MAG39-P01 Room:Poster Time:May 1 18:15-19:30

Composition of the subducted slab beneath Izu collision zone, Japan

ISHIKAWA, Masahiro[1*]

[1]Graduate School of Environment Information Sciences, Yokohama National University

The Philippine Sea plate subducts northwesteward under the Honshu arc, Japan. The presence of the Izu-Bonin arc within the Philippine Sea plate causes a complex tectonic environment. In eastern Kanto area, an accretionary wedge composed of late Cenozoic sediments overlies the downgoing Philippine Sea plate. In western Kanto area, the Izu-Bonin arc has collided with the Honshu crust; remnant pieces of the Izu-Bonin arc such as the Tanzawa block were accreted to the Honshu crust. A megathrust separates the Philippine Sea slab from the Honshu crust. According to seismic servey (Sato et al., 2005), the megathrust fault separates the upper/middle crust from the Izu-Bonin arc beneath the Izu collision zone. Devastating M8-class earthquakes occur on the megathrust fault, and the epicenter of the Kanto earthquake of 1923 (M7.9) is located in the Izu collision zone. To evaluate seismic hazard in the Greater Tokyo Area of Japan we need to clarify the lithological properties of Izu collision zone.

This study presents an interpretation of the crustal structure of the Izu collision zone. This study infers that amphibole is a main constituent mineral of the subducted lower crust of the Izu-Bonin arc. Dehydration embrittlement process resulting from the dehydration of hydrous minerals (e.g. amphibole) in the subducting lower crust is expected, and it may have induced the microearthquakes by enhancing pore pressures along the pre-existing faults/fractures in the subducting lower crust beneath the Izu collision zone. Stability filed of amphibole within the gabbroic composition from the Tanzawa plutonic complex was calculated by Theriak-Domino software, and the phase diagram shows hot subduction can account for seismicity of the microearthquakes beneath the Tanzawa Mountains and the resulting dehydrated dry slab may therefore account for the observed absence of seismicity below the northern part of Tanzawa Mountains and Kanto Mountains.

Keywords: collision zone, slab

Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

MAG39-P02 Room:Poster Time:May 1 18:15-19:30

Tsunami Heights of the 1854 Ansei-Tokai Earthquake Tsunami in Gokasho Bay Region, Mie Prefecture

NARUHASHI, Ryutaro[1*] ; SATAKE, Kenji[1]

[1]Earthquake Research Institute, Univ. Tokyo

The Kumano-nada Sea coastal area has been repeatedly attacked by tsunamis from the Nankai Trough subduction-zone earthquake. For historical tsunamis, since this area is close to Kinki region, many historical records exist. For the recent 1944 Showa-Tonankai earthquake tsunami and the 1854 Ansei-Tokai earthquake tsunami, not only historical records and monuments but also many folklores still remain. However, the 1944 Showa Tonankai earthquake tsunami has a comparatively small scale, and is unsuitable for examining the average scale about the tsunami from the Nankai Trough. Based on above-mentioned reason, we studied for the 1854 Ansei-Tokai earthquake tsunami.

Gokasho Bay is a blockade inner bay which has typical ria coasts and drowned valleys. It is located in central Kii Peninsula and faced with the Nankai Trough. In this bay area, measurement points of the tsunami height for the 1854 Ansei-Tokai earthquake tsunami and the data on height were mainly based on historical records and oral traditions. In particular, in Konsa district, it is based on the words of the Bon festival dance currently kept in there called ”Shongai kudoki” or ”Tsunami kudoki”. Tsunami heights were measured by level measurement using laser range finder TruPulse360 and a hand level on the basis of the spot elevation given by 1/2500 topographical maps.

As a result, a total of 40 points of tsunami height were obtained in Gokasho Bay region. The average inundation height of whole bay area was approximately 4 - 5 m.

In Konsa, located in the most closed-off section of the bay, dendritic valley plains which have small-sized rivers spread. According to distribution of both inundation and run-up points by this research, it is supposed that tsunami ran-up to every valleys of those. Tsunami heights in Konsa ranged 4 - 11 m, and were higher than those in other districts. The maximum run-up height was 11.5 m in the valley of Ushirogochi.

Keywords: Gokasho Bay, 1854 Ansei-Tokai Earthquake Tsunami, tsunami height, run-up height, inundation height

MAG39-P03 Room:Poster Time:May 1 18:15-19:30

Publication of the Japan University Network Earthquake Catalog of First-Motion Focal Mechanisms (JUNEC FM^2)

ISHIBE, Takeo[1*] ; TSURUOKA, Hiroshi[1] ; SATAKE, Kenji[1] ; NAKATANI, Masao[1]

[1]Earthquake Research Institute, the University of Tokyo

We determined focal mechanism solutions for 14,544 earthquakes that occurred in and around the Japanese Islands from July 1985 to December 1998 by using first-motion polarities reported by the Japan University Seismic Network, and compiled the Japan University Seismic Network Earthquake Catalog of First-Motion Focal Mechanisms (JUNEC FM^2). JUNEC can be obtained from ftp site provided by ERI: ftp://ftp.eri.u-tokyo.ac.jp/pub/data/junec/hypo/. JUNEC FM^2 also can be obtained via ftp site: ftp://ftp.eri.u-tokyo.ac.jp/pub/data/junec/mech/. The Earthquake Research Institute, the University of Tokyo has compiled observed data with the cooperation of universities and determined hypocenters amounting to about 190,000.

This catalog covers small-magnitude earthquakes (M$\geq$2.0) prior to the recent development of seismic observation networks and automated waveform data processing systems, and it will prove helpful in understanding the spatial and temporal heterogeneities of stress fields by combing recent focal mechanism solutions. Abundant focal mechanism solutions will be useful for statistical analyses. Their distribution is spatially and temporally heterogeneous, and it clearly reflects both the development of observation station network and spatial variations of first motion polarity report rate (i.e., first motion polarity report number / the number of picked onsets). Determined focal mechanisms are basically consistent with previously reported ones such as Full-range Seismograph Network of Japan (F-net; Okada et al., 2004) moment tensor solutions provided by National Research Institute for Earth Science and Disaster Prevention (NIED), or P-wave first motion focal mechanisms provided by the Japan Meteorological Agency (JMA) though some focal mechanisms are significantly different from them.

In Japan, an abundance of first-motion focal mechanism solutions for earthquakes have been determined after the 1995 Kobe earthquake (magnitude according to JMA-, M_{JMA} 7.3) through the development of the High Sensitivity Seismograph Network Japan (Hi-net). In addition, moment tensor solutions for moderate- to large-magnitude earthquakes have been routinely determined since 1997 using the F-net and improved data processing systems. These focal mechanism solutions have provided a good understanding of the fault structures and the local/regional stress fields in which earthquakes occur. However, focal mechanism solutions for earthquakes covering the Japanese Islands prior to the development of recent seismic observation networks have been very limited, barring a few studies (e.g., Ichikawa, 1961, 1971). Following the 2011 off the Pacific coast of Tohoku earthquake (moment magnitude according to the JMA, Mw9.0), the distribution of focal mechanism solutions has drastically changed especially in and around the source region. This indicates that stress fields or focal mechanism solutions are temporally variable. In light of this, data on the focal mechanisms of earthquakes extending as far back as possible are desirable in order to investigate intermediate- to long-term spatial and temporal heterogeneities of focal mechanism solutions and local/regional stress fields.

Acknowledgements
We used a program modified from HASH (Hardebeck and Shearer, 2002) to estimate the focal mechanism solutions and the pick files observed by Hokkaido University, Hirosaki University, Tohoku University, the Earthquake Research Institute of the University of Tokyo, Nagoya University, the Disaster Prevention Research Institute of the Kyoto University, Kochi University, Kyushu University, and Kagoshima University. We also used focal mechanism solutions for earthquakes provided by NIED and JMA. This study was supported by the Special project for reducing vulnerability for urban mega earthquake disasters from the Ministry of Education, Culture, Sports, Science and Technology of Japan.

Keywords: first-motion focal mechanism solution, Japan University Network Earthquake Catalog (JUNEC)

MAG39-P04 Room:Poster Time:May 1 18:15-19:30

Three-dimensional earthquake forecasting model for the Kanto district: Completeness magnitude of earthquake catalogs

YOKOI, Sayoko[1] ; TSURUOKA, Hiroshi[1*] ; HIRATA, Naoshi[1]

[1]Earthquake Research Institute, The University of Tokyo

We started to construct a 3-dimensional (3D) earthquake forecasting model for the Kanto district in Japan under the Special Project for Reducing Vulnerability for Urban Mega Earthquake Disasters based on the Collaboratory for the Study of Earthquake Predictability (CSEP) experiments. Because seismicity in this area ranges from shallower part to a depth of 80 km due to subducting Philippine-Sea and Pacific plates, we need to study the effect of earthquake depth distribution.

We tried to construct a prototype of 3D earthquake forecasting model for the area based on the Relative Intensity model (Nanjo, 2011) which forecasts earthquake probabilities using historical data. For a large earthquake forecasting, we need a longer period of earthquake data than current studies. Therefore, we analyzed completeness magnitude (Mc) every 10 km in a depth from 0 to 100 km of earthquake catalogs of Utsu (1979, 1982), Japan Meteorological Agency (JMA) and National Research Institute for Earth Science and Disaster Prevention (NIED) which are partially covered from 1885 to 2013 by the Maximum curvature method (Wiemer and Wyss, 2000) to assess a quality of their catalogs considering a depth of hypocenters. In the case of JMA catalog, an average and its standard deviation of Mc for a year from 1923 to 1970's showed 3.7 and 0.4, respectively. Then, they decreased from 1970's to 2000, which means that quality of the catalog improved with time. After the 1980's, Mc showed heterogeneous distribution with depth. Mc in shallower depth are smaller than that in deeper one. For example, averaged Mc and its standard deviation from 2000 to 2010 is 0.25 and 0.14 with 0 to 30 km in depth against 0.67 and 0.10 with 60 to 100 km in depth. In this presentation, we discuss how use the heterogeneous catalog to develop a 3-dimensional forecasting model in Japan.

The authors thank JMA and NIED for their earthquake catalogs. This work is sponsored by the Special Project for Reducing Vulnerability for Urban Mega Earthquake Disasters from Ministry of Education, Culture, Sports and Technology of Japan.

Keywords: Three-dimensional forecasting model, Kanto district, Collaboratory for the Study of Earthquake Predictability, earthquake catalogs

MAG39-P05 Room:Poster Time:May 1 18:15-19:30

Sparse Modeling to Estimate Spatial Distribution of Ground Motion Required for Rapid Prediction of Structural Damages

MIZUSAKO, Sadanobu[1*] ; NAGAO, Hiromichi[1] ; HIROSE, Kei[2] ; KANO, Masayuki[3] ; HORI, Muneo[1]

[1]Earthquake Research Institute, The University of Tokyo, [2]Graduate School of Engineering Science, Osaka University, [3]Graduate School of Science, Kyoto University

A rapid prediction of structural damages due to a large earthquake is important to prevent secondary disasters. The first step of the prediction is to estimate ground motion at a targeted construction from observed seismic data, and the second step is to predict structural damage using the estimated ground motion. An accurate damage prediction requires ground motions with spatially-high resolution although the spatial density of constructions is much higher than that of seismometers in urban area. We have been developing a statistical method to model such ground motions using seismograms obtained by a seismometer array. Our target is Tokyo metropolitan area in which seismogram of MeSO-net (Metropolitan Seismic Observation network) is available.

Mizusako[2013, graduation thesis] proposed a method based on the Taylor expansion, and applied it to MeSO-net data when the Great East Japan Earthquake occurred. This method was found never to account for ground motions higher than 0.15 Hz, which was insufficient when considering that the eigenfrequency of constructions is usually between 1-10 Hz. Mizusako[2013] determined the partial differential coefficients, which appear in the Taylor expansion, from five nearest observatories with a truncation of the first order, but a better selection of a truncation of order and a group of observatories, which is hereinafter called " cluster ", could more accurately explain ground motions higher than 0.15 Hz.

We propose an algorithm based on sparse modeling that automatically and objectively determine the truncation of order and the size of the cluster. Our algorithm adopts the lasso, which is able to select dominant partial differential coefficients owing to the L1-norm regularization term. Moreover, the group lasso is implemented on our algorithm in order to select the coefficients of the same order associated with different components. We will report initial results obtained by the proposed method, comparing with the results of Mizusako[2013].

Keywords: Sparse modeling, lasso, urban disaater, MeSO-net