

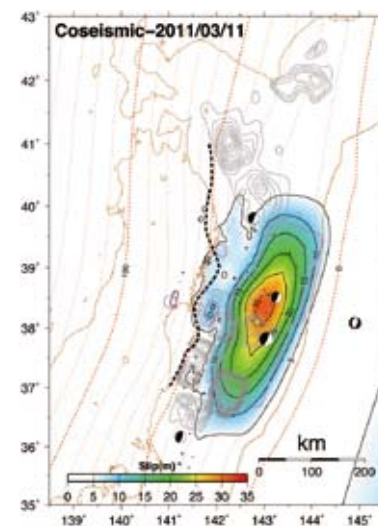
Successfully estimating slip amount on the plate boundary

In Japan, there is a network of 1300 GPS observation points called GEONET, established by the Geographical Survey Institute (GSI). It allows crustal deformation on the land's surface to be detected with high accuracy. On the other hand, the depth of the ocean makes it quite difficult to detect crustal deformation on the seafloor. The Research Center for the Prediction of Earthquakes and Volcanic Eruptions (RCPEV), Tohoku University, has installed unique monitoring equipment, which they developed and produced independently, on the seafloor around the source area of the expected Miyagi-oki earthquake, 7 years ago.

An uplift of 5m and a horizontal displacement of up to 31m, due to the 2011 magnitude 9.0 Great East Japan Earthquake, were measured with this observation system. Analyzing this data, they estimated that the slip amount on the plate boundary was more than 60-70m. They were the first to succeed in detecting such a large slippage, not only in Japan, but around the world as well.

Because it has been only 100 years since seismic observation using seismometers started, there was not enough data to anticipate the occurrence of the 2011 earthquake. However, through recent advances in observation techniques, researchers have revealed that there is a strong coupling near the focal area of this earthquake, and the analysis of tsunami deposit on the Pacific Coast of NE Japan indicates that a great tsunami occurred there due to the Jogan earthquake, which had an estimated magnitude of 8.3 or larger, in 869. The 2011 earthquake occurred just after the Headquarters for Earthquake Research Promotion undertook a review of long-term predictions for Miyagi-oki earthquakes.

Full-scale data analysis of the Great East Japan earthquake has only just begun. Seismologists think "it is important to derive a generation mechanism (cause) of the earthquake that can explain the observed data (result)." Prof. Norihito Umino told us that it's essential to make steady efforts in collecting and analyzing data.



Slip distribution of the 2011 Great East Japan Earthquake. The source region of this earthquake extends 200km in an east-west direction and 450km in a north-south direction. There is a large slip area located far off the Miyagi coast, just to the west of the Japan Trench.



There are seismometers installed at the end of a tunnel that was constructed 44 years ago, located 45 meters underground and accessed by elevator at RCPEV.



All the equipment used for ocean bottom observations are handmade. This equipment is used for observation of ocean-bottom crustal deformations and was developed at the center. Currently, identical equipment is set up at four points off the coast of Miyagi.

Director, Research Center for Prediction of Earthquakes and Volcanic Eruptions, Graduate School of Science Professor, Crustal Physics Laboratory

Norihito Umino

Born in Yamanashi Prefecture in 1948. Dr. Science. Graduated from the Department of Geophysics, Faculty of Science, Tohoku University. Worked as Assistant and then Assistant Professor at the Department of Geophysics, Faculty of Science, Tohoku University. Has been in his current position since 2003. Appointed as Director, Research Center for Prediction of Earthquakes and Volcanic Eruptions in 2008.

<http://www.aob.geophys.tohoku.ac.jp/>



When investigating the history of Japan and its regional communities, old documents made by village officials and ordinary people are absolutely necessary. Such historic documents have been passed down from generation to generation. Many such documents have not been made public. These documents are clues to the history of local communities, but many were damaged by the shaking and tsunami caused by the Great East Japan Earthquake. Damaged documents might be disposed of together with debris.

Prof. Arata Hirakawa at the Center for Northeast Asian Studies, and his team have worked energetically and without rest to rescue as many damaged old documents as possible since just after the great earthquake. In some cases they had to enter old storehouses that were about to collapse to rescue old documents.*

The successive earthquakes in the north part of Miyagi Prefecture in 2003

occasioned the beginning of the Center for Northeast Asian Studies program to rescue historic materials that were about to be lost due to disasters.

Prof. Hirakawa and his team visited old families' houses to allow them to record old documents. "Natural disasters usually affect a wide area, so the number of people and budget set a limit on our capacity. That taught us a lesson, and since then we have acquired the know-how to record large quantities of old documents in a short time. This is called the Miyagi System. We have provided classes to teach that know-how to research institutions across the country," says Prof. Hirakawa.

After the Great East Japan Earthquake, which caused extensive damage in an enormous area, a great many damaged documents were rescued and recorded. This was possible because they had accumulated the know-how to rescue such documents over many years.



Of the 15 old family homes on the Sanriku coast whose documents had been recorded in the form of digital images, 13 were carried away by the tsunami.



Old documents that have become wet, e.g., due to tsunami, go moldy soon. The center arranged an industrial refrigerator to store them; however, its capacity was insufficient. So they asked the Nara National Research Institute for Cultural Properties for help preserving the documents.



Instructions for constructing a database of old documents have been compiled into a manual and made public.

Professor, Japanese and Korean Studies, Basic Studies, Center for Northeast Asian Studies

Arata Hirakawa

Born in Fukuoka Prefecture in 1950. Ph.D. (Literature). Graduated from the Master course of the Graduate School of Arts and Letters, Tohoku University. Worked as Assistant at the Graduate School of Arts and Letters, Tohoku University, in 1981, then as Assistant Professor at Miyagi Gakuin Women's University, then as Assistant Professor of the College of General Education, Tohoku University. Has been in his current position since 1996. Appointed as an expert member of Cultural Properties, Expert Investigation Committee, Council for Cultural Affairs, Ministry of Education, Culture, Sports, Science and Technology in 2011.

<http://www.cneas.tohoku.ac.jp/staff/hirakawa/hirakawa.htm>



* Helmets are life-protecting partners for them because they may have to go into half-collapsed storehouses to rescue old documents.



Rescuing local historic materials from earthquakes