

"NATIVE" WAVELET TRANSFORM DATA OBTAINED ON SPHERICAL EARTH'S SURFACE

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ABSTRACT

In this paper we considered the basic theory and real results of applying the technology of processing geophysical data based on continuous and discrete wavelet transform in the three-dimension case. Wavelets are a powerful tool for the analysis of signals in one or two dimensions. We give a brief review of the methods of constructing a wavelet transform on the sphere. Further, we discuss the advantages and disadvantages of these methods in terms of their application to geophysical problems solutions. The results of the application of wavelet transformation techniques for solving some applied problems for a plane and a sphere.

The most important result is the technique for determining location and magnitude of the sources of the gravitational fields in its wavelet domain for the two- and three-dimensional cases.

Keywords: wavelet transforms, interpretation of geophysical data, three-dimensional sphere

2D-FITTING METHOD OF GEOMAGNETIC DATA AT CONSISTENT DEFINITION GEOMETRICAL AND PETROMAGNETIC PROPERTIES

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ABSTRACT

The joint assessment of geometrical and physical properties of investigated geological objects in the mixed statement of the solutions of geophysics inverse problem is offered. The basis of this statement consists in replacement of the assumption of known exact values of an effective magnetization of geological bodies on an interval task of accepted values of petrophysical parameters that more answers geophysical practice. These conceptions are realized in 2D-fitting technologies for geomagnetic data of a magnetic inductance vector, directed on definitions of form, sizes, occurrence depth and vector effective magnetization in-situ.

Keywords: geomagnetic interpretation, mixed inverse problem, fitting method, effective magnetization, geological object

ANALYSIS OF MAGNETOGRAMS FROM MAGNETIC STATION PLACKOVICA

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ABSTRACT

In the Republic of Macedonia are placed bases for establishment of Geomagnetic Observatory on the location Plackovica. From that perspective, this location, where there is a secured facility and office space, is mounted the equipment for geomagnetic measurements.

In this paper will be present selected magnetograms that are registered in the period 2012 - 2013. Because there are conditions for measurements of the absolute value of the F - component, or the total vector of the magnetic field, for determination of the normal value of the magnetic field is used NGDC geomagnetic calculator (<http://www.ngdc.noaa.gov/geomag-web/#igrfwmm>).

Geomagnetic station established at Plackovica, despite the inadequate conditions in which variometer is placed show a high degree of purity or absence of noise from surrounding influences. This quality of the geomagnetic station Plackovica is provided with the location that is more than 30 km away from any settlement, and also in this area there are no sources of electromagnetic waves that would contribute to increased noise.

This is the first paper in which are presented data from the geomagnetic station Plackovica.

Keywords: magnetogram, geomagnetic station, total vector, noise, variometer

ANALYZING OF BUILDINGS SAFETY USING NONDESTRUCTIVE GEODYNAMIC TESTS

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ABSTRACT

The paper deals with analysing the level of building safety on basis of non-destructive tests results. The non-destructive tests proposed consist of determination of physical and mechanical characteristics of concrete specimens. The devices used for these determinations as Pundit Lab and Hammer Digi-Schmidt are in according with European and Romanian norms. The results obtained from tests according to European Norms for testing hardened concrete proved that the use of non-destructive testing provides plausible values on compressive strength of concrete specimens. The values are used for modelling Reinforce Concrete structures in order to develop a comparative study of buildings response under seismic actions. In the second part of the paper the influence of irregularities on dynamic amplification phenomenon is emphasized. The results are conclusive and are discussed both on the charts and analytical results obtained with help of structural analysis program Autodesk Robot.

Keywords: non-destructive tests, hardened concrete, irregular buildings, seismic action, structure response

APPLICATION OF PROMPT FISSION NEUTRON LOGGING TO THE URANIUM DEPOSITS OF STRATIFIED INFILTRATION TYPE

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ABSTRACT

The article deals with topical issues of applying the prompt fission neutron logging progressive method to the ores of stratified infiltration uranium deposits. As an example, the method is assessed on data collected from the Chu Sarysu ore province.

Exogenous infiltration-type uranium deposits are currently used as a mineral and resource base for uranium production in Kazakhstan.

Stratified infiltration deposits provide more than a third of global uranium supplies. In the 2000s, the Republic of Kazakhstan began developing a series of major stratified infiltration ore deposits in the Chu-Sarysu province, establishing the republic as the world leader in uranium production.

Keywords: well logging, prompt fission neutron logging, uranium deposits, stratified infiltration ore deposits, areas with stratified oxidation, radioactive equilibrium factor.

APPROXIMATION OF EQUIVALENT TRANSFER FUNCTION OF THE GEOELECTRIC SECTION IN GEODYNAMIC INSPECTION

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ABSTRACT

The paper considers representation techniques of geological section transfer functions by means of equivalent rational functions. The functions are based on subsurface heterogeneity model having the shape of imperfect dielectric represented by discrete electric circuits. The description of the basic model for geoelectric section having the shape of a layered half-space is given. Therefore, the inequality of electrical parameters along the layers can be approximated to the first approximation by models representing geoelectric arrays with horizontal, vertical and inclined boundary between two media. The application of the resulting models simplifies geodynamic variation estimation for individual objects under study on the basis of ratio model changes in geoelectric transfer function of the geoelectric section.

Keywords: geodynamics, a geoelectric method, seismic monitoring system, data processing algorithms

COMPOSITION OF UPPERMOST CRUST BENEATH NORTHERN FENNOSCANDIA FROM INVERSION OF SEISMOLOGICAL DATA

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ABSTRACT

This work presents the result of velocity model inversion, which has been calculated from passive teleseismic LAPNET array data. The main aim of this investigation is to compute numerical model of dry uppermost mantle beneath Fennoscandia, which could explain known velocity model and has not disturbance with geological setting, mostly xenoliths composition and minerals equilibrium. Our calculations are based on multicomponent model with elastic minerals affected by pressure and heat flow. Elastic properties were calculated using method of conditional moments in isotropic approach. Heat flow affect was accounted by Gruneissen parameters formalism. Inversion procedure is realized by least-square method, which minimize misfit between calculated and previously inverted from traveltimes velocities. Understanding that inverted velocities obtained as a shift to 1D IASP model of bulk velocity, the initial model of mineral composition for such 1D distribution were calculate firstly. This model has not significant differences to garnet lherzolite composition in uppermost mantle (beneath Moho and above of 400 km depth level). Also another models such as eclogite has been checked.

Keywords: inversion, Fennoscandia, bulk velocity, shear velocity, uppermost mantle

CONTROL STRATEGIES FOR SEISMIC ENERGY DISSIPATION

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ABSTRACT

This paper presents design criteria of passive, semi-active or active control strategies taking into account the energy characteristics for the whole system (control mechanism and structure) subjected to seismic action (NS component recorded at El Centro). If passive control systems are used for enhancing the structural damping or stiffness, the other control techniques employ controllable forces to add or to dissipate energy in a structure due to the specific devices integrated with sensors, controllers and real-time processes to operate.

The numerical analyses of the shear-type model of a single-degree-of freedom (SDOF) structure have been carried out to mitigate the energy dissipation demand for the primary structural elements in the following four cases: 1) the non-linear behavior of the primary structural system; 2) a passive hysteretic damper attached at the primary structural system; 3) an active system that applied control forces on the structural mass; 4) a semi-active fluid damper attached at the primary structural system.

Design decisions in order to choose a right control strategy regarding the reduction of energy requirement and the decreasing of the displacement response for a SDOF structure will be discussed.

Keywords: damping, energy concept, energy dissipation, ductility, seismic action.

**EFFECT OF SEMI-ACTIVE TUNED MASS DAMPER TO CONTROL
VIBRATIONS OF A THREE-STOREY BUILDING**

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ABSTRACT

This paper presents the numerical results of a semi-active tuned mass damper (STMD) attached to a three-storey building in reducing the response of the structure to harmonic and earthquake excitations. Uncertainties in dynamic characteristics of a structure as well as the frequency content and intensity of the excitation may cause a deterioration of the performance of the passive tuned mass damper (TMD). For these reason a semi-active tuned mass damper with variable damping (linear) is studied. The simulation of the semi-active clipping control strategy is performed in order to select an optimal semi-active damping for improving the performance of the TMD. In addition, this paper shows the STMDs are enough effective to diminish the vibrations induced by harmonic loads and earthquakes.

Keywords: passive tuned mass damper (TMD), semi-active tuned mass damper (STMD), vibration control, earthquake engineering.

**FROM TRAVELTIME TO COMPOSITION: A NEW INVERSION
ALGORITHM FOR SEISMIC AND GRAVITY DATA**

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ABSTRACT

A new approach to interpretation of seismic tomography data is proposed. The model based inversion is usually limited for velocity model calculation. However, uncertainties of these data within geological interpretation led us to developing a compositional based inversion algorithm. In this study joint seismic and gravity data inversion methodology are described. Parallel computing algorithm requires large datasets. The purpose of our paralleled tomography is to deliver better performance utilizing all CPU's performance as well as using installed in PC GPU. Running CUDA Kernels will have a large impact on processing time and also may affect in solving much more difficult models at the same amount of time comparing to CPU. This tomography approach could be useful both in seismological and shallower seismic investigations.

Keywords: tomography, inversion, travel-time, composition, gravity field, parallel programming.

GEOELECTRICAL METHODS APPLIED FOR PROSPECTING AN AREA WITH GEOTHERMAL POTENTIAL

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ABSTRACT

Non-invasive prospecting methods were deployed in an area with geothermal potential, not enough exploited. Occurrences of thermal springs were known to exist in the Toplita area, due to the existence of two old spa and geothermal gradient data maps.

In order to locate a new borehole, geophysical investigations consisting in apparent resistivity measurements were carried out in two areas within Toplita City.

Due to the local constrains (private properties, infrastructure, fences) measurements were performed mainly in areas where exploitation of new thermal springs would have been possible.

The recent geophysical measurements included apparent electrical resistivity investigations. Techniques deployed for field data acquisition were Electrical Resistivity Tomography (ERT) and Vertical Electrical Sounding (VES).

Following the low apparent resistivity anomalies, evidences of high permeability zones were noticed on resulted sections and models. Three locations were delineated as possible bearing thermal groundwater. Despite their close locations, differences in electrical resistivity data were noticed both on ERT and VES data.

After advanced data processing on ERT data, it was concluded that only one of them was bearing mineralized and moderate temperature water. In the selected location, a borehole (210m) was drilled and successfully located a thermal spring, having the highest temperature among known thermal water occurrences in the City area.

Keywords: geothermal resources, geophysical investigations, Toplita, Romania, electrical resistivity measurements

GROUND PENETRATING RADAR (GPR) METHOD OF GEOLOGICAL PROPERTIES OF COAL SEAMS NEAR THE SURFACE

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ABSTRACT

Requirement needed to energy increases as a result of the changes occurred in today's technologic situations. The low-rank coals of Turkey represent the country's major energy source with their relatively large geological reserves. Fossil fuels, at the present time, are the most required fuels and being estimated that they would preserve this situation in the future, although studies devoted to development as alternative of the renewable energy sources such as wind, solar and biogas resume rapidly. Thus, many research methods are required to determine the situations of the coal seams underground. In the previous years, by precising their different physical properties because of their formation in order to be determined the coal layers, researches with the different geophysical methods such as seismic, electrical resistivity and gravity were made. But, it is possible to be acquired the needed high-definition underground-sections with the development of the geophysical measuring sets and methods in today's technology. The depths including coal seams near the surface and thicknesses can be determined with the GPR method which can collect data quite rapid to the other geophysical methods relatively and providing with high-resolution underground section. It can be provided information quickly and reliably with the Ground Penetrating Radar (GPR) method about the structural elements such as faulting, translation and kinking by forming stereograms with the different measurement techniques that are used.

Keywords: ground penetrating radar, coal, Kangal coal basin fossil fuels, geophysical methods

GROUND PENETRATING RADAR DATA ACQUISITION AND ANALYSES AT THE MOST HOLY TRINITY CHURCH IN STEBARK, POLAND

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ABSTRACT

Ground Penetrating Radar (GPR) is a geophysical technique mainly used for shallow acquisition and works on the basis of sending electromagnetic waves vertically down to the ground, detecting the response. Data are usually affected by instrumental and environmental noise. The work presented in this research aims to illustrate the processing steps done on the data acquired at the Most Holy Trinity Church in Stębark, Poland. The acquisition was conducted in order to try to detect medieval knights' graves which can be there since Grunwald Battle in 1410. Initially, the acquisition was done on the several sites in order to detect the areas of interest where more detailed acquisition will be conducted. Only in the main room of the church there were found some anomalies and afterwards, data were recorded and processed using a 2D module of REFLEX and after that interpreted using 3D module to provide better understanding of a certain subsurface anomalies.

Keywords: Ground Penetrating Radar (GPR), The Most Holy Trinity Church in Stebark, The Battle of Grunwald, Global Navigation Satellite System (GNSS), Geographic Information System (GIS).

HYBRID KINEMATIC-DYNAMIC SEISMIC WAVE MODELLING

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ABSTRACT

The efficient hybrid kinematic-dynamic technique for finite-difference (FD) computation and storing the seismic wavefields is presented. At every time step of the FD scheme computations are done only in the moving window, around the first-arrival wave front that is consistent with the dominant wavelength. The specific feature of the proposed method is that all computational arrays: velocity, density, particle velocities e.t.c are stored in the original first-arrival traveltimes increasing order. The presented fashion allows us to obtain significant reduction in memory requirements and CPU time for first-arrival waveform computations. The considered approach allows one to store the wavefield in the window at every time step. That is very useful for constructing gradients for wave-equation based seismic data inversion methods, such as full waveform inversion, reverse time migration, wave equation tomography and other. The proposed forward modelling method is illustrated by numerical examples.

Keywords: geophysics, seismic waves, numerical modelling, finite-difference methods, eikonal equation

**IMPROVED METHODOLOGY TOWARDS A QUANTITATIVE ASSESSMENT
OF SITE EFFECTS EMPLOYING GEOPHYSICAL
AND SEISMOLOGICAL DATA**

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ABSTRACT

The evaluation of seismic hazard and mitigation of the seismic risk is one of the permanent and urgent problems facing the Romanian society, equally implying work of seismologists, geologists and engineers. Significant efforts were made to predict the peak values and spectral characteristics of the strong motion in large urban areas, like Bucharest. At the same time, important efforts were made to determine the site effects and microzonation maps for the same city.

Bucharest, the capital of Romania, with more than 2 million inhabitants, is considered after Istanbul the second-most earthquake-endangered metropolis in Europe. Four major earthquakes with moment-magnitudes between 6.9 and 7.7 hit Bucharest in the last century. The most recent destructive earthquake of 4-th March 1977, with a moment magnitude of 7.4, caused about 1.500 casualties in the capital alone. All disastrous earthquakes are generated within a small epicentral area – the Vrancea region - about 150 km north of Bucharest.

The present study will lead to an improved methodology of assessment of local seismic hazard (microzonation) of sites of specific interest.

It is already known that, from January 2011, all EC countries are obliged to implement the Eurocodes. Eurocode 8 deals with Earthquakes. The existing European Building Code Eurocode 8 (<http://eurocodes.org.ua/>) must be critically reviewed by specialists in each country and improvements should be suggested in order to adapt it to the Carpatho-Balkan region and to the specific seismic hazard in Romania.

This paper will introduce an improved and updated methodology of seismic hazard evaluation (microzonation) of relatively low cost and suitable to be applied in large cities or at industrial objectives of national interest, like nuclear power plant of Cernavoda, big dams, industrial constructions, etc. This will be a direct contribution to reduce the seismic risk and towards an improved seismic safety in large cities, like Bucharest City, capital city of Romania.

Keywords: destructive earthquake; improved methodology of microzonation; site effects.

INTEGRATED METHODS FOR ANALYSING AN AREA AFFECTED BY OIL AND WASTE WATER POLLUTION

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ABSTRACT

In the vicinity of a refinery the shallow aquifer system is severely affected by historical oil pollution. Large quantities of petroleum products leaked into the ground during time, and despite the remediation actions, floating contaminants plumes are still affecting the area.

By means of borehole data, a highly contaminated area was delineated, corresponding to a sector located inside the refinery and its vicinity. The first evidences of the aquifer pollution date since 1976, when the polluted area was analyzed, considering the floating- oil plume thickness. Even though the oil recovery processes executed in the area and the efforts made for diminishing the oil leakages, nowadays the geological formation and the groundwater are still affected by past contamination (residual fractions trapped into the soil) and recent leaks, as a consequence of handling accidents during storage and oil products transport.

Since 2003, more accurate investigations were carried out in this area, consisting in volatile organic compounds and total hydrocarbon measurements. The samples were collected using over 150 boreholes (Phare RO 9910.02 project, coordinated by APM-PH). The total sum of benzene, toluene, ethylbenzene and xylenes (BTEX) showed great variability both in time and space (2003 - 2006).

According to the results of total hydrocarbons analyses, the contaminant plume developed in the south-eastern part of the refinery, the light non aqueous liquids affecting the phreatic aquifer and the soil.

Due to the complex situation, in the frame of the research project GEOMON, a non-invasive investigation method was tested. Geoelectrical resistivity measurements were performed along profiles crossing the south-eastern sector of the contaminated plume. As the electrical resistivity data showed a good applicability in evidencing the contaminated areas, the geophysical investigation was extended. Eight field campaigns were completed from summer 2007 till spring 2014, to monitor the evolution of the contamination plume.

Monitoring measurements showed important changes regarding electrical signature of the polluted aquifer. Apparent resistivity values for some of the VES stations were

subject to a detailed time-lapse analysis. Considering the first apparent resistivity measurements (Summer 2007) as a reference base, percentage differences sections were constructed for the successive time intervals. Significant variation between data sets (> 25% of apparent resistivity normalized differences) observed along the VES profile were mainly ranging from the near surface (2m) to a depth of 8m, evidencing the effect of groundwater water table vertical displacements.

As depicted from the geophysical data, from Summer 2007 till Summer 2008 the intensity of the oil pollution has decreased, but in Spring 2009 the intensity of the hydrocarbon pollution was again high. Till Spring 2014, the apparent resistivity data did not overcome the apparent resistivity results of 2007.

Geophysical measurements, but also chemical analyses of water samples, showed that the aquifer is affected also by discharged industrial water, being unusable for drinking or agricultural purposes.

Keywords: Vertical Electrical Sounding, oil pollution, apparent electrical resistivity, environmental pollution, phreatic aquifer contamination

INTERACTION BETWEEN SEISMIC AND GEOMAGNETIC FIELD

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ABSTRACT

This paper analysed physical known parameters which connect changes in mechanical field of the matter with electromagnetic wave occurrence. Previous laboratory investigations and theoretical prediction from Pride (1994), gives hope for detailed analysis of magnetograms to discover the seismic effects of disturbance of the magnetic field.

In this paper is studied influence of the earthquake from 12.10.2013 in Crete, Greece, or magnetograms from geomagnetic stations on Plackovica and Skopje. Because of the low value of the amplitude of geomagnetic variation caused from seismic action, the transformation was made in the geomagnetic field in dH/dt time domain.

The area of expected impact of seismo-magnetic phenomena in the magnetogram is defined, depending on the distance between the source of the earthquake and the area where magnetogram is registered (geomagnetic observatory), taking into account propagation velocity of the seismo-magnetic disturbances.

Successful laboratory experiments and basic theory for correlation of seismic and geomagnetic field gives opportunity for development of seismomagnetism.

Keywords: interaction, seismicity, geomagnetic field, relation

MAPPING THE RESONANCE FREQUENCY OF SEDIMENTARY LAYERS IN THE VICINITY OF A PERMANENT SEISMIC STATION IN UNDERMINED AREA

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ABSTRACT

This paper presents an analysis of site effect in Stonava locality, the Karviná region (Czech Republic). This region is a populated area, where underground mining activities are still active, and the vibration effect on the surface has been documented by observations for a long time. The vibration effect on the surface, mainly mining induced seismic events, is evaluated using solitaire seismic stations situated in selected surface objects. Local geology in the area of Stonava is very complicated. A thin layer of Quaternary sediments covers the Tertiary sediments of a different thickness (400 – 600 m) and a different stiffness. Several significant faults have also been found there. The local geology has a significant influence on the intensity of vibrations on the surface. The first studies by means of spectral ratio methods were carried out in the Karviná region mostly from the records of mining induced seismic events generated in the Karviná Coalfield. It was found out that the spectral ratio exhibits significant peaks in localities covered by sedimentary layers. These ratio curves for individual measured points document the significance of amplification of seismic effect on the surface in this area. Two or more peaks were often detected which indicates a complexity of subsurface layers. From the geological point of view, it is also necessary to consider changes of hydro-geological regime of the area and a deformation of the terrain. This effect might be evaluated e.g. by using special maps of potential conflicts of interest between the use of residential area and mining effects. The maps have been developed to estimate possible seismic effect in undermined areas with different classes of foundation conditions. It has also been found out that an area of about 2 x 2 km needs at least two seismic stations: One in favourable foundation conditions and the other one in critical foundation conditions as the seismic effect may vary due to changes of geological conditions. This paper summarizes the evaluation of resonance frequency of sedimentary layers in a selected locality. Short-term measurements of seismic noise were performed at about 15 places near the permanent seismic station in Stonava village. Resonance frequency was determined using the HVNR method (horizontal to vertical noise ratio). Obtained results were compared with the previous ones specified for the permanent seismic station.

Keywords: HVNR method, mining induced seismicity, undermined area, site effect, seismic noise

**MICROGRAVITY MONITORING DISCONTINUOUS TERRAIN
DEFORMATION IN A SELECTED AREA OF SHALLOW COAL
EXTRACTION**

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ABSTRACT

This paper presents an example of possibility of using the microgravity method to locate voids and loosen zone of subsurface party, in the selected area of the former coal mine "Siersza". Physical basis on which this method is based allow to use it to predicting the effects of shallow mining activities on the surface even before this results can be seen as continuous and discontinuous deformation of the ground surface.

Microgravity research evaluation of the rock mass are conducted usually in the form of microgravity monitoring, that study gravity field changes in time. This allows to determine what changes are in rock mass which was subjected to human pressure and at what pace and direction of these changes are progressing.

Keywords: microgravity method, effects of shallow mining, microgravity monitoring, discontinuous deformation

**NUCLEAR SEISMOLOGY: THE CASE OF THE PORTO (PTO) WORLD-WIDE
STANDARD SEISMOGRAPHIC NETWORK WWSSN STATION**

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ABSTRACT

The Geophysical Institute of the University of Porto (IGUP) constitutes an important pillar in the scientific and technological culture, developed over more than a century in the city of Porto. A strategic plan for its recovery has been recently developed. In terms of instruments there are currently some instruments related to seismology, meteorology and radiation, which are directly related to the measurement of variables involved in the estimation of seismic hazard and risk, meteorological hazards and radiological hazards. Thus IGUP has the potential to become a center for research in the field of Natural Hazards that in turn may contribute to studies, data and parameters for civil society and the scientific community.

The Recovery that is already underway in seismic station, previously included as PTO in the world network known as *Worldwide Standardized seismographic Network* (WWSSN), can help achieve the implementation of a complex research in seismology and simultaneously acknowledging the geopolitical importance of this stations records.

With the current work we intend to show a brief analysis of a few previously unknown seismic records, relating to Soviet nuclear explosions, as well as a few aspects of the the digital signal conversion adaptation of the previous 1960s analogue equipment.

Keywords: Seismology, Nuclear Test, WWSSN

PARAMETRIC ANALYSES OF REINFORCED CONCRETE STRUCTURES USING SCREENING DESIGN

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ABSTRACT

Two typologies of planar reinforced concrete structures - frames and shear walls were analyzed. The determination of the parameters having the highest influence on the structural response (the so-called "Screening Design") was performed using Fractional Factorial and Plackett-Burman Designs of Experiments. These two types of experimental designs were chosen taking into consideration a large number of parameters during the analyses. One target is obtaining a reasonable number of combinations of the parameters so that it would result an equal number of structural models. The influence of each structural parameter on the structural response will be determined using a first order linear regression model.

The results indicate that the distinct behavior of reinforced concrete frames in comparison with reinforced concrete shear walls is the result of the influence of different structural parameters on their seismic response.

Keywords: Screening Design, parametric analysis, Fractional Factorial Design, Plackett-Burman Design, reinforced concrete structures

PARAMETRIC ANALYSIS OF THE BUILDINGS BEHAVIOUR UNDER EARTHQUAKES IN CONTEXT OF VRANCEA SEISMICITY

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ABSTRACT

There are three components of the seismic risk assessment: seismic hazard, vulnerability of structures and elements at risk. Seismicity of Vrancea is characterized by a source process and some spectral characteristics of this intermediate-depth source in a narrow epicentral and hypocentral region. Frequency content of the Vrancea ground motions shows significant differences in source mechanisms, a directivity between events, an asymmetric distribution of the ground motion, soil condition with long predominant period of ground vibration, $T_g=1.4-1.6s$, in Bucharest. Objective of the present paper is to present a parametric analysis of the building behaviour under earthquakes in context of Vrancea seismicity. In order to get the building's future performance, a parametric analysis from qualitative and quantitative point of view was made. Qualitative evaluation is based on the inspection and on the examination of the building, being characterized by inductive approach to data gathering, interpretation, and reporting. For structural analysis using the response spectra both software ROBOT and SAP2000 were used. Quantitative evaluation aims mainly at determining the conventional capacity to the seismic loads of the inspected building and determining the structure's stiffness to lateral displacement.

Keywords: Vrancea earthquakes, qualitative and quantitative evaluation methods, seismic risk assessment

**PROCESSING AND INTERPRETATION OF GRAVIMETRIC DATA BASED
ON «NATIVE» CONTINUOUS WAVELET TRANSFORM**

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ABSTRACT

In this study we present a method for interpretation of gravimetric data based on the so-called “native” wavelet basis. We show that this approach has several distinct advantages over commonly used methods, including a simple way of obtaining formal solutions of the inverse problem, easy identification of the causative sources, and efficient search for solutions of the nonlinear inverse problem in the wavelet domain.

Keywords: gravimetry, Bouguer anomaly, inverse problem, wavelet transform

PROFILE SEISMOLOGICAL MEASUREMENT DURING WINDING TOWER DEMOLITION

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ABSTRACT

This paper describes experimental measurements of seismic effect originated during demolition of a reinforced-concrete winding tower in the area of former company “Rudné doly” in Zlaté Hory (the Czech Republic). A short mining history of the deposit in Zlaté Hory is included. The winding tower, situated above the abandoned mining pit, was demolished using blasting operations on April 15, 2011. Seismological measurement was performed by six three-component sensors in the profile of 250 m long for the purpose to obtain the information on the effect of vibration in the near zone. Recorded wave patterns caused by demolition can be divided into three phases in accordance with the visual observation – the first phase caused by blasting, the second one caused by settling of a separate part of the tower to its foundations, and gradual tilting, and the third phase caused by falling of a separate part of the tower to the ground. Vibration effect during those individual phases is analysed in this article in time and frequency domain. The analysis documents a direct demonstration of the blasting operation with recorded air pressure induced wave. A complex combination of successively emerging waves, including surface wave with a significant harmonic vibration during the second phase of demolition, is also identified. In order to get more detailed information on the source of recorded harmonic vibration, analysis of resonance frequency of soil layers along the profile was performed. Geological search study, including the description of borehole in the area, documents that rock massif represents slates covered by disintegrated rocks and shallow layer of loams. Experimental measurement of seismic noise was carried out at 11 points along the profile of the length of almost 210 m. The data were analysed and resonance frequency was determined using the HVNR method. The seismic refraction measurement was also performed in the same profile to specify local geology in order to complete the results of seismic noise measurement.

Keywords: demolition, blasting operation, vibration effect, frequency analysis, site effect

**RELATIVE DATING THROUGH LICHENOMETRY OF THE PERIGLACIAL
LANDFORMS FROM THE UPPER BASIN OF CAPRA VALLEY, FĂGĂRAȘ
MOUNTAINS, ROMANIA**

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ABSTRACT

Făgăraș Mountains were an interesting subject for many researchers during time, for they are the highest mountains in Romania, and they represent the place where glacial and periglacial landforms are specific. We will analyse the specifics of periglacial landforms in the Upper basin of Capra Valley in Făgăraș Mountains, as being representative for this area. Periglacial landforms as debris slope, rock glaciers, avalanche paths are very complex and various. For a better understanding of the dynamism of these landforms, determined by the frosting-thaw processes, different lichenometric methods and Schmidt Hammer tests were apply. The largest lichen from a landform is the oldest from that area, so we measured the period when the surface of the rocks started to weathered. We determined the relative age of the landform and periods with intense dynamism. For a better understanding of the frosting-thaw processes, the Schmidt Hammer tests were applied on the landforms but also on the steep slope nearby. We compared the results with other similar studies from Alps and Tatra Mountains, to improve the understanding of periglacial landforms dynamism of the last 200 years or even more, from the Romanian Carpathian Mountains, being the first study that used lichenometric methods on this area.

Keywords: lichenometry, Schmidt Hammer tests, periglacial landforms, Făgăraș Mountains

**SEISMIC RISK EVALUATION OF TYPICAL RESIDENTIAL BUILDINGS OF
ROMANIAN URBAN AREAS – GIS-BASED TOOL FOR THE CITY OF IASI**

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ABSTRACT

Natural disasters can strike anytime and anywhere. It is, therefore, the duty of the civil engineer to make sure that buildings remain safe during the occurrence of such events. The paper presents a risk evaluation methodology for the Iasi Municipality, a city located in the North-Eastern Romania, characterized by an existing built-up area. The methodology is based on the non-linear finite element analysis of a specific class of residential buildings widely used in Romanian cities. The structural model is subjected to a real Romanian earthquake scenario in order to assess its behavior and degree of degradation developed during the life span of the structure. The visualization of the seismic risk of the considered structure in a selected urban sample is achieved by using NetSET GIS-software. This enables the mapping of the vulnerable areas affected by past earthquakes together with forecasting the seismic risk, both being key features for decision makers.

Keywords: seismic risk evaluation, residential buildings, non-linear FEA, GIS

SEISMIC SAFETY OF INDIVIDUAL BUILDINGS IN ROMANIAN RURAL AREAS

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ABSTRACT

In Romania the rural area is about 90% of the country territory and the share of rural inhabitants, among the highest in Europe, amounts to 47.3% of total population. According to the new seismic design code of buildings, approximately 50% of Romanian territory has a ground acceleration upper than 0.12 g. In these conditions, the article presents some seismic protection measures considered by the owners in the execution of own buildings. Many things of both negative and positive, from the Vrancea 1977 earthquake have learned. Some structural shortcomings of buildings with one or two storey, which were observed at the incidence of intermediate Vrancea earthquake of March 4, 1977, will be emphasized. Also, strengthening solutions are presented as a result of lessons learned from this seismic event. Some structural types like timber structure with bracing and walls with OSB panelling, timber-frame structure filled with masonry brick and mixed structure, with rigid base from masonry and floors with timber frame structure. It is interesting how the transition is made from the rigid structure to the flexible one, knowing that the amplification of efforts appears at the top of them. It is studied how it is treated "the design" of these buildings which is the evidence of local seismic culture, where the flexible system is stiffened by bracing and the beams are arranged by the two orthogonal directions in the plane. The general idea is that in rural areas, even in those affected by earthquakes, an acceptable vulnerability of buildings with a minimum transfer of knowledge in the local community can be maintained. The public policy for seismic safety in rural areas should involve at least four stakeholders: the residents, authorities, researchers and education system.

Keywords: non-engineered buildings, masonry, timber, bracing, belt beams, code rules, Vrancea earthquake.

SELECTION AND PARTIAL PROCESSING GEOMAGNETIC SIGNALS IN MAGNETOTELLURIC OBSERVATIONS

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ABSTRACT

Nowadays efficient algorithms processing and interpretation of the recorded electromagnetic signals in magnetotelluric sounding are developed and widely used. However, the using of irregular natural sources of electromagnetic fields for studying and monitoring the natural environments associated with some problems. Purpose of this work is development of algorithms for selecting and regression processing of partial geomagnetic signals during directional analyzing magnetotelluric observations in the monitoring system of pulsed geomagnetic sources on the basis of the model of plane inhomogeneous waves. In paper we obtain a ratio of error estimates for determining the polarization characteristics in the field registration points. They allow synthesizing directional analysis algorithms. Its can be directed at optimizing the construction of measuring systems and the optimal selection of geomagnetic disturbances in the organization of monitoring pulse geomagnetic sources. We offered techniques and algorithms for partial processing of geomagnetic signals. This allows us completely resolve the ambiguity estimates epicenter geomagnetic disturbance, which is typical for the traditional regression analysis conducted by an invariant polarization characteristics.

Keywords: geomagnetic signal, parcial processing, magnetotellurics.

SOIL-STRUCTURE DYNAMIC INTERACTION EXPERIMENTAL ANALYSIS DUE TO RAILWAY TRAFFIC

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ABSTRACT

Nowadays the matters of structural elements vibration due to microtremor involved by railway are more actual. Objective of this paper was to analyze the vibration wave's propagation from traffic line which causing structural vibration in buildings including a process of the system soil structure interaction (SI) due to traffic microtremor. Based on the results of this work applying of the dynamic interaction coefficient is an effective way. Using of the theoretical analysis and experimental procedures results it seem to be the practical application of engineering practice in prediction and assessment buildings vibration due to seismicity induced by transport.

Keywords: vibration, railway, spectrum, soil, interaction

SOILS MECHANIC CHARACTERIZATION AIMED AT THE SEISMIC RISK ASSESSMENT IN THE SULMONA BASIN

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ABSTRACT

Intermountain basins are a peculiar physiographic feature of the Apennine range in Central Italy. With flat extensions up to hundreds of km², these basins are endoreic depressions of tectonic origin characterized by a high seismicity and their morphology facilitate the development of important urban settlements and productive activities into the Apennine chain. In this paper are presented data from multidisciplinary investigations carried out in the central-western sector of the Sulmona intermountain basin, where main productive activities are located, aimed at the assessment of safety conditions of industrial plants regarding natural risks, namely the seismic hazard.

Geomorfologic investigations, geoelectrical (VES) and seismic refraction prospectings were carried out to obtain a general framework of the main geological characteristics of the area. Subsurface layers are characterized by lithological bodies with different resistivity values and with different deformability properties, in agreement with the presence of lateral and vertical *facies* heterotopias, typical of the basin depositional framework. Collected data allowed to localize sites for the execution of mechanical soundings in which further were carried out cross-hole (waves-P and S) investigations; informations were used to integrate and validate previous data stored in a geognostic database and to compute the ground dynamic modula E and μ and the Poisson ratio (ν).

Local seismic response induced by seismic waves travelling from the bedrock was performed by software Shake[®]. Data input of subsurface layers were provided both by geophysical prospectings and cross-hole investigations; diagrams for the computing of G/G_{\max} ratios and damping values were obtained from literature. Results showed that seismic shaking leads to a maximum amplification in the 2-3 Hz and 5 Hz frequencies range and is equal to a factor of 5.5; as the spectrum frequencies values increase, the amplification reduces until it drops by about a fifth in the 20-25 Hz range. These values indicate the presence of conditions for a significant amplification of seismic waves and also processes of potential liquefaction phenomena in soft and un-cohesive soils.

Keywords: geognostic investigations, local seismic response, industrial activities, seismic risk.

**SOLUTIONS OF INVERSE PROBLEM OF GRAVIMETRY ON THE SPHERE
USING "NATIVE" WAVELET TRANSFORM**

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ABSTRACT

In this study we present a method for interpretation of gravimetric data obtained on spherical surface based on wavelet transform with the so-called “native” wavelet basis. We show that this approach has several distinct advantages over commonly used methods, including a simple way of obtaining formal solutions of the inverse problem and easy identification of the causative sources.

Keywords: gravimetry, inverse problem, wavelet transform

THE FORKLIFTS GROUNG VIBRATIONS EFFECTS ON THE SENSITIVE MACHINES

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ABSTRACT

Vibrations caused by passing forklifts used in manufacturing facilities can affect the quality of the production activity. The vibration velocity of concrete slabs, which passes through forklift can be determined with measuring line. In the paper is presented the case study with measurement due to cramped conditions realized in two stages.

Keywords: forklifts, vibration, frequency spectrum, vibration velocity, vibration acceleration

**UNDERGROUND GRAVITY SURVEY
FOR EXPLORATION UNKNOWN GALLERIES**

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ABSTRACT

The author presents the results of underground gravity survey carried out in three galleries of object "Osówka", which is part of the post-war complex "Rise" in the Owl Mountains in Poland. The structure was drilled in the gneiss. The aim of this survey was detection of the hypothetical galleries lying below the elevation level of survey. Results have shown the possibility of using the gravimetric method to explore galleries located under the measurement profile. Carrying out the correct interpretation is possible on condition the precise spatial projection of existing galleries. This projection allows for correct calculation of the gravitational effect of the excavation and remove it from measured values of gravity. Unfortunately, this survey has not confirmed the existence of an unknown gallery

Keywords: underground gravity, gallery, excavation, double Bouguer anomaly

THE SEISMIC RETROFITTING OF ROMANIAN SKETE PRODROMU NORTH WING FROM MOUNT ATHOS

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ABSTRACT

Prodromu Romanian Skete, dedicated to John the Baptist is one of two Romanian convents on Mount Athos (along Lake Skete) and depends on the Great Lavra monastery. It is situated in eastern end of the Athos peninsula called Vigla in a desert land, rocky and haunted by storm. For these reasons, the hermitage was named St. John the Baptist (Prodromu in Greek language). The place is wild, wonderful natural beauty, favorable to hermitage and contemplations. The place was loved by hermits, eager high spiritual life. Officially founded in 1820, Prodromu Romanian Skete consists of a central church surrounded by four wings of the building (north, south, east or west). With exterior perimeter structure consist of stone masonry and mortar of clay and volcanic ash from Santorini, 70-120 cm thick, and a wooden interior structure, all components of building buildings were damaged in the nearly 200 years because of weather and earthquakes. Located in an advanced state of decay, the northern wing is seismic and gravitational vulnerable and require urgent intervention to bring him to the structural safety. The work contains particular aspects of retrofitting this historical heritage building.

Keywords: Prodromu, skete, stone, masonry, retrofitting.

**A MODERN RETROFITTING SOLUTION
FOR EXISTING MASONRY BUILDINGS SEISMICALLY VULNERABLE**

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ABSTRACT

In the entire world there is a huge number of existing masonry buildings with masonry structural walls system made of: stones, solid or cored bricks. Because of their emplacement in the earthquake or mining subsidence areas for a lot of them a retrofitting solution must be adopted as quick is possible. The use of composite materials in religious buildings and historical monuments, include two key principles, supported by the Venice Chart (1964), namely: structural interventions are less visible and does not alter the appearance of the building; action is reversible, with the possibility of disassembling initially established in the event of non-performance. Composite building efficiency is obtained only by ensuring adequate anchorage length at the ends of the material.

Keywords: FRP, polymer, grids, strength, node