correspond to the Tapingting fault, which is a strike-slip fault reactivated from the inherited normal fault and intersects the Tiechanshan and Tunghsiao anticlines. Based on the empirical relationship between the moment magnitude and surface rupture length, the maximum potential earthquake for the Tapingting fault is ~Mw 6.1 by taking 7.5 km as the fault rupture length.

7. **SE111-D3-AM1-Leo1-020** (SE111-A031)

Estimation of the Seismic Moment and the Corner Frequency with Continuous Broadband AE Records Under Uni-axial Compressive Conditions

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The seismic moment and the corner frequency are typical parameters that characterize the source properties of earthquake rupture. It was reported that the seismic moment is proportional to the cube of corner frequency for natural earthquakes. However, it has been yeiled whether smaller events (< ~Mw -2) also satisfy this relationship or not. In this study, we attempt to compare the source parameters of micro cracking (AE) in a fracturing rock sample (Mw -5 ~ -6) with those of natural earthquakes.

PZT elements which have often been used for AE recording are inadequate for parameter estimation because of their narrow frequency ranges. In addition, during the most of previous experiments, AEs were obtained by triggered recordings, which hid some events behind the mask times. To solve these problems, we tried to record all events in a fracturing Westerly granite sample with broadband, continuous recording.

We carried out two experiments under uni-axial compressive conditions, and analyzed the manually picked up AEs. The seismic moments and the corner frequencies are estimated by grid search from the displacement spectrums. The estimated parameters of this study satisfy the same scaling relationship as that for natural earthquakes.

8. **SE111-D3-AM1-Leo1-021** (SE111-A047)

1d Interpretation of CSAMT Data from Kamojang Geothermal Field, West Java, Indonesia Using Full-solution Forward Formulation

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We collected controlled-source audio-magnetotelluric (CSAMT) data around Kamojang geothermal field from 60 sounding stations in 2007. In addition to the well practiced 1D or 2D CSAMT interpretation in which far-field or magnetotelliric (MT) assumption is implemented to CSAMT data upon applying near-field correction to the data, we conducted 1D interpretation of the data using full-solution approach where the source effects is explicitely incorporated in forward formulation, thus avoiding the need for the near-field correction. First we tested the applicability of the scheme by comparing the far-field MT interpretation results with the full-solution CSAMT interpretation of synthetic CSAMT data using the smoothness-constrained Occam's inversion. We then applied both approaches to the field data to infer the resistivity structure. It is revealed that the general feature of the resistivity structure beneath Kamojang area can be expressed by a resistive surface layer followed by a conductive layer (1-10 ohm.m) overlying a third resistive layer which is typically found in geothermal area. However, the full-solution approach gives further detail of the resistivity variation especially in the deeper part.

SE111 - General Session for Solid Earth Sciences

Wednesday, August 15, 2012 | Leo 1 | 11:00-12:30

1. **SE111-D3-AM2-Leo1-008** (SE111-A062)

Velocity Structure Estimation with Combination of SPAC and Seismic Interferometry

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We conducted SPAC and seismic interferometry survey with temporal and permanent seismic stations deployed in active folding area in Niigata prefecture, Japan, to estimate S-wave velocity structure. Fifteen velocity seismometers have been deployed with intervals 5 to 10 km in an area of 50km x 15km. Thirteen temporal seismic arrays also have been deployed each with 12 velocity seismometers arranged as three equilaterals whose radii range from several hundred meters to several kilometers. Each temporal observation is carried out for more than 10 days to assure reliable survey.

Continuous data of the permanent stations are analyzed with ambient noise interferometry to obtain group velocities of the surface waves. Each continuous data of the temporal arrays are analyzed with SPAC and CCA method to estimate phase velocity. In addition, the ambient noise interferometry is applied for the data of some temporal stations.

Finally the S-wave velocity structure is inverted from the estimated phase velocity and group velocity. Velocity structures up to the seismic basement (Vs =3 km/s) at several to ten kilometer deep are estimated.

3. **SE111-D3-AM2-Leo1-010** (SE111-A051)

Source Characterization and Simulation for Earthquakes in Taiwan

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We characterized the seismic sources for earthquakes in Taiwan, investigated the historical instrumental earthquakes, and source scaling of earthquakes (Mw4.6-8.9) from Taiwan orogenic belt to make also the global compilation of source parameter to discuss the scaling self-similarity. Finite-fault slip models (12 dip-slip and 7 strike-slip) of recent earthquakes using mainly from Taiwan dense strong motion and teleseismic data were utilized. Seven additional earthquakes (M>7) were included for further scaling discussion on large events. Considering the definitive effective length and width for the scaling study, we found a non-self similar scaling for small to moderate events and a self-similar scaling for large events. Although the events showed the variation in stress drops, except three events with high stress drops, most of the events had the stress drops of 10-100 bars. The bilinear relation was well explained by the derived magnitude-area equation of Shaw (2009) while we considered only the events with the stress drops of 10-100 bars and the seismogenic thickness of 35 km. We found some distinct high stress drops events from blind faults in the western foothill of Taiwan, and intra-plate earthquakes from subduction slab yield local high Peak Ground Acceleration (PGA) as we made the comparison to the Next Generation Attenuation (NGA) model. Regardless the relative small in magnitudes of these crustal events, or, deep focus of the intra-plate events, the high PGA of these events will give the high regional seismic hazard potential, and, thus, required special attention in earthquake engineering for seismic hazard mitigation.

4. **SE111-D3-AM2-Leo1-011** (SE111-A028)

Validation of Seismic Attenuation Curve from Ground Motion Prediction of Using Empirical Green's Function

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Taiwan is situated in the western portion of the circum-Pacific seismic belt. In the northeastern Taiwan, the Philippine Sea plate is subducted below the Eurasian plate along the Ryukyu trench. The large subduction-zone earthquakes occurring here can inflict a severe loss on life and property, especially for a populated metropolitan area such as Taipei City. Youngs et al. (1997) categorized the subduction-zone earthquakes into two groups: Interplate earthquakes and Intraplate earthquakes. A interplate earthquake is an event occurring at the interface between the subducting and overriding plates with a shallow thrust angle, whereas intraplate earthquake occurs within the subducting oceanic plate. The much longer recurrence interval and higher stress drop of intraplate events generally result in the stronger ground motion regardless its relative deeper focal depth. In probabilistic seismic hazard analysis, a ground-motion attenuation curve is one of the most important parameter, which can help us predict the ground-motion values . In this study, we classified the past events within local magnitude (M_L) larger than 6.0 in northern Taiwan, and used Empirical Green's functions method which utilizing ground motions of actual small-events as Green's functions rather than theoretical Green's functions to simulate the full spectra of the waveforms. These simulation were used to give the comparison to the existing attenuation curves to validate the attenuation relationships for inter- and intra- plates earthquake with full spectra. In order to objectively estimate the ratios of fault dimension (N) and stress drop (C) of large to small events, the source spectral fitting method (Miyake et al.,1999) is used. The synthetic waveform and spectrum are thus obtained with C and N values to assess the theoretical PGA values and verify the present ground-motion attenuation curve.

5. **SE111-D3-AM2-Leo1-012** (SE111-A035)

Establishing the Real-time Rupture Process Determination System for Moderate-to-large Earthquakes by Moment Tensor Inversion

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We use moment tensor inversion technique incorporated with grid-search scheme to monitor regional large size earthquakes as a real-time system. Our recent study results have shown that events smaller than Mw6.5 can be detected accurately both in determinations of location and focal mechanism. Nevertheless, we are aiming those moderate-to-large size events (Mw > 6.5), which are fairly hard to be treated as a simple point source. Some of the technical problems coming with data processing force the finite-fault source inversion to be a case-by-case study. This poses the challenge of real-time monitoring source parameters for large size earthquakes.
Based on the approach published by *Kikuchi & Kanamori (1982),* a large earthquake could consist of several sub-events propagating through the fault plane, and the locations and source parameters of these sub-events could be determined under a semi-iteration basis of waveforms. Thus, the waveforms can be simulated by superposition of synthetics of corresponding sub-events. Instead of modeling larger events by a point source, this iteration approach is practicable to extract multi-source information from the full waveform of a large event. According to this concept, we establish a process to not only define the first centroid moment tensor but also extract the following sub-events information contained in the full waveform. Prior to giving the exercise to an on-line real-time data, various benchmarks that considering synthetic rupture scenarios would be tested to justify the stability and capability of the system. Besides the source parameters of sub-events, the timing information between sub-events can also be treated as another powerful constraint on the determination of the rupture fault plane.

6. **SE111-D3-AM2-Leo1-013** (SE111-A072)

Multi-scale Decomposition and Imaging of Strong Subsurface Heterogeneities with Sharp Boundaries

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Wave propagation and scattering is a natural process of multi-scale analysis. Waves with different wavelengths have the tendency to interact (scattering) with heterogeneities of some corresponding scales, especially the backscattering which has strongest response to the medium spectral components of wavelength scale. Therefore it is attractive to apply multi-scale analysis to seismic wave imaging of subsurface structures. In this study we investigate different decomposition methods using various basis or frame functions and search for the proper decomposition atoms which can efficiently represent strong heterogeneities with sharp boundaries. We also perform numerical experiments on the scattering property of different decomposition atoms, and calculate their sensitivity kernels (spreading functions) for imaging and inversion. Then we propose a multi-scale seismic imaging scheme to reconstruct the full spectra of the heterogeneities, including both the sharp boundaries and the smooth variations. As an example, we decompose the SEG/EAGE salt model into multi-scale representation by multi-resolution analysis using dyadic scaling. The multi-scale images by beamlet migration using the band-passed data (octave bandwidths) correspond well with the relative scales of the model. Further work along the multi-scale waveform inversion is also discussed.

SE63 - Earthquake Hydrology and Hydroseismology

Wednesday, August 15, 2012 | Leo 2 | 08:30-10:30

1. **SE63-D3-AM1-Leo2-001** (SE63-A002)

Implication of Groundwater System Change by Distant Earthquakes in Korea

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Groundwater responses to earthquake events have mostly been reported in terms of water-level fluctuations. After the Tohoku earthquake in 2011, in perspective of long-term effects of earthquake disaster, changes in groundwater quality also became significant. In this report, we present the observation data from the National Groundwater Monitoring Stations (NGMS) of Korea showing pre-seismic, co-seismic and post-seismic changes of water level and water quality. Our study covers the distant earthquakes in 2008 and 2011, Wenchuan earthquake (M8.1) and Tohoku earthquake (M9.0), respectively, that occurred with the series of strong fore- and after-shocks. For Wenchuan earthquake (M8.1), water-level and -quality changes were recorded in 13 and two wells, respectively. And for Tohoku earthquake (M9.0), those changes were observed in 43 and 12 wells, respectively. Changes of groundwater quality could imply changes in groundwater flow systems including mixing of different water bodies through newly developed flow paths. These changes also can be recovered in short periods or take some time to be recovered,