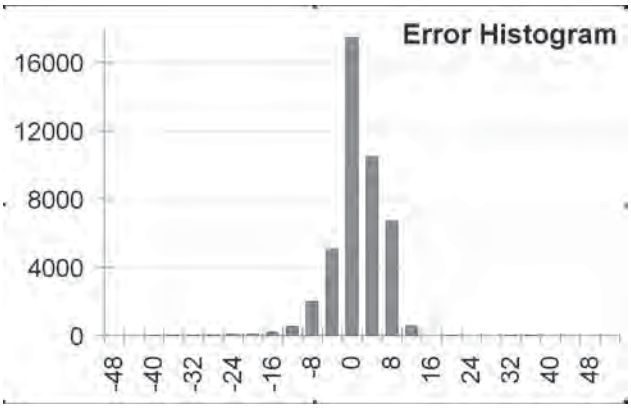

Fig. 2: Error histogram of the WAR picks results.

„Wave area" is defined as the area of linear polygons of one half-cycle seismic waveform. Based on the observation that the first full cycle of the first break waveform is rather consistent throughout a shot gather and still very similar for adjacent shots, it is proposed to use the ratio of the areas of first (positive) half cycle to second (negative) half cycle as a characteristic quantity. The principle of this approach is sketched in Fig. 1. W_{ij} denotes the area of the half-cycle of window *j* of trace *i*: window 1 represents the positive lobe of the waveform (peak) and window 2 the negative lobe (trough). The ratios of areas 1 and 2 (W_{11}/ W_{12}) should be similar when identical polarity of neighboring traces is assumed.

In WAR method, amplitude spectra of the both traces are used together with wave area ratios as secondary properties for alikeness. It is assumed that spectral characteristics before and after first break show similarities for the adjacent traces. In the detection algorithm, again two windows are used to compare spectral properties. It is claimed that ratio of standard deviations of the amplitude spectra of two windows should be similar for the adjacent traces (Figs. 1, 2).

Proposed method is tested on a 3D seismic data set which has 1,4 million traces. At first, 52000 traces are manually picked for the comparison. After that, first arrival times are calculated using the WAR method for the same data. Differences between the manual pick and auto-pick values are calculated. These differences show an error limit for the WAR method and are used to create error histograms. Statistical evaluation of the error histograms shows that, WAR method can detect first breaks with 95,8 % accuracy within the range of 8 milliseconds. In this case, the range of 4 milliseconds is accepted as good quality picks.

Test results show that proposed method can be considered as high probable accurate method. The WAR method can be improved using wavelet estimation to calculate the onset of the first break wave. Moreover, a statistical method can be used to evaluate the validity of the estimated first breaks to avoid miss picks.

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Geochemistry of biotites in the Shah Jahan Cu-Mo-Au mineralized batholith (NW Iran) and its petrological and metallogenic implications

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The significance of biotites for metallogenic studies results from their widespread occurrence in magmatic, metamorphic and hydrothermal ore-related environments (Selby & Nesbitt 2000). Chemical composition of biotites in the felsic intrusion associated with ore deposits *can be used to distinguish* between mineralized and barren plutons. This study focuses on chemical composition of biotites from Shah Jahan batholith in order to understand some of the magmatic and hydrothermal events that led to the formation of ore deposits related to the intrusion. The Shah Jahan batholith is the largest granitoidic intrusion in the main porphyry Cu ± Mo ± Au metallogenic belt of NW Iran which is located in the lower Cenozoic continental arc. The study area consists of three different intrusions in the interior part of the Shah Jahan batholith and is situated at 35 km distance to the northwest of the Sungun Cu ± Mo porphyry mine. The Shah Jahan granitoids are chemically characterized by calc-alkaline, meta-aluminous and I-type bodies that generated in a continental margin magmatic arc above a subduction setting (Mokhtari 2009). Biotites of Shah Jahan granitoids are divided into magmatic and secondary hydrothermal types. Igneous biotite usually occurs as euhedral to subhedral phenocrysts. Altered igneous biotites are commonly observed in the late magmatic or hydrothermal alteration assemblage and are partially or completely chloritized. Secondary biotites are inferred from aggregates of fine-grained flakes of biotite that were precipitated from hydrothermal fluid responsible for potassic alteration. These assemblages occur as either partially or completely replacement of magmatic biotite and hornblende or precipitated throughout the potassically altered rock and in envelopes of quartz veins. Studied samples contain mainly magmatic fresh biotite with rare chloritization. X_{Mg} (Mg/Mg+Fe) values of biotites from the studied intrusions illustrate the most significant chemical factor which differentiates samples of distinct intrusions and vary systematically between ~0.63 to 0.66, 0.67 to ~0.72 and 0.70 to ~0.74. The relatively high X_{Mg} value of biotite corresponds with high oxidation states of magma, and its variations exhibit a positive correlation with the chemical composition of host rocks from relatively less to more silicic magma types. The total Al content of

biotites varies between 2.23 to 2.82 and the tetrahedral site of biotites is not completely filled with Si and Al. Possibly, Ti-substition occurs in tetrahedral sits of biotites, which is also reinforced by the positive correlation between Ti/Fe vs. Ti/Al ratios.

F and Cl wt.% of biotite is correlated versus X_{Mg} values for each of the three rock types. F contents represent three distinctive populations of 0, ~1-2.2 and ~ 3.3-4.3 wt.%. Correlation between X_{Mg} values and F content of studied biotites show that the Fe-F avoidance principle (MUNOZ 1984) in crystal-chemical structure of biotites is not valid for the analyzed biotites, suggesting that biotite with lower X_{Mg} values coexisted with F rich fluids. Cl contents of biotites display a gradually variations in the range of 0-0.073 wt.% and biotite in all rock types shows additionally different X_{Mg} values. Correlation between X_{Mg} values and Cl content of biotites expresses that analyzed biotites coexisted with Cl-rich to Cl-poor solutions through the time of crystallization. Biotite chemistry implies that all studied samples are crystallized from highly oxidized magma with an average f_{O2} of about $10^{-12.5}$ to $10^{-7.5}$ bars at assumed 700 to 800 °C crystallization temperatures and 2 kbars pressure. Highly oxidation state is characteristic for magmas which are associated with porphyry Cu-Mo deposits (ANTHONY 2005). The total Al content of biotites (Al_{tot} <2.82 apfu) corresponds with biotites from mineralized granitoidic suites (UCHIDA et al. 2007). F and Cl contents of biotites from Shah Jahan granitoids indicate that the coexisting solutions with F and Cl had possibly the potential for ore (Cu-Mo-Au) formation.

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Geologische Interpretation linearer und planarer Elemente aus LiDAR-Geländemodellen der Massenbewegung von Doren (Vorarlberg)

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Auf der Basis von lasergescannten digitalen Geländemodellen (DGMs), die zu unterschiedlichen Zeiten und mit unterschiedlicher Messverfahren (terrestrisch: TLS-DGM und flugzeuggetragen: ALS-DGM) aufgenommen wurden, wurde eine allgemeine strukturgeologische Auswertung eines der größten rezenten Massenbewegungen in Österreich, des Erdrutsches von Doren, unternommen. Das Untersuchungsgebiet dieser Fallstudie liegt in Vorarlberg, nordöstlich von Dornbirn in der Molassezone vor der Front der nördlichen Kalkalpen. Die Massenbewegung liegt in einer geomorphologisch markanten Lage am Rand eines Plateaus mit vom Gletscher geprägten Tälern und Geländerücken. Lithologisch ist die Untere Süßwassermolasse bestimmend im Gebiet, gemeinsam mit Gletschermoränensedimenten.

Die Flusstäler im Gebiet tragen alle die Merkmale schneller Einschneidung in den relativ leicht erodierbaren Untergrund. Dieser unausgeglichene Sedimenttransport beeinflusst die Talflanken, an denen sich an einigen Stellen Massenbewegungen unterschiedlicher Größe gebildet haben. Von diesen ist die Massenbewegung bei Doren die zur Zeit bekannteste; sie gefährdet bereits besiedeltes Gebiet.

Die bisherigen Untersuchungen beinhalteten die wiederholte Erstellung von TLS- und ALS-DGMs der Massenbewegung, um die kurzfristigen volumetrischen Veränderungen und die Neugestaltung der Geländeoberfläche im Bereich des Erdrutsches zu bestimmen. Zusätzlich wurde eine strukturell-geomorphologische Analyse mit Hilfe von GIS und dazugehörigen Methoden von der Arbeitsgruppe durchgeführt. Hierbei wurde die geologische Umgebung der Massenbewegung und angrenzender Gebiete untersucht, um eine mögliche Verbindung zwischen (mikro)tektonischen Strukturen und dem Erdrutsch aufzuweisen. Es wurden lineare und planare Elemente, die aus den DGMs durch (1) visuelle Lineamentanalyse und (2) automatische Segmentierung abgeleitet wurden, mit Hilfe strukturgeologischer Geländearbeit und Messungen verifiziert.

Bei der automatischen Segmentierung wurde ein Verfahren angewendet, das ursprünglich für die Gebäudeidentifizierung und Modellierung von Dachlandschaften entwickelt wurde (DORNINGER & PFEIFER 2008). Es basiert auf einem hochentwickelten, robusten Segmentierungsverfahren der dreidimensionalen Punktwolke anhand eines Nachbarschaftskriteriums, das eine Anzahl an lokalen 3D-Regressionsebenen sucht. Hierbei werden die Elementflächen gesucht, so dass die maximale Ausdehnung der einzelnen Elemente erreicht werden kann wobei die Anpassung der Punkte den vom Benutzer angegebenen Schwellenwelt erfüllt. Von diesen Elementen ausgehend werden alle Punkte, die eine zusammenhängende, ebene Fläche bestimmen, ausgewählt. Aufgrund des Algorithmus können Millionen von Punkten zeitgleich auf einem Standard-PC innerhalb einer angemessenen Rechnerzeit bearbeitet werden. Somit können geomorphologisch relevante Gebiete gleichzeitig bearbeitet werden. Für jedes Segment werden zusätzliche Para-