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ENGELDER, T. & DELTEIL, J. The orientation distribution of single joint sets Post propagation ENGELDER, T, SCHULMANN, K. & LEXA, O. Indentation pits: a.

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Chapter 2 : GeolCarp_Vol68_No4__

Title: Indentation pits: a product of incipient slip on joints with a mesotopography: Authors: Engelder, T.; Schulmann, K.; Lexa, O. Publication: Geological Society.

Porphyric granitoids in the western part of the Slovenske rudohorie Mts.: Emplacement and deformation in shear zones. Extension tectonics and exhumation of crystalline basement of the Veporicum unit Central Western Carpathians. Combination of continental underthrusting and indentation tectonics. Geologica Carpathica, 50, Calculations of tectonic, magmatic and residual stress in the Stiavnica stratovolcano, Western Carpathians: Implications for mineral precipitation paths. Geologica Carpathica, 51 1 , Structural evolution of the central part of the Krusne hory Erzgebirge Mountains in the Czech Republic - evidence for changing stress regime during Variscan compression. Journal of Structural Geology, 23 9 , Strain distribution and fabric development modeled in active and ancient transpressive zones. Cretaceous collision and indentation in the West Carpathians: View based on structural analysis and numerical modeling. Tectonics, 22 6 , , doi: Reply to comments by A. Journal of Structural Geology, 25 6 , Apparent shear-band geometry resulting from oblique fold sections. Journal of Structural Geology, 26 1 , Geological Society Special Publications, pp. The quantitative link between fold geometry, mineral fabric and mechanical anisotropy: Journal of Structural Geology, 27 4 , Contrasting microstructures and deformation mechanisms in metagabbro mylonites contemporaneously deformed under different temperatures c. Deformation Mechanisms, Rheology and Tectonics: Contrasting textural record of two distinct metamorphic events of similar P-T conditions and different durations. Journal of Metamorphic Geology, 23 8 , Chronological constraints on the pre-orogenic history, burial and exhumation of deep-seated rocks along the eastern margin of the Variscan orogen, Bohemian massif, Czech Republic. American Journal of Science, , Kinematic and rheological model of exhumation of high pressure granulites in the Variscan orogenic root: Mineralogy and Petrology, 86 , Metamorphic record of burial and exhumation of orogenic lower and middle crust: Extreme ductility of feldspar aggregatesâ€"Melt-enhanced grain boundary sliding and creep failure: Rheological implications for felsic lower crust. Microstructural-deformation record of an orogen-parallel extension in the Vepor Unit, West Carpathians. Journal of Structural Geology, 29 11 , Origin of migmatites by deformation enhanced melt infiltration of orthogneiss: Journal of Metamorphic Geology, 26 1 , Transforming mylonitic metagranite by open-system interactions during melt flow. Journal of Metamorphic Geology, 26, Vertical extrusion and horizontal channel flow of orogenic lower crust: Alpine burial and heterogeneous exhumation of Variscan crust in the West Carpathians: Journal of Geological Society, , High-density nitrogen inclusions in barite from a giant siderite vein: Mobilization of ore fluids during Alpine metamorphism: Evolution of microstructure and melt topology in partially molten granitic mylonite: Influence of melt induced mechanical anisotropy on the magnetic fabrics and rheology of deforming migmatites, Central Vosges, France, Journal of Structural Geology, 31, 10, The mechanism of flow and fabric development in mechanically anisotropic trachyte lava, Journal of Structural Geology, 31, 11, Origin of hydrothermal mineralization and environmental impacts of mining, Acta Mineralogica-Petrographica, 28, Early Cambrian eclogites in SW Mongolia: Journal of Metamorphic Geology, 28 9 , Lithostratigraphic and geochronilogical constraints on the evolution of the Central Asian orogenic belt in SW Mongolia: Model of syn-convergent extrusion of orogenic lower crust in the core of the Variscan belt: Origin of felsic granulite microstructure by heterogeneous decomposition of alkali feldspar and extreme weakening of orogenic lower crust during the Variscan orogeny, Journal of Metamorphic Geology, 29, 1, Heat sources and trigger mechanisms of exhumation of HP granulites in Variscan orogenic root, Journal of Metamorphic Geology, 29, 1, A geophysical model of the Variscan orogenic root Bohemian Massif: Implications for modern collisional orogens, Lithos, , , Prograde and retrograde metamorphic fabrics - a key for understanding burial and exhumation in orogens Bohemian Massif , Journal of Metamorphic Geology, 29, 4, Tectono-metamorphic history recorded in garnet porphyroblasts:

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Emplacement dynamics of phonolite magma into maar-diatreme structures â€” Correlation of field, thermal modeling and AMS analogue modeling data, Journal of Volcanology and Geothermal Research, , , Journal of Metamorphic Geology, 30, 2, â€" Crustal influx, indentation, ductile thinning and gravity redistribution in a continental wedge: Building a Moldanubian mantled gneiss dome with underthrust Saxothuringian material European Variscan belt , Tectonics, 31, TC, doi: Extreme ductile deformation of fine-grained salt by coupled solution-precipitation creep and microcracking: A numerical model of exhumation of the orogenic lower crust in the Bohemian Massif during the Variscan orogeny, Studia Geophysica et Geodaetica, 56, 2, Inverse ductile thinning via lower crustal flow and fold-induced doming in the West Carpathian Eo-Alpine collisional wedge, Tectonics, 31, TC, doi: Kinematically unrelated Câ€"S fabrics: Elastic anisotropy and pore space geometry of schlieren granite: Late Paleozoicâ€"Mesozoic tectonic evolution of the Trans-Altai and South Gobi Zones in southern Mongolia based on structural and geochronological data, Gondwana Research, 25, 1, Mid-crustal shear zone formation in granitic rocks: Constraints from quantitative textural and crystallographic preferred orientations analyses, Tectonophysics, , Contrasting tectonic and metamorphic evolution of orogenic lower crust in the Bohemian Massif: A numerical model, Gondwana Research, 25, 2, Anatomy of a diffuse cryptic suture zone: Journal of Metamorphic Geology, 32, 4, Differences and similarities, In: Implications for Altaid oroclinal bending. Journal of Asian Earth Sciences, 94, Geophysical constraints for terrane boundaries in southern Mongolia. Journal of Geophysical Research:

Chapter 3 : Publications [Ondrej Lexa personal webpage]

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Discontinuous and kinematically unrelated Câ€”S fabrics have been recognized along the contact between the Gemeric and Veporic Units in the Western Carpathians. The formation of S and C fabrics within orthogneiss, quartzite and chloritoid-kyanite schist of the Veporic Unit is associated with Cretaceous syn-burial orogen-parallel flow and subsequent exhumational unroofing. Central Western Carpathians, Veporic Unit, structural geology, monazite dating, quartz deformation microstructure, shear band cleavage, discontinuous Câ€”S fabrics. The extension resulted transecting an earlier anisotropy at small to intermediate an- in the development of major shear zone associated with un- gles which typically develop within larger-scale shear zones. The main distinction be- versus unrelated nature of the Câ€”S fabrics developed within tween compressional crenulation cleavage and extensional a major extensional shear zone at the boundary between the shear band cleavage is based on the angle between cleavage Gemeric and Veporic Units in the Western Carpathians. Therefore the shear band cleavage needs to be to perform detailed structural, microstructural, metamorphic revealed by the complete Câ€”S structure defined by pervasive and geochronological characterization of the two fabrics. The main controversy the complicated structure of the eastern part of the Gemeric related to the field interpretation of Câ€”S fabrics is their tem- and Veporic contact zone is discussed. The contact zone between two major basement-cover thrust The Veporic Unit together with the Gemeric Unit to the sheets, the hanging-wall Gemeric and footwall Veporic Units, eastâ€"southeast and Tatric Unit to the north Fig. Map based on Geological map of the Slovak Republic 1: Contours are double the multiples of standard deviation above the uni- form distribution. GPS coordinates of se- lected localities: On the scale of the Gemeric In this area, In the footwall Veporic Unit, we recognized three defor- the Gemeric Unit comprises Lower Paleozoic volcano-sedi- mation-metamorphic fabrics which were subsequently af- mentary basement rocks of the Gelnica and Rakovec Groups fected by one folding event. The oldest deformation fabric marked by low- to medium-grade Variscan metamorphism comprises scarce relics of high-grade Variscan foliation SV Faryad and overlying Upper Carboniferousâ€"Permian in basement migmatites and schists. The SA1 fabric bears mineral Henjes-Kunst and the uppermost Silica carbonate and stretching lineation LA1 defined by shape preferred ori- nappe system Fig. Mostly low-grade Alpine metamor- entation of quartz aggregates and white mica, which plunges phic conditions have been determined for the Gemeric Unit generally to the east Fig. The SA1 is axial planar to the e. The fold axes are , comprising from west to east and bottom to top typically E-W trending and so subparallel to lineation LA1. In the studied area, the SA1 and SA2 fabrics typically show The southern part of the studied area has ation SA1 Fig. Structural record in the studied area Within the hanging-wall Gemeric Unit, we identified one Analytical techniques penetrative metamorphic foliation overprinted by two phases of folding. The greenschist facies metamorphic foliation SV The Câ€”S fabrics in the Veporic Unit were analysed in or- recognized exclusively in the Lower Paleozoic rocks of the thogneiss, chloritoid-kyanite schist and quartzite Figs. Ho- 3a , which allowed us to characterize both fabrics in terms of vorka et al. This foliation shows various phism and age. Field photographs a, b and micrographs c, d of Câ€”S fabrics in the Veporic Unit: In this paper, the average 2D grain size to intersection of Câ€”S fabrics. In addition, two monazite sam- The precision control was held by repeated analysis mea- ples with known TIMS ages Tarasinga leptynite, India, surements on known phases, mainly standards. The classifica- tion of white mica followed Tischendorf et al. The aggregates show grain isotopic ratios. A fragment of a large for quartzite Fig. The shape ing by Montel et al. Quartz microstructure within S and C fabrics from orthogneiss sample BZ15 left column and quartzite sample BZ77 right col- umn. The c-axis ori- entation colouring of individual grains is shown in colour look-up table pole figure. The black lines in the pole figures correspond to the long axis of S aggregates and C tails, and the contours correspond to multiples of uniform distribution. S fabric aggregates or C fabric tails Fig. The surface strongly monocline with maxima that are slightly and ODF SURFOR in quartzite aggregates shows symmetrical strongly inclined with respect to aggregate and tail orienta- distribution with maximum parallel to the aggregate long tion, respectively Fig. Within the C fabrics, the inclina- axis. In quartzite tails, the surface ODF is weakly monocline tion of surface ODF maxima with respect to C tails with a maximum that is slightly inclined with respect to the orientation is consistent with the observed macroscopic tail orientation. In orthogneiss, the surface ODF is weakly to sense of shear e. This inclination is more pronounced in or- 4a. On the other hand, the aggregate in quartzite sam- 4b,c. Petrography and mineral chemistry Within the imbricated structure of the studied area several lithologies have been evaluated by means of petrogra- phy and mineral chemistry. These are from bottom to top: In ortho- gneiss and chloritoid-kyanite schist, the analysis revealed that both S and C fab- rics are associated with distinct meta- morphic records. In orthogneiss, the S fabric is defined by metamorphic mineral assemblage of biotite, chlorite, white mica, albite and quartz. In contrast, the discrete C fabric contains only chlorite, white mica and quartz. The lattice preferred orientation data of recrystallized quartz within S aggregate a and C tail b, c in sample BZ15 same region as in Fig. Each pole figure in lower varies between 3. In sample BZ located near the chloritoid- fication of Tischendorf et al. On the the deformation structures has been revealed. The white mica in quartzite samples lo- the contact between the basement schist and Permian cover cated closer to the basement orthogneiss is phengite with quartzite samples BZH, BZ and BZ consists of 3. The diagrams show a three white mica genera- tions in orthogneiss: The distinction between phengite and muscovite is based on Tischendorf et al. The covitic mica ranges between 2. The chemical The XMg in chloritoid within different samples ranges be- analysis of white mica did not reveal major compositional dif- tween 0. The Within individual samples the XMg in chloritoid differs rock is phengite absent comparing to the cover quartzites mostly by 0. The C fabrics are characterized by BZ White mica is muscovite with 3. For mineral abbreviations see Fig. Monazite dating Monazite was identified in the chloritoid- and kyanite- bearing schist sample BZ; for location see Fig. Monazite occurs either within the recrystallized quartz aggregates or as grains completely enclosed by muscovite. Many monazite grains show sharp, non-altered contacts with chloritoid and other mineral phases of this kyanite, chloritoid, white mica, chlorite and quartz assemblage Fig. The high resolution back-scattered electron images of several monazite grains revealed some compositional variations Fig. Monazite grains were analysed directly in polished thin sections Fig. U-Th-Pb concordia diagram for monazite from sample BZ The subhorizontal S SA1 fabric in these rocks is asso- The Câ€"S fabrics at the contact between the Gemeric and Ve- ciated with the growth of phengite and garnet-bearing assem- poric Units have been previously interpreted as synkinematic blages Figs. Based on the presence of the two generations of gar- ture and geochronology-based evidence suggesting that the net in the studied schists, we interpret these rocks as parts of studied S and C fabrics in the Veporic Unit were in contrast an imbricated Veporic basement that overthrusted Permian formed during two independent and kinematically unrelated cover quartzites. This interpretation contrasts with the previ- tectonic events. In the basement, this fabric is associated with with respect to the S fabric Fig. The chloritoid and kya- al. The distinct white mica compositions namic PT calculations revealed that the core to rim composi- revealed from the structurally lower and upper belt of cover tional changes in these garnets correspond to an increase in quartzites Figs. On the basis of this evidence, they con- and footwall position of the two belts with respect to the de- cluded that the formation of subhorizontal SA1 fabric is asso- tachment shear zone cross-cutting the imbricated structure of ciated with burial of the Veporic Unit and not its exhumation the Gemeric-Veporic contact zone. Furthermore, it has been proposed that the defined by the lower grade chlorite- and muscovite-bearing Veporic Unit experienced an Early Cretaceous pure shear assemblage Figs. The main detachment is lo- ment-cover Gemeric and Veporic Units. The Câ€"S fabrics occur cated within the Permian quartzitic-arkosic rocks as within a major detachment shear zone, which cross-cuts the suggested by sharp metamorphic contrast between the mus- earlier imbricated structure related to overthrusting of the Ge- covite-bearing arkose sample BZ and chloritoid-kyanite meric

Unit over Veporic. The evidence from deformation micro- schist samples BZ, BZ and BZ for the position structures, petrology and geochronology, suggests that the S of the detachment see map in Fig. Towards the structur- fabric formed during an Early Cretaceous subhorizontal lateral al footwall in the west, the garnet-bearing basement schist flow associated with overthrusting of the Gemeric Unit and sample BZ, Fig. On Vojtko and D. Following the interpretation of Kilian et al. Timing of early Proterozoic collisional and exten- with overall monocline symmetry of surface ODF within the re- sional events in the granulite-gneiss-charnockite-granite com- crystallized C tails is promoted by a high amount of rhombohe- plex, Lake Baikal, USSR: Shear band formation and The dated monazite appears in close association with the strain localization on a regional scale: Evidence from anisotro- inter-tectonic chloritoid and kyanite-bearing assemblage pic rocks below a major detachment Betic Cordilleras, Spain. On the contrary, South Armorican Shear Zone. The in situ 40 Veporides. Gneiss-amphibolite complex of the Gemericum. On the other hand, a large number Miner. Pre-Alpine metamorphic events in Gemericum. One way or the other, these Tectonophysics , â€" Ductile shear bands in naturally de- time gap between the formation of the S and C fabrics. Textures and Microstructures 5, 1â€" Automatic grain boundary detection and grain Lexa O. Numerical approach in structural and microstructural size analysis using polarization micrographs or orientation im- analyses. Cretaceous collision and Hovorka D. Petrology indentation in the West Carpathians: View based on structural and geochemistry of metabasalts from Rakovec Paleozoic of analysis and numerical modeling. Gemeric Group, Inner Western Carpathians. Extensional tectonics of the Lister G. Fabric development in shear western part of the contact area between Veporicum and Ge- zones: Slovaca 25, â€" Geol.

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Chapter 5 : Publikace ÃšPSG â€" PÅ™ÃrodovÄ›deckÃ¡ fakulta UK

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Publications Collett, S. New constraints on the timing of eclogite- and granulite-facies metamorphism. Late Palaeozoic palaeomagnetic and tectonic constraints for amalgamation of Pangea supercontinent in the European Variscan belt. In Earth-Science Reviews, Geochemical and geochronological constraints on distinct Early-Neoproterozoic and Cambrian accretionary events along southern margin of the Baydrag Continent in western Mongolia. In Gondwana Research, In Journal of Maps, 13 2: In Tectonics, 36 Detachment folding of partially molten crust in accretionary orogens: A new magma-enhanced vertical mass and heat transfer mechanism. In Lithosphere, 9 6: Computational study of deformation mechanisms and grain size evolution in granulites - Implications for the rheology of the lower crust. In Earth and Planetary Science Letters, Metamorphic inheritance of Rheic passive margin evolution and its early-Variscan overprint in the Tepla-Barrandian Unit, Bohemian Massif. 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T. Engelder and J. Delteil, (). The orientation distribution of single joint sets. K. Schulmann, O. Lexa, (). Indentation Pits: A product of incipient.

Chapter 7 : The Geological Society

Collett, S.; Å tÃpskÃ¡, P.; Schulmann, K.; PeÅ™estÃ½, V.; Soldner, J.; Anczkiewicz, R.; Lexa, O. and Kylander-Clark, A. Combined Lu-Hf and Sm-Nd geochronology.

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