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**Muhittin Grm**  
**Ankara University**

## **Subjects**

**Geology journals in Turkey**

**Journal rules, an example**

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## Geology Journals in Turkey

### University journals

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**RULES OF PAPER WRITING**



# YERBİLİMLERİ

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## Bulletin for Earth Sciences

Cilt / Volume 40  
No. 2  
Ağustos / August 2019



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## Manuscript Submission

### STATEMENT OF EDITORIAL AND PUBLICATION POLICIES

Manuscripts submitted to YERBİLİMLERİ/Bulletin for Earth Sciences should have not been published or simultaneously submitted elsewhere. The overlap of contents between related papers should be at minimum, and normally confined to the introductory/discussion sections.

Authors should consult the Journal's "**Instructions for Contributors**" for detailed stylistic guidelines during preparation of their manuscript. Editors may return manuscripts that are grossly inconsistent with these guidelines. One individual will need to be the Corresponding Author where the submitted manuscript is multi-authored. It will be assumed that all the authors have been involved in the work, have approved the manuscript, and have agreed to its submission.

Manuscripts submitted to the Journal are initially evaluated by the Editor-in-Chief and one of the Associate Editors. The Editor-in-Chief then allocates the manuscript to an Associate Editor, to handle the reviewing, revision and acceptance or rejection procedures. Manuscripts are sent to at least two reviewers selected from the Editorial Advisory Board and/or external specialists. Reviewers are requested to treat the manuscript confidentially. They may choose to identify themselves or to remain anonymous. After the reviewers' comments have been received, the Editor-in-Chief and an Editor also review the papers. The Editor-in-Chief's judgment is final with regard to the review process and suitability for publication.

### TYPES OF CONTRIBUTIONS

The Journal is concerned with original research, new developments, and case studies in earth sciences (geology, geophysics, mining, and geomorphology). The two main types of contributions are "Original Research Papers" and "Technical Notes". Ideas, preliminary results and confirmations on existing techniques are suitable as Technical Notes. In general, Technical Notes are shorter than papers and do not require Abstracts. In addition, "Comprehensive Reviews" and "Discussion" of papers that have already appeared in the Journal may also be submitted. Discussions should not exceed three pages. There is no provision for the publication of Discussion of Technical Notes.

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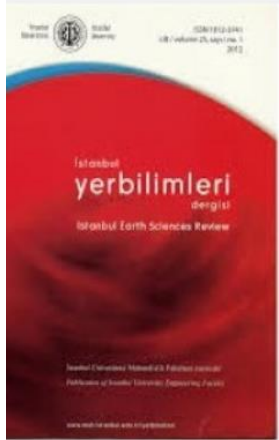
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- Dergide Jeoloji, Jeofizik ve Maden Mühendisliği konularında özgün çalışmalar yayımlanır. Yayımlanma dili Türkçe ve İngilizce'dir.
- Dergiye gönderilen yazıların daha önce kesinlikle yayımlanmamış olması gerekmektedir.
- Yayınların içeriğinden yazarlar sorumludur.
- Makaleler, hakemlerin görüş ve önerileri gözetilerek, Yazı Kurulu'nca yayına kabul edilir veya edilmez.
- Yayına kabul edilmeyen makaleler yazar veya yazarlarına geri verilir.
- Metinler A4 boyutlu kağıda, çevresinde 2.5 cm. boşluk bırakılarak yazılmalıdır. Dergi web sitesinde bir şablon bulunmaktadır.
- 200 sözcüğü geçmeyecek Türkçe Öz ve İngilizce Abstract eklenmelidir.
- Makalelerde "ÖZ"den sonra "Anahtar Sözcükler" ve "Abstract"dan sonra "Keywords" ilave edilmelidir.
- Türkçe sunulan makalelerde ayrıntılı bir İngilizce özet (Summary), İngilizce hazırlanan makalelerde ise yine ayrıntılı bir Türkçe özet makalenin sonuna eklenmelidir.
- Gönderilecek olan yazılar 12 punto ve 1.5 aralıklı yazılmalı; şekil, ek vb. dahil 20 (Yirmi) sayfayı geçmemelidir.
- Yayınlarda kullanılan büyüklükler için birimler (SI) olarak verilmelidir.
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- Renkli şekillerden herhangi bir ücret talep edilmemektedir.
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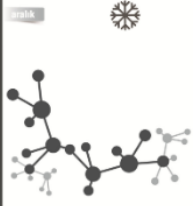
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## Maden Tetkik ve Arama Dergisi Bulletin of the Mineral Research and Exploration

MTA Dergisi / Bull.Min.Res.Exp.

Maden Tetkik ve Arama Dergisi 1936 yılından bu yana yayın hayatına devam eden, yerbilimleri alanında en uzun tarihçeye sahip hakemli bilimsel yayınlardan biridir. MTA Dergisi 1936-1983 yılları arasında tek bir dergi olarak Türkçe, İngilizce, Fransızca ve Almanca makaleler içerecek şekilde basılmış, 1985'den bu yana ise Türkçe ve İngilizce olmak üzere iki dergi şeklinde ve 2019 yılı itibarıyla yılda 3 kez yayımlanmaktadır. Dergimizde yayımlanmak üzere gönderilen makalelerden makale kabul ücreti, makale işlem ücreti ve basım ücreti alınmamaktadır.

MTA Dergisi aşağıda belirtilen ulusal ve uluslararası indekslerde taranmaktadır.

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*Syn-sedimentary tectonic markings in the Oligocene Datça-Kale-Acı Göl basin, Western Anatolia*

Gülşen ELMAS, Gürol SEYİTOĞLU, Nizamettin KAZANCI, Veysel IŞIK

**İstanbul - Yenikapı'daki Holosen yaşlı istifin sedimentolojik özellikleri ve çökeltme ortamları**  
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### 1. Yayın Amaçları

- Türkiye'de ve Uluslararası alanda yerbilimleri konularında bilimsel iletişimin sağlanmasına katkıda bulunmak,
- Türkiye'de yerbilimleri konularında yapılan araştırmaların yabancı ülkelere duyurulmasına aracı olmak,
- MTA tarafından yerbilimleri konularında yapılan bilimsel araştırma ve uygulamaların kamuoyuna duyurulmasını sağlamak,
- Dergiyi nitelik, kapsam ve biçim açısından yüksek düzeyde tutarak uluslararası yayım değişiminde etkili bir araç olarak kullanmak,
- Türkçe'nin bilim dili olarak geliştirilmesi ve yabancı sözcüklerden arındırılması çabalarına katkıda bulunmaktır.

### 2. Kapsam-Nitelik

Yazıların Maden Tetkik ve Arama Dergisi'nde yayımlanabilmeleri için aşağıdaki niteliklerden en az birini taşımaları gereklidir:

#### 2.1. Araştırma Makaleleri ve Derlemeler

# Publication Rules

## . Aims of Publication

- To announce and share researches in all fields of geoscientific studies in Turkey with geoscientists worldwide.
- To announce scientific researches and practices on geoscientific surveys carried out by the General Directorate of Mineral Research and Exploration (MTA) to the public.
- To use the journal as an effective media for international publication exchange by keeping the journal in high quality, scope and format.
- To contribute to the development of Turkish language as a scientific language.

## 2. Scope

At least one of the following qualifications is required for publishing the papers in the Bulletin of Mineral Research and Exploration.

### 2.1. Research Articles

#### 2.1.1. Original Scientific Researches

- These articles cover and contribute to the main subjects of the earth sciences, the original scientific researches and its results related to all aspects of disciplines in geoscience like exploration and evaluation of the underground sources and environmental problems, and
- The studies, which apply new aspects and methods for the solution of problems about the earth sciences and researches, which apply new aspects and methods for the solution of the problems, in the engineering sciences carried out in MTA.

#### 2.1.2. Review Articles

**These papers include comprehensive scholarly review articles that summarize and critically assess previous geoscientific researches with a new perspective and reveal a new approach.**



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#### **Anatolia**

Gülşen ELMAS, Gürol SEYİTOĞLU, Nizamettin KAZANCI, Veysel IŞIK

**İstanbul – Yenikapı'daki Holosen yaşlı istifin sedimentolojik özellikleri ve çökeltme ortamları**  
*Sedimentological properties and depositional environments of the Holocene sequence in Yenikapı, Istanbul*

Meltem SEZERER BULUT, M.Namik YALÇIN, Oya ALGAN

**Babaeski–Lüleburgaz–Muratlı–Çorlu bölgesindeki Paleojen–Neojen istiflerinin paleoortamsal özellikleri ve ostrakod incelemesi (Güneydoğu Trakya, Türkiye)**  
*Paleoenvironmental features and ostracod investigation of Paleogene–Neogene sequences in Babaeski– Lüleburgaz– Muratlı–Çorlu region (Southeastern Thrace, Turkey)*

Ümit ŞAFAK

**Biga Yarımadası'ndaki granitoyitlerin (KB Anadolu, Türkiye) petrolojik ve jeokimyasal özellikleri**

*Petrological and geochemical features of Biga Peninsula granitoids, NW Anatolia, Turkey*

Ümit AYDIN, Pınar ŞEN, Öner ÖZMEN, Erdal ŞEN



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*Syn-sedimentary tectonic markings in the Oligocene Datça-Kale-Acı Göl basin, Western Anatolia*

Gülşen ELMAŞ, Gürol SEYİTOĞLU, Nizamettin KAZANCI, Veysel İŞİK



**İstanbul - Yenikapı'daki Holosen yaşlı istifin sedimentolojik özellikleri ve çökelme ortamları**  
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Ümit ŞAFAK

**Biga Yarımadası'ndaki granitoyitlerin (KB Anadolu, Türkiye) petrolojik ve jeokimyasal özellikleri**



**TMMOB  
JEOLOJİ MÜHENDİSLERİ  
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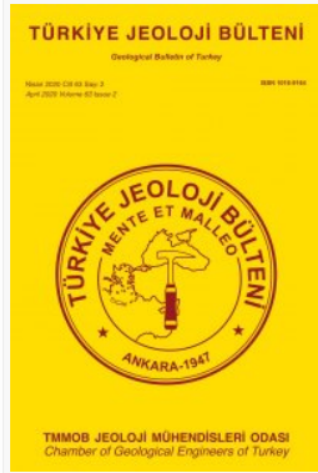
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 (7090 KB)

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Batı Anadolu Tektonik Kaması'nın Güncel Deformasyonu: Batıya Doğru Kaçıştan Kaynaklanan Blok Hareketleri / Recent Deformation of the Western Anatolia Tectonic Wedge:Block Motions Caused by Escape to the West

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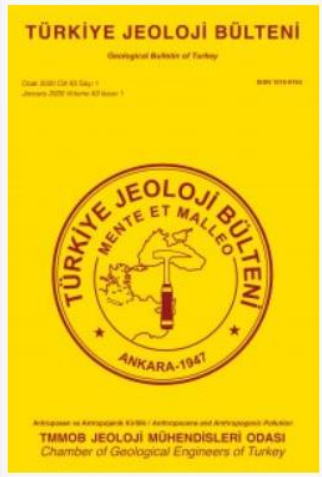
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RAHIM MASOUMI, ALI ASGHAR CALAGARI, KAMAL SIAHCESHM, SOHEIL PORKHIAL  
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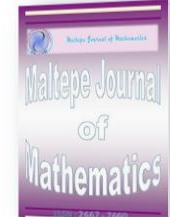


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## Evaluation of hydrogeochemical and isotopic properties of the geothermal waters in the east of Mount Sabalan, NW Iran

Rahim MASOUMI<sup>1\*</sup>, Ali Asghar CALAGARI<sup>1</sup>, Kamal SIAHCESHM<sup>1</sup>, Soheil PORKHIAL<sup>2</sup>

<sup>1</sup>Department of Earth Sciences, Faculty of Natural Sciences, University of Tabriz, Tabriz, Iran

<sup>2</sup>Iranian Renewable Energy Organization, Tehran, Iran

Received: 13.05.2017

• Accepted/Published Online: 09.11.2017

• Final Version: 23.11.2017

**Abstract:** The Mount Sabalan district is regarded as the best place to investigate geothermal activities in northwest Iran. Since the last episode of volcanic activity in the Plio-Quaternary time, hot springs and surficial steams as conspicuous manifestation of geothermal activities have appeared around the slopes of Mount Sabalan. The hot fluids circulating in this geothermal field contains anions chiefly of  $\text{HCO}_3^-$  and  $\text{Cl}^-$ ; however,  $\text{SO}_4^{2-}$  content in some water samples is relatively high, imparting sulfate characteristics to such fluids. Geothermometric studies provided compelling evidence for estimation of the reservoir temperature ( $\sim 150^\circ\text{C}$ ) in the study areas. Thus, in this respect, the geothermal systems in the east of Mount Sabalan were categorized as high-temperature. The composition of stable isotopes of oxygen ( $\delta^{18}\text{O}$ ) and hydrogen ( $\delta\text{D}$ ) indicated that the waters involved in this geothermal field have mainly meteoric origin. On the basis of  $^3\text{H}$  isotopes, only a few water samples exhibited a residence time of  $\sim 63$  years, which can be grouped as old waters.

**Key words:** Mount Sabalan, geothermal field, geothermometry, stable isotopes, residence time

of  $\text{HCO}_3^-$  and  $\text{Cl}^-$ ; however,  $\text{SO}_4^{2-}$  content in some water samples is relatively high, imparting sulfate characteristics to such fluids. Geothermometric studies provided compelling evidence for estimation of the reservoir temperature ( $\sim 150^\circ\text{C}$ ) in the study areas. Thus, in this respect, the geothermal systems in the east of Mount Sabalan were categorized as high-temperature. The composition of stable isotopes of oxygen ( $\delta^{18}\text{O}$ ) and hydrogen ( $\delta\text{D}$ ) indicated that the waters involved in this geothermal field have mainly meteoric origin. On the basis of  $^3\text{H}$  isotopes, only a few water samples exhibited a residence time of  $\sim 63$  years, which can be grouped as old waters.

**Key words:** Mount Sabalan, geothermal field, geothermometry, stable isotopes, residence time

## 1. Introduction

Geothermal research is used to identify the origin of geothermal fluids and to quantify the processes that govern their compositions and the associated chemical and mineralogical transformations of the rocks with which the fluids interact. The variation in the chemistry of geothermal fluids provides information regarding the origins, mixing, and flow regimes of the systems (Smith et al., 2011). The subject has a strong applied component. Geothermal chemistry constitutes an important tool for the exploration of geothermal resources and in assessing the production characteristics of drilled geothermal reservoirs and their response to production. Geothermal fluids are also of interest as analogues to ore-forming fluids. Understanding chemical processes within active geothermal systems has been advanced by thermodynamic and kinetic experiments and numerical modeling of fluid flow (Arnosson et al., 2007).

The Mount Sabalan district in the northwest of Iran is a part of the Azarbaijan block. From the geotectonic point of view, this block is situated between the Arabian and Eurasian plates (McKenzie, 1972; Dewey et al., 1973). In fact, the Sabalan volcano is a part of a volcanic belt stretching from the Caspian Sea in the east to the Black Sea in the west (Neprochnov et al., 1970). The volcanic

activities along this belt are observed in various parts of Armenia, Anatolia, and western Alborz.

The geothermal gradient in the young volcanic regions is normally higher and shows thermal anomalies. This was noted by various researchers in the early twentieth century and many countries having such anomalously high geothermal gradients in potential areas took measures to harness such endless thermal energies accumulated beneath the surface.

The areas around the Mount Sabalan volcano in northwest Iran were geothermally active during the Plio-Quaternary period (Alberti et al., 1976) and have higher surficial thermal anomalies relative to the other parts of the country. Thus these areas were recognized to be very important and hence were regarded as the first priority for exploiting the geothermal energy. The primary appearance of geothermal systems including hot springs and surficial steams in many areas around the Mount Sabalan is indicative of widespread young subsurface magmatic activities in this region.

The main objective of this study involves consideration of hydrogeologic characteristics, chemical composition, and isotopic aspects of the hot springs in the east of Mount Sabalan with emphasis on lithologic units hosting the geothermal fluids in this district. Since the geothermal

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## 2. Materials and methods

After implementing the primary geologic works like identification of the lithologic units and determination of tectonic occurrences in various areas, an accurate geologic map of the district was prepared. Among the numerous hot springs to the east of Mount Sabalan, those with higher flow rate and temperature were chosen for sampling. The temperature and electrical conductivity (EC) of the water samples were directly measured in the field and their  $\text{HCO}_3^-$  content was determined by titration. All water samples were collected and kept in polypropylene bottles and were used for laboratory experiments such as quantitative analysis of cations, anions, rare elements, and stable isotopes. The prepared samples were first passed through 0.45- $\mu\text{m}$  filters and treated with 1% of concentrated  $\text{HNO}_3$  to prevent precipitation of cations and rare elements.

In the present study, the chemical and stable isotope ( $\delta^{18}\text{O}$  and  $\delta\text{D}$ ) analyses were carried out in G.G. Hatch stable isotope laboratory (Gasbench + DeltaPlus XP isotope ratio mass spectrometer, ThermoFinnigan, Germany) at Ottawa University, Canada. The chemical analyses were done using ICP-MS in ACME Analytical Laboratories Ltd, Canada. Still some more samples were analyzed for  $\delta^{18}\text{O}$  and  $\delta\text{D}$  in the hydrogeologic labs at Berman University, Germany. The precision of the measurements for  $\delta^{18}\text{O}$  was  $\pm 0.2\%$  and for  $\delta\text{D}$   $\pm 1\%$ . The main cations including Mg, Ca, K, Na, and Si were analyzed by ICP-OES (PerkinElmer) and the main anions such as  $\text{Cl}^-$ ,  $\text{F}^-$ , and  $\text{SO}_4^{2-}$  were measured by ion chromatography using an IC-Plus Chromatograph (Metrohm).

The  $^3\text{H}$  values were measured in terms of tritium unit (TU), where  $1 \text{ TU} = ([\text{T}]/[\text{H}]) \times 10^{18}$  (IAEA, 1979).

## 3. Results and discussion

The study district encompasses the eastern part of the Mount Sabalan strato-volcano and its geology was influenced by the Sabalan volcanic activities with calc-alkaline nature. The volcanic rocks in this district

(Dumaliq, 1997). The hot springs in the Sardabeh area are discharging through these lithologic units. Around the hot springs in the Sardabeh area massive silica (principally of chalcedony and opal) accumulations (silica sinters) were formed with thicknesses up to about 300 m. The south of the district was covered by 15-m-thick porous limestone, which was likely deposited in a freshwater lacustrine environment. In addition, Quaternary alluvial sediments were also observed in this part.

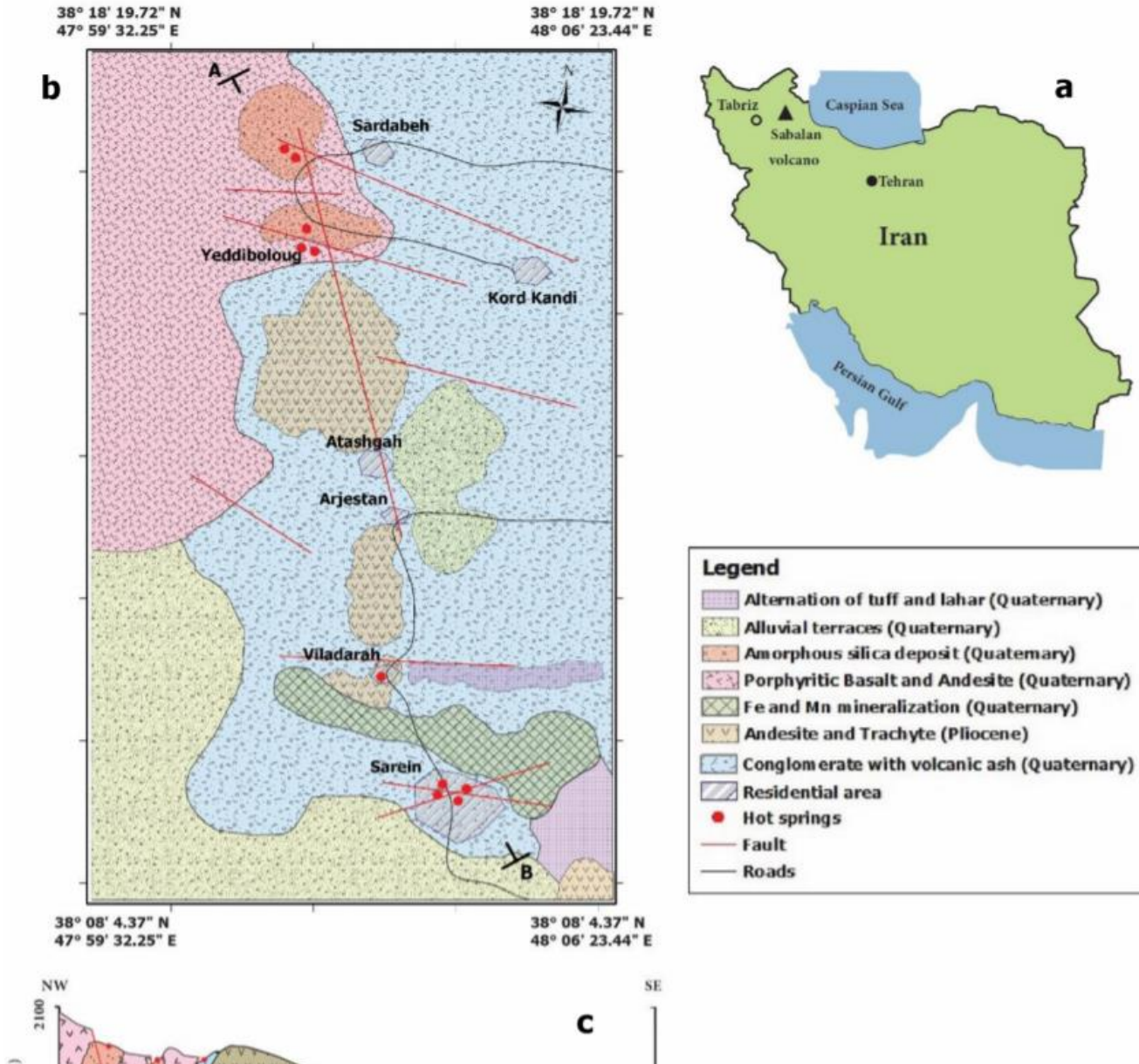
Tectonically, numerous faults and fractured zones developed in this district. The major faults passed through the Sarein and Sardabeh areas (with NW-SE trend) and played a crucial role in the development of surficial hot springs. In the southern part of the district, there are some folded zones with an overall NE-SW trending. It appears that these tectonic occurrences were influenced by the last volcanic activities of Mount Sabalan and to some extent control the geothermal systems in this district.

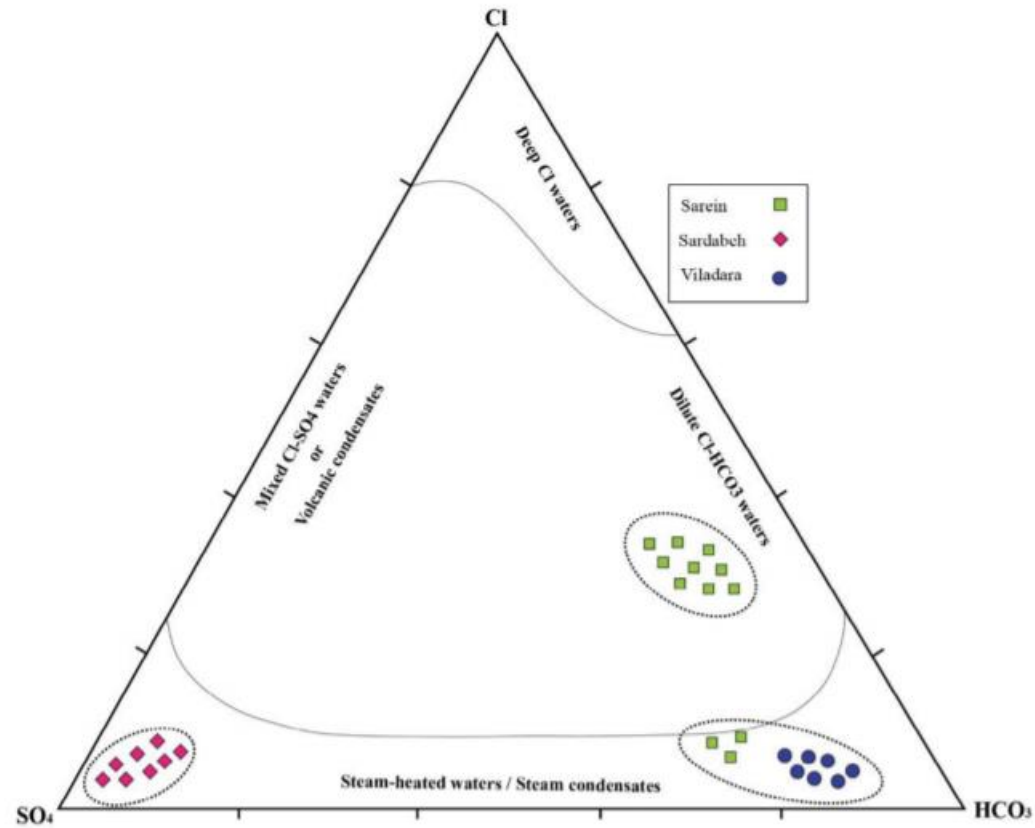
### 3.1. Hydrogeochemistry

Hydrogeochemistry is an indispensable unit of hydrogeological studies because it aids in the determination of chemical properties as well as the overall qualities of groundwater, including their genesis and relationship with surface and rain waters. Therefore, it is an important part of geothermal research programs (Tarcan, 2002).

So far, little work on geothermal fluids has been carried out to the east of Mount Sabalan, and most of the previous studies were done on geothermal activities in other areas around Mount Sabalan (Masoumi et al., 2016, 2017a, 2017b, 2017c). Despite the lack of deep diamond drilling data, the important subjects such as hydrogeochemical characteristics of the fluids, isotopic issues, geologic conditions governing the geothermal reservoirs, lithologic compositions, and fluid-feeding localities in the study area merit more detailed investigations.

Hydrogeochemical studies were reckoned to be the most suitable method to consider the potential geothermal characteristics of the district with the aim of approaching to applicable geothermal energy. The data obtained from chemical (major cations and anions, rare and heavy

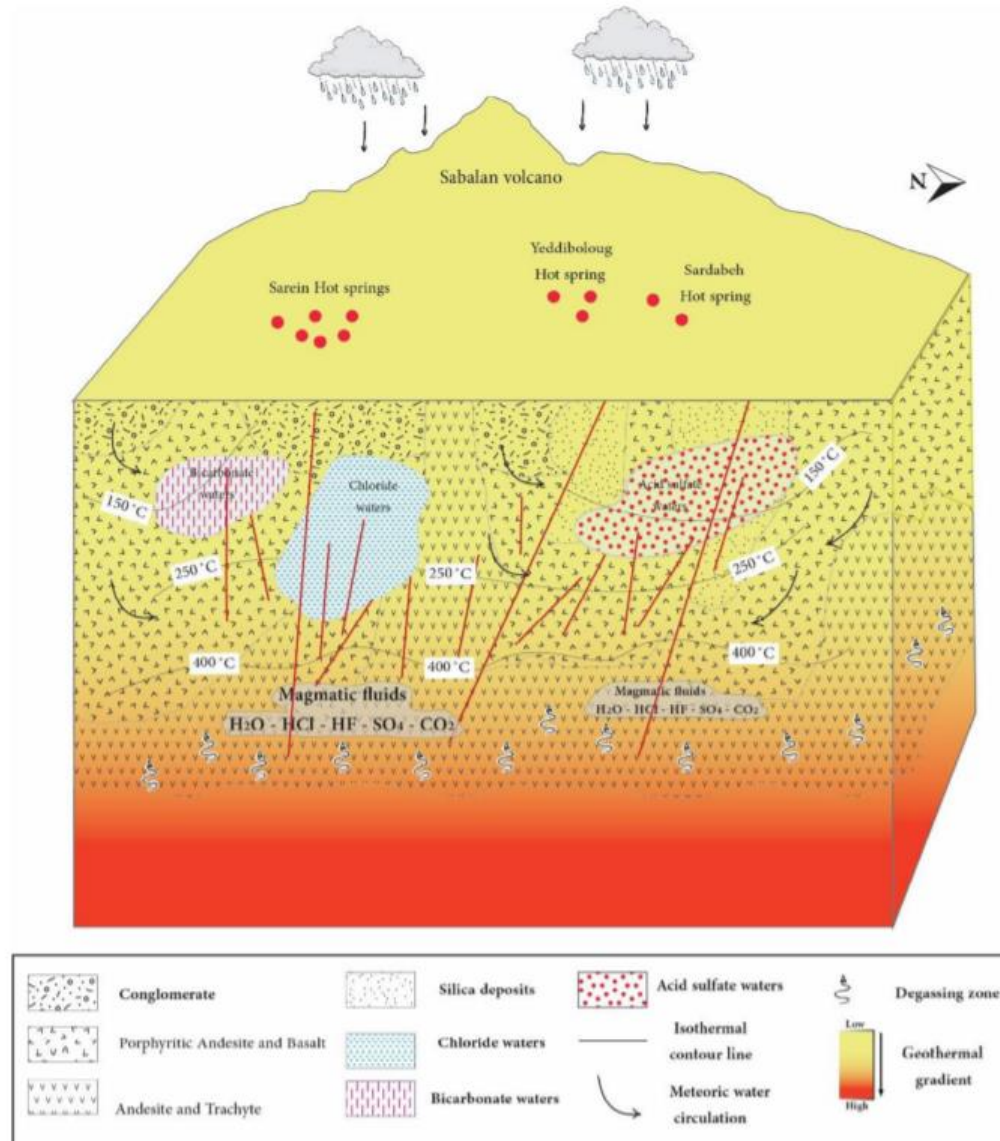




**Figure 2.** Ternary plot of  $\text{HCO}_3\text{-SO}_4\text{-Cl}$  for the geothermal fluids to the east of Mount Sabalan.

Schoeller (1962) (Figure 3). According to this diagram the concentration values of cations and anions in the hot springs representing the three above-mentioned areas are not similar and show different distribution patterns. However, an overall trend for cations like  $\text{Ca}^{2+} > \text{Na}^+ > \text{K}^+ > \text{Mg}^{2+}$  and for anions like  $\text{SO}_4^{2-} > \text{HCO}_3^- > \text{Cl}^-$  can be observed (Figure 3)

Among the cations,  $\text{Na}^+$  (240 mg/L) and  $\text{Ca}^{2+}$  (198 mg/L) have the highest concentration values. The hot springs in the Sarein area contain the highest  $\text{Na}^+$  content. The highest  $\text{Ca}^{2+}$  content belongs to the hot springs in the Sardabeh and Yeddiboloug areas. The maximum concentration values for K and Mg are 40 mg/L and 20 mg/L, respectively.



**Figure 7.** Conceptual model of Eastern Sabalan geothermal field showing the lithological composition of the reservoir, geothermal water types, and the reservoir thermal condition.

## 5. Conclusions

The most important results obtained from this study are as follows:

1- Geological considerations east of Mount Sabalan indicate that the calc-alkaline volcanic-sedimentary units constitute the great volume of the geothermal reservoir in the study district. The rocks that suffered argillic alteration acted as cap rocks for this reservoir. In some localities in the study district siliceous (chalcedony and opal) sinters developed around the orifice of the hot springs. Tectonically, the NW-SE trending faults played an important role in the development of these hot springs.

2- The geothermal fluids in the study district, in terms of physico-chemical parameters, have characteristics that

differ from those of other geothermal fields around Mount Sabalan, particularly in the southern and northwestern districts. These differences are: (a) the measured pH values of the geothermal fluids range from approximately 4.5 to 8.8, signifying a variation from acidity to alkalinity; (b) the measured TDS values of these waters, in comparison with the average TDS values for most types of geothermal systems, are low and the minimum values were recorded in the Viladara area; (c) estimations of concentration values of anions and cations in the selected spring water samples indicate that they have chiefly chloride and bicarbonate anions; however, samples from the Sardabeh area contain relatively high sulfate ( $\text{SO}_4^{2-}$ ) content.

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3- The concentration values of trace elements in these waters are notable. Selenium has the highest concentration value (170 mg/L) among the rare elements, and considering its similarities in geochemical behavior with sulfur and besides volcanic activities are the principal source of selenium, the high selenium content in these waters can be justifiable. The maximum concentration values of boron and arsenic were measured to be 7 mg/L and 10 mg/L, respectively. The rest of the rare elements have relatively low concentration values in the studied samples.

4- The calculation of solute-based geothermometry was

Sabalan revealed that their  $\delta\text{D}$  and  $\delta^{18}\text{O}$  values vary from  $-63.37\text{‰}$  to  $-80.19\text{‰}$  and from  $-9.96\text{‰}$  to  $-13.4\text{‰}$ , respectively. The bivariate plot of  $\delta^{18}\text{O}$  versus  $\delta\text{D}$  shows that the data points mainly lie between lines GMWL and NMWL, indicating that the great portion of these waters have meteoric origin and the role of magmatic waters is almost negligible.

6- Consideration of radioactive isotope of  $^3\text{H}$  delineated that the average  $^3\text{H}$  content of these waters is 5.1 TU. Illustration of diagrams of tritium- $\delta^{18}\text{O}$  and tritium- $\text{Cl}^-$  showed that most of these waters are categorized as



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