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

STT59-01 Room:106 Time:May 21 13:45-14:00

Development of new EEW seismographs for Shinkansen based on international standards (IEC-61000, 62236)

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1. Introduction

Railway Technical Research Institute (RTRI) has been studied seismic observation method to detection P-wave and developed EEW system for Shinkansen. Seismograph in railway must observe seismic wave and judge train control whether electric power and communication lines in the state of disconnect. Therefore, Seismograph in railway essential that a single observation point processing capabilities.

Every seismograph needs to have high observation accuracy and reliability. Two years ago, we made a draft of EMC test menu and evaluated seismograph for Shinkansen using a draft EMC test menu (Sato: Japan Geoscience Union meeting 2010). We developed new EEW seismographs for Shinkansen based on IEC-61000, 62236.

Keywords: Seismograph, Shinkansen, IEC, EMC

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STT59-02 Room:106 Time:May 21 14:00-14:15

Evaluation on detectability of teleseismic events by FDSN stations in Antarctica

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Phase identifying procedure for teleseismic events at Syowa Station (69.0S, 39.6E), East Antarctica have been carried out since 1967 after the IGY period. From the development of INTELSAT telecommunication link, digital waveform data have been transmitted to NIPR for utilization of phase identification. Arrival times of teleseismic phases, P, PKP, PP, S, SKS have been reported to USGS, ISC, and published as "JARE Data Reports". In this presentation, hypocentral distribution and time variations for detected earthquakes was studied in 21 year period from 1987 to 2007. Characteristics of detected events, magnitude dependency, spatial distributions, seasonal variations, together with classification by focal depth are demonstrated. Obtained b values (Magnitude-number relation factor) for various focal depth groups took in 0.89-1.03 which was comparable with those by regional arrays and ISC data. Variations in teleseismic detectability in longer terms have possibly associated with meteorological environment and sea-ice spreading area in terms of global worming. Moreover, several kind of ice signals (sea-ice movement, tide-crack shocks, ice-berg tremor, basal sliding of ice-sheet) are demonstrating in the vicinity of the Station. Broadband array deployments, moreover, were carried out on the outcrops around the Lutzow-Holm Bay (LHB). Recorded teleseismic and local signals have sufficient quality for various analyses of dynamics and structure of the crust and mantle. Teleseismic passive seismic studies such as receiver functions and shear wave splitting were carried out; indicating heterogeneous structure along the coast in LHB. The obtained data can be applied not only to lithospheric studies but also to Earths deep interiors, as one of the major contribution to POLENET during the IPY 2007-2008.

Keywords: Syowa Station, teleseismic events, detection capability, monitoring observation, global network

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STT59-03 Room:106 Time:May 21 14:15-14:30

Improvement of Automatic Hypocenter Determination in JMA

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Estimating spatial and temporal hypocenter distributions in swarms and aftershocks quickly is essential for taking a measure to mitigate earthquake disaster. The automatic hypocenter determination method is important to grasp seismic activities in real time, especially after the 2011 off the Pacific coast of Tohoku Earthquake.

JMA can usually determine 90% or more hypocenters automatically compared with JMA catalog (M >= 2.0). However their determination rate fall to 10-30% in swarms and aftershocks due to rise of a trigger level and wrong pickings. We examined several approaches to solve these problems.

First, we examined to pick phases every second by AR-AIC method, without using trigger by STA/LTA. This approach increased wrong pickings, but also increased correct pickings.

Second, we examined the particle filter method [Yamada (2011)] and the pattern matching method [Tsukada and Ohtake (2001)]. These methods can separate earthquakes that occurred at the same time. We applied these methods for some swarms and aftershocks activity, including the 2011 off the Pacific coast of Tohoku Earthquake.

In addition, we examined the stacking algorithm [Sakai (1998), Tamaribuchi et al. (2011)] and the scanning method [Nakagawa and Hirata (2000)] for swarms. We also applied the envelope correlation method [Obara (2002)] for detect low-frequency earthquake swarms.

References:

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Keywords: automatic hypocenter determination, particle filter, pattern matching, scanning method, envelope correlation method

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STT59-04 Room:106 Time:May 21 14:30-14:45

Designing a martian broadband seismometer system under surface wind environment.

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The surface of Mars has been extensively investigated and huge amount of data have been acquired such as high resolution images. On the other hand interior of the Mars has been only weakly constrained by the mean density, the moment of inertia and gravity data. A major purpose of seismic observation on the planet is to detect the distribution of seismic velocities. Using the seismic velocity data, we provide the primary evidence for the process of differentiation whereby material within planets became compositionally segregated during their evolution. But the current available Mars interior models based on indirect and insufficient data, since we have no seismic information about Mars. Melos project is Japan Mars exploration project. It is now under consideration. It will launch about 2020s. This project includes seismic observation plan. The plan is to install broadband and high sensitivity seismometer. The purposes of this presentation are to reveal relationship of frequencies of the Mars planetary free oscillation to it’s core states, by considering several set of 1 dimension models of elastic velocity and density. In addition to the calculation, we designed a martian seismometer wind shelter with a small torque (a large torque makes large noisy data) by using wind tunnel tests and computation fluid dynamics simulations.

Keywords: Mars, broadband seismometer, internal structure, wind shelter, planetary free oscillations, CFD

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Design of a broadband accelerometer for the observation of slow earthquakes

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Slow earthquakes, which include LFEs, VLFs, Short-term or Long-term SSEs, have a scaling law (Ide et al, 2007) that the moments of them are proportional to their duration. Certain types of slow earthquakes with the characteristic duration of about 10 seconds and about 10^3 to 10^4 seconds can be predicted to exist by the scaling law, but have not been measured yet. It is difficult to observe those with the characteristic duration of 10 seconds because of microseisms caused by the oceanic waves. On the other hand, with a certain device, it becomes possible to observe those of 10^3 to 10^4 [s] duration. We have considered building equipment intended to be used for observing them. The calculated spectrum of the acceleration or strain of the ground caused by them is compared with that of the noise of equipment and the natural ground motion and we estimate feasibility of detection. Moreover, it is difficult with conventional equipment and methods, so we suggest the new methods of observations matching with the characteristics of slow earthquakes. Then we propose a design of a broadband accelerometer optimized to the methods.

Keywords: accelerometer, slow earthquake