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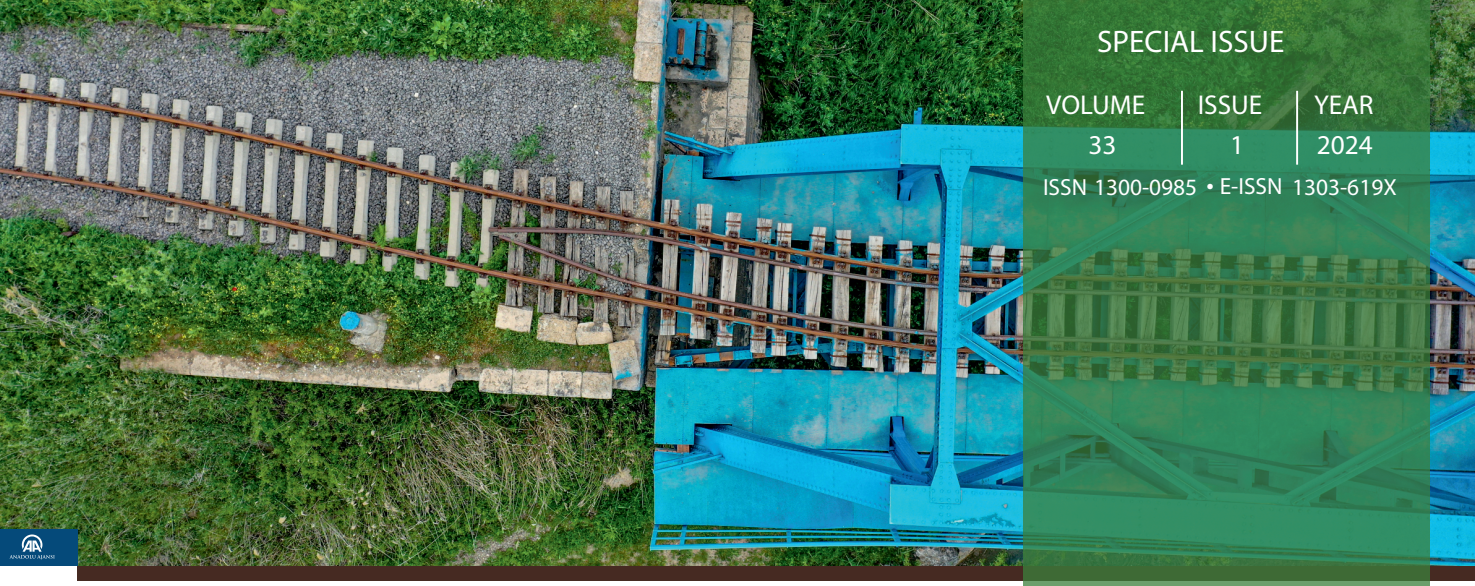

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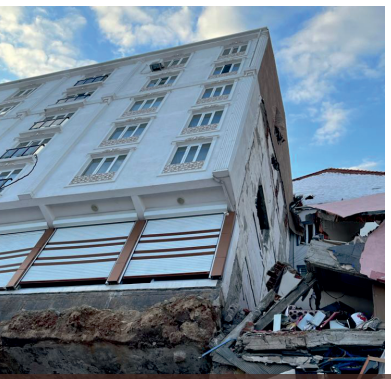

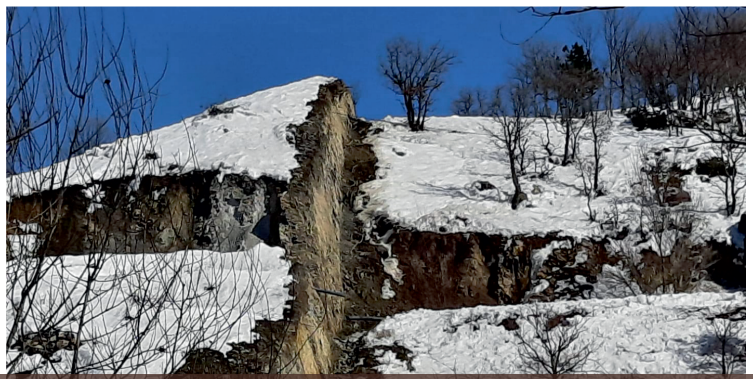

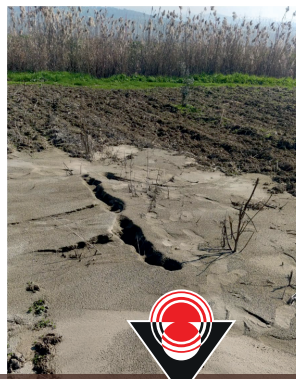

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SCOPE OF JOURNAL

- The Turkish Journal of Earth Sciences is published electronically 6 times a year by the Scientific and Technological Research Council of Türkiye (TÜBİTAK).
- It is an international English-language journal for the publication of significant original recent research in a wide spectrum of topics in the earth sciences, such as geology, structural geology, tectonics, sedimentology, geochemistry, geochronology, palaeontology, igneous and metamorphic petrology, mineralogy, biostratigraphy, geophysics, geomorphology, palaeoecology and oceanography, and mineral-deposits.
- The journal publishes the highest quality papers and comprehensive review papers on hot topics of current interest, with high quality illustrations.
- Submitted papers should have regional implications and attract international interest as the journal aims to provide a medium for interdisciplinary papers that would be of interest to many different specialists.
- Specialized papers can be submitted if they illustrate significant progress in that specific area of the earth sciences. In addition to original and review articles, we are also interested in publishing discussions of papers that have already appeared in recent issues of the journal.
- The journal also publishes thematic sets of papers on topical aspects of geology or special issues of selected papers from conferences.
- Short articles (6 printed pages maximum) for rapid publication reporting a significant advance in the earth sciences with regional impact are welcome. Contribution is open to researchers of all nationalities.

EDITORIAL BOARD

ABSTRACTED AND INDEXED

- Science Citation Index Expanded
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Preface

Southern Türkiye and northwestern Syria experienced widespread devastation due to a series of earthquakes on February 6, 2023, including one of the most catastrophic events on continental crust in the last century. The earthquake, centered in Kahramanmaraş, resulted in one of the highest tolls in terms of loss of life and destruction in our history. In response to this tragedy, all national institutions and organizations mobilized their resources to mitigate the devastating effects of the earthquake.

Aside from the significant destruction it caused, the series of earthquakes presented a unique opportunity for open laboratory research in the field of earthquake studies. Consequently, immediate action was taken, and a budget was allocated to scientists through the 1002-C Natural Disasters Focused Field Study Emergency Support Program initiated by TÜBİTAK on February 6, 2023. Following the seismic events, 124 scientific projects were supported by TÜBİTAK , enabling numerous scientists to conduct comprehensive investigations using various methodologies in the affected earthquake region.

The studies funded by TÜBİTAK programs are not merely scientific projects; they represent a crucial investment in our country's future resilience against earthquakes. TÜBİTAK remains committed to developing lasting solutions through science and technology to position Türkiye as the world's most prepared nation against disasters, capable of responding swiftly and effectively. Consequently, this special issue holds significant importance in sharing the initial findings of scientific studies, including those supported by TÜBİTAK, in the field of earth sciences with the international community. In this context, I extend my deepest gratitude to all the scientists who contributed to the development of this special issue, as well as to the editorial board overseeing its publication.

Prof. Dr. Hasan MANDAL
President of The Scientific and Technological Research Council of Türkiye (TÜBİTAK)

Preface

The earthquakes that struck Kahramanmaraş on February 6, 2023, resulted in a significant loss of life and property across eleven cities in southern Türkiye. These seismic events, occurring 9 hours apart and registering as Mw7.7 (04:17 local time) in Pazarcık (Kahramanmaraş) and Mw7.6 (13:24 local time) in Elbistan (Kahramanmaraş), have entered the annals of history as the most destructive earthquakes globally in the past century. Following these earthquakes, which induced a total surface rupture of 500 km, scientists conducted on-site examinations of the deformations caused by employing geological, hydrogeological, geophysical, and geodetic methods.

In response to the seismic events, TÜBİTAK's Turkish Journal of Earth Sciences (TJES) aimed to promptly disseminate the data collected by researchers who completed their fieldwork immediately after the earthquake. As a result, a special call for papers on the Kahramanmaraş earthquakes was made, leading to the acceptance of six articles for publication in this special issue. Special thanks are extended to the President of TÜBİTAK, Prof. Dr. Hasan Mandal, for providing invaluable support in preparing this special issue, and to the Disaster and Emergency Management Presidency (AFAD) for its institutional support.

We are pleased to present this special issue, published 11 months after the earthquake. On this occasion, I express my gratitude to Prof. Dr. Volkan Karabacak (Eskisehir Osmangazi University, Türkiye) and Prof. Dr. Hasan Sözbilir (Dokuz Eylül University, Türkiye) for their service as guest editors, meticulously evaluating the articles, and to all authors who contributed valuable works to this issue.

Sincerely,

Prof. Dr. Orhan TATAR
Editor-in-Chief

Preface

It is our privilege to introduce the special issue in the Turkish Journal of Earth Sciences, titled "February 2023, Southern Türkiye Earthquake Sequence," dedicated to the population of Türkiye and to the victims of these earthquakes.

Southern Türkiye witnessed extensive and devastating destruction caused by three major earthquakes during two weeks in February 2023. The initial earthquakes occurred at 04:17 (Mw=7.7, Pazarcık, Kahramanmaraş) and 12:30 (Mw=7.6, Elbistan, Kahramanmaraş) on February 6, 2023, where neighboring fault systems of the East Anatolian Fault Zone sequentially ruptured between the Amik Basin (Hatay) and Malatya Province. Over the next two weeks, the accumulated stress propagated southward, triggering additional earthquakes that extended towards the Mediterranean Sea, including the Yayladağ-Antakya Earthquake (Mw: 6.4).

The Pazarcık (Kahramanmaraş) earthquake (Mw 7.7), which occurred on the East Anatolian Fault (EAF) at 04:17 local time on February 6, 2023, was one of the most significant land-based earthquakes of the last century. These earthquakes directly impacted eleven provinces in southern Anatolia, resulting in extensive property damage, the loss of millions of dollars, and over 50,000 casualties.

The international community expressed deep interest in this catastrophic and unique earthquake sequence, which bore similarities to continental plate boundaries around the world. Following these events, numerous scientists conducted field investigations in the affected region, sharing their findings with the public. In this special issue dedicated to the southern Türkiye earthquakes, the seismic events were examined from a geoscientific perspective, resulting in the acceptance of six articles addressing various aspects.

Alkan et al. investigated the February 2023 earthquake sequence using Coulomb stress analysis. They demonstrated that earthquakes transfer stress to one another during their formation stages, and this is consistent with the occurrence of six main earthquakes and their subsequent small aftershocks. Coulomb stress changes suggested that the mainshock ruptures played a pivotal role in transferring stresses across various regions, including Elazığ and Malatya in the northeast, Kahramanmaraş-Göksun in the west, and Hatay and Syria in the south. The calculations indicated that shallow areas around the source regions experienced positive voltage changes (approximately 1.0 bar) in relation to the focal depths of the aftershocks. These findings provide insights into the rupture dynamics, suggesting that the prolonged absence of a major earthquake in this segment of the EAFZ had led to the accumulation of significant stresses, culminating in the high-energy rupture observed.

Softa et al. presented field data on the surface rupture geometry and coseismic displacement characteristics immediately following the February 6, 2023, Ekinözü (Kahramanmaraş, Türkiye) earthquake (Mw 7.6). Their preliminary findings indicated a total rupture length of 130 ± 10 km on the Çardak segment and Doğanşehir segment, known as the northern branch of the East Anatolian Fault Zone. The observations revealed left-lateral strike-slip faulting with a maximum horizontal displacement of 6.60 m and an average displacement of 3.00 m. The surface rupture exhibited restraining bend and releasing bend structures at small scales on the Çardak segment. The preliminary results suggested that Çardak and Doğanşehir segments consecutively ruptured during the Mw 7.6 Ekinözü (Kahramanmaraş) earthquake, extending between the Göksun and Nurhak region and reaching the Eskiköy regions. The potential stress concentration was also considered, not only on the Sürgü segment, which lies on the transfer fault between the northern and southern branches of the East Anatolian Fault Zone but also on the west of the Çardak segment and the northeast of the Doğanşehir segment near Yeşilyurt (Malatya).

Gürboğa et al. conducted a comprehensive study to understand the rupture geometry, fault kinematics, and the nature of brittle deformation associated with the February 2023 earthquakes. Their work encompassed field observations, kinematic measurements, and the analysis of differential interferometry (DInSAR) on Sentinel-1 SAR images to evaluate surface deformation. The findings indicated that field data, palaeostress analysis, and deformation zones aligned with the focal mechanism solutions of the February 2023 earthquakes. Furthermore, it was suggested that the first Mw 7.7 event may have been caused by motion along the Pazarcık and Amanos segments simultaneously as a single seismic segment.

Sümer provided an in-depth investigation of the Tepehan Rockslide, a rapidly developed translational interrupted ridge-type earthquake-induced large-scale rockslide located 19 km from the surface rupture and 136 km from the earthquake epicenter. Through field observations and centimeter-precise numerical data obtained from high-resolution unmanned aerial vehicle (UAV) footage with GNSS-RTK mounted modules, the study revealed that the longest axis of the structure extended approximately 496 m in an east-west orientation, with the widest profile spanning 184 m in the north-south direction. The total moving mass was estimated to cover an area of approximately 71,000 m2, with an average volume of at least 1.1 million m3 and a total weight of 2.75 megatons.

Using field observations and in situ analysis of water sources and tap water, **Şimşek et al.** investigated the physical deformation of the aquifer system and the current water quality characteristics in the affected region. Their study documented significant physical changes in karst springs and groundwater wells, including turbidity discharges from all karst springs due to limestone-covered terra rosa soils in the region, destruction of groundwater wells near the coastal alluvial aquifer due to liquefaction, significant water intrusion, and the presence of microbiological pathogens in water resources and in some tap waters due to contamination resulting from deformation in natural and manmade water networks. Preliminary results indicated that the shaking and physical deformation caused by the earthquake significantly impacted the quality of groundwater resources and tap water in the earthquake zone.

Öztürk et al. proposed that liquefaction in the primary ground area played a crucial role in the collapse or toppling of high-rise buildings along the coast of İskenderun during the southern Türkiye earthquake. The Mw 7.7 Pazarcık earthquake on February 6, 2023, induced typical liquefaction in the coastal area of İskenderun Bay, characterized by 0.8 m settlement and 0.4% lateral spread within the first 29 minutes after the earthquake. In the subsequent 6.4 MW Defne earthquake, which occurred 14 days after the initial major earthquake, lateral spreading and collapse accelerated along the coasts of Iskenderun. Field observations made 25 days after the first earthquake revealed a settlement of 1.7 meters and a lateral spread of approximately 1% in the coastal area of Iskenderun.

We extend our heartfelt appreciation to all the referees who reviewed the articles and to the journal's Editor-in-Chief, Prof. Dr. Orhan Tatar, for extending the invitation to this special issue.

Guest Editors
Prof. Dr. Volkan KARABACAK, Eskişehir Osmangazi University
Prof. Dr. Hasan SÖZBİLİR, Dokuz Eylül University

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