Seismic signals recorded in volcanic areas and associated with volcanic activity can be originated from many different sources. Among various types of transient signals, i.e., explosion quakes, tectonic quakes, long period events, those related to rockfall episodes are very important because rockfalls might contribute significantly to volcanic hazard even in areas characterized by volcanic quiescence. In this study we have analyzed the intracrateric rockfall events occurred since 2001 along the Vesuvius asymmetrical crater rim. Field investigations of the main morphostructural features carried out in the summit area, along with digital images collected during the study period, allowed us to infer the time evolution and the areal distribution of the rockfalls. Two main source areas located on opposite sides of the volcanic crater, to the NW and SSE, have been identified. Both of them are characterized by intense fracturing and fumarolic emissions. Seismic signals of the intracrateric rockfall events, recorded by the broadband and short-period permanent stations operated by the Osservatorio Vesuviano-INGV of Naples and located within a few kilometers from the crater, have been analyzed in terms of duration and frequency content in order to characterize the peculiar features of the source areas.

SC-B 0: Data Acquisition, Theory and Interpretation (Open Session – Posters Only)

Level 2

APPLICATION OF EMD IN SEISMIC DATA TREATMENT – ID 312

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In seismic record treatment, the velocity or displacement time history curve, which is generally calculated from integrating an original acceleration. The integral curve usually deviates from the time axe. Especially for the displacement, its deviation is serious. This phenomenon is named zero-float. Huang Transform, i.e. EMD method (Empirical Mode Decomposition) can be used to pick up the mean value or trend of signals. This paper suggests to apply EMD to solve the zero-float problem. To verify its feasibility, the integrated and original seismic displacement time histories are compared with the corrected curve, which got by using EMD method. Their response spectra are also compared. We also use the acceleration data of El Centro record and its corrected displacement data by using EMD as input ground motions to calculate one structure displacement response. The analysis show that Huang transform is a useful tool to solve the deviate integral in seismic record treatment.

THE INTERNATIONAL SEISMOLOGICAL CENTRE : AN UPDATE – ID 501

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The International Seismological Centre is a non-governmental, non-profit making organization, charged with the final collection, analysis and publication of earthquake source information from all over the world. Earthquake data are received from more than 100 seismological agencies representing every part of the globe. This data comprises readings from almost 3,000 seismograph stations. The ISC builds on the efforts of seismologists who run stations and networks around the world to locate tens of thousands of earthquakes each year. With the current tendency of almost all local agencies to focus their efforts on rapid dissemination of earthquake information, it is the ISC that becomes the source for the most complete earthquake information. We wait more than a year for all possible earthquake data to be collected before we start to analyze it and to edit the Bulletin. As soon as the data are parsed and inserted into the database, contributed hypocentres are grouped and phase readings are associated with the automatically selected primary hypocentres. This automatic process is repeated every few days. Many of these events will be relocated by ISC seismologists who manually review every event that complies with one of the following conditions: . The reported magnitude is higher than 3.5. . The event was reported by at least 2 agencies . The event was recorded at a distance greater than 1000 km. On the average, about 3500 events with more than 150,000 associated readings are reviewed each month. The ISC also maintains the International Registry of seismic stations (jointly with USGS/NEIC), provides links to web-sites with additional seismological information, information about seismologists and seismological institutions (national points of contact), bibliography lists, reports and documentation of ISC's software. Visit www.isc.ac.uk <http://www.isc.ac.uk/> for move details.

DETERMINATION OF EPICENTRAL AREA ATTRIBUTES BASED ON SEISMOGRAM PROCESSING – ID 565

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For determination of epicentral area attributes we present an experience of applying image processing and pattern recognition techniques on images obtained by time-frequency transforms of earthquake seismograms. The approach is to extract, from a signal belonging to a class (epicentral area), certain attributes, which are discriminating. We call this set of attributes a signature for the associated signal. This signature can then be used to detect the presence of similar attributes in unknown data. Since the signals/seismograms of interest in this research are non-stationary, we determine the signatures based on time-frequency analyses of the signal. Our goal was to experience whether the applied transforms could provide signatures for our recognition task.

To recognize patterns, the selection of input data sets is important. The appropriate inputs should be effective to represent the characteristic of pattern. The experimental data used in this presentation were collections of seismograms of local earthquakes (M<4) from epicentral zones in Macedonia, recorded at the Seismological Observatory in Skopje (SKO) and at the seismological station in Ohrid (OHR). We did our processing on the S-P-phase part of the vertical components of the seismograms.

Time-frequency transforms decompose the preselected part of the seismogram into elementary components, the atoms. These atoms, well localized in time and frequency are linear transforms of the signal. Another approach consists in distributing the energy of the signal along time and frequency, which leads to quadratic transforms of the signal. Preliminary analysis of our data sets has shown that few time-frequency signal transforms could provide discriminable parameters for the recognition task. The following looked promising: Instantaneous frequency, Continuous wavelet transform, spectrograms and the Wigner-Ville transform.

The results demonstrate the applicability of the presented procedures, based on image processing and pattern recognition techniques, for (even automatic) epicentral zone classification.

THE WESTERN MEDITERRANEAN SEISMIC NETWORK – ID 687

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The Royal Naval Observatory in San Fernando (ROA), together with the Complutense University from Madrid (UCM), and in collaboration with the GeoForschungsZentrum of Potsdam (GFZ), have deployed a broad band seismic network around the Alboran sea, in southern Spain, northern Africa. This network started to operate in 1996 with the installation of the SFUC station, near the Observatory. Since then, several stations have been installed and nowadays it is being in expansion with the future installation of several ocean bottom seismometers (OBS). This network is called the Western Mediterranean Network (WM). In this work the present status and the future of the broad band WM network are shown.

A COMPARATIVE EVALUATION OF NOISE MODELS USING TURKISH STRONG GROUND MOTION DATA – ID 793

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A consistent ground-motion data processing scheme is important for most earthquake engineering and engineering seismology related research. Of the various data processing procedures filtering is the most implemented technique in removing the low- and high-frequency noise from the strong motion data. As noted by various studies the crucial point in filtering is the determination of high-pass and low-pass filter corner frequencies. In essence, the chosen filter corner frequencies should not distort the actual frequency content of the ground motion. In particular, the determination of appropriate low-cut corner frequency values is very important as they have a significant effect on the spectral features of the ground motion. This issue is more challenging for ground-motion records from analogue instruments due to their limited dynamic response range.

The main objective of this study is to determine a frequency-dependent noise model for analogue records using the available fixed trace information in the Turkish strong ground- motion data base. This model is compared by the previously proposed similar noise models in the literature to note the differences that may originate from different sensor features and digitization schemes. The filter corner frequencies computed using the noise model are also compared with the corner frequencies of some theoretical source spectra. This comparison enables one to observe whether the suggested filter cut-offs significantly remove the actual frequency content of the records based on the information revealed by the theoretical source spectra. The results and conclusions of this study are going to be used in the processing and recompilation of the Turkish strong ground-motion data base.

FUNCTIONAL CRITERIA FOR STRONG-MOTION SEISMOGRAPHS – ID 797

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This paper describes the optimum configuration for non-continuous (triggered) digital strong motion seismographs. The paper begins with a brief description of a generic signal acquisition and recording process, along with the relevant requirements. This is then extended to seismic data acquisition and recording. The paper then focuses on the particular requirements for capturing natural seismic events on a triggered basis. A summary of accepted parameters are given and particular attention is paid to the relationship of signal bandwidth to both noise floor and the capture window length. The paper then concludes with a suggested optimum configuration for triggered digital strong motion seismographs over a range of instrument noise floors and trigger levels.

MICROSEISMICITY AND FAULTING GEOMETRY IN CENTRAL GREECE – ID 1062

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During November 2004 – June 2005 a digital seismological network was deployed in the eastern part of central Greek mainland, in an area seismically active in the 20th century, particularly in the decade of fifties. The strongest earthquake (M=7.0) occurred in 1954, while the last strong one in 1980 (M=6.5). In total 18 Reftek digital loggers (both 72A–07 and R–130) were installed assembled with guralp CMG40T broadband and Le_1Hz seismometers. The average spacing between stations was of the order of 20 km to ensure earthquake depth accuracy. Local earthquakes with P– and S– arrivals at four or more stations were located using modern techniques as HYPOINVERSE and HYPODD. The best–recorded earthquakes divided spatially in clusters and a reasonable crustal structure for each sub area was defined. Lateral variations of the crustal model taken into account, calculating time delays for each station. By this way, earthquakes inside the network or close to its boundaries were located with accuracy less than 1 km in both the epicenter and focal depth. In addition, focal mechanisms of earthquakes with proper azimuthal coverage were computed. Seismicity covers the most of the area distributed mainly in clusters along active structures. A magnitude M=4.4 earthquake, was the largest local one recorded by this network (5 December 2004, 17:58 UTC), close to the focal area of the 1980 strong earthquake. Several cross sections striking normal to the trend of the clusters of the epicenters reveal the geometry of the active structures as well as the width of the seismogenic layer. Most of the focal mechanisms exhibit normal faulting and were used along with the microseismicity foci in the cross sections for the definition of the properties of the faults that activated during the experiment.

WAVELET PROCESSING OF MULTICHANNEL RECORDS FOR THE ANALYSIS OF SURFACE WAVES – ID 1449

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The refraction microtemor (ReMi) technique is a proven seismic method for measuring in-situ shear wave (S wave) velocity profiles. The application of this method requires only conventional seismic equipment for recording data and ambient noise as a seismic source. In our case the equipment is the same multichannel recorder used for refraction studies, which is connected to a line of 24 vertical component geophones. After the data acquisition process, the recorded multichannel data are treated through the slowness-frequency (p-f) transform in order to separate Rayleigh waves from other seismic arrivals and obtain the shear-wave dispersion curve. Nevertheless, in general the recorded data are contaminated with stationary and local noise, as they are taken from urban areas. In other way, sometimes one of the channels fails, contaminating the data with several spikes or even making useless the information associated to it. In this paper, we apply a pre-processing stage based on wavelet analysis with the aim of reducing the previously commented problems. Concretely, the wavelet packet transform is first used to increase the signal to noise ratio of the data, which provides us clearer signals and makes easier the detection of useless channels. After that, if one of the channels is contaminated by spikes, then we apply again the wavelet analysis in this channel in order to eliminate the spikes and recover the signal of interest. Finally, the data are transformed to the slowness-frequency domain and the dispersion curve is obtained. The recorded data have been taken from the Segura river basin (southeastern of Spain) and the shear-wave dispersion curves