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THE MAGNETIC AND MESOSCOPIC FABRICS OF THE CRYSTALLINE COMPLEX OF THE STRÁŽOVSKÉ VRCHY MTS. AND THEIR TECTONIC IMPLICATIONS

(Figs. 4, Tabs. 2)

Abstract: In metamorphic rocks of the Strážovské vrchy Mts. both the magnetic and the mesoscopic fabrics originated during the processes of deformation and recrystallization in an anisotropic stress field associated with Hercynian or older regional metamorphism. In granitoid rocks the magnetic fabric was formed partially by the intrusive movements and partially by plastic deformation due to the folding.

Резюме: В метаморфических породах Стражовских гор возникли магнитные и мезоскопические строения во время процессов деформации и рекристаллизации в поле анизотропного напряжения связанного с герцинским или же старшим региональным метаморфизмом. В гранитоидных породах магнитное строение было образовано частично интрузивными движениями и частично пластической деформацией вызванной складкообразованием.

Introduction

Among crystalline complexes of the West Carpathians that of the Strážovské vrchy Mts. is conspicuous by a very close association of the metamorphic and granitoid rocks. Though such an association is a common phenomenon in the West Carpathians, it is nowhere as close as in the Strážovské vrchy Mts. These mountains therefore offer a good opportunity for investigating the fabric relations between the granitoid and metamorphic rocks as well as for their genetic and structural interrelations.

The Strážovské vrchy Mts. form a part of the outer arc of the core mountains of the Central West Carpathians.

The crystalline complex of the Strážovské vrchy Mts. (see Fig. 1) consists of two partial massifs — the Suchý and Malá Magura ones — free of remnants of younger formations, such as Palaeozoic, Mesozoic, or Tertiary. Its southern and eastern boundaries with Mesozoic and Tertiary are tectonic, while the northern ones are more or less stratigraphic (tectonically stressed).

The crystalline complex of the Strážovské vrchy Mts. has been studied in more detail by Ivanov (1957), Klinec (1958), Kahan et al. (1978), Kahan (1979, 1980), Putiš (1976, 1977, 1979, 1982), Kahan — Putiš (1980), Demian (1972), and Šarkan (1977). Among these studies, extensive investigation of the mesoscopic fabric and reconaissance investigation of

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the microscopic quartz fabric have been made. In the present paper these studies are complemented by the investigation of the microscopic magnetic fabric, which enables the fabric anisotropy to be evaluated not only qualitatively (as the mesoscopic fabric study), but also quantitatively. In addition, the magnetic fabric can identify some non-rupture fabric elements in granitoids which are not observable mesoscopically.

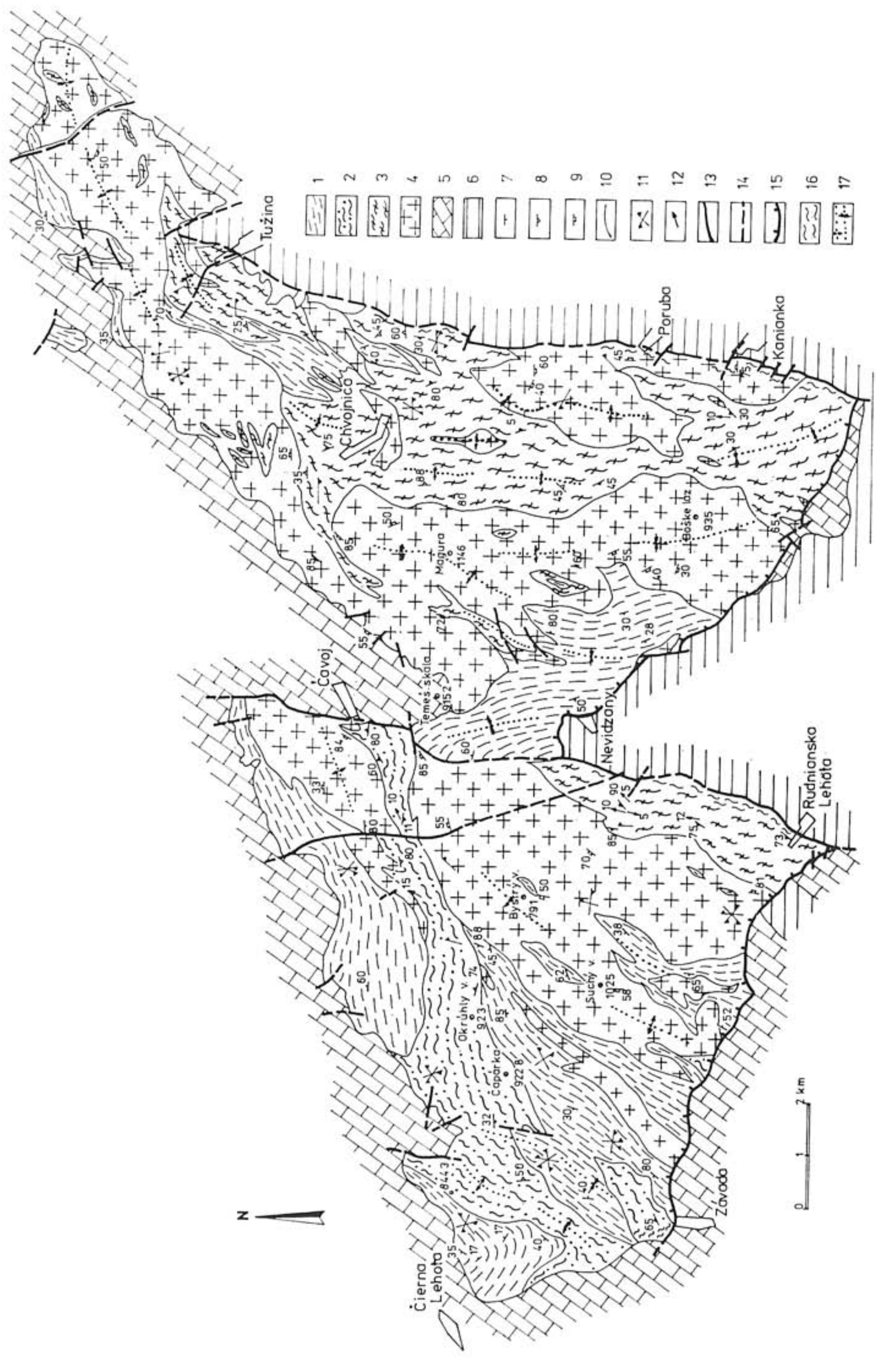
Geological setting

The crystalline complexes of the Suchý and Malá Magura massifs consist of various types of crystalline schists, granitoids, and migmatites alternating in approximately parallel belts meters to kilometers wide. The amount of metasediments is much higher in the Suchý massif than in the Malá Magura massif. The palynologic analysis of graphitic schists associated with amphibolites of the upper part of the crystalline complex of the Suchý massif has ascertained the Early Palaeozoic age (Č o r n á – K a m e n i c k ý, 1976). The age of the higher-grade metamorphic rocks has not been determined more exactly till now; it is considered Early Palaeozoic up to pre-Cambrian. The amount of amphibolites among the paragneisses (with garnet-almandine, staurolite, sillimanite) and migmatites is low.

Among migmatites, stromatites predominate displaying transitions both into migmatitized gneisses or para-gneisses and into nebulites up to inhomogeneous ("hybride") granitoids. From the genetic point of view two migmatite types can be distinguished: the Závada type and the Liešťany type (K a h a n in K a h a n et al., 1978). The former associated with a complex of paragneisses and diffusive migmatitized paragneisses represents the external part of the Suchý crystalline complex, while the latter generated in a deeper zone (partial anatexis zone), where characteristic banded types of anatectic migmatites (containing fibrolithic sillimanite) originated.

The principal petrographic types of granitoids are: (1) inhomogeneous biotite granite to granodiorite, (2) aplite pegmatite granite, (3) homogeneous (or almost homogeneous) granodiorite. These rocks are accompanied by aplite and pegmatite dikes. The individual granitoids are very variable. Their petrographical character varies not only within a magmatic "body" (I v a n o v, 1957), but also within an exposure and even within a hand specimen. This variability is mostly controlled by the degree of granitization of contamined paragneiss (or amphibolite) material, which is preserved as xenolithes, biotite schlieren, and considerable amount of fibrolithic sillimanite (amounting up to 10 %, see P u t i š, 1976, 1982) in all granitoid types.

Fig. 1. Tectonic sketch map of the crystalline complex of the Strážovské vrchy Mts. Compiled by K a h a n (1980).
Explanations: 1 – paragneisses; 2 – migmatites, Závada type; 3 – migmatites, Liešťany type; 4 – granitoids, 5 – mesozoic; 6 – tertiary; 7 – metamorphic schistosity (S_1) in gneisses; 8 – palimpsests of S_1 foliation in migmatites; 9 – palimpsests of S_1 foliation in granitoids; 10 – geological boundaries; 11 – main systems of joints; 12 – strike of fold axes, 13 – faults; 14 – assumed faults; 15 – thrust planes; 16 – mylonites; 17 – the axes of antiforms and synforms.


Tužina
Poruba
Kanianka
Chvojnica
Magura
Čavoj
Temeš skala
Nevidzany
Rudnianska Lehôta
Bystrý v.
Suchý v.
Okrúhly v.
Čaparka
Čierna Lehota
Závada
N
2 km

According to Read's (1957) classification of granites, the granitoids of the Suchý and Malá Magura massifs are in the transition position between the autochtonous and paraautochtonous granites – they are in intimate association with anatectic migmatites and medium to high grade metamorphites. The palingenic granitoid magma originated and ascended ("intruded" the mantle) in the late-tectonic stage of the Hercynian orogenesis.

Mylonite and phyllonite occur in the massif central areas only rarely (in the vicinity of faults), they are more frequent only in the marginal parts of the massifs.

Mesoscopic and microscopic structural analyses

Among the mesoscopic fabric elements metamorphic schistosity (S_I), and small-scale folds have been investigated (see Figs. 1, 3). As clear from Fig. 3, the pattern of the S_I planes is relatively simple. In our opinion, it results from original (pre-Alpine) metamorphic processes and pre-Alpine syngranitic tectogenesis and has only subordinately been affected by Alpine movements.

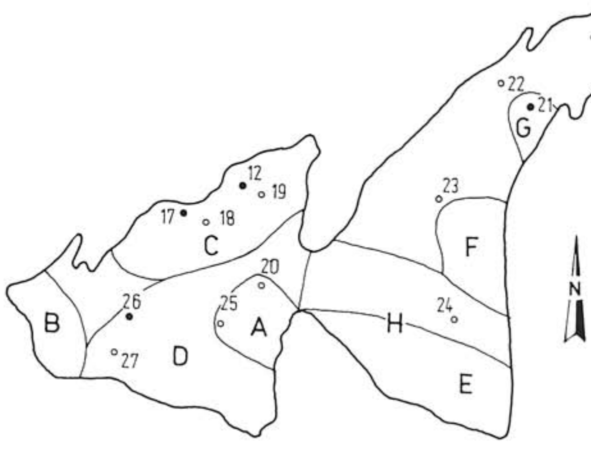


Fig. 2. Sketch map of the locations of the study areas of the mesocopic fabric elements presented in Fig. 3 (denoted by capital letters corresponding to letter suffixes in Fig. 3) as well as of localities sampled for magnetic anisotropy study (the numbers correspond to the locality numbers in Tables 1, 2).

The great majority of S_I planes are steep and form fan-like structures in the vertical section. In the W and N part of the Suchý massif and in the central and N part of the Malá Magura massif the S_I planes dip only moderately to gently, creating open synforms and antiforms. The strike deviations of the S_I planes from the general course suggest the existence of partial brachystructures.

The S_I planes display an arcuate course in both massifs. In the Suchý massif they strike NNE-SSW to N-S in the southern part (Fig. 3 A), Ne-SW in the central part (Fig. 3 B) and ENE-WSW to W-E in the northern part

(Fig. 3 C) (P u t i š, 1976, 1977, 1979; K a h a n et al., 1978; K a h a n, 1979, 1980). In the Malá Magura massif they strike NNW-SSE in the southern and central parts (Fig. 3 E), N-S to NE-SW in the western and northern parts (Fig. 3 F, G) (K l i n e c, 1958; K a h a n, o. c.; Š a r k a n, 1977; K a h a n et al., 1978).

The fold axes trend resembles the strike of the S_1 planes. A part of the fold axes display gentle to moderate plunge, suggesting an existence of an "open" transversal folding F_2 with respect to the main direction of the S_1 planes in both massifs.

The microscopic structural analysis (D e m i a n, 1972; P u t i š in K a h a n et al., 1978; P u t i š, 1979) of biotite paragneiss and interfoliation penetrations of granitoid neosome (c-axis se fabric of quartz) has shown that these rocks are mostly B-tectonites with faint transitions to S-tectonites possessing monoclinic symmetry of homotactic fabric. The fabric of granitoids originated partially through reflecting the fabric of the crystalline mantle, partially through a plastic deformation during and shortly after the emplacement.

In forming the inner structural plan, the pre-Alpine tectogenesis was dominant, while the Alpine influence was relatively weak and did not substantially change the older inner structural plan. In Alpine tectogenesis a post-Palaeogene dextral shift took place along the N-S fault (M a h e ľ, 1961; Malá Magura fault-sensu M a h e ľ, 1969) which divides the crystalline complex into two partial massifs. This shift has also involved a rotation of both partial massifs and caused the overthrust (Závada fault-sensu M a h e ľ in M a h e ľ et al., 1962) of the southern margins of the crystalline complex over the Mesozoic and Palaeogene rocks. This dextral shift can be seen in the tectonic scheme in Fig. 1. The rotation of the massifs is manifested mainly in the different courses of the arcs of the pre-Alpine structures. The difference in rotation is approximately 45°.

Sampling and data presentation

Hand specimens for the investigation of magnetic anisotropy were taken in the natural outcrops and road cuts where fresh rocks were available. From each locality five oriented hand specimens were taken and from each of them two cylinder specimens for measuring magnetic anisotropy were drilled. On each hand specimen, before its removal from the exposure, the orientations of mesoscopic fabric elements (schistosity, lineation, if developed) were measured.

The magnetic anisotropy was measured by the KLY — 2 AC bridge developed by V. J e l í n e k (see Geofyzika's leaflet, 1980) and computed using the ANISØ 11 program (an improved version of the ANISØ 10 program described by J e l í n e k, 1977). In order to obtain a statistical evaluation of the magnetic anisotropy in individual localities, recourse was had to the ANS 21 computing program (J e l í n e k, 1978), which enables a complete statistical evaluation of a group of symetric second rank tensors to be carried out.

The results of the low-field magnetic anisotropy measurements are summarized in the Tables 1, 2 and in Fig. 4. In the tables the first column contains the locality numbers (as presented in Fig. 2), the second the totals of the specimens measured (n) and the third the arithmetical means of the mean magnetic susceptibility, $k_m = (k_1 + k_2 + k_3)/3$, where $k_1 \geqslant k_2 \geqslant k_3$ are the principal susceptibilities; the k_m values are given in the order of 10^{-6} (the SI units are used). In the fourth and fifth columns there appear pairs of values of the magnetic lineation, $L = k_1/k_2$, and magnetic foliation, $F = k_2/k_3$, respectively. The sixth and seventh columns contain the pairs of the values of the corrected magnetic anisotropy degree,

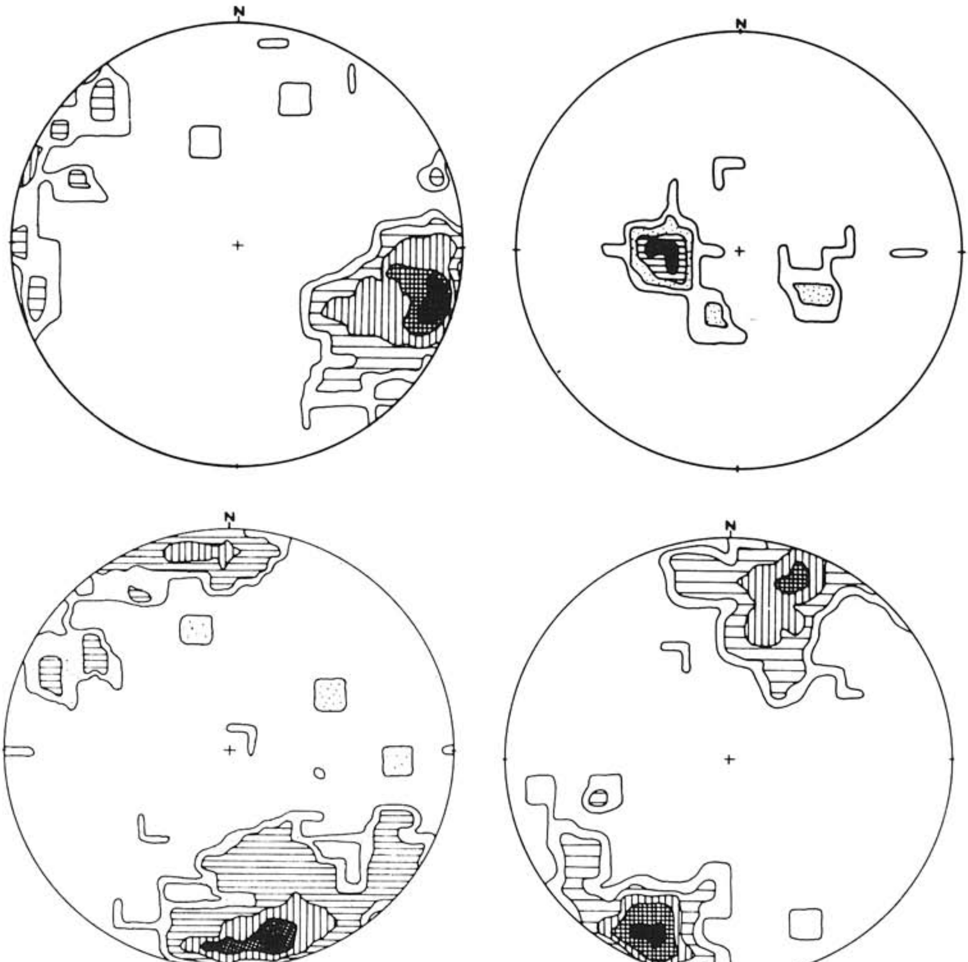
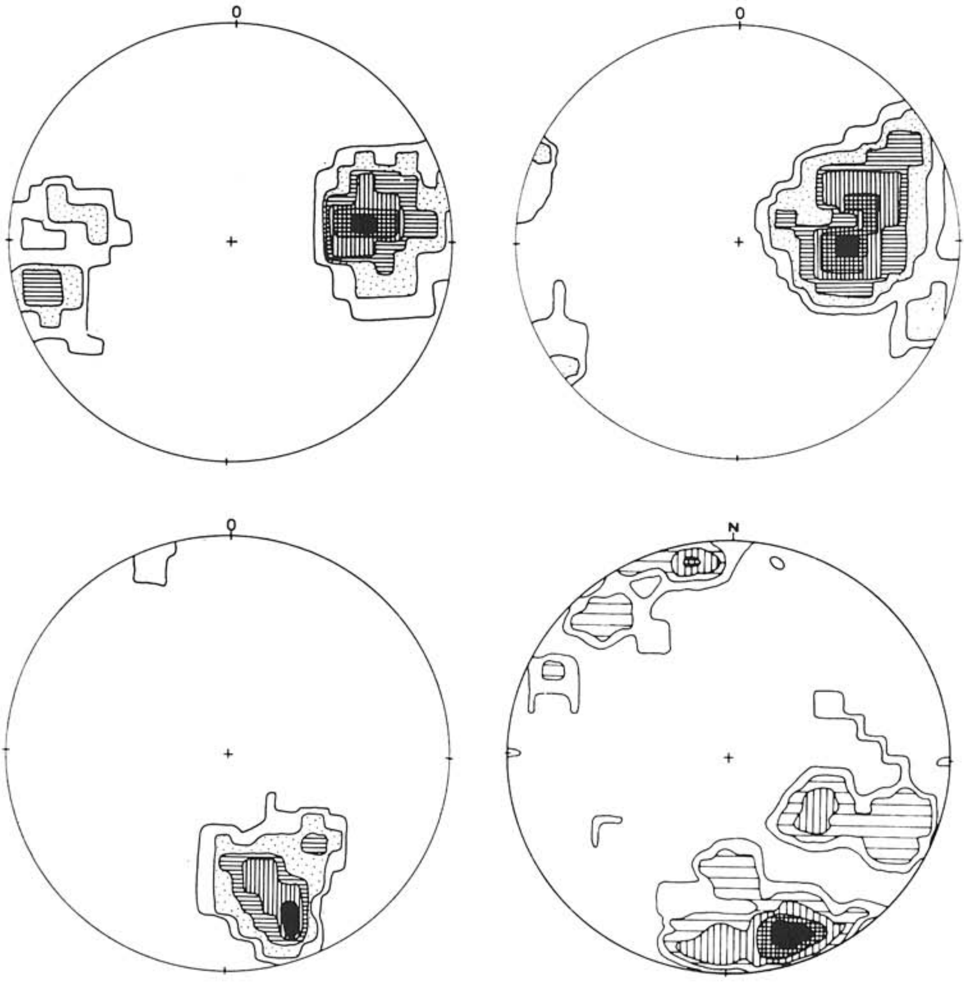


Fig. 3 A–H. Diagrams of the orientations of mesoscopic fabric elements in the Strážovské vrchy Mts. Equal-area projections on lower hemisphere.
A – S_1 poles of all rock types in the Liešťanská dolina valley area. 100 measurements. Contours: 11–7–4–1.5–0.5 %.
B – S_1 poles of all rock types in the area between Kšinská dolina valley and Čierna Lehota village. 20 measurements. Contours: 35–20–7.5–0.5 %.
C – S_1 poles of all rock types in the area between the Čavoj village and the Okrúhly vrch hill. 150 measurements. Contours: 12–8–4–1–0.5 %.
D – fold axes and β axes in the eastern part of the Suchý massif. 80 measurements. Contours: 12–7–4–2–0.5 %.

$P' = \exp. \, 2 \, [(\eta_1 - \eta)^2 + (\eta_2 - \eta)^2 + (\eta_3 - \eta)^2]$ and of the shape factor, $T = 2 \, (\eta_2 - \eta_3)/(\eta_1 - \eta_3) - 1$, where $\eta_1 = \ln k_1$, $\eta_2 = \ln k_2$, $\eta_3 = \ln k_3$, $\eta = (\eta_1 + \eta_2 + \eta_3) \, 3$ (see Jelínek, 1981). If $T = +1$, the magnetic fabric is perfectly planar, if $0 \leqslant T \leqslant 1$, it is planar, if $T = 0$, the magnetic fabric is linear-planar, if $-1 \leqslant T \leqslant 0$, it is linear, and if $T = -1$, the magnetic fabric is perfectly



E – S_1 poles of all rock types in the S part of the Malá Magura massif. 155 measurements. Contours: 21–18–10–7–3–0.5 %.
F – S_1 poles of migmatites of the Chvojnická dolina valley. 100 measurements. Contours: 12–10–8–4–2–0.5 %.
G – S_1 poles of migmatites of the Tužinská dolina valley. 50 measurements. Contours: 16–14–8–2–0.5 %.
H – fold axes and β axes in the S part of the Malá Magura massif. 60 measurements. Contours: 10–6–3–1.5–0.5 %.

Table 1

The magnetic anisotropy parameters of the metamorphic rocks of the Strážovské vrchy Mts. crystalline complex

Loc. No.	n	k_m	L	F	P'	T	Type
12	10	332 —	1.091 1.057	1.131 1.092	1.241 1.155	0.24 0.23	II c
17	10	208 —	1.069 1.057	1.060 1.023	1.135 1.084	−0.10 −0.42	II a
18	10	299 —	1.025 1.032	1.184 1.134	1.236 1.180	0.73 0.21	II c
26	15	905 —	1.134 1.111	1.299 1.280	1.496 1.436	0.46 0.40	II c
21	9	279 —	1.013 1.013	1.216 1.197	1.264 1.241	0.87 0.87	II c

linear. If $T = 0$, $P' = k_1/k_3$, if $T = +1$ or -1, $P' = (k_1/k_3)^{1.15}$. The values of the L, F, P', T parameters given in the upper line are the arithmetical means of the values for individual specimens, while those given in the lower line represent the parameters derived from the mean susceptibility tensor for each locality as a whole (determined through averaging out the individual components of the specimen susceptibility tensors in the geographical coordinate system and calculated by the ANS 21 program). In order to distinguish in the text the anisotropy parameters for individual specimens from those derived from the mean tensor for a locality as a whole, the former will henceforth be called the specimen parameters, while the latter the locality parameters.

In the eight column the anisotropy type is indicated, as introduced by Kligfield et al. (1977) for a comprehensive characterization of magnetic anisotropy in a locality. The distribution pattern of principal susceptibilities is characterized by a Roman numeral (I: only k_3 directions concentrated, II: all three principal directions concentrated, III: only k_1 directions concentrated) and the shape of the magnetic fabric by a letter suffix a) almost all specimens with linear magnetic fabrics, b) some with linear and some with planar fabrics, c) almost all with planar magnetic fabric).

In Fig. 4 domain diagrams of the orientations of the principal susceptibilities and fabric elements are presented in equal-area projections on the lower hemisphere.

The magnetic fabric

The metamorphic rocks

The metamorphic rocks investigated are represented by various kinds of gneiss and migmatite sampled both in the Suchý massif (loc. Nos. 12, 17, 18, 26) and in the Malá Magura massif (loc. No. 21). The results of the magnetic anisotropy investigation are summarized in Table 1 and Figs. 4 A, B.

Table 2

The magnetic anisotropy parameters of the granitoid rocks of the Strážovské vrchy Mts. crystalline complex

Loc. No.	n	k_m	L	F	P'	T	Type
Suchý massif							
19	9	119 —	1.013 1.012	1.029 1.023	1.044 1.036	0.36 0.33	II c
20	10	120	1.033	1.027	1.062	−0.09	III b
25	10	30 —	1.012 1.004	1.028 1.019	1.042 1.025	0.32 0.62	I c
27	12	67 —	1.035 1.029	1.047 1.041	1.085 1.072	0.11 0.16	II b
Malá Magura massif							
14	14	46 —	1.019 1.018	1.054 1.040	1.077 1.060	0.49 0.39	II c
22	11	205 —	1.018 1.010	1.067 1.062	1.091 1.080	0.55 0.71	II c
23	11	22 —	1.041 1.028	1.065 1.055	1.112 1.086	0.24 0.33	II c
24	9	34 —	1.020 1.014	1.042 1.016	1.066 1.030	0.27 0.08	II b

As seen in Table 1, the mean specimen anisotropy degree P' ranges from 1.24 to 1.50, being thus relatively high and the highest of all rock types in the Strážovské vrchy Mts. The locality anisotropy degree is either only slightly (loc. Nos. 18, 21, 26) or considerably (loc. Nos. 12 and 17) lower, which indicates small and large scatters in the orientations of the principal susceptibilities, respectively. Both the specimen magnetic fabric and the locality magnetic fabric are planar in almost all localities investigated, only in the locality No. 17 they are linear.

In all localities all three principal susceptibilities are well defined in space, so that both the magnetic foliation and magnetic lineation are well developed on locality scale. In all localities the magnetic foliation is near to the S_I schistosity. In the Suchý massif, sampled in the NW part, the poles of both the magnetic foliation and S_I schistosity tend to create imperfect girdles oriented NW–SE, the π axes of which are oriented NE–SW (Fig. 4). This orientation is in agreement with that of the poles of S_I planes in the NW section of the massif (see Fig. 3 C). The mesoscopic lineation is clearly observable only in the locality No. 26, where two sets of this lineation are developed, being roughly perpendicular each to the other. The magnetic lineation lies in between these two sets of the mesoscopic lineation. Except the locality No. 12, the magnetic lineation ternds WSW–ENE, plunging gently both ENE and WSW, and is therefore roughly parallel to the strike directions of the S_I schistosity and magnetic foliation as well as to the axes of mesoscopic folds. In the locality No. 12 magnetic lineation trends WNW-ESE, plunging gently WNW. The sum of these two types of the magnetic lineation orientations gives rise to the rather complicated pattern for the Suchý massif as a whole, seen in Fig. 4 B. The lineations tend to create a girdle oriented WSW-ENE and a group trending WNW – ESE and plunging WNW.

In the only locality investigated in the Malá Magura massif (No. 21) the magnetic foliation trends WSW-ENE, i. e. roughly parallel to the general strike of S_1 schistosity in the NE area of the Malá Magura massif. The magnetic lineation trends N-S and plunges steeply N.

The granitoid rocks

The results ofthe measurements of granitoid rocks are summarized in Table 2 and Fig. 4 C, D.

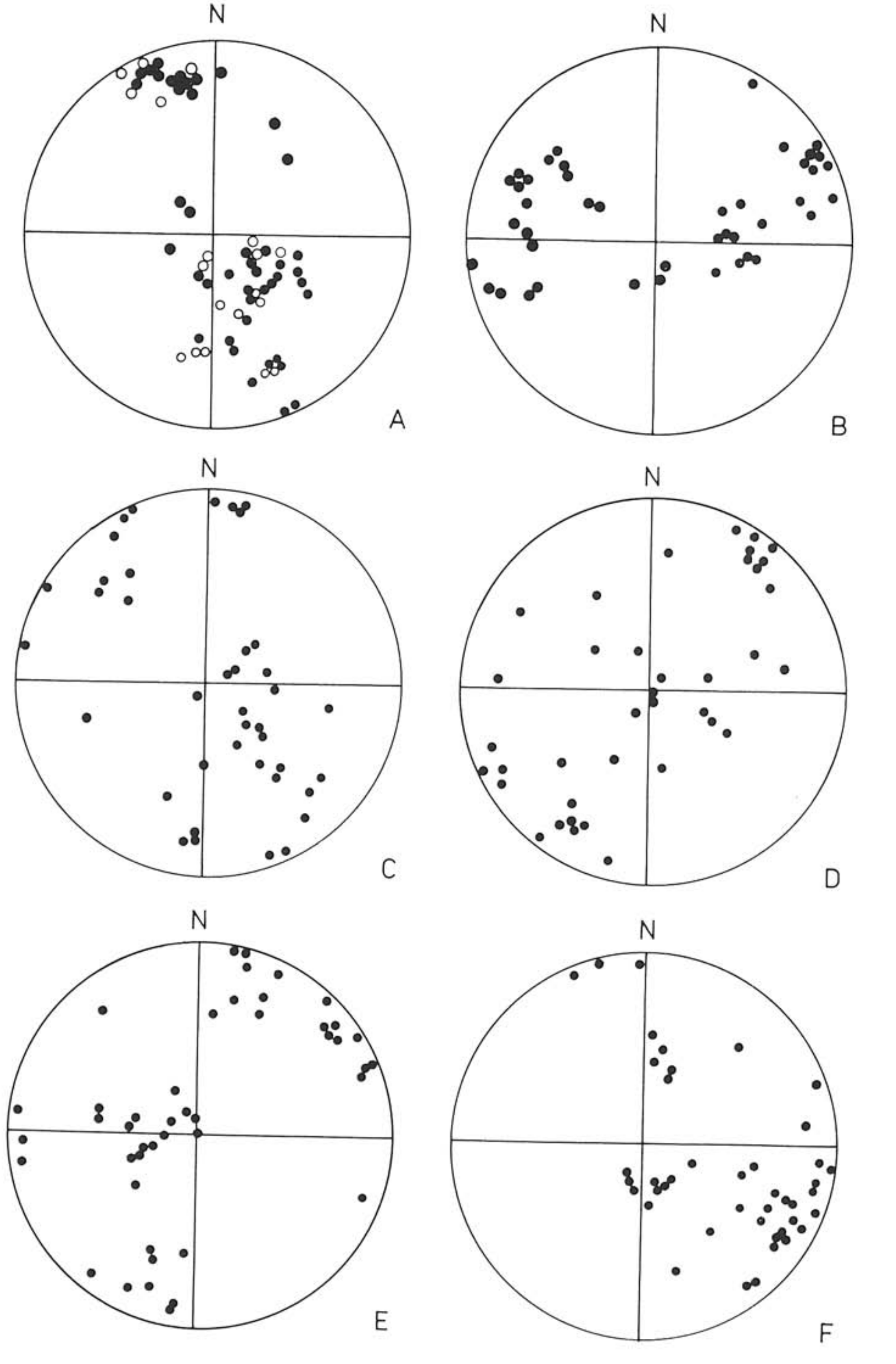
The specimen anisotropy degree of the granitoid of both massifs is low, ranging from 1.04 to 1.11. The locality anisotropy degree is much lower, indicating a relatively wide scatter of the principal susceptibilities. Both the specimen magnetic fabric and the locality magnetic fabric are planar in localities Nos. 19 and 25 in the Suchý massif and in localities Nos. 14, 22, 23 in the Malá Magura massif. In localities Nos. 20, 27 (the Suchý massif), and 24 (the Malá Magura massif) the magnetic fabric of some specimens is planar, that of the others is linear.

The directions of principal susceptibilities are in general more scattered than those in the metamorphic rocks. Despite this scatter the anisotropy types of the majority of localities can be denoted as the types II, with relatively well defined both the magnetic foliation and magnetic lineation in space. In the locality No. 20 only the k_3 directions are well concentrated in space, while the k_1 a k_2 directions are widely scattered in the perpendicular plane. On the other hand, in the locality No. 25 only the k_1 directions are concentrated around its mean direction, while the k_2 and k_3 directions are partially intermixed.

The poles of magnetic foliation in granitoid rocks in the Suchý massif create an imperfect girdle oriented NW-SE (see Fig. 4 C). This girdle resembles that in metamorphic rocks very closely (cf. Fig. 4 A and Fig. 4 C). The magnetic foliation therefore strikes in general NE-SW, being in good agreement with the general strike of planar elements in the Suchý massif (see Fig. 1). The magnetic lineation is relatively much scattered in space, but a very wide NE-SW oriented girdle is clearly observable (Fig. 4 D). Hence, the magnetic lineation

Fig. 4. Orientations of magnetic foliation poles, magnetic lineation and mesoscopic schistosity poles in the crystalline complex of the Strážovské vrchy Mts. Closed circles indicate the magnetic fabric elements, open circles the mesoscopic fabric elements. Equal-area projection on lower hemisphere.

A – metamorphic rocks of the Suchý massif, magnetic foliation poles, S_1 schistosity poles; B – metamorphic rocks of the Suchý massif, magnetic lineation; C – granitoid rokcs of the Suchý massif, magnetic foliation poles; D – granitoid rocks of the Suchý massif, magnetic lineation; E – granitoid rocks of the Malá Magura massif, magnetic foliation poles; F – granitoid rocks of the Malá Magura massif, magnetic lineation.


N
A
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resembles fully neither the magnetic lineation in metamorphic rocks nor the mesoscopic linear fabric elements which are strike-oriented.

In the Malá Magura massif the poles of magnetic foliation create a very imperfect girdle oriented NE-SW (see Fig. 4 E), i. e. perpendicularly to the respective girdle in the Suchý massif. In addition, the magnetic foliation in granitoid rocks in the Malá Magura massif, striking generally NW-SE, courses oblique to the run of the strike of S_1 schistosity (cf. Fig. 4 E and Fig. 3 E-C). The magnetic lineations of the majority of specimens trend ESE-WNW and plunge gently ESE (Fig. 4 F); all specimens together create a very imperfect girdle oriented NW-SE (Fig. 4 F). This girdle is oriented perpendicularly to the girdle of magnetic lineations in the Suchý massif. The magnetic lineation agrees with one of two submaxima in the small-scall fold axis pattern (cf. Fig. 4 F and 3 H).

Interpretation

In all the metamorphic rocks investigated the magnetic foliation is virtually parallel to the metamorphic schistosity and the magnetic lineation of a great part of specimens is virtually parallel to the fold axes and strike lines of the schistosity. From this it can be concluded that the magnetic fabric was largely formed together with the formation of the mesoscopic silicate fabric, i. e. during the processes of ductile deformation and recrystallization in an anisotropic stress field associated with regional metamorphism of the garnet amphibolite facies taking place probably during the Hercynian (or earlier?) orogenesis (see Kahan, 1980). However, the complex pattern in the magnetic lineation in the Suchý massif, and mainly the WNW-ESE trending magnetic lineations in the locality No. 12, indicate the more complex development of the magnetic fabric than of the mesoscopic silicate fabric. The WNW-ESE directed magnetic lineations probably indicate an existence of a younger ductile deformation phase perhaps associated with retrogressive metamorphism operating during the Alpine orogenesis during which the rocks may have been more susceptible for componental movements. This retrogressive metamorphism took place at the margins of the crystalline massifs and did not affect the central areas (Kahan, o. c.). (The locality No. 12 is situated at the very NE margin of the Suchý massif; the rigid body rotation, which may also have given rise to the WNW-ESE magnetic lineations, is improbable, because the magnetic foliation displays no sign of such a rotation.)

In the Suchý massif the magnetic foliation pattern in granitoid rocks resembles that in metamorphic rocks very closely (cf. Figs. 4 A and 4 C) and the magnetic lineation pattern in granitoids is similar to the WSW-ENE girdle part of the magnetic lineation pattern in metamorphites (cf. Figs. 4 B and 4 D). In addition, the girdle pattern in the magnetic foliation poles in the granitoid rocks is a deformational phenomenon and cannot generate through magma flow. Consequently, a part of the magnetic fabric development of metamorphic and granitoid rocks was common and this part was due to deformation. As the girdle pattern in magnetic foliation poles in metamorphic rocks reflects the deformation due to the buckling of S_1 schistosity and the same pattern is developed in granitoid rocks, it is necessary to assume that the granitoid rocks intruded the metamorphic rocks before or together with the bending of S_1

schistosity of the latter. During the deformation giving rise to the bending of S_I schistosity both metamorphic and granitoid rocks were deformed together and very similar magnetic fabric patterns in both types of rocks generated.

The magnetic anisotropy degree is clearly higher in metamorphic than in granitoid rocks. This phenomenon may be due to three causes: (1) granitoid rocks intruded after the development of S_I schistosity in metamorphic rocks and deformational magnetic fabric due to the buckling of S_I schistosity was superposed on highly anisotropic magnetic fabric in metamorphic rocks originated by a recrystallization in an anisotropic stress field and on weakly anisotropic magnetic fabric due to intrusive flow in granitoid rocks, (2) the rheological properties during deformation may have been different in metamorphic and granitoid rocks (granitoids may have been less viscous), and (3) the magnetic anisotropy may be carried by different minerals (ferromagnetic vs paramagnetic) with different grain anisotropies in both rock types. Special studies were conducted to evaluate the importance of the individual causes. The separation of the ferromagnetic part of the anisotropy, using the method by Henry and Daly (1983), has shown that the anisotropy degrees both in the total anisotropy and in the ferromagnetic part of anisotropy are higher in metamorphic than in granitoid rocks. Hence, the cause (3) can be excluded from our considerations. Special mathematical modelling, using the Gay's (1968) equations treating the influence of different viscosity between the deformed grains and matrix, has shown that the cause (2) cannot be excluded. For the cause (1) we have developed no test. Consequently, the higher anisotropy degree in metamorphic than in granitoid rocks may be due to the causes of both (1) and (2).

In the Malá Magura massif the magnetic foliation in granitoid rocks strikes in general NW-SE. This orientation is in a rough agreement with that of S_I schistosity in the S part of the massif and in disagreement with that of schistosity in the N part (cf. Figs. 3 E-G and 4 E). The magnetic lineation trends in general NW-SE, i. e. roughly parallel to one submaximum in the fold and beta axes in both parts of the massif (see Figs. 3 H and 4 F). This is very clear on the example of localities Nos. 14, 21, 22 situated in the northernmost part of the massif. While in the gneiss locality No. 21 both the S_I schistosity and magnetic foliation strike WSW-ENE, in the granitoid localities Nos. 14, 22 it strikes clearly NW-SE. In addition, the magnetic foliation strikes approximately parallel to the courses of the bodies of amphibolite and individual granitoid rock types (cf. Fig. 1 and 4 E). It can be deduced from this that the development of magnetic fabric in the granitoid rocks of the Malá Magura massif was different from that in the Suchý massif. While in the Suchý massif the magnetic fabric of granitoid rocks follows the mesoscopic silicate fabric in metamorphic rocks very closely and was developed together with it during folding, in the Malá Magura massif it follows the mesoscopic silicate fabric in metamorphic rocks only partially. As, moreover, in the N part of the Malá Magura massif the small folds only subordinately follow the general strike of schistosity, we can assume a relatively complex deformation history. In our opinion, the magnetic fabric formation of granitoid rocks in this massif may have been controlled by the space of emplacement in the time of intrusion (it agrees with the shapes of the bodies of individual types of granitoid rocks) as well as by the movements responsible for the formation of the NW-SE trending folds.

From the different relation of the magnetic fabric in granitoid rocks to the mesoscopic silicate fabric in metamorphic rocks in the Suchý and Malá Magura massifs we can deduce that the Suchý and Malá Magura massifs represent partially different parts of the Hercynian orogeny. In the Suchý massif the anatectic magma (Kahan, 1980) probably ascended before or together, with the buckling of S_1 schistosity of metamorphic rocks, while in the Malá Magura massif it may have ascended partially after that.

Conclusions

The research of mesoscopic fabric and magnetic fabric in the crystalline complex of the Strážovské vrchy Mts. has drawn the following conclusions:

1. In metamorphic rocks magnetic fabric closely resembles the mesoscopic fabric. Both fabrics were formed during the processes of ductile deformation and recrystallization in an anisotropic stress field associated with Hercynian or older regional metamorphism.

2. The magnetic fabric pattern in granitoid rocks of the Suchý massif resembles that in metamorphic rocks. The former originated by the emplacement after the development of metamorphic schistosity and during the subsequent buckle folding.

3. The magnetic fabric in granitoid rocks of the Malá Magura massif resembles the fabric of metamorphic rocks only partially. It generated partially by intrusion movements partially conform and partially unconform to the schistosity and by ductile deformation connected with the formation of the NW-SE (i. e. partially transversal) folds.

4. The Suchý and Malá Magura massifs were tectonically juxtaposed during a dextral shear movement along the fault (oblique-slip fault) separating them and they also represented different structural horizons with regard to the relation of granitoid and metamorphic rocks.

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