

Contribution of Turkish Scholars to Earthquake Literature: The Impact of the Marmara Earthquake

Türk Bilim Adamlarının Deprem Literatürüne Katkıları: Marmara Depremi'nin Etkisi

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Abstract: *This paper addresses the question of whether the Marmara Earthquake of August 17, 1999, has had an impact on the contribution of Turkish scholars to the earthquake literature. We identified a total of 1,098 papers published between 1990 and 2009 by Turkish earthquake scientists. These papers were cited 7,691 times. Both the number of papers and the citations they generated increased considerably after the Marmara Earthquake. This may be explained, in part, by the increase in the number of projects being carried out since then to study the Marmara Sea basin.*

Keywords: *Marmara Earthquake, citation analysis, earthquake literature*

Öz: *Bu çalışma 17 Ağustos 1999 Marmara Depremi'nin Türk bilim adamlarının deprem literatürüne yaptıkları katkıda etkisinin olup olmadığını araştırmak amacı ile tasarlanmıştır. 1990 ve 2009 yılları arasında Türk deprembilimciler tarafından 1098 yayın üretilmiş ve bu yayınlar 7691 kez atıf almıştır. Yayın ve atıf sayılarında Marmara Depremi'nden sonra büyük bir artış görülmüştür. Sonuç olarak, deprem ile ilgili çalışmalardaki gelişmeyi, kısmen, Marmara denizi havzasında uygulanmış projelerin sayısındaki artış ile açıklamak mümkündür.*

Anahtar sözcükler: *Marmara Depremi, atıf analizi, deprem literatürü*

Introduction

Due to its geographical position, there have been many earthquakes in Turkey throughout history. The Marmara Earthquake of August 17, 1999, was one of the most destructive earthquakes in recent history. It measured 7.4 on the Richter scale and affected mainly the urban dwellers living in Istanbul and its environs (Ozerdem, 1999). According to the initial reports, the earthquake resulted in approximately 15,226 fatalities and 23,983 injured. In addition to mortalities and injuries, it caused US \$9-13 billion property damage. It was estimated that 14,444,298 inhabitants living in the Marmara region were affected by the event. The Marmara Earthquake has had negative effects on Turkish industry, education and health systems, labor force, agriculture and infrastructure (T.R. Prime Ministry State Planning Organization, 1999).

This paper reviews the effects of the Marmara Earthquake on the number of publications authored by Turkish scholars. It identifies the most productive authors and institutions carrying out earthquake research in Turkey.

Problem Statement

The main aim of this study is to evaluate the papers on earthquakes authored by Turkish scholars between 1990 and 2009 and to determine the impact of the Marmara Earthquake of 1999. The hypothesis of this study is: "The number of publications authored by Turkish scholars in the earthquake field increased after the Marmara Earthquake of 1999". More specifically, this study attempts to answer the following research questions:

- What types of publications are published by Turkish earthquake scientists?
- What percentage of the world's earthquake literature is generated by Turkish scholars?
- Who are the most productive authors and institutions carrying out research on earthquakes in Turkey?
- Where do Turkish earthquake scientists publish and how often are their works cited?

Literature Review

There have been many papers about bibliometric analysis of publications in a specific field (Ding, Chowdhury, & Foo, 2000; Zhang, 1998; Burright, Hahn, & Antonisse, 2005; Qiu & Chen, 2009). The earthquake literature doesn't

include any work directly relevant to citation analysis. However, there are three such articles on seismic studies and earthquake engineering.

Some 1128 papers published by the Institute for Geophysics of University of Texas were evaluated in a study (Frohlich & Resler, 2001). Papers were classified into four categories that differed significantly with respect to statistics such as lifetime citation rates, fraction of papers never cited after 10 years and cited half-life. It was concluded that reported differences in cited half-lives must be quite large to be significant.

Trifunac (2006b) analyzed the works of 51 academics for the aim of finding influential researchers on earthquake engineering. He used ISI's HighlyCited.com and tried to find out why there are no earthquake engineers in the category of engineering. As a result, earthquake engineering was absent in the engineering category of ISI's HighlyCited.com. Trifunac also compared female and male academics in earthquake engineering by using citation analysis methods (Trifunac, 2006a).

Studies on bibliometrics and citation analysis have also been published in Turkey. They generally examined dissertations (Tonta & Al, 2006; Uçak & Al, 2009a; Uçak & Al, 2009b; Bayram, 1998).

Some 572 Turkish physics publications that appeared in Science Citation Index between 1982 and 1990 were evaluated in a study (Uzun, Menard, & Özel, 1993). They found that papers from Turkey published in European or American journals are cited more frequently.

Papers from Hacettepe University published between 1975 and 2003 were appraised in 2004 (Al, Al, & Bahşıoğlu, 2004). Science Citation Index and Journal Citation Reports were used as data tools and 9688 publications were analyzed. As a conclusion, over one third of publications were published after 2000. Almost all the publications were written in English. Four, and more than four-author, publications constituted 57% of all publications. Only 8% of the publications had single authorship.

There are a few studies for the combination of earthquakes and citation analyses in print. However, Turkey hasn't yet published such an analysis. This is the first study based on citation analysis of papers on earthquakes in Turkey.

Methodology

ISI Web of Science has been used as a data tool for this study. Data have been collected from Science Citation Index (SCI), Social Sciences Citation Index (SSCI), Conference Proceedings Citation Index – Science (CPCI-S) and Conference Proceedings Citation Index – Social Sciences (CPCI-SS) databases.

Searches were carried out on April 27, 2010. The term “earthquake” was used as the search topic. Then, for the purpose of finding papers with addresses belonging to Turkish institutions, the terms “Turkey” or “Türkiye” were entered in the address field.

Data were analyzed by using “analyze results” and “create citation reports” options provided by the Web of Science (Thomson, 2007). In addition, Excel and SPSS software were used to create tables and charts.

Findings

Publication Count and Citations

We identified a total of 1,098 papers on earthquakes published by Turkish scholars between 1990 and 2009 (Web of Science, 2010). These publications were cited 7,691 times and average citations per publication was 7. The average citations per publication per year was 366.24. Figure 1 shows the graph of annual publication counts for Turkey and the world.

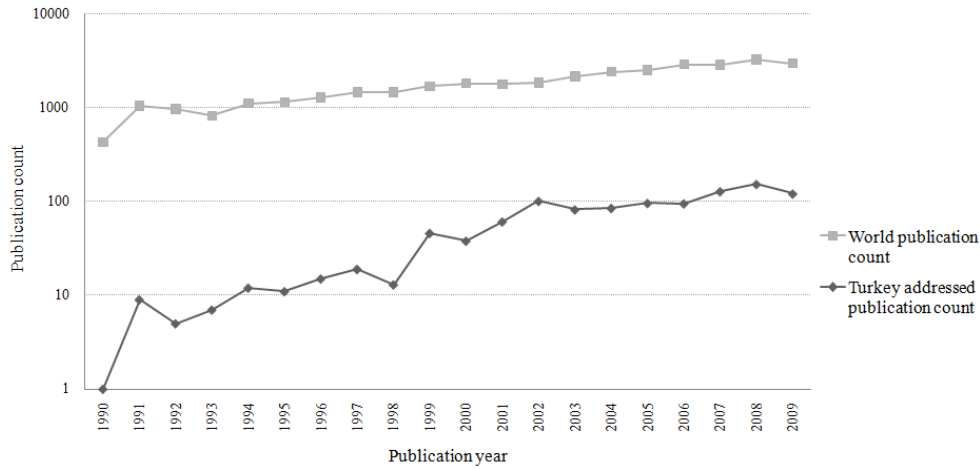


Figure 1. The graph of publication count by years

Although the publication count had been relatively low until the end of the 1990s, there has been a huge growth since the year 2000. Commensurate with the increase in the number of publications, the number of citations to papers by Turkish scholars has also increased tremendously since the year 2000 (Figure 2). These figures clearly show that the number of papers and citations thereto have almost doubled since the Marmara Earthquake of 1999.

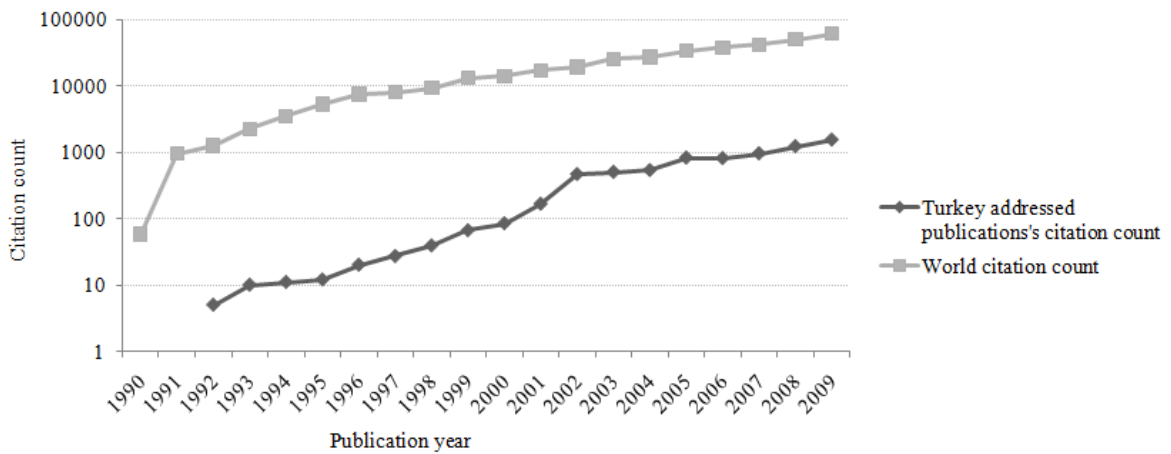


Figure 2. The graph of citation count by years

Nearly 220 of the publications are about the Marmara Earthquake of 1999. Figure 3 clearly shows that, 55% of these publications were published between 2002 and 2005. Although almost all publications published in 2002 are about the Marmara Earthquake, the number of publications on this subject has decreased in recent years.

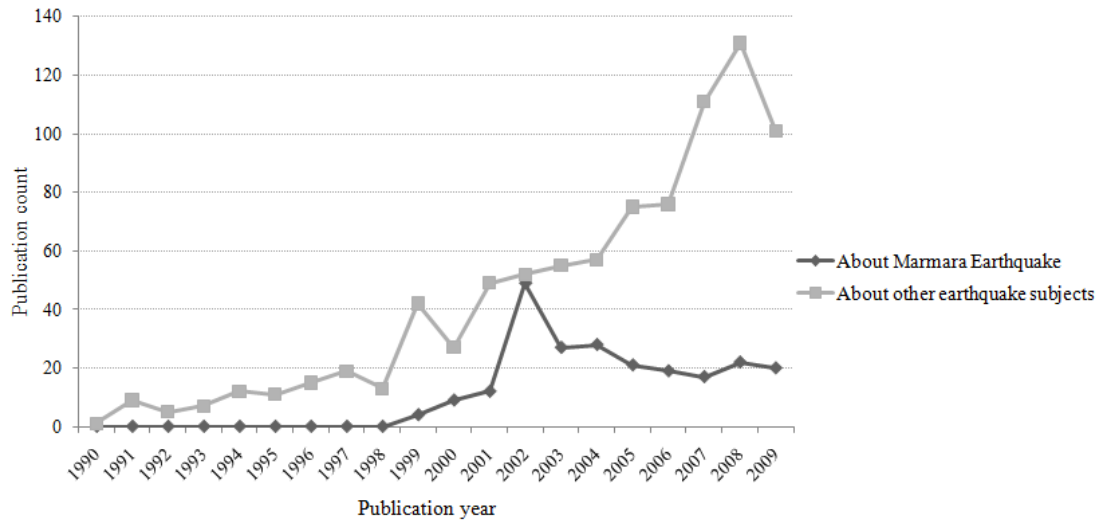


Figure 3. Distribution of publications according to their subjects

Some 61% of publications were cited at least once. The rest have yet to be cited. Ten publications were cited more than 100 times. Figure 4 shows the distribution of publication and citation counts.

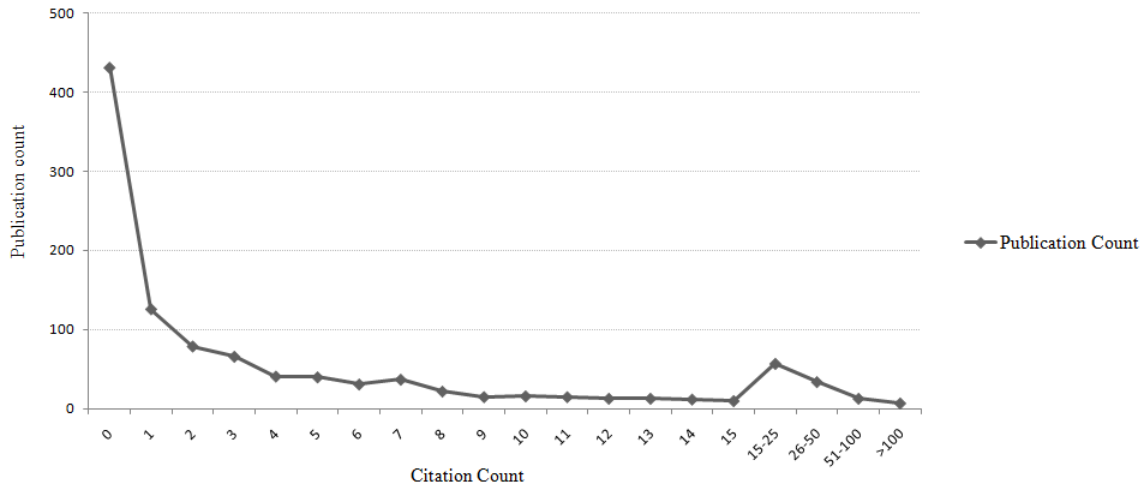


Figure 4. Distribution of publications and citation counts

Nearly half the non-cited 431 publications were published in 2008 and 2009 (see Figure 5), which means that they have the potential of generating citations in the coming years.

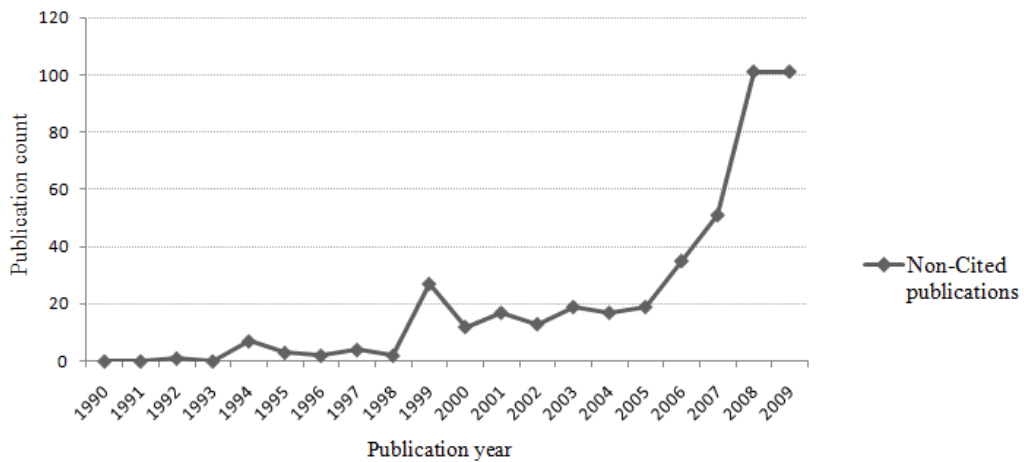


Figure 5. Non-cited publications and their publication years

Publication Types

Almost three fourths of the publications were journal articles. In addition to these articles, there are also proceedings papers, editorial materials and letters (see Table 1).

Table 1. Document types (N=1,098)

Document Type	N	%
Article	823	74.9
Proceedings paper	215	19.5
Editorial material	26	2.3
Letter	14	1.2
Review	12	1.1
Meeting abstract	7	0.6
Note	1	0.1

Comparison with Other Countries

Some 34,721 articles were published between 1990 and 2009 in the world about earthquakes. USA ranks 1st generating one third of the papers, while Turkey ranks 11th in terms of contribution to the earthquake literature. The Turkish contribution made up only 1% of the world's earthquake literature before 1998, whereas it quadrupled to 4% after the Marmara Earthquake of 1999.

Journals

Over 7% of all articles published by Turkish scholars appeared in one journal (*Bulletin of the Seismological Society of America*). The vast majority of journals published one or two articles from Turkish scholars. Journals publishing only one article constituted 60% of all journals in which contributions from Turkey appeared. Figure 6 shows the cumulative distribution of articles in accordance with journals.

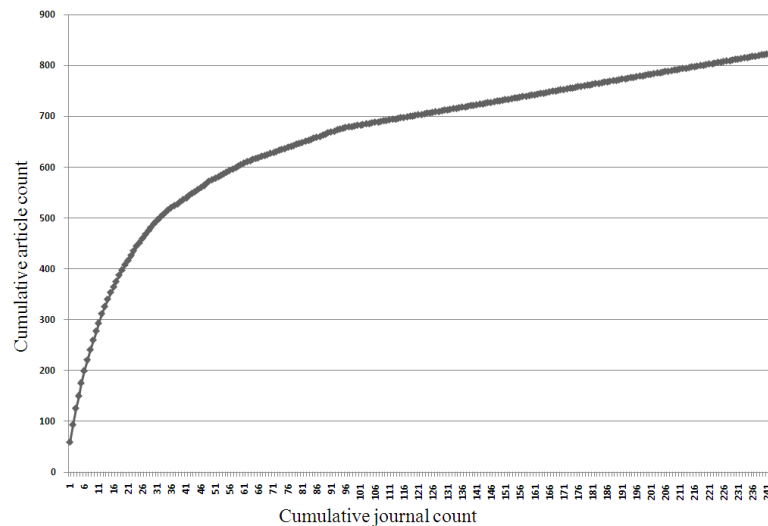


Figure 6. Cumulative distributions of articles

Some 822 articles were published in 241 journals. The impact factor is a measure of the frequency with which the “average article” in a journal has been cited in a particular year or period. Journal Citation Reports (JCR) of Thomson Reuters provides journals' impact factors. The annual JCR impact factor is a ratio between citations and recent citable items published (Thomson Reuters, 2010). The most used journals and their impact factors are listed in Table 2. Turkish authors seem to have preferred international journals. They published only 12 articles in the *Turkish Journal of Earth Sciences* and 9 in *Teknik Dergi*, both journals published in Turkey.

Table 2. Most used journals and their impact factors (JCR, 2008)

<i>Journal's Name</i>	<i>Number of articles</i>	<i>Impact Factor</i>
Bulletin of The Seismological Society of America	60	2,199
Geophysical Journal International	33	2,219
Engineering Structures	32	1,102
Soil Dynamics And Earthquake Engineering	26	1,182
Engineering Geology	25	1,197
Structural Engineering And Mechanics	23	0,500
Earthquake Engineering & Structural Dynamics	21	1,240
Natural Hazards	21	1,142
Journal of Seismology	18	1,091
Tectonophysics	18	1,670

Authors and their Institutions

Generally, journal articles were published by authors based in big universities of Turkey. Five universities published over half the articles (see Table 3).

Table 3. Top five universities for earthquake articles

<i>Institution Name</i>	<i>N</i>	<i>%</i>
Bogazici University	117	14.21
Istanbul Technical University	114	13.85
Middle East Technical University	107	13.00
Istanbul University	59	7.16
Karadeniz Technical University	57	6.92

The most productive author was A. Bayraktar who published 27 articles. Dr. Aykut Barka, who died in 2002, ranked 3rd with 21 articles published between 1996 and 2002 (see Table 4).

Table 4. Most productive first ten authors

<i>Author</i>	<i>N</i>	<i>%</i>
Bayraktar, A	27	3.28
Erdik, M	22	2.67
Barka, A	21	2.55
Sever, MS	20	2.43
Aktar, M	19	2.30
Ergintav, S	18	2.18
Sucuoglu, H	17	2.06
Vanholder, R	17	2.06
Alptekin, O	14	1.70
Eyidogan, H	14	1.70

Conclusion

The number of publications authored by Turkish earthquake scientists has increased considerably since 1999. The main reason seems to be the Marmara Earthquake of 1999, as the publication and citation counts have doubled since then. The contribution of Turkey to the world's earthquake literature quadrupled as well, placing Turkey in the 11th rank among the world's countries. The hypothesis of this study is accepted.

Yet, papers by Turkish earthquake scientists have not been cited heavily in the literature. Very few papers have generated more than 100 citations although 60% of publications were cited at least once. Turkish earthquake scientists generally preferred international journals to publish their work, and 7% of their contributions appeared in a prestigious journal (*Bulletin of the Seismological Society of America*).

It is hoped that research earthquake carried out in Turkey will improve our understanding of devastating earthquakes not only in Turkey but elsewhere. If the current growth rate of publications on earthquakes continues, Turkey can be one of the top ten countries in the world conducting serious research on earthquake engineering.

Acknowledgements

I would like to thank Prof. Dr. Yaşar Tonta for his very helpful comments, suggestions and improvements on this paper.

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