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Data Article

Data on assessment of groundwater quality with application of ArcGIS in Zanjan, Iran

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ABSTRACT

The aim of this study was to Monitoring of physical and chemical characteristics of ground water including Ca^{2+}, Mg^{2+}, EC, pH, TDS, TH, HCO_3^-, Na^+, K^+, Cl^-, SAR, %Na and SO_4^{2-} in Zanjan city, Iran. For assessing the physic-chemical parameters from 15 wells, water samples 4 times at different times were collected and examined. Data were analyzed using R and Arc GIS software. According to the calculated correlation coefficients, the highest correlation Coefficient belonged to TDS-EC while HCO_3^- and Cl^- showed low and weak correlations. However, Na^+, Mg^{2+}, K^+, Ca^{2+} exhibited good positive correlations with EC and TDS. The results show that the water in the study area at the time of the study was based on the WHO standards and appropriate for drinking.

Specifications Table

Subject area	Water chemistry
More specific subject area	Describe water subject area
Type of data	Table, Figure

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How data was acquired	Analysis for Each sampling point was performed for 4 times at different times that included calcium, magnesium, chloride, temporary and permanent hardness, pH and electrical conductivity (EC). Sulfate analyzed by Hatch spectrophotometer (DR 5000). Total hardness was determined by EDTA method by titration method and TDS was measured gravimetrically.
Data format	Raw, Analyzed
Experimental features	The parameters mentioned in this paper have been analyzed according to Standard Methods for the Examination of Water and Wastewater.
Data source location	Zanjan, Zanja province, Iran
Data accessibility	Data are included in this article and supplement file excel and ArcGIS

Value of the data

- Determination of the physical and chemical parameter including Ca^{2+}, Mg^{2+}, EC, pH, TDS, TH, HCO_3^-, Na^+, K^+, Cl^-, SAR, %Na and SO_4^{2-} in ground water was conducted in Zanjan city, Iran.
- Data of this study with Arc GIS can help to better understand the quality of groundwater in this area.
- The results show that the water in the study area at the time of the study was based on the WHO standards and appropriate for drinking.

1. Data

Monitoring of physical and chemical characteristics of ground water including Ca^{2+}, Mg^{2+}, EC, pH, TDS, TH, HCO_3^- , Na^+, K^+, Cl^-, SAR, %Na and SO_4^{2-} was done in Zanjan city, Iran. In this regard data were analyzed using R and Arc GIS software. Table 1 summarizes analysis of the groundwater samples at the study area. Table 2 shows results of Pearson correlation matrix for 10 chemical constituents of the groundwater samples. The TDS and EC level in the study area depicted using the ArcGIS software, as shown in Fig. 1. In this figure, the brighter range represents fewer values, and the darker range is a large value.

2. Experimental design, materials and methods

2.1. Study area description

Zanjan is the capital of Zanjan province in Iran and located about 80 miles south from the Caspian Sea. That coordinates are 36°40′27.6204″N and 48°29′4.0812″E. 15 wells were selected as sampling points. Study area and the sampling points are shown and in Fig. 2.

2.2. Materials and methods

For assessing the physicochemical parameters, from 15 wells, water samples 4 times at different times during the year were collected from Zajan city in 2016. Analysis included calcium, magnesium, chloride, temporary and permanent hardness, pH and electrical conductivity (EC) [1–5]. Sulfate analyzed by Hatch spectrophotometer (DR 5000) [6–10]. Total hardness was determined by EDTA method by titration method and TDS was measured gravimetrically. All of parameters in this paper have been analyzed according to handbook of Standard Methods for the Examination of Water and Wastewater [1–12]. Since a simple a method for evaluating the changes of high sodium is the Sodium Adsorption Ratio (SAR) and the sodium percentage (Na %).The excess concentration of sodium in

Table 1
Groundwater quality parameters analyzed in this study.

Well no	UTM		EC (μmhos/cm	TDS (mg/l)	pH	meq/l							SAR	Na%	TH
	Utmy	Utmx				HCO_3^-	Cl^-	SO_4^{2-}	Ca^{2+}	Mg^{2+}	Na^+	K^+			
P1	4074050	257400	236	145	7.77	1.64	0.25	0.415	1.4	0.44	0.42	0.01	0.44	18.60	92
P 2	4064250	261300	1952	1245	7.47	4.28	4.08	10.44	5.95	6.18	6.80	0.06	2764	35.81	606.35
P 3	4073050	263000	665	425	7.78	2.04	1.24	3.03	3.09	1.04	2.23	0.03	1553	34.88	206.95
P 4	4057850	264850	1568	1005	7.45	3.72	1.93	9.33	4.27	3.75	7.09	0.06	3548.5	46.76	401.15
P 5	4071800	265250	697.5	445	7.74	2.56	0.98	3.11	2.22	0.88	3.64	0.025	2923.5	53.80	154.95
P 6	4067000	265900	518.5	325	7.84	2.56	0.78	1.61	2.87	0.9	1.23	0.02	0.8955	24.51	188.95
P 7	4063750	268100	1747	1100	7.28	2.72	7.52	6.77	7.21	5.96	3.91	0.055	1059.7	19.68	658.5
P 8	4068775	268950	1962	1245	7.3	5.36	4.73	8.8	9.28	4.02	5.73	0.07	2221	30	664.95
P 9	4060825	270050	1039	665	7.73	2.96	1.32	5.61	4.77	1.14	4.07	0.03	2378.5	40.76	295.9
P 10	4056200	271750	1040	665	7.79	3.52	1.67	4.74	3.47	1.21	5.35	0.025	3505.5	53.23	233.95
P 11	4060850	272175	904	570	7.19	3.28	1.74	3.65	3.87	1.57	3.29	0.05	1996	37.5	272
P 12	4059000	276500	1145	715	7.32	4.84	2.87	3.31	5.35	2.19	3.57	0.04	1834.5	31.91	377
P 13	4060600	282475	889	560	7.49	4.28	1.75	2.52	4.29	1.56	2.75	0.03	1641	33.32	292.95
P 14	4053850	293375	442.5	275	7.845	3.04	0.425	0.815	2.44	0.72	1.115	0.015	0.8895	26.045	157.95
P 15	4051050.00	299800	538.33	336.67	7.72	2.93	0.90	1.33	2.40	0.95	1.87	0.02	1453.33	35.77	167.30

Table 2
Pearson correlation matrix among the chemical constituents for the groundwater samples.

Variables	K^+	Na^+	Mg^{2+}	Ca^{2+}	SO_4^{2-}	Cl^-	HCO_3^-	TDS	EC	TH
K	1.00									
Na^+	0.81	1.00								
Mg^{2+}	0.90	0.70	1.00							
Ca^{2+}	0.82	0.62	0.78	1.00						
SO_4^{2-}	0.90	0.93	0.84	0.75	1.00					
Cl	0.78	0.51	0.88	0.86	0.66	1.00				
HCO_3^-	0.60	0.61	0.46	0.71	0.54	0.42	1.00			
TDS	0.94	0.87	0.91	0.89	0.95	0.83	0.67	1.00		
EC	0.94	0.87	0.91	0.89	0.94	0.83	0.67	0.99	1.00	
TH	0.91	0.70	0.93	0.94	0.84	0.92	0.63	0.95	0.96	1.00

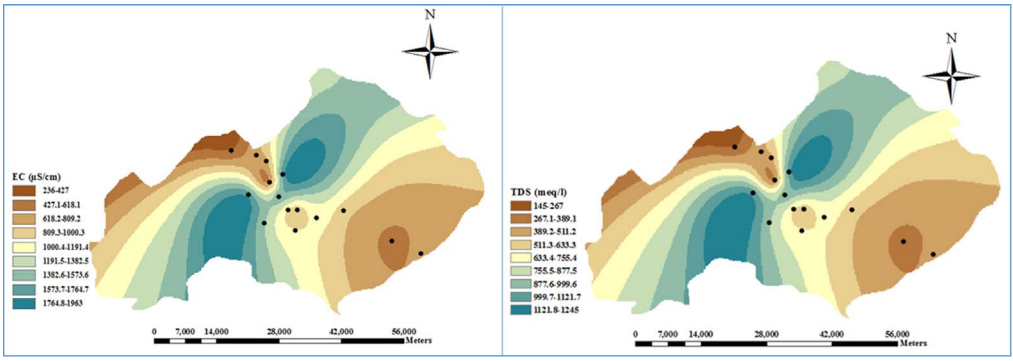

Fig. 1. The amount of EC and TDS in the samples studied.

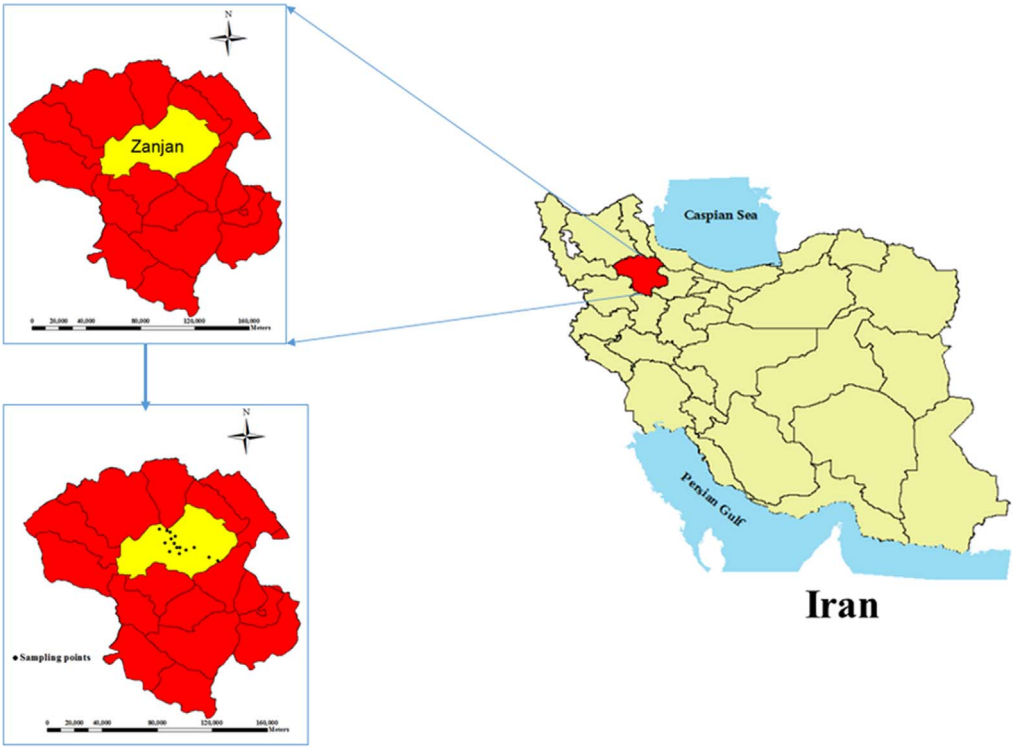

Fig. 2. The map and location of sampling points of Zanjan city,Zanjan,Iran.

Table 3
sodium percentage (Na%) in present study.

Parameter	Range	Water class
Na%	< 20	Excellent
	20–40	Good
	40–60	Permissible
	60–80	Doubtful
	> 80	Unsuitable

groundwater creates adverse effects as it reacts with the soil and decreases soil permeability and influences plant growth. Sodium percentage is also widely used to evaluate the suitability of water quality for irrigation. The percentage of sodium solution is calculated from the following formula [2] (Table 3).

$$Na\% = \frac{Na + K}{Ca + Mg + Na + K} \times 100$$

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Transparency document. Supporting information

Supplementary data associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.dib.2018.03.059.

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