Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

MIS02-P01 会場:コンベンションホール 時間:5 月 26 日 18:15-19:30

NPO 法人地震前兆総合観測センター設立と地震発生予測実験
Establishment of NPO Japan Earthquake Precursor Comprehensive Observation Center and Experiment of earthquake prediction

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１．概要
NPO 法人地震前兆総合観測センターは平成 27 年 1 月 7 日に設立認可された。
当センターは、観測装置開発のハードウェア技術者、データ収集・表示システム開発のソフトウェア技術者と観測点を設置する一般民間人にて運営される。
多方式・多点観測を実施し、まず実際の地震と各方式の異常の相関関係を検証する。当初は植物生体電位観測、多周波数帯電磁気 2 周波同時観測でスタートし、将来は地震発生予測を行う。潮位偏差、大気イオン濃度、大気中ラドン濃度、等の民間観測グループとの連携も行う。
運営資金は公的、民間助成金、寄付、会員会費等で、観測装置は原則自前で手配する予定。
観測電磁気の周波数帯は VLF 帯 (3～30kHz、開発中)、LF 帯 (30～300kHz)、MF 帯 (300～3MHz)、VHF 帯 (30MHz～300MHz)、UHF 帯 (300MHz～3GHz、開発中) にて近傍の 2 周波にて同時観測を実施。
現在全国で 9 か所で植物生体電位、電磁気等を観測している。

２．役員
理事 5 名、監事 1 名 (すべて観測点運営者)、理事の一人は早川正士氏。社員 12 名 (すべて観測点運営者)。

３．観測点設置計画
１）実地震と異常データ検証のために地震発生が多い宮城～茨城県太平洋沿岸に 2 か所
２）関東直下地震前兆観測
房総半島太平洋側、千葉県内、三浦半島、神奈川県県央、多摩地区、埼玉県、各地に 1 か所づつ
３）東海地震前兆観測
静岡県函南町 (設置済)、浜松市 (設置済)、石廊崎、御前崎
４）東南海・南海地震前兆観測
渥美半島、潮岬、室戸岬、足摺岬、宮崎県
５）将来構想
全国 100km メッシュ、離島に観測点を設置し全国をカバーする

４．予知情報の発信方針
１）M=5 級以上を予測する
２）学術的分野では“見逃しはしょうがない、空振りはいけない”であるが、当センターは実用的防災情報発信を目指し、“空振りはいい、見逃しはいけない”とのポリシーで実施
３）空振りを恐れず積極的に予測をする
４）根拠となる異常データは必ず公開する
５）来なかったら“来なくてよかった”と思っていただく (台風進路予測と同様)
・予知情報は自己責任で使う
・来なかったら（空振り）損害賠償を請求しようと思う人は予知情報を使わなくて結構

５．Data Processor (Data Logger) の仕様
５－１ 構成
Data Processor ユニット (dSPIC とワンボードマイコンにて処理)、キーボード、マウス各一台
DVI-D または HDMI 入力の液晶ディスプレイは別途ご用意願う。(中古品の供給は可能)

５－２ 仕様
１）入力：Buffer 付き、DC 0V～+3.7V (± 5V Type も可能)、10 Channel
２）Sampling Time：1kHz

３）出力：1 分に 1 回、1 分間の最大値、最小値、平均値を出力、1 日 1440 行の CSV Format
４）1 日 1 回 Auto Reboot(CPU の Hang up 頻度を下げるため)
５）太陽光給電、Wi-Fi 対応可能 (商用電源、インターネット環境のない所用)
６）最大 2 か所の Web Server への自動転送 (1 時間に 1 回)
７）CSV Data を USB Stick Memory への手動格納

６．おわりに
・観測点設置にご協力いただきたい。
・研究者が M=6 級以上の地震を予測した場合は是非ご連絡をいただき、多方式統合の情報発信をしたい。

キーワード: 地震予知, 植物生体電位, 電磁気現象, 潮位偏差, イオン濃度, ラドン濃度
Keywords: prediction, bio potential, EM, tidal, ion, radon

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MIS02-P02 会場:コンベンションホール 時間:5 月 26 日 18:15-19:30

房総半島を対象としたMT探査と予察的考察
MT survey and its preliminal result at Boso Peninsula, Japan

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A magnetotelluric (MT) survey is one of the methods to understand the underground electric properties. In Boso area, Japan, there are three main topic to perform the MT survey; (1) to estimate underground resistivity structures related to the plate boundaries, seamount, asperities, and slow slip events, (2) to obtain a regional realistic resistivity structure for the numerical simulation in generation and propagation mechanisms of electromagnetic precursors, and (3) to develop a new MT technique to reduce the cultivated noises such as DC driven trains. In these aims, we decided to carry out the MT survey in Boso area, Japan during 2014-2016. Due to sensing down to 100 km depth, we use induction and fluxgate magnetometers. The first MT survey in 2014-2015 had 21 and 6 stations for induction and fluxgate type magnetometer, respectively. We checked the observed data and analyzed the local midnight time (02:00-04:00(JST)) data because of noises and performed 1D inversion.

The preliminarily results show that we can presume the resistivity structure about 80 m-2 km depth from the surface. A typical resistance down to 200 m depth was 1-10 ohm-m and below 200 m depth, a specific resistance was estimated at 0.1-1 ohm-m at many stations. This suggests that there is a geological boundary around 200 m depth. In comparison with the geologic structure interpreted by the reflection seismology data, the upper part seems to be the Shimousa Group, and the lower, the Kazusa Group (Earthquake Research Committee, 2005).

To presume resistivity structure at the deeper depth, it is necessary to remove the artificial noises from observed MT data. These observed noises have characteristics of transient signals and processes in time domain are required such as singular spectrum analysis and neural network analysis. Further preprocessing will be essential.

キーワード: 地磁気地電流法, 房総半島
Keywords: MT method, Boso Peninsula

Japan Geoscience Union Meeting 2015
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MIS02-P03 会場:コンベンションホール 時間:5 月 26 日 18:15-19:30

地震に先行する地磁気日変化異常
investigations of geomagnetic diurnal variations associated with the 2011 off the Pacific coast of Tohoku earthquake

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As one of the most promising candidates for short-time earthquake forecasting, the seismoele-ctromagnetic phenomena have been intensively studied for several decades. Recently, Xu et al. (2013) have reported unusual behaviors of geomagnetic diurnal variations in the vertical component prior to the 2011 off the Pacific coast of Tohoku earthquake (Mw9.0). In this study, we carry out further studies by investigating the spatial distribution of the anomalous geomagnetic diurnal variations associated with the Tohoku earthquake.

Ratios of Z component diurnal variations between the target station and the remote reference station Kakioka have been computed. After removing seasonal variations revealed by wavelet transform analysis, the 15days running mean of the ratio shows a clear anomaly exceeding the statistical threshold about 2 month before the mega event in Esashi and Mizsawa stations, which are close to the Mw9.0 earthquake epicenter. These results indicate that the location of the anomalies is consistent with the epicenter. Moreover, other independent geophysical parameter such as seismicity and crustal deformation also show clear unusual changes simultaneously, which suggests these anomalies might be related with the mega event.

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MIS02-P04 会場:コンベンションホール 時間:5 月 26 日 18:15-19:30

Visualization of Groundwater Motion Using Self-Potential Tomography for Indoor Rainfall-Induced Landslide Experiment
Visualization of Groundwater Motion Using Self-Potential Tomography for Indoor Rainfall-Induced Landslide Experiment

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As it increases in the frequency of the local heavy rain in recent years, the occurrence number of the landslide also increases. It's an important problem to elucidate the process of the landslide caused by rainfall and monitor the slope and forecast the occurrence time to reduce damages. To achieve this, we need to monitor groundwater movement. In this study, we try to develop the early warning system with SP method to predict/monitor rainfall-induced landslide.

The relationship between the SP fluctuation, the movement of water, and the displacement of soil is confirmed by the former interior flume experiments. We adopt the PRESS-aided Philips-Tikhonov regularization to develop the SP tomography and sand-box experiments to apply the tomography successfully show the water levels and flows. To expand the SP tomography approach to the flume tests, we perform the numerical simulation to visualize the underground water condition. The size of the slope is depth 9.0 m, height 4.8 m and width 1.0 m. And the height of the soil stratum is 0.7 m. We assume a rectangular reconstruction area and we divide the area into a 0.2 m x 0.1 m pixel, and compute the value of electric charge every pixel. In addition we assume the electric charge outside of the slope area is 0 and the permittivity in the analyzed area is uniform. Checkerboard-like positive and negative electric charges are generated and the number of electrodes was changed with 16-85. An error of 10% of the observation value has been added to data observed at electrodes.

We found the following results; (1) it's possible to reconstruct the structure of charge distribution with scale of 1.2 times greater than the inter-electrode distance. (2) the objective selectivity of the optimal reconstructed image with minimum PRESS criterion fails in the case of sparse electrodes.

Keywords: Self-Potential Tomography, PRESS-aided Philips-Tikhonov regularization, visualize underground water condition

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MIS02-P05 会場:コンベンションホール 時間:5 月 26 日 18:15-19:30

Multiple geophysical observations for earthquake monitoring in Kanto, Japan
Multiple geophysical observations for earthquake monitoring in Kanto, Japan

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In order to understand the preparation process of large earthquakes and clarify the mechanisms of Lithosphere-Atmosphere-Ionosphere (LAI) coupling, an observation network are established in Kanto, Japan. Multiple geophysical parameters such as geomagnetic field, geoelectric field, radon concentration, ion concentration, and atmospheric electric field are monitored. The meteorological data at each station are also recorded. These data may provide some new knowledge of earthquake process. We will demonstrate the observation system and some recent data in our poster.
Keywords: multiple geophysical observations, earthquake monitoring, preparation process of large earthquakes, mechanisms of Lithosphere-Atmosphere-Ionosphere coupling