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In this paper, I first validate a ground motion simulation procedure against ground motion observation from the Imperial Valley, Loma Prieta, Landers, Northridge, Kobe, and Kocaeli earthquakes. The ground motion simulation procedure follows Zeng et al. (1994) using a composite source model. In that model, the source is taken as a superposition of circular subevents with a constant stress drop. The number of subevents and their radius follows a power law distribution equivalent to the Gutenberg and Richter's magnitude-frequency relation for seismicity. The heterogeneous nature of the composite source model is characterized by its maximum subevent size and subevent stress drop. As rupture propagates through each subevent, it radiates a circular crack rupture pulse. In addition to wave propagation through a layered earth, the model has been improved by including scattering waves from small scale heterogeneity structure of the earth, site specific ground motion prediction using weak motion site amplification, and nonlinear soil response using geotechnical engineering models. In the current validation study, the fixed and free model parameters have been systematically cataloged and the statistical distribution of those free parameters has been carefully identified. A critical component of the study is to define the function of goodness-of-fit. In this investigation I emphasize on goodness-of-fit based on ground motion response spectra. Other forms of goodness-of-fit based on seismic waveform, shake duration, accumulative energies, etc., are also examined. Based on the result, I then conduct broadband ground motion prediction from scenario earthquakes. The objective of this simulation is to argument the existing empirical strong ground motion database on magnitude, distance, and frequency range. The result will be used to test the function forms used in developing the Next-Generation-Attenuation relation initiated by PEER/SCEC/USGS.

S52A-0134 1330h POSTER

Focal Mechanism Influence on Probabilistic Estimation of Strong Ground Motion

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One major challenge of the modern seismology is the mitigation and the reduction of the consequences on structures and society due to the occurrence of future earthquakes. Probabilistic seismic hazard analysis (PSHA), in the last years has assumed a fundamental role in this research field. In fact, using the past seismicity and information regarding the tectonic environment, it allows to estimate the most probable strong ground motion level at a particular site for a given time period. Moreover, from an engineering point of view, using de-aggregation techniques, it permits to infer the design earthquake. The aim of the present work is to illustrate a new methodology for improving the probabilistic peak ground motion estimation and, consequently, the seismic hazard through the modification of attenuation laws. In fact, attenuation laws are usually used in tectonic environment different from that they have been retrieved. This may conduct to unrealistic estimates of the strong ground motion thus influencing the PSHA result. The proposed modifications are carried out by means of theoretical and empirical considerations and, in particular, regard the source focal mechanism. A corrective multiplicative coefficient is formulated in order to use a-priori information on the most probable focal mechanism expected in a given seismogenic source region. This information can be inferred, for example, by the actual tectonic stress regime or by historical seismicity, and are often available in the present-day catalogues. The proposed methodology is used also to extend the design earthquake to the focal mechanism. In fact, a specific probability density function of the focal mechanism parameters can be formulated and introduced into the general formulation of the PSHA. This probability density function allows the analytical formulation of available a-priori information. An application to a site located in the southern Apennines (Italy) along with the formal treatment of the proposed methodology is shown.

S52B MCC: Level 1 Friday 1330h

Earthquake Hazards of Greater Tokyo: Eighty Years After Kanto II Posters *(joint with G, T)*

Presiding: **Y Okada,** National Research Institute for Earth Science and Disaster Prevention (NIED)**; T Nishimura,** Geographical Survey Institute

S52B-0135 1330h POSTER

Characteristics of Seismic Activities in and around the Boso-Peninsula, in Central Japan, with Dense Seismographic Array Observation

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We investigated seismic activities in and around the Boso Peninsula, which is located east of Tokyo, Japan. A velocity structure beneath the Boso area is very complex, consisting of three layers: an overriding plate in land, northward subducting Philippine Sea plate, and westward subducting Pacific plate. The area includes a part of the source region of the 1923 Kanto Earthquake (M=7.9) and other older large earthquakes. Several slow-slip events were also detected by continuous GPS observations. First, we investigated whether or not exist repeating earthquakes, which was found in Tohoku district, in northeastern Japan (Igarashi et al., 2003), also beneath the Boso Peninsula. It is suggested that the repeating earthquakes occurred when a small asperity was periodically broken due to stable sliding of the plate boundary surrounding the asperity. If this is the case, the repeating event can be a kind of sensors to detect an aseismic slip in the area. We used the same algorithm for detecting them as Igarashi et al. [2003] did in Tohoku area. We found that many repeating earthquakes occurred on the subducting Pacific plate boundary and some of them around the subducting Philippine Sea plate. The repeating earthquakes in the Philippine Sea plate occurred on the edge of source regions of large interplate earthquakes or slow events. This suggests that the repeating earthquake is related with the degree of the plate coupling. Furthermore, we expect the repeating earthquake to be a clue to understand the location of asperities and also next large earthquake. Next, we investigated other small earthquakes. Seismicity beneath the Boso Peninsula is reported to be lower than that around the area, and large events did not occur in recent 50 years. The entire Japans Island is covered with a highly dense seismographic network. However, an interval of seismographs in the Boso Peninsula is relatively wide for populous area. And a thick sediment also prevents to detect a small event there. An accurate crustal structure and relationships between seismicity and configuration of boundary have not been well understood. Therefore, we need a dense seismographic array in the Boso Peninsula to clarify the seismic velocity structure of deeper part of the crust and subducting plate, detect micro earthquakes, and image the seismic fault of earthquakes that may destroy the metropolitan area. These seismographs are installed along the line of the northeast-southwest direction. Station intervals are about 2 km to 10 km. We install 30 stations during this fiscal year, data from which are continuously transmitted to the Earthquake Research Institute, the University of Tokyo, in Tokyo, by using the Internet and a satellite communication system. The new array enables us to detect smaller events beneath the array than the current networks, to clarify whether the lower seismic activity is real or not beneath the peninsular. Observed waveforms have many converted phase, which seem to appear on a common boundary. We expect to estimate the location of the upper plate boundary of the subducting plate by the conversion point, resulting in characterization of seismic activities in this region.

S52B-0136 1330h POSTER

Correlating Seismicity and Subsidence in the Tokai Region, Central Japan

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We investigate the correlation between seismicity rate changes as well as changes in the earthquake size distribution (b-value) of earthquakes and transients in geodetic data in the Tokai area of Central Japan. As a first target, we analyze the period of accelerated subsidence in the period 1988 - 1990. Three largely independent seismic catalogs cover this region: NIED, JMA and JUNEC, offering a unique opportunity to verify seismicity anomalies based on independent sources. We spatially and temporally map out seismicity rates, finding that a significant decrease in the earthquake rate of $M > 2.0$ events coincides with the accelerated subsidence period; however, this anomaly disappears when including smaller magnitudes in the analysis. This relative quiescence of larger events can readily be explained when interpreting the transient in seismicity in the framework of a change in the earthquake size distribution, or b-value. The background b-value of about 0.8 increased in the period 1987.5 to 1989.5 to a value of b=1.2 and is confirmed in all three data sets. This b-value transient occurred in the immediate vicinity of a patch of low b-value in the centre of Suruga Bay (b=0.5) that could be interpreted as a major locked patch or asperity. We also analyze stress tensor inversions of NIED focal mechanism data, finding an increase in thrusting type earthquakes for the anomalous period show. While a unique interpretation of the relationship between subsidence, b-value and stress tensor inversion results is not possible, we propose that an increase in the locking strength, a slow stick event, is consistent with all observations. We are now investigating the seismicity transients accompanying the recent slow slip event that started in the year 2000. Our ultimate goal is to construct a quantitative model that relates micro-seismicity and deformation data in the Tokai region.

S52B-0137 1330h POSTER

Effects of Differences in Subsurface Structural Models on Synthetic Ground Motion During The 1923 Kanto Earthquake

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In this study, two 3D grid models for subsurface structure of deep sediments in the Kanto plain, Japan, were constructed for strong motion simulation from geological investigations by Suzuki (1999) and S-wave profiles obtained with microtremor array explorations by Yamada and Yamanaka (2001). We tested the performance of the 3D structure models from comparison between the simulated long-period ground velocities during the 1923 Kanto earthquake using a 3D finite difference technique. The differences between the strong motions are small at sites in the focal region, because the source effects are dominant. However, they become large at sites out of the focal region due to site effects. As these sensitive depend on the 3D structure model, we need considerations of setting up the source model for strong ground motion prediction.

S52B-0138 1330h POSTER

Detailed Structure of Plate Boundary Revealed by Seismic Reflection Survey and Spatial Relation With Interplate Seismic Activity Indicated by Converted Waves, East off Boso Peninsula, Japan

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Tokyo metropolitan area of Japan is located near Sagami trough where Philippine Sea(PHS) plate subducts beneath Kanto district and large earthquakes including Kanto Earthquake, 1923 took place repeatedly. Thus, for the purpose of damage mitigation in Tokyo metropolitan area, it is important to study the characteristics of plate boundary and relation with seismic activity. The area eastern off Boso peninsula is one of regions where interplate earthquakes are occurring at shallower part around Kanto district. We researched the detailed structure of plate boundary and spatial relation with seismic activity using seismic reflection survey data and waveform data of microearthquakes. In this region, multi-channel seismic surveys were conducted by NIED and JNOC(Japan National Oil Corporation). From the analysis of those data (Kimura and Kasahara, 1997; Kimura and Kasahara, 2001), the following results are obtained. 1)There exists clear sediment layer which consists of Quaternary and Tertiary layer(Kazusa , Shimousa and Miura group) with thickness of 0.2 - 2.0 sec in TWT. 2)Major deep reflectors(MDR) have been found dipping northward along the survey line coincident to the plate boundary between PHS plate and landward plate. 3)From the analysis of cross-correlation between reflected waves at acoustic basement and MDR, it is revealed that the polarity of upper reflector is reverse and that of lower is normal. 4)Crustal layer between acoustic basement and MDR is transparent. The candidates of MDR may be the upper and lower boundary of oceanic crust or other surface structure of PHS plate. Taking into consideration polarity of reflectors and results of past survey, it is thought that this layer would correspond to shallowest layer of Izu peninsula with acoustic velocity of 4.1 - 5.0 km/sec and with thickness of 1.0 - 2.0 km revealed by the explosion seismic survey(Asano et al., 1982). In the southern portion of survey line, TWT of MDR is 6.0 - 8.0 sec and suggesting that depth of the reflector is about 14 - 18 km which is close to earthquake hypocenters. From the analysis of observed converted waves recorded by microearthquake observation network of NIED, it is revealed that seismic activities around this region is occurring just beneath some major acoustic impedance discontinuity (Kimura and Kasahara , 2003) and from the analysis of polarity of converted waves, it is more probable that this discontinuity corresponds to lower reflector of MDR. From these result, it is indicated that thin layer within MDR would play important role on the characteristics of seismic activity.

S52B-0139 1330h POSTER

3-D Attenuation structure beneath the Kanto District

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Subsurface structure, both seismic velocity and attenuation, beneath the Kanto region is complex. The Pacific (PAC) plate subducts beneath Tokyo from the east and the Philippine Sea (PHS) plate subduct from southwest. Because of this complexity, three-dimensional (3D) velocity and attenuation structure should be examined and may be used for both reappraisal of historical earthquake sources and prediction of intensity distributions from future large earthquakes. 3-D attenuation structure for Japanese Islands was estimated from seismic intensity distribution (Hashida and Shimazaki, 1989, Tectonophysics). More detailed attenuation structure beneath the Tohoku region (Nakamura and Uetake, 2003), from a large number of strong-motion records, show that high Q in the Pacific plate and very low Q in volcanic zones. Here we report our estimate of 3-D attenuation structure estimated from dense seismic network. We obtained the Q structure at 10Hz in the Kanto area using strong motion records of the K-NET, KiK-net of National Research Institute for Earth Science and Disaster Prevention (NIED) and the 95-type seismometers of Japan Meteorological Agency (JMA). Study area is 138-142°E and 34-38°N. Block size is horizontally 0.2° and 30km in depth direction. Number of earthquakes and rays are 1649 and 22922, respectively, and 998 blocks are penetrated by the rays. We found several low Q zones, most of which correspond to the volcanic front. A significant NW-SE trend low-Q zone however lies under the non-volcanic Kanto area. This low-Q zone exists about 35.6°N at the depth range of 0-30km, 36.0°N at 30-60km and 36.4°N at 60-90km. In the 3-D velocity model (Kamiya and Kobayashi, 2000, GRL), low-Vp and low-Vs with NW-SE trend and high Poisson's ratio are found at 36.0°N at the depth of 40 km. The low-Q zone found in this study corresponds to this zone, and indicate wedge just above the subducting PHS plate. Such 3-D structure would play an important role to evaluate seismic intensity from earthquakes in the region.

S52B-0140 1330h POSTER

Regional Characterization of the Crust in Metropolitan Areas for Prediction of Strong Ground Motion

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Introduction: After the 1995 Kobe earthquake, the Japanese government increased its focus and funding of earthquake hazards evaluation, studies of man-made structures integrity, and emergency response planning in the major urban centers. A new agency, the Ministry of Education, Science, Sports and Culture (MEXT) has started a five-year program titled as Special Project for Earthquake Disaster Mitigation in Urban Areas (abbreviated to Dai-dai-toku in Japanese) since 2002. The project includes four programs: I. Regional characterization of the crust in metropolitan areas for prediction of strong ground motion. II. Significant improvement of seismic performance of structure. III. Advanced disaster management system. IV. Investigation of earthquake disaster mitigation research results. We will present the results from the first program conducted in 2002 and 2003. Regional Characterization of the Crust in Metropolitan Areas for Prediction of Strong Ground Motion: A long-term goal is to produce map of reliable estimations of strong ground motion. This requires accurate determination of ground motion response, which includes a source process, an effect of propagation path, and near surface response. The new five-year project was aimed to characterize the "source" and "propagation path" in the Kanto (Tokyo) region and Kinki (Osaka) region. The 1923 Kanto Earthquake is one of the important targets to be addressed in the project. The proximity of the Pacific and Philippine Sea subducting plates requires study of the relationship between earthquakes and regional tectonics. This project focuses on identification and geometry of: 1) Source faults, 2) Subducting plates and mega-thrust faults, 3) Crustal structure, 4) Seismogenic zone, 5) Sedimentary basins, 6) 3D velocity properties We have conducted a series of seismic reflection and refraction experiment in the Kanto region. In 2002 we have completed to deploy seismic profiling lines in the Boso peninsula (112 km) and the Sagami bay area (75 km) to image the subducting Philippine Sea plate. On the Boso line we drilled a hole at a depth of 2000 m with core sampling and logging including VSP. A high sensitivity down hole seismometer will been installed at the hole. In 2003, a 71-km-long reflection/refraction line covered the Tokyo bay area to characterize the source area of the 1923 Kanto quake. The southern part of the line ran through the Miura peninsula, which was covered by a 20 x 15 km array consisting of 51 3-component continuously recording seismographs to identify the asperities suggested by strong motion studies. We also cover the eastern boundary of the Kanto Mountains in this fall. Reconstruction of source fault and velocity models allow for more realistic 3D seismic wave simulations. All of this information will be synthesized and provided to communities involved in probabilistic hazards analysis, risk assessment and societal response.

URL: http://www.eri.u-tokyo.ac.jp/daidai/index-e.html

S52B-0141 1330h POSTER

Deep seismic profiling using off-line recorders, Miura Peninsula, Kanto, Japan.

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The deep seismic profiling around Metropolitan Tokyo (Kanto area) began from 2002 under the project named <Regional Characterization of the Crust in Metropolitan Areas for Prediction of Strong Ground Motion>. The deep seismic profiling was performed along the Tokyo Bay (Tokyo Bay 2003) from July to August in 2003, to obtain an image of the source fault of the Kanto earthquake of 1923 (M7.9), and deeper extension of inland active faults in Miura Peninsula. In the Tokyo Bay 2003, seismic reflection data were acquired along a 71-km-long seismic line from the Miura Peninsula to Tokyo Bay, using digital-telemetry cable system, including ocean bottom cables. However, this seismic line at Miura Peninsula passes through the densely populated area and due to the cultural noise the low S/N ratio was expected. Keeping away from the noise along the cable-type receiver line, 51 off-line recorders with a 4.5 Hz and 3-component geophone were deployed at carefully selected, quiet receiver points. During 90 days continuous recording, seismic signals produced by four vibroseis trucks at 195 locations and air-guns (1500 cu. inch) at 4280 locations were recorded including ca. 150 of earthquakes. Judging from the preliminary receiver gathers, two later phases (A and B) are recognized. The later phase A, located at TWT (Two-way travel time) 4 to 5.5 sec., is interpreted as a reflection from the top of the Philippine Sea Plate. The later phase B at TWT 7 to 8 sec. corresponds to the deeper reflection under the Philippine Sea Plate, respectively.

S52B-0142 1330h POSTER

Two Oceanic Plates Subducting Beneath the Kanto Area and Implications for the Prominent Seismicity Before the 1923 Kanto Earthquake

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Though the 1923 Kanto earthquake (M7.9) is the shallow thrust faulting between the overriding Okhotsk plate (OKH) and the descending Philippine Sea plate (PHS) along the northern Sagami Trough, the remarkable seismicity associated with the 1923 earthquake has occurred extensively around the source area. One important constraint of the subduction of PHS and the accompanying seismicity is the existence of another thrusting boundary in depth, which is located in the seismic zone of the overlapped portion of PHS and the Pacific plate (PAC). The slip vectors of earthquakes in the PHS-PAC seismic zone are consistent with the relative plate movement at PHS-PAC. Thus due to the difference of the relative movement at the OKH-PHS, OKH-PAC and PHS-PAC boundaries, both the Philippine Sea plate and Pacific plate have to deform elastically during the subduction. As a remarkable deformation, we demonstrate the striking feature of concave of the Pacific slab, which is located eastward adjacent the PHS-PAC boundary beneath eastern Kanto. According to the catalogue by Utsu (1982) and JMA catalogue revised recently, the seismicity before the 1923 Kanto earthquake was remarkably high in the wide area, in particular in the northward and deeper portion of the imminent 1923 earthquake source area, and also in the sea area far east off the Pacific coast (off Ibaraki Prefecture). Space-time distribution and magnitude time series of these earthquakes show a gradual increase of event size and seismicity starting from about 1906, and an accelerating tendency of the cumulative seismic energy release toward the 1923 earthquake. In particular the intense swarm including two M7 events occurred off Ibaraki Prefecture just three months before the 1923 Kanto earthquake. After the remarkable aftershock activities the seismicity decreased systematically in wide area. All these long-term seismicity pattern imply that the Kanto subduction zone is not always in a statistically stationary critical state, i.e., self-organized criticality, but evolves widely in a critical state before the impending large earthquake. After the large event the state retreat from the criticality and the convergence of the three plates stated above may maintain as a mechanically equilibrating system.

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S52B-0143 1330h POSTER

Source Process of The 1923 Kanto Earthquake From Geodetic, Teleseismic And Strong Motion Data

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The available geodetic (Matsu'ura et al, 1980) and teleseismic data (Kanamori, 1971) were studies by Wald and Somerville (1995) for the source process of the 1923 Kanto earthquake. Recently, Takemura et al. (2003) and Kikuchi et al. (2003) compiled historical strong motion seismograms. These dataset are combined and the inversion method of Yoshida et al. (1996) is applied for a detailed image of the source process. We first invert the geodetic data alone, since they are plentiful, high quality and self-consistent. The parameters of the

fault model are determined based on the model of Wald and Somerville (1995). The fault is divided into 10x7 subfaults. The slip directions of the subfaults can vary by using a linear combination of 90- and 180- degree slips. Their magnitudes are determined by the inversion. The inversion result shows that there are two asperities. The larger one with the maximum slip of 11 m is located around the Uraga Channel between the Miura and Boso Peninsulas, and the second one with a slip of 9 m appears around the base of the Izu Peninsula, where the hypocenter is located. The slip direction changes from a right-lateral strike slip around the hypocenter to a thrust slip around the Uraga Channel. These features of the recovered slip distribution are consistent with the result of Wald and Somerville (1995), but the total seismic moment is slightly larger than their one. The calculated geodetic data show good agreement with the observed ones. We then invert the geodetic and teleseismic data jointly, and will finally carry out a joint analysis of all the geodetic, teleseismic and strong motion data. The geodetic data are insensitive to the deep slips. The seismic data, in particular near-field data, can improve the slip distribution in the deeper portion. The seismic data can also determine the temporal variation of slip. Two arrivals of S-wave are recognized in the horizontal component at several stations. They may be correspond to the two asperities inferred from geodetic data, and provide a constraint on the rupture process.

S52C MCC: Level 1 Friday 1330h

Seismic Data and Network Developments Posters

Presiding: **H Dragert,** Geological Survey of Canada**; L Zhu,** Saint Louis University

S52C-0144 1330h POSTER

Experiments With an Optical Seismometer

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Modern seismometers rely on electronic displacement transducers to sense the motion of an inertial mass suspended by a spring. The more sophisticated systems use electrostatic or electromagnetic force-feedback on the inertial mass to ameliorate the shortcomings of the spring and the displacement transducer. Recent advances in optical fiber technology and digital signal processing offer an alternative to the modern observatory seismometer. We have developed an optical fringe resolver to replace the electronic displacement transducer, which promises to lead to a greatly improved seismometer. The use of optical fiber interferometry rather than traditional electronic displacement transducers affords significant advantages, including: • A linear, high-resolution displacement detector the proposed optical sensor includes the functionality of a digitizer providing about a 30-bit digital output;
• Absolute displacement measurement referenced to the wavelength of light;
• Bandwidth sufficient to resolve the USGS Low Noise Model from DC to > 15 Hz;
• Dynamic range sufficient to record the largest teleseisms and most regional and local earthquakes;
• Minimum electronics in package - only optical fiber connection to the seismometer, minimizing heat from electronics in the sensor package and noise pickup from connecting electrical cables;
• Smaller package our design will be applicable to both vault and borehole installations and should be relatively easy to manufacture. Our first test of this concept was to apply it to a standard STS-1 seismometer. For this experiment, we added interferometric components to the seismometer frame and a retroreflector to the seismometer's mass. We removed the feedback electronics and recorded the STS-1 mass displacement with our new interferometric system. Simultaneously, we recorded the output of a standard STS-1 set up on the same pier. The results, which include observations of large teleseisms and microseisms, indicate that the new technique is promising. In our second experiment, we measured the inherent noise floor of the optical fringe resolver. In a 100 Hz bandwidth, the RMS noise was approximately 5 × 10-12 m, sufficient to resolve the USGS ground noise model up to at least 15 Hz with the STS-1 suspension.

S52C-0145 1330h POSTER

The GSN Noise Model: Estimates of the Least Ambient Earth Noise From the IRIS Global Seismographic Network.

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It has been a decade since the last comprehensive model of ambient earth noise was published*(Peterson, USGS Open-File Report 93-322, 1993)*. Since then observations of ambient earth noise from the IRIS Global Seismographic Network of widely distributed, similarly equipped, and well-calibrated stations have become available. The broad geographic sampling of this large data set and the ease of access to waveform data provided by the IRIS Data Management System facilitate analysis of global noise samples. We analyze data from the 118 GSN stations operating during the year July 2001 through June 2002. Based upon over 738,000 hourly spectral estimates computed from these stations' data, we have developed a robust noise model, which exhibits significant differences from the Peterson model both in the normal mode and body-wave bands.

S52C-0146 1330h POSTER

CISN Display Progress to Date - Reliable Delivery of Real-Time Earthquake Information, and ShakeMap to Critical End Users

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The California Integrated Seismic Network (CISN) has collaborated to develop a next-generation earthquake notification system that is nearing its first operations-ready release. The CISN Display actively alerts users of seismic data, and vital earthquake hazards information following a significant event. It will primarily replace the Caltech/USGS Broadcast of Earthquakes (CUBE) and Rapid Earthquake Data Integration (REDI) Display as the principal means of delivering geographical seismic data to emergency operations centers, utility companies and media outlets. A subsequent goal is to provide automated access to the many Web products produced by regional seismic networks after an earthquake. Another aim is to create a highly configurable client, allowing user organizations to overlay infrastructure data critical to their roles as first-responders, or lifeline operators. And the final goal is to integrate these requirements, into a package offering several layers of reliability to ensure delivery of services. Central to the CISN Display's role as a gateway to Web-based earthquake products is its comprehensive XML-messaging schema. The message model uses many of the same attributes in the CUBE format, but extends the old standard by provisioning additional elements for products currently available, and others yet to be considered. The client consumes these XML-messages, sorts them through a resident Quake Data Merge filter, and posts updates that also include hyperlinks associated to specific event IDs on the display map. Earthquake products available for delivery to the CISN Display are ShakeMap, focal mechanisms, waveform data, felt reports, aftershock forecasts and earthquake commentaries. By design the XML-message schema can evolve as products and information needs change, without breaking existing applications that rely on it. The latest version of the CISN Display can also automatically download ShakeMaps and display shaking intensity within the GIS system. This can give Emergency Response managers' information needed to allocate limited personnel and resources after a major event. The shaking intensity shape files may be downloaded out-of-band to the client computer, and with the GIS mapping tool, users can plot organizational assets on the CISN Display map and analyze their inventory against potentially damaged areas. Lastly, in support of a robust design is a well-established and reliable set of communication protocols. To achieve a state-full server connection and messaging via a signaling channel the application uses a Common Object Request Broker Architecture (CORBA). The client responds to keep-alive signals from the server, and alerts users of changes in the connection status. This full-featured messaging service will allow the system to trigger a reconnect strategy whenever the client detects a loss of connectivity. This sets the CISN Display apart from its predecessors, which do not provide a failover mechanism, or a state of connection. Thus by building on past programming successes and advances in proven Internet technologies, the CISN Display will augment the emergency responder's ability to make informed decisions following a potentially damaging earthquake.

URL: http://www.cisn.org

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Conversion of Historic Seismic Data at the Southern California Earthquake Data Center (SCEDC)

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The Southern California Earthquake Data Center (SCEDC) archives and provides public access to continuous and event-based earthquake parametric and waveform data gathered by the Southern California Seismic Network. The mission of the SCEDC is to maintain an easily-accessible, well-organized, high-quality, searchable archive of earthquake data for research in seismology and earthquake engineering. The SCEDC has compiled and converted all available historic seismic data to create a single source of southern California earthquake data from 1932-present. The 1932-1976 era of seismic data was key-punched from the original phase cards into CUSP-format on a VAX system. The data was then imported into the SCEDC Oracle database, so phase and epicenter data is available for direct retrieval by users via STP. A problematic four-year span of CEDAR data from 1977-1980 is currently not accessible, but has been converted and is being processed to include magnitude information. The parametric data from 1981 to present has been loaded into the Oracle 9i database system and the waveforms for that time period have been converted to mSEED format and are accessible through the STP interface. Quality control of 1981-2000 historic parametric and waveform data has progressed using a detailed reverse-chronological examination and verification of magnitudes. Current efforts at the SCEDC are focused on continuing to expand the available seismic datasets, enhancing and expanding distribution methods, and providing rapid access to all datasets, historic and modern. Through the California Integrated Seismic Network, the SCEDC is working with the NCEDC to provide unified access to California earthquake data.

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A Decade of Regional Moment Tensor Analysis at UC Berkeley

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Several magnitude estimates are routinely determined by regional networks in California. The issue of magnitude reporting hierachies, particularly the question of when moment magnitude (M_w) should be preferred over local magnitude (M_L), is being addressed in the framework of the development of a statewide earthquake monitoring system in California through the CISN, and is also faced by the ANSS. The Berkeley Seismological Lab (BSL) has made routine determinations of the seismic moment tensor and moment magnitude for over 10 years. These determinations are made automatically for events with local magnitude of 3.5 and higher in northern California and typically reviewed for events of M4.0 and higher. The moment tensor catalog includes nearly 400 events in northern and central California, southern Oregon, and eastern Nevada, as well as events of interest in Washington, Idaho, Utah, and Arizona. We compare the regional