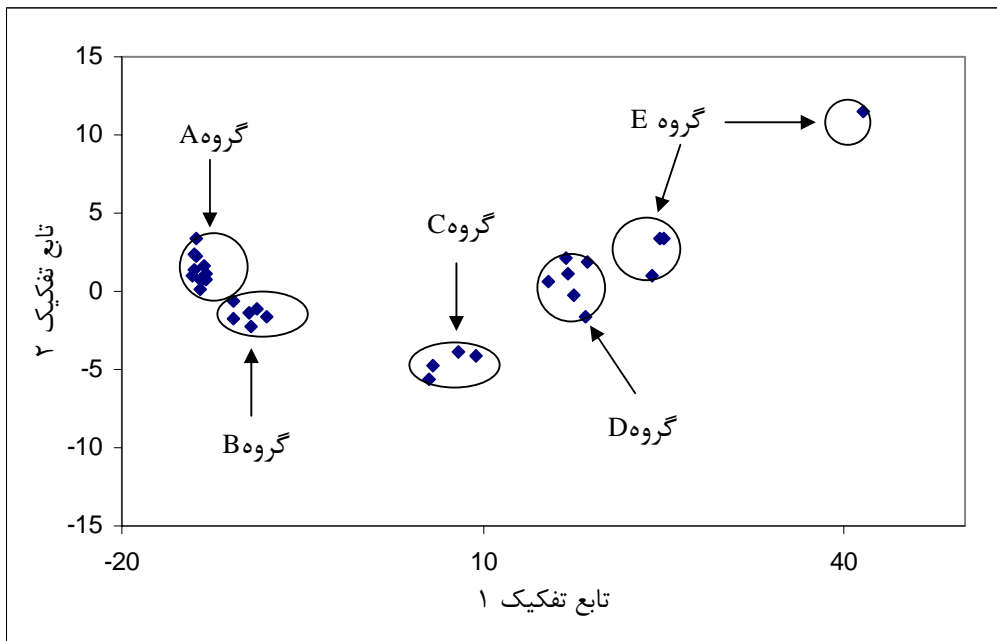
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تابع تفکیک ۱

F A

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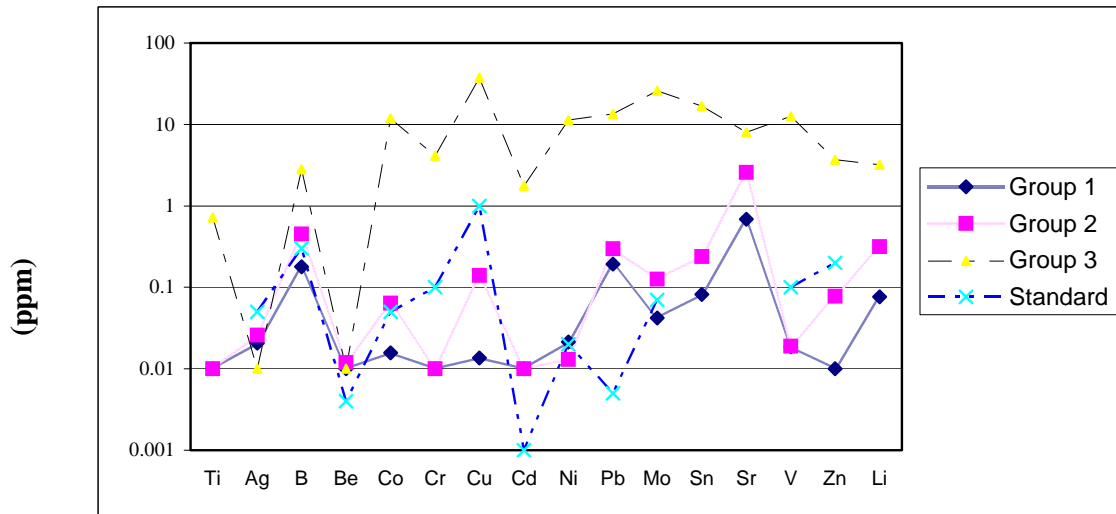


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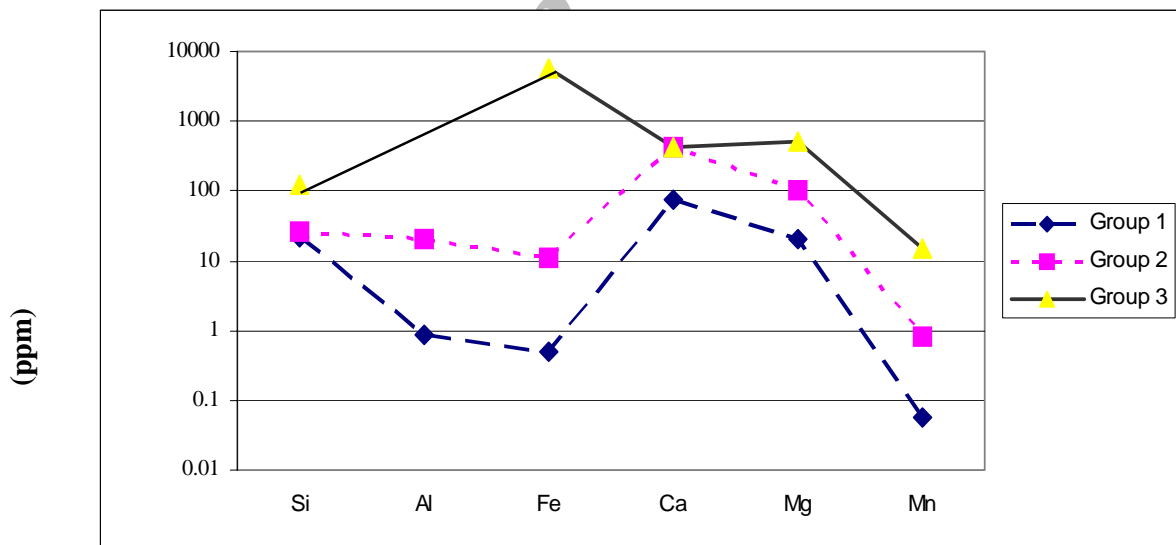
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An Evaluation of Groundwater Quality in Alteration Zones of Tarom Range, Zanjan, Using Multivariate Analysis

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J. Ghayoumian²

Z. Shoaie³

Abstract

Geological, mining, agricultural and industrial activities may be the origins of introducing toxic materials into the ecosystem. If traces of toxic elements are introduced three times the permitted doze into human's body through geochemical circulation, it can be hazardous in the long run. In this research, the adverse effects of alteration zones on groundwater quality have been investigated in Tarom Range, Iran. Surface and groundwater water samples (from alteration zones and various as well as from rock types were taken from the study area. The samples were analyzed for pH, TDS, main cations and anions, as well as for trace elements. The hydro geochemical data were also analyzed using multivariate analysis of cluster and discriminate analyses. The results indicate that the naturally contaminated water can be separated from fresh water using multivariate analysis. The water quality groups resulting from multivariate analysis were evaluated using Stiff, Piper and Wilcox diagrams. Such quality water bears a sour taste; it is dangerous and particularly very dangerous if used for drinking; it as well as seriously harmful to plants if used for irrigation.

Keywords: Alteration zone, Hydro geochemistry, Multivariate analysis, Cluster analysis, Discriminate analysis, Water quality, Tarom Range.

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