GENERALIZED AVERAGE OF SIGNALS (GAS) - A NEW METHOD FOR DETECTION OF VERY WEAK WAVES IN SEISMOGRAMS

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Abstract

A novel method called Generalized Average of Signals (GAS) for detection of very weak waves in seismograms is described and tested. The general principle of the GAS method is to take advantage of the coherency of the signal, which is extracted. The signals are shaped with moving window and converted to the frequency domain. Then they are non-linearly summed considering their complex representation (amplitudes and phases). The method improves signal-to-noise ratio of coherent seismograms considerably. The GAS method is tested on synthetic seismograms and compared with the PWS method.

KEYWORDS: Generalized average of signals, signal-to-noise ratio, coherent stack, non-linear sum

MOHO REFLECTIONS FROM STRONG NEAR QUARRY BLASTS: AN EXAMPLE FOR THE CENTRAL ORE MOUNTAINS, CZECH REPUBLIC

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Abstract

The present paper describes a method for identification of reflected waves on the seismograms from a cluster of quarry blasts. These reflections are used for determination of the Moho depth. Only one seismic station is sufficient, but a cluster of seismic sources is needed. To increase the signal-to-noise ratio of reflected waves, several techniques are applied, such as filtering, polarisation analysis and stacking of seismograms. The method was tested on seismic data from the central part of the Ore Mountains region, Czech Republic. Seismic waves were generated by strong quarry blasts at the Tušimice open-pit coal mine, and recorded at the Přísečnice (PRI) temporal seismic station at an epicentral distance of about 16 km. As the station was equipped with a three-component seismograph, also S-wave onsets could be determined. Although Pg, Sg and surface waves dominate the seismograms, weak Moho reflections of P and S waves could also be recognized at travel times of 9.7 s and 17.3 s, respectively. From these times we found the mean ratio of the P- to S-wave velocities in the crust to be 1.78. Considering P-wave velocity model of Beránek (1971), the observed travel times of the reflections yield a crustal thickness of 29.5 – 31.5 km, which agrees with recent receiver function studies. These agreements indicate that the proposed method of reflected seismic waves, generated by quarry blasts, could represent a simple way for mapping the Moho discontinuity.

KEYWORDS: Moho reflection, crustal thickness, quarry blast, Ore Mountains

ASSESSMENT OF P-WAVE ANISOTROPY BY MEANS OF VELOCITY ELIPSOID

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Abstract

A method for estimation of elastic wave velocity anisotropy based on ultrasonic sounding data during rock-sample loading was developed. The subject matter of the method is approximation of ultrasonic sounding data by triaxial velocity ellipsoid. The applicability of proposed method was verified on investigation of anisotropic rock samples.
Laboratory loading of migmatite samples was realized under various mutual orientations between acting force direction and rock foliation – perpendicular, parallel and under 45°. P-wave velocity of ultrasound waves was monitored by 8 sensors network. The velocity ellipsoid was computed and changes of sizes and orientation its main axes during loading were analyzed for separate experiments with regard to loading level. It was found, that independently to mutual orientation between rock foliation and loading direction, the minimum velocity vector turns to perpendicular direction to final rupture plane and maximum velocity vector turns to the plane of final rupture.

MINERALOGY OF THE CLAY GOUGE ON PRAGUE FAULT

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Abstract

The research has dealt with mineral composition of the dislocation clays developed on the Prague fault. The Prague fault is a tectonic boundary between underlying clayey slates of Záhořany series and Skalka quartzite. The fault zone is filled with clay or sandy-silt to silty-sand matrix with scattered fragments of the surrounding rocks either slates or quartzite. Quartz, illite, kaolinite, chlorite, sporadic feldspar and gypsum were identified in powdered preparations by X-ray diffraction. The clay fraction of the taken samples is composed of illite, less kaolinite and sporadic chlorite and gypsum.

CHARACTERIZATION OF ANTHROPOGENIC INFLUENCE ON THE SOIL COVER ON SELECTED LOCALITIES OF PRAGUE

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Abstract
The character of soil cover in anthropogenically affected areas was determined on the basis of soil morphology, particle size distribution, soil chemical properties, soil organic matter properties and mineralogy of clay fraction. The degree of anthropogenic influence was variable in the individual soil profiles. This is probably the first time that data on hot-water extractable carbon distribution in soil profile were obtained from the territory of Prague.

KEYWORDS: soil development, clay mineralogy, anthropogenically affected areas of Prague, loess, hot-water extractable carbon

INVESTIGATION ON INFLUENCE OF THE NUMBER AND LOCALIZATION OF STATIONS ON ESTIMATION ACCURACY OF THE PLATE MOTIONS

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Abstract
This paper concerns an analysis of accuracy of estimated parameters which define the tectonic plate motions. The study is based on the velocities of station positions published by ITRF2000 for (Satellite Laser Ranging) SLR and (Global Positioning System) GPS technique, separately. The Eurasian, North-American, Australian and Pacific plates were analysed. Influence of the number and localization of stations on estimation accuracy of the tectonic plate motions for SLR and GPS technique were analysed. The discrepancies were discussed.

KEYWORDS: SLR and GPS techniques, the coordinate shifts, the tectonic plate motions

SORPTION OF ALKYLAMMONIUM CATIONS ON MONTMORILLONITE

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Abstract
Adsorption procedure of two cationic surfactants hexadecyltrimethylammonium bromide (HDTMABr) and benzyldimethylhexadecylammonium chloride (BDHDACl) onto two samples of montmorillonite was studied. Infrared spectroscopy and X-ray diffraction proved intercalation of both quaternary cations into the interlayer space of montmorillonite. An aspect of time showed not to be important for the cations adsorption.

ALUMINIUM COMPLEX IN COAL

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Abstract
On the basis of solid-state aluminium-27 nuclear magnetic resonance measurements a new organo-aluminium complex in coal substance was discovered in the solid extracts obtained both from the Ostrava-Karviná bituminous coal and the North Bohemian Basin brown coal. In the 27Al MAS NMR spectra it was found that the significant chemical shift at 13.6–14.6 ppm corresponds with that obtained for the aluminium hexaphenoxide complex (14.2 ppm). Therefore, organo-aluminium complex with hexa-coordination to oxygen is present in coal substance.

A NEW METHOD OF ASSEMBLING LARGE MAGNETIC BLOCKS FROM PERMANENT NdFeB MAGNETS

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Abstract

The presented technological procedure makes it possible to assemble large magnetic blocks from permanent magnets with a high value of maximum energy product in such a way that the individual magnets or magnetic plates are moved toward each other at a controlled speed in the direction perpendicular to the future common contact surface of these magnets, i.e. parallel to the induction lines crossing this contact surface. Unlike in the previously used way of assembling the blocks, it is thus possible to eliminate the influence of partial demagnetization as the blocks are being assembled and consequently to reach higher values of magnetic induction in the air gap of the magnetic circuit. When applying the new method of assembling the blocks for instance in circuits of magnetic filters for the purification of ceramic suspensions, a prerequisite for the further improvement of the technological parameters of filtration is thus created.

KEYWORDS: Magnet assembly, magnetic circuits, magnetic separation, magnetic filtration, permanent magnets, NdFeB magnets, large magnetic blocks

KINETICS AND MECHANISM OF CURING EPOXY/ANHYDRIDE SYSTEMS

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Abstract

The paper reports the results of studying the kinetics of DGEBA reactions with maleic anhydride catalyzed by N, N-dimethyl aniline (DMA). This stuffs are used as photoelastic model materials. The origination of monoester was studied separately on a model reaction of maleic anhydride with isopropyl alcohol. The subsequent reaction of epoxy groups with monoester was examined on a system of epoxy resin and isopropyl maleic monoester. The curing process depends significantly on the content of hydroxyl groups in the system.

KEYWORDS: epoxy resins, anhydrides, kinetics, catalyzed, model reactions