Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

U06-01 Room:IC Time:May 22 09:00-09:20

Suggestions for the future of seismology from the temporary committee (summary)

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The 2011 Tohoku-oki earthquake and associated tsunami caused tremendous damage to Japanese society and its economy. The Seismological Society of Japan established a temporary committee to discuss countermeasures to various problems raised by this earthquake. The committee has been discussing various issues such as predictability of large earthquakes, seismic hazard mitigation, scientists' responsibility to the society, and so on. In addition, the committee gathered opinions from member of the society to publish a topical volume about the future direction of seismology. In this summary talk, I introduced the activity of the committee and present suggestions for the future of seismology by summarizing the discussion at the committee. Moreover, we raise a question about the relationship between geoscientists and the society.

Keywords: seismology, Tohoku-oki earthquake, disaster mitigation, society, outreach

Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

U06-02 Room:IC Time:May 22 09:20-09:35

Why we did not consider the occurrence of M9 earthquake along the Japan trench?

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Why we did not examine the possibility of the M9 class event occurrence along the Japan trench more deeply? What is the problem in research strategy? What is the problem in the national research project for earthquake forecast in Japan? In this talk, we will discuss such problems based on the review of questionnaire to the SSJ members, the symposium presentation and discussion in the last October, and some opinion letters submitted to SSJ.

Japan Geoscience Union Meeting 2012
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U06-03 Room:IC Time:May 22 09:35-09:50

Proposal for Earthquake Prediction Program I: Short-term Prediction

UYEDA, Seiya[1*], Masashi Hayakawa[3], MOGI, Toru[4], Kiyofumi Yumoto[5], Katsumi Hattori[6], Masashi Kamogawa[7], TAKANO, Tadashi[8], FUJINAWA, Yukio[9], KODAMA, Tetsuya[10], IZUTSU, Jun[11], HOBARA, Yasuhide[3], NAGAO, Toshiyasu[2]

[1]Japan Academy, [2]Tokai University, [3]Electro Communication University, [4]Hokkaido University, [5]Kyushu University, [6]Chiba University, [7]Tokyo Gakugei University, [8]Nihon University, [9]FERD INC., [10]JAXA, [11]Chubu University

A national project for earthquake prediction has been conducted over several decades in Japan. However, no successful prediction has ever been made. One of the main reasons for this may be the fact that the program has always laid too much emphasis only on seismological observations. Needless to say that seismology is important and the national program has built the world's most advanced and reliable seismic networks that have already made great contributions to global seismology. Immediately after occurrences of every sizable earthquakes, including the 2011 M9 Tohoku mega-event, seismologists were always able to clarify what happened exactly, largely thanks to these networks. It is, however, also an almost consensus view of all concerned that it is difficult to achieve short-term earthquake prediction by seismic observation alone.

However, if it is short-term predicted the hazard will be diminished dramatically. In fact, many of the victims could have survived the Tohoku tragedy. We believe that among long-, mid- and short-term earthquake predictions, the last one is not only the most scientifically challenging but more importantly most directly concerned with people's security. Although long- and mid-term predictions have their own merits such as for city planning, for almost every citizen, an earthquake prediction means nothing but a short-term prediction.

It is clear to everybody that precursory signal is absolutely necessary for short-term prediction. Therefore, finding reliable precursory phenomena is the central issue for it but it has been considered impossible to find them for the present science, namely the present seismology. Therefore, there has practically been no solid program for precursor search in the national project, in particular, after the Kobe earthquake.

However, it now seems that the possibility of finding precursors comes from various researches, such as geoelectric and geomagnetic anomalies in a wide frequency range, emissions of radon and other gases, hydrology and geochemistry of underground water. These have been suggested in the past from many different parts of the world, but became more and more actively reported ironically at and after the Kobe earthquake when seismology gave up the precursor search. Of course, many of them are unreliable. However, some of them appear undeniably reliable and well based on scientific backgrounds. We are interested in them.

We must admit that above stated merely suggests short-term prediction may be in the range of our science. In order to develop a workable science and technology, we have to anew develop at least minimum relevant systems for monitoring and data analysis, basic experiments and theoretical grounds. All of these are rather foreign to conventional seismological ones. Therefore, these researches have to be supported with at least minimum funds and staff, which are nearly totally unavailable so far. Actually, there are almost no jobs available for continuation of the work for new PhDs or university graduates. They have to abandon their career soon, in a few years even if they are lucky enough to find some temporary jobs and make significant contributions. Here we urge that a research program on short-term prediction centered around seismo-electro magnetism be included at least at a modest scale in the national earthquake prediction program of the 21 century.

Short-term earthquake prediction and its science and technology transfer to earthquake prone countries in Asia, Oceania, Middle East, and the South and Middle American regions will be one of the best international contributions that Japan could ever make.

Keywords: short-term prediction, earthquake prediction, seismo-electromagnetism, earthquake precursor

Japan Geoscience Union Meeting 2012
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U06-04 Room:IC Time:May 22 09:50-10:05

Proposal for earthquake prediction program II: Satellite observation

UYEDA, Seiya[1], OYAMA, Koichiro[2], HAYAKAWA, Masashi[3], HOBARA, Yasuhide[3], YUMOTO, Kiyohumi[4], MOGI, Toru[5], NAGAO, Toshiyasu[6], HATTORI, Katsumi[7], KAMOGAWA, Masashi[8], KODAMA, Tetsuya[9*]

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Seismo-electromagnetic research by satellite observation started in Soviet Union in the 1980. After the collapse of USSR, France took over the initiative and its small satellite: DEMETER has already clarified, by statistical analysis of 9000 cases, that night-time attenuation of VLF range electromagnetic emission occurs 4 hours before earthquakes larger than M4.8. (it would have required many 100-years for it by ground observation). Recently, satellite observation has followed in Ukraine, Italy, Taiwan, etc. and similar projects are being planned in Russia, UK, Mexico, India, China, and South Korea.

The European Union has started, under the 7th Research Framework, the Pre-Earthqukes Project to conduct earthquake precursor researches by joint ground and satellite observations, through cooperation with Russia. They have reported about rapid increase in electron density and outgoing longwave ratiation anormaly before the Tohoku megaquake. China is particularly active and plannning to launch in 2014 their first Seismo-electromagnetic satellite: Zhangheng-1 named after Zhang Heng (78-139) who invented the first seismometer of the world. They plan to add two more setellites by 2017.

The advantage of observation from space is that statistical research on the correlation between precursory phenomena and earthquakes is possible in a dramatically short-time compared with ground observation which is limited in the spatial coverage. Beyond this, the studies on the mechanism of observed phenomena will be facilitated by adoption of various instruments.

It is hoped by not only researchers but also by general public that JAXA, the only space agency of Japan, the country of high seismic and volcanic activity, will soon launch satellites for seismo/volcano electromagnetic observation. It should be kept in mind that the system small satellites proposed here is possible to realize at low cost and can contribute also to extensive fields, such as meteorogy, atmospheric and ionospheric sciences, space environment and space weather researches.

In other words, interdisciplinary research is nessesary and helpful for pre-earthquake atmospheric/ionospheric phenomena. It is therefore a logical conclusion that we should conduct comprehensive observations of space-time variations of the lithothephere, atmosphere and ionosphere by satellite constellation.

Keywords: Precursor, Seismo-electromagnetics, Electron density, Electron temparature, GPS occultation, Small satellite constellation

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U06-05 Room:IC Time:May 22 10:05-10:20

Remember our original purpose and try to develop the research and contribute to prevention of earthquake disaster

KOIZUMI, Naoji[1*], NAKAGAWA, Kazuyuki[2]

[1]Active fault and earthquake research center, AIST, [2]Jiji Press

We should remember our original purpose. We have to develop our research and to contribute to prevention of earthquake disaster.

Keywords: earthquake prediction, earthquake forecasting, disaster prevention, seismology

Japan Geoscience Union Meeting 2012
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U06-06 Room:IC Time:May 22 10:45-11:05

Remarks from Meteorology to Seismology

SUMI, Akimasa[1*]

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Earth science has to be related to social systems, because it investigates the Earth, where our society exists. Meteology was initiated from a safety of navigation, and it has to be involved in a weather forecasting, besides an understanding of weather phenomena. A typical example is a weatherforecasting as a physical problem proposed by L.F.Richardson. Since then, a method based on physical principles and numericak models playes a very important role in sceince and apllication.

Global warming was started from a viewpoint of understanding a mechanism of the Earth climate formation. However, as it became a political issue, meteorology has to be involved in it. As is often said that the global warming issue is a problem with science and politics, but both arena are completely different. We need a professional who can connet both arenas.

Then, scientific community are now presenting scientific results with uncertainty. At the same time, we are going to present different senarios, where probability and impacts to the society is shown. Political discision is not free from value judgement, and different values exist in the society. Final discion should be made by people.

Problems in seismology relating to the Eathquake prediction may have similar characters.

Keywords: Global warming, Numerical model, Meteorology, earthquake predition

Japan Geoscience Union Meeting 2012
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U06-07 Room:IC Time:May 22 11:05-11:25

Role and activity of Committee for Geosphere Stability Research in The Geological Society of Japan

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[1]Committee for Geosphere Stability Research in The Geological Society of Japan

Geological disposal of nuclear waste disposal requires understanding of long-term processes relevant to earth scientific issue and also the communication with society to release non-bias information as much as possible. Here, we would like to introduce the activity of Committee for Geosphere Stability Research in The Geological Society of Japan, for doing geological disposal for high level radioactive waste in Japan during last one decade.

Keywords: Geological Disposal of Radioactive Waste, The Geological Society of Japan, Science Communication

Japan Geoscience Union Meeting 2012
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U06-08 Room:IC Time:May 22 11:25-11:40

How to deal with the policies of government: From advocates to critics

HASHIMOTO, Manabu[1*], KAWAKATSU, Hitoshi[2], SAGIYA, Takeshi[3]

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We play a role of conveners in the Session 2 ”How should SSJ relate to governmental policies? - What is the social role of scientists?” in Special Symposium held in the last Fall Meeting of Seismological Society of Japan. We continued discussion and would like to propose a new plan referring to these discussions and opinion papers submitted to the Special Report of the Symposium.

It is needless to say that the one of the desires of earthquake scientists is the reduction of earthquake disasters. However, there were few criticisms against policies of the government, since the national or local governments are in charge of earthquake disaster reductions and many researchers who are active in society are involved in these policies. Rather, annual meetings of societies were good opportunities to present their products or progress reports of projects sponsored by governments. The most typical example is ”The Science of Earthquake Prediction”, a popular book edited by The Earthquake Prediction Committee of the Seismological Society. For example, this book expresses an affirmative opinion for the Countermeasure Act against Great Earthquake, against which there are many objections in the Seismological Society, in a short column. Since such an address might have been regarded as the common view of the Seismological Society, it is very controversial. It is regrettable that we confronted with the East Japan Great Earthquake Disaster without any critical discussions against the long-term forecast for the Miyagi-oki earthquakes in related societies. We cannot find any objections to the criticism that scientists are advocates of the government.

Kawakatsu (2012) pointed out that the policies related to earthquake sciences are trans-scientific problems that cannot be solved only by sciences. There are several solutions for such problems. One solution is the Consensus Meeting. In Consensus Meeting, scientists provide with affirmative/negative opinions from several viewpoints to participants, in order to deepen the discussion of a specific theme. It may be very difficult for only scientists to hold such a meeting, but we believe that we can collect various opinions from different viewpoints and provide them with the participants of the meeting. Yomogida (2012) proposed that we should establish such a mechanism in societies. Should we introduce a variety of opinion on a specific social problem from personal and liberal standpoints? There is no doubt that the Hamaoka Power Plant problem is included in themes to be discussed.

At the end of 2011, the Central Disaster Prevention Committee of the National Government released a new source model for the great earthquake along the Nankai trough, but we have not heard any comments or criticisms from researchers. One of the authors, who is the member of the sub-committee, is surprised that very few colleagues in his surroundings say anything about this issue. It is essential to change the mind of researchers who do not recognize that they are also the persons concerned. We would like to propose a regular session where we discuss social problems in improve our consciousness of public.

Keywords: Disaster reduction policy, earthquake science, trans-science, scientific society, social problem

Japan Geoscience Union Meeting 2012
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U06-09 Room:IC Time:May 22 11:40-12:00

Immature Science and Social Responsibility

TOMARI, Jiro[1*]

[1]ERI

Various researches for earthquake prediction have been carried out since 1880 in Japan. But any earthquake prediction has never succeeded, although a lot of money has been spent on the research.

One reason of it would be that the earthquake prediction research is immature. It has no paradigm. Most hypotheses which are used in this study have no potential to be refuted by some possible observation. It looks like pseudoscience.

I would like to discuss what we must do as social responsibility of earthquake scientists.

Keywords: earthquake prediction, pseudoscience, paradigm, social responsibility

Japan Geoscience Union Meeting 2012
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U06-10 Room:IC Time:May 22 13:45-14:00

Seismology vs earthquake and tsunami disaster mitigation

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Earthquakes and tsunamis are natural hazards. Seismology as a means to study these hazards is therefore not a pure science, and those who investigate them, such as seismologists, are closely related to society, whether they like it or not. We should look back, for example, to see whether earthquakes and tsunamis are just used as data to construct physical models, whether our research products are really useful for disaster mitigation, or whether ”disaster prevention” is only exploited to ensure research budgets. As for disaster prevention, more effort should be directed to understand the effects of the possible largest earthquakes and tsunamis in each area, rather than publish the probability of occurrence of an earthquake. Furthermore, in order to make a better contribution to society, it would be important to lean from the ideas and methods of historical science and earthquake engineering. Here, we are going to discuss how seismological knowledge can contribute to society. We will present the summary of discussions held at the Special Session of the Seismological Society of Japan in November 2011 in Shizuoka. We will also introduce the contents of papers dealing with the future direction of seismology to be published in a topical volume of the Society.

Keywords: earthquake, tsunami, disaster mitigation, seismology, society

Japan Geoscience Union Meeting 2012
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U06-11 Room:IC Time:May 22 14:00-14:20

Public's cognition and support toward seismology

NAKAYACHI, Kazuya[1*]

[1]Faculty of Psychology

After experiencing the vast destruction by the 2011 Tohoku Earthquake, how Japanese people are recognizing seismology as an ology, and whether they are supportive or not is an arising question.

We conducted a nationwide survey utilizing a representative sample selected randomly from the Japanese public. Based on its result, we discuss the public cognition of seismology and their support of the investment on research of seismology (budget, human-resources and facility). Moreover, we empirically examine whether the seismology is taken as a "Science" or as "Disaster Prevention". It is expected that the public cognition relates to their opinion of supporting the investment to seismology or not. The result may become basic information to provide better understanding for the seismologist to recognize the position of seismology in the society, and to discuss the cognition gap between the seismologists and the public on what the seismology is.

The brief overview of the survey is as follows:

Sampling: The representative samples were gained by a stratified two-step random sampling method which selects the area and respondents randomly. For the surveying area, we divided Japan into 5 different category: "Tokyo's 23 wards", "government-decreed city", "city with population more than 100,000 people", "city with population less than 100,000 people", "rural district". Then we set the number of extraction from each of the areas according to the resident ratio, and selected the investigation spots randomly. Then, assigned number of adults over 20 years old were randomly selected from the residents' basic register in each spot. The breakdown is : 7 investigation spots from Tokyo's 23 wards (140people), 23 investigation spots from government-decreed city (407people), 45investigation spots from city with population more than 100,000 people, 27 investigation spots from city with population less than 100,000 people(431people), 13 investigation spots from rural district (191people). Total: 115 investigation spots with 2000 respondents.

Period of investigation: Held between mid Januarys to mid February 2012.

Method: Surveyor visiting and collecting from each respondent, after sending survey request via post card.

Questions: The data we are reporting in this study is collected as part of the investigation project on measuring the anxiousness of the Japanese residence, toward 51 hazards, including earthquake. The respondent was required to answer on the six-point Likert scales: 0 as "not agree at all" and 5 as "strongly agree" to the 9 questions about seismology. Question no.1 to 3 asks to evaluate about seismology as a "Science", and the following 3 questions no.4 to 6 is about evaluating seismology as "Disaster Prevention". The last 3 questions from no.7 to 9 asks to judge about investment for seismology.

1. The aim of seismology is clarification of the natural phenomenon.
2. Seismologist has interest in earthquake as a physical phenomenon.
3. Theoretical development of seismology is meaningful for its own sake.
4. The aim of seismology is disaster prevention.
5. Seismologist has interest in social impact of the earthquake.
6. Seismology becomes meaningful by utilizing their findings.
7. A large amount of budget should be allotted to seismological research.
8. Outstanding human-resources should be recruited for seismology.
9. The facilities for seismological research should be improved.

From each of these average values, we can figure out the general cognition of the public toward seismology, especially whether they are taking it as a "Science" or as a "Disaster Prevention". Moreover, by comparing the correlation of the composite of evaluation as "Science" and investigation judgment, and the correlation of the evaluation as "Disaster Prevention" and investigation judgment, we may be able to discuss in what way the resource allocation to seismology is judged as appropriate by the public.

Keywords: outreach, social survey

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U06-12 Room:IC Time:May 22 14:20-14:35

How we should reach out to the public

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To utilize findings in seismology, what kind of information should be conveyed to the public? Or how should it be informed? In the symposium held at the 2011 Fall Meeting of the Japan Seismological Society, we had an opportunity to know how the situations like in the press media and schools.

The media set out the importance of seismology to give the information of life-protecting and ?saving or of next risk for the people in disaster affected areas. Some brand new idea such as conveying information or findings to the local people by living there with them.

From a school field, a successful example of collaboration of a primary school and a university carrying out effective earthquake drill was introduced. School kids are now able to protect their lives without waiting for teachers' command. On the other hand, it is revealed that earthquake protecting manuals at schools write only about the case for Tokai Earthquake Prediction Warning being issued, which would never work at all in real.

Both media and schools insisted on the importance of seismological society to improve their situations if only a few supports are given from us.

In this presentation, we go further steps on how we should convey findings or information to the public.

Keywords: outreach, seismology, disaster prevention, media, school

Japan Geoscience Union Meeting 2012
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U06-13 Room:IC Time:May 22 14:35-14:55

Science communication after the Tohoku earthquake: ”bilateral communication” for what?

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In Britain, the BSE scandals from late 1980’s to mid 90’s created a massive crisis for scientific communities, which was called ”a crisis of trust”. As a result, British government dramatically changed its policy for science communication; from paternalistic policy making to public engagement, or from public understanding of science (PUS) to bilateral dialogue. In fact, Japan faced a similar crisis in 1995, when Kobe earthquake, Tokyo subway sarin gas attack, and sodium leak at the Monju fast-breeder reactor happened in quick succession. This has created a bilateral-science-communication fad in Japan. For example, Science Council of Japan took a leadership role in starting as many as 22 science cafes at the same time during Science Week in 2006. However, in these cafes, ”interactivity” or ”bidirectionality” only means ”questions welcomed”.

The Tohoku earthquake and the subsequent Fukushima nuclear plant accident caused the second crisis of trust for the government and scientists in Japan. And this time, it seems to trigger serious reflection about the whole concept of scientific communication and we can see some noteworthy trend. The 4th Basic Program for Science and Technology which was approved in a Cabinet meeting on 19th August advocates an emphasis on public engagement in scientific policy making.

This situation raises important and fundamental questions: why we need public engagement? what is it that citizens engage in science polity? what is meant by ”bidirectionality” of communication? What is the aim of dialogue over scientific matters? what is the point for scientists of such a dialogue? I will try to answer these questions from a viewpoint of philosophy of science.

Keywords: philosophy of science, science communication, scientific policy, public engagement

Japan Geoscience Union Meeting 2012
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U06-14 Room:IC Time:May 22 14:55-15:15

A proposal to the community of earthquake researcher - overcoming the crisis of confidence -

KATO, Teruyuki[1*]

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It is needless to say that the 11 March 2012 Tohoku-Oki earthquake (Mw9.0) created a serious issue for the community of earthquake researchers. Here, we define ”community of earthquake researchers” by collective body of researchers related to earthquake, which is mostly the same as the body of the Seismological Society of Japan, but is used in a little broader sense. Though some researchers might claim that the earthquake had been anticipated before its occurrence, the earthquake may be said as an unexpected one.

Given that the earthquake is the largest one in the history of Japan, and such large earthquake was not anticipated previously, lots of criticisms were directed to the community. Though this kind of criticism is brought mostly from outside of the community, some criticisms or reflective comments were brought within the community; ”What was wrong in our study?”, etc. Considering these voices, the SSJ established an ad-hoc committee to discuss and report the action plans to SSJ. The committee convened a symposium in the occasion of the fall meeting of the SSJ for discussing the issue.

On the other hand, some big questions are raised: ”Is the earthquake prediction research meaningless?”, ”Is the outcome of earthquake studies properly disseminated to the society?”. These criticisms were also raised after the Kobe earthquake of 1995. A series of furor that followed a media article in late January 2012 that titles ”M7 earthquake chance of 70% within coming 4 years beneath the metropolitan area of Tokyo” would be one of such typical reactions from the public society. We should not dismiss this kind of reaction as just a sad news, but should take it seriously as a representation of crisis of confidence of the society against earthquake studies.

In this era of crisis of confidence, how should we face to the society? There is no simple solution for this problem. At least, the situation will be worse if we do nothing.

The Seismological Society of Japan took some countermeasure after the 1995 Kobe earthquake to tackle these problems; Open seminar for the public in the occasion of the fall meeting of SSJ, publication for public relations ”Naifuru”, production and distribution of advertisement of video, maintenance of publicly open mailing list, etc. These activities may have contributed to the community for familiarizing seismology to the public. However, it may be still premature for people to apply their knowledge of earthquake to their countermeasure against earthquake. Considering that the study of earthquake is mostly done by tax, it is indispensable for researchers to achieve accountability and to try more to contribute to build a safer society. It is necessary for the SSJ to tackle this problem and work together with the public people. These kinds of activities are said as ”science communication”. We may have to try to implement the technique of science communication. The most important subject of science communication in the field of earthquake would be ”earthquake prediction”. I would try to dissert some thoughts about this problem in my presentation.

In order to overcome the present crisis of confidence in earthquake study and make the study more reliable to the society, researchers themselves may have to change their mind for tackling this problem.

Keywords: earthquake study, Tohoku-Oki earthquake, Seismological Society of Japan

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U06-P01 Room:Convention Hall Time:May 22 17:15-18:30

Discussion on contribution of seismology to seismic damage mitigation based on questionnaire study

BABA, Toshitaka[1*], KANEDA, Yoshiyuki[1], TAKAHASHI, Narumi[1], OHORI, Michihiro[1], citak seckin ozgur[1]

[1]Japan Agency for Marine-Earth Science and Technology

We discuss on contribution of seismology to seismic damage mitigation based on questionnaire investigation in the regional seismic study groups.