International Research Trend on Sediment-related Disasters Induced by Earthquakes

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INTRODUCTION

In the southeast of Korea, the largest earthquake since the observing earthquake was occurred on September 12, 2016. Despite a high possibility of sediment-related disasters induced by earthquake in the mountainous areas, there is still a lack of the related researches and measures in South Korea. This study was conducted to examine the international research trend of the earthquake-induced sediment-related disasters in mountainous areas, as a part of the study aimed at presenting the future direction of the related researches in South Korea.

METHOD

To analyze trends of researches regarding the earthquake-induced sediment-related disasters by decade, we compiled general information including the published years of research papers since the 1980s from the Web of Science database. Then, we identified the study site(s) in each paper to analyze trend of the researches by country. Finally, we performed text-mining and co-word analysis using the VOS viewer program to analyze trend of the researches by topic.

RESULTS & DISCUSSION

A total of 415 previous research papers dealing with the earthquake-induced sediment-related disasters since the 1980s were extracted from the Web of Science database, and were used in the following analyses.

The number of the research papers increased with the passing of decades (i.e., from the 1980s to the 2010s). In addition, there were 223 previous research papers with the study sites located in China, followed by research papers in Taiwan, Japan, and the USA. The result examining the major target countries in each decade showed that the majority of research papers were conducted in Canada in the 1980s, USA in the 1990s, Taiwan in the 2000s, and China in the 2010s.

Through the VOS viewer program with text-mining, a total of 10,045 words representing the research topics were extracted from 415 previous research papers, with a total of 603 words appearing in more than five research papers. Of these words, 362 words were rated at the top 60% of topic relevance score, and thus were applied to co-word analysis. The result of co-word analysis showed that the previous researches regarding the earthquake-induced sediment-related disaster in mountainous areas are mainly classified into four topic areas (**Fig. 1**). Based on the words appearing frequently in each cluster, the cluster I was analogized as the topic 'process of sediment-related disaster'; the cluster II was defined as the topic 'rainfall impact to sediment-related disaster'; the cluster III was concluded as the topic 'prediction of sediment-related disaster'; and the cluster IV was inferred as the topic 'risk mapping and modeling of sediment-related disaster' (**Tab. 1**).

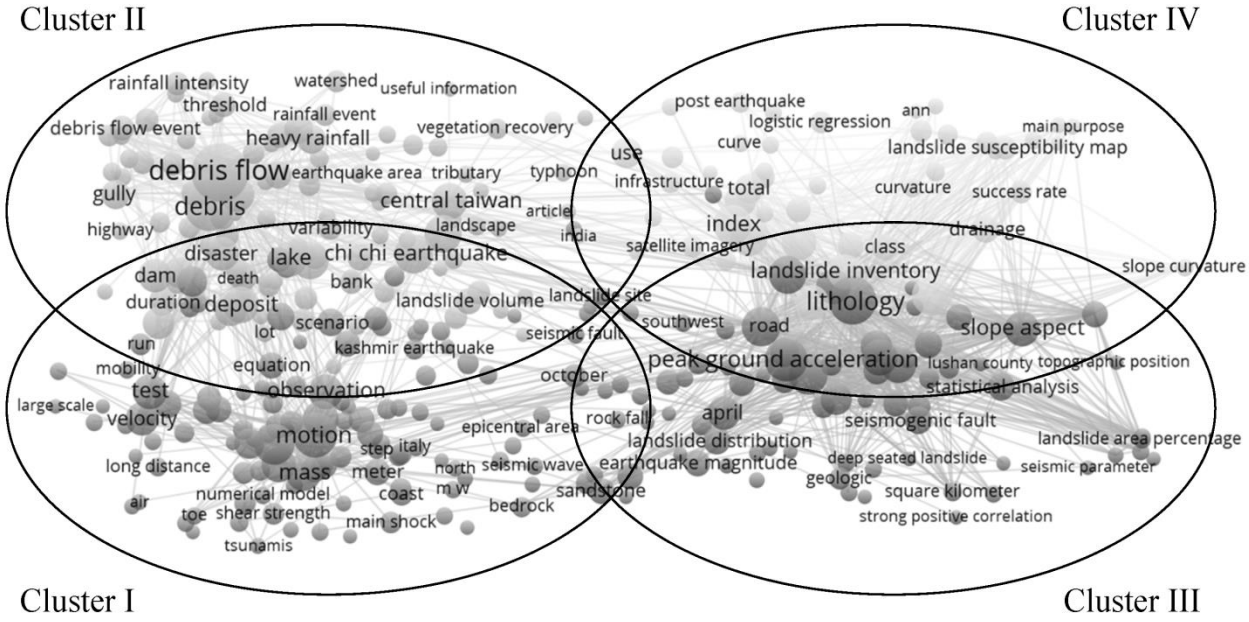

Fig. 1 A thematic map displaying the research areas regarding the earthquake-induced mountainous sediment-related disasters classified by co-word analysis.

Tab. 1 Top 10 most frequent words appearing in each cluster

Cluster	Appearing word	Research topic
I	motion, surface, movement, deformation, mass, understanding, observation, initiation, rupture, test	Process of sediment-related disaster
II	debris flow, debris, deposit, period, channel, lake, disaster, landslide dam, measure, risk	Rainfall impact to sediment-related disaster
III	peak ground acceleration, correlation, aerial photograph, slope gradient, purpose, spatial distribution, thousand, slope aspect, total area, inventory	Prediction of sediment-related disaster
IV	lithology, index, elevation, GIS, landslide occurrence, total, landslide inventory, road, landslide susceptibility, drainage	Mapping and modeling of sediment-related disaster risk

Of four research topics, the research papers belonging to the cluster I (i.e., process of sediment-related disaster) showed the largest proportion. However, a proportion of the papers belonging to the cluster III (i.e., prediction of sediment-related disaster) showed the greatest increase with the passing of decades.

CONCLUSIONS

This study presents several past trends of international researches dealing with the earthquake-induced sediment-related disasters in mountainous areas, and should be meaningful in providing information to predict future international trends on the macro-scale perspective.

However, as a part of the study aimed at presenting the future direction of the related researches in South Korea, the database may need to be dug up deeper. In particular, we should review the advanced researches of countries that are similar to the earthquake type, magnitude and frequency, and will have to apply the research results to present the future research direction of our country.

Keywords: text mining; co-work analysis; web of science, VOS viewer program; thematic map