

OBVESTILO O PREISKAVAH PRODORNIN V SLOVENIJI

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V letih 1951 do 1953 sem pregledal skoraj vse izdanke vulkanskih kamenin na Štajerskem. Nabral sem preko 300 vzorcev in jih mikroskopsko preiskal. Obdelal sem jih tudi z mikroskopom Fedorova. Kemične analize najznačilnejših kosov so razen ene še v delu.

Triadne štajerske vulkanite moremo razdeliti po nahajališčih na tri skupine. Genetično je ta razdelitev le deloma utemeljena.

Dobroveljska skupina

Najzahodnejše preiskane prodornine leže vzhodno od Kamnika oziroma južno od prelaza Črnilec. Vzorci so vzeti iz t. zv. porfirnega pasu (K o s s m a t) med Studenci in Ravnami ter iz zahodnega dela porfirnega pasu, ki leži severovzhodno od Raven. Tu prevladujejo tufi kremenovega keratofira. Manj je tufov avgitnega porfirita s kloritnimi mandlji ali brez njih. Teh je največ okoli Raven. Vulkaniti nastopajo le kot vložki med tufi. To so kremenovi keratofiri in ortofiri s felzitno osnovo, najdemo jih tudi z drobnozrnato osnovo. En kos ima tako debelo-zrnato osnovo, da že prehaja v žilnino. Vsi imajo vtrošnike albita (0—10 % an), manj kremenena. Nekateri vsebujejo še biotit, pri večini pa so bazični minerali že spremenjeni. Na enem kraju sem našel avgitni porfirit z vtrošniki plagioklazov, ki imajo približno 35 % an. V obeh pasovih vulkanskih kamenin nahajamo kaolin.

Vse te kamenine naj bi bile vložene v skrilavcih, ki jih Teller (1896) prišteva kristalastim skrilavcem; v resnici kažejo videz tipičnih psevdofiljskih plasti z vložki tufitov in tufov.

Podobni skrilavci so tudi na prelazu Črnilec in na južnem pobočju Kranjske Rebri; dosedanja literatura jih prišteva v stari kristalinik. Vsebujejo tufe kremenovega keratofira in avgitnega porfirita, ki imajo prav take vtrošnike in ostale petrografske značilnosti kot tipični wengski vulkaniti. Zato je večji del Tellerjevih sericitnih skrilavcev Kranjske Rebri, če že ne vsi, wengenske starosti. Del triadnih tufov in prodornin okoli Črnilca je vrisal Teller (1895) kot andezit oz. dacit.

Preiskal sem tudi vse domnevne izdanke andezita in dacita na južni polovici lista Mozirje (Teller, 1895).

Južno od Bočne se pojavljajo kremenovi keratofiri in albitni porfiri. Nekateri imajo kot vtrošnike albit s poprečno 5 % an, drugi pa oligoklaz

s poprečno 15 % an. Bazičnih vtrošnikov ni več, ti so pretežno kloritizirani. Osnova je felzitna ali drobnozrnata. Ena golica pripada kremenovemu porfiritu z andezinom kot vtrošnikom. Najde se tudi nekaj porfiritnih tufov.

Južno od Šmartnega ob Dreti se prav tako pojavlja kremenov keratofir z albitom (3—7 % an) in njegov tuf. Našel sem tudi kremenov biotitni porfirit. Dolomit je ob kontaktu s kremenovim keratofirom prekristaliziran.

V dolini Volažnice sem si ogledal t. zv. sericitne skrilavce (Teller, 1895). Po videzu so pa mnogo bolj podobni wengenskimi plastem; to tem bolj, ker sem našel med njimi plasti tufov kremenovega keratofira. Na njenem levem pobočju je razvita debela serija apnenčevega konglomerata. Po položaju sodeč je spodnjeladinske ali anizične starosti.

Ob zahodnem vznožju Dobroveljske planote ob grapi Potok najdemo biotitne kremenove porfirate z vtrošniki andezina (35—41 % an), kremen in biotita. Kemična analiza pove, da pripada ta vulkanska kamešina normalnemu granitnemu tipu granitne magme pacifične družine kamenin (Niggli, 1923). Vendar kaže že prehode h granodioritnemu tipu iste magme. Torej pripadajo slovenske magmatske kamenine dvema magmatskima provincama (Germovšek, 1953). Na podlagi kemične analize bi imenovali kamenino pravilneje plagiofir. Analizo je naredil ing. M. Babšek, za kar se mu najtopleje zahvaljujem. Vsi ostali kosi vulkanitov z Dobroveljske planote pripadajo kremenovemu keratofiru ali njegovim tufom. Vtrošniki so albit, ponekod tudi oligoklaz. Osnova je felzitna ali zrnata.

Vzhodno od Šmartnega ob Paki se pojavljata dva tipa kremenovega vulkanita, rjavi in zeleni. Rjavi ima poleg ortoklaza lepe vtrošnike kremen in rogovače, zeleni pa le albit. Tudi tu kot v vseh do sedaj omenjenih krajih prevladujejo tufi kremenovega keratofira. Izdanek vulkanskih kamenin poleg Podvina pri Polzeli je prav tako zgrajen iz tufov kremenovega keratofira. V njem se najdejo leče močno preperelega kremenovega keratofira. Zahodno od Šentandraža pri Velenju se pojavlja prav tak biotitni kremenov porfirit kot na zahodnem pobočju Dobroveljske planote. Tellerjev andezit oz. dacit okoli Zaloga ob Trnavi se je izkazal kot kremenov keratofir. Opis kremenovega keratofira pri Veliki Pirešici sem že objavil (Germovšek, 1953). Okoli Vojnika je Teller označil serijo kristalastih skrilavcev. Mikroskopska preiskava je pokazala, da so to večji del tufi kremenovega keratofira, ki so prav taki kot ostali wengenski tufi. Vtrošniki albita imajo 1—6 % an. Ni razloga, da ne bi tudi te plasti uvrstili v wengen. Kar ima Teller (1895) označeno zahodno od Vojnika kot andezite oziroma dacite, je v resnici pelitski tuf kremenovega keratofira.

Videli smo torej, da so vsi izdanki vulkanskih kamenin, ki jih je vrisal Teller v južni polovici lista Mozirje, triadne, najverjetneje wengenske starosti. Terciarne starosti so le daciti pri Velenju, ki jih obdaja širok pas dacitnih tufov. Vtrošniki so andezin (38—43 % an), kremen in rogovača.

Laška skupina

Vzorci sem vzel iz vseh treh alpsko usmerjenih vulkanskih kamenin med Celjem in Laškim ter južno od Črnoalice. Vsi ti izdanki so wengenske starosti.

Zahodno od Laškega in v okolici Govc sem našel le izdanke kremenovega keratofira in njegovega tufa (Munda, 1953). Plagioklazi imajo sestavo od 5—8 % an. Nekateri kosi imajo tudi kremen in biotit kot vtrošnike. Ti keratofiri so enaki onim iz doline Pake in Drete. Vzhodno od Laškega se pojavlja poleg kremenovega keratofira še diabazni porfirit z ofitsko in drobnozrnato osnovo. Glavni sestavni deli so andezin s približno 35—40 % an in avgit. Tudi tukaj prevladujejo tufi vseh naštetih kamenin. Veliki vrh vzhodno od Laškega je zgrajen pretežno iz diabaznega porfirita in njegovih tufov. Vzhodno od tod se poleg avgitnega porfirita zopet pojavi kremenov keratofir v enakih različnih kot v dolini Drete. Poleg plagioklazov ima tudi alkalne glinence. Tufi tu še bolj prevladujejo kot zahodno od tod.

To, kar je Dregger (1907) označil južno od Črnoalice kot Hornfels-trachyt, sestavljajo v resnici avgitni porfiriti z vtrošniki plagioklazov od 33—39 % an, kremenov keratofir, andezit, tufi vseh treh kamenin, psevdofiljski skrilavci in silificiran dolomit.

Severnejša dva pasova vulkanskih kamenin med Celjem in Laškim sta zgrajena predvsem iz tufov kremenovega keratofira in različnih tufitov, ki so v tesni zvezi s psevdofiljskimi plastmi. Mnogo manj je kremenovih keratofirov in porfiritov tufov. Smer vseh izdankov od vzhoda proti zahodu je posledica alpsko usmerjenega gubanja.

Vzhodnoštajerska skupina

Sem štejem vulkanite in tufe Rudnice, Bohorja, Orlice in Krškega hribovja. To je po sestavi še najbolj enotna skupina vulkanskih kamenin. Pojavlja se le avgitni in albitni porfirit; preiskal sem preko 100 kosov. Sestav plagioklazov se spreminja od 0 do 50 %, le v enem kosu je dosegel 70 % an. V glavnem opazujemo enake vrste porfiritov kot vzhodno od Laškega. Poleg ofitske in zrnate osnove je pogostna še steklasta. Tufi so najrazličnejši, od steklastih do groboklastičnih. Na Bohorju se pojavljajo poleg običajnih avgitnih porfiritov tudi porfiriti s kislejšimi plagioklazi sestave oligoklaza.

Del vzorcev z Bohorja mi je prepustil v obdelavo geolog A. Nosan, za kar se mu najlepše zahvaljujem.

Kot za vsa štajerska vulkanska območja velja tudi za to, da opazujemo mnogokratno menjavanje različnih vrst tufov. Menjava je tudi stokratna. Torej so bili zelo številni plinski in mnogi lavini izbruhi.

Bazični značaj vzhodnoštajerske skupine in pojavljanje mandljev je v soglasju z globokomorskim razvojem dela wengenskih sedimentov. Pojavljajo se namreč ploščasti apnenci z roženci. Glavna smer razvoja omenjenih sedimentov kot tudi vulkanskih kamenin je prečnoalpska.

Istočasno sem preiskal tudi vulkanske kamenine okoli Rogatca in zahodno od tod. Pretežno so to andezitni tufi z vložki rogovačnih ande-

žitov. Kislejše oblike andezita imajo vtrošnike andezina s 31—39 % an, bazičnejši pa plagioklaze s 45—52 % an. Conarni plagioklazi pa imajo jedro celo iz labradorita s poprečno 68 % an.

Najbolj bazična prodornina slovenske Štajerske je andezit poleg Šentilja pri Dramljah, ki prehaja morebiti že v bazalt. Ta ima steklasto osnovo z vtrošniki bazičnih plagioklazov (60—80 % an), hiperstena, avgita in verjetno tudi klinoenstatita.

V zvezi s preiskavo štajerskih vulkanitov sem za primerjavo preiskal tudi wengenske vulkanite iz okolice Kamne gorice in Nemilj. Vzorce mi je prepustil v preiskavo A. Nosan, deloma pa sem jih nabral sam. Tu opazujemo rogovačni in biotitni kremenov keratofir z albitom (1 do 5 % an). V nekaterih kosih je kremen kot vtrošnik, v drugih le v osnovi. Opazimo obe vrsti osnove, kot ju opazujemo pri kremenovem keratofiru poleg Velike Pirešice (Germovšek, 1953). Nekateri kosi kažejo lepo sferulitsko strukturo. Opazimo tudi nekoliko bazičnejši kremenov keratofir z vtrošniki oligoklaza (10—15 % an). Zelo številne so bile tudi plinske erupcije. To dokazujejo različni tufi, med katerimi so najznačilnejši brečasti lavini tufi.

Končno sem preiskal še t. zv. kremenov porfir jugozhodno od Jezerskega (Teller, 1895). To je kremenov porfirit z velikimi vtrošniki andezina (45—50 % an).

Sprejel uredniški odbor dne 16. junija 1954.

NOTE ON THE PETROGRAPHIC EXAMINATIONS OF THE SLOVENIAN ERUPTIVE ROCKS

In the years 1951 to 1953 I looked over nearly all the outcrops of the eruptive rocks in Slovene Styria. Over 300 samples were examined with petrographic microscope, and by means of the Fedorov-universal stage. Chemical analyses of the most characteristic pieces — except one — are still being worked on.

The triassic Slovene Styrian eruptive rocks can be divided into three groups according to their find-spots. This division is only partly founded as regard to their origin.

The Group of Dobrovlje

The most western eruptive rocks, already examined, are to be found east of Kamnik resp. to the South of the Črnilec-Pass. The samples have been taken from the so — called Porphyrite-Zone between Studenci and Ravne and from the western part of the Porphyrite-Zone, lying to the northeast of Ravne. The quartz-keratophyre tuffs are predominating here. The augite-porphyrite tuffs with chlorite-amygdules or without them are rare. Most of them are to be found near Ravne. Eruptive rocks

are only interbedded among the tuffs. These are most quartz-keratophyres with felsitic groundmass but we can find them with fine-grained groundmass too. One of the pieces has such a coarse-grained groundmass that it passes in the dyke-rock already. They all contain phenocrysts of albite (0—10 % an), with less quartz. Some of them contain biotite too but the majority the femic minerals are altered already. In one place I found augite-porphyrity with phenocrysts of plagioclases which contain 35 % an approx. In both the zones of eruptive rocks kaolin can be found.

All these rocks should be intercalated in slates which according to Teller (1896) belong to ancient crystalline rocks. But they appear to be typical Pseudo-Ziljan strata with intercalations of tuffic sandstones and tuffs.

Similar geological conditions we find also on the Črnilec-Pass and on the southern slope of Kranjska Reber. In the slates which the literature so far has counted among the old crystalline rocks, there can be found tuffs of quartz-keratophyre and augite-porphyrity, which have the same phenocrysts and other petrographical characteristics as the typical Wengenian eruptive rocks. That is the reason why the majority — if not all — of Teller's sericite-schists of Kranjska Reber, are of Wengenian age. A part of the triassic tuffs and eruptive rocks around Črnilec was recorded by Teller (1895) as andesite resp. dacite.

I also examined all the outcrops of supposed andesite and dacite on the southern part of the Mozirje geological map (Teller, 1895). To the South of Bočna quartz-keratophyres and porphyrs can be found. Some of them contain albite as phenocrysts with an average of 5 % an, others oligoclase with an average of 15 % an. There are no basic phenocrysts more as they are generally veathered into chlorite. The groundmass is felsitic or fine-grained. One outcrop (exposure) belongs to the quartz-porphyrity with andesine as phenocryst. Some porphyrite tuffs can be found as well.

To the South of Šmartno on the Dreta-stream the quartz-keratophyre with albite (3—7 % an) and its tuff can be found too. I also found the quartz-biotite-porphyrity. The dolomite coming into contact with quartz-keratophyre is recrystallized.

I had a look at the so-called sericite-schists (Teller, 1895) in the valley of the Volažnica-stream. But they appear more similar to the Wengenian strata; the more so as strata of the quartz-keratophyre tuffs have been found among them. On its left slope a thick series of limestone conglomerate has developed. According to their position they have to be of Lower Ladinian or Anisian age.

Along the western foot of the plateau of Dobrovlje by the ravine Potok biotite-quartz-porphyrity with phenocrysts of andesine (35—41 % an), quartz, and biotite can be found. The chemical analysis proves that this eruptive rock belongs to the normal granitic type of the granitic magma of the pacific province of rocks (Niggli, 1923). Yet it shows the transition to the granodioritic type of the same magma. Consequently the Slovene magmatic rocks belong to two magmatic provinces

(Germovšek, 1953). On the basis of the chemical analysis the rock should perhaps be called plagiophyre.

All other pieces of the eruptive rocks from the plateau of Dobrovlje belong to the quartz-keratophyre or its tuffs. The phenocrysts belong to albite and in some places oligoclase too. The groundmass is felsitic or grained.

To the East of Šmartno on the river Paka two types of eruptive rocks, brown and green, appear. The brown type contains beside orthoclase some beautiful phenocrysts of quartz and hornblende while the green one contains the albite only. Here as well as in all the places mentioned so far the quartz-keratophyre tuffs are predominating.

The outcrop of the eruptive rocks by Podvin near Polzela is based on the quartz-keratophyre tuffs too. In it lenses of rather weathered quartz-keratophyre can be found. To the West of Šentandraž near Velenje the same biotite-quartz-porphyrityte appears as on the western slope of the plateau of Dobrovlje.

The Teller's andesite resp. dacite round Zalog on the Trnava-river has proved to be quartz-keratophyre. A description of the quartz-keratophyre near Velika Pirešica was published earlier (Germovšek, 1953).

Teller showed some schists round Vojnik. It was proved by the microscopic examination that these are mostly quartz-keratophyre tuffs, corresponding quite well with other Wengenian tuffs. The phenocrysts of albite contain 1—6% an. There is no reason why these should not be classified as Wengenian too. That part, to the West of Vojnik, marked by Teller (1895) as andesites resp. dacites, is actually a pelitic tuff of quartz-keratophyre.

As we have seen, all the outcrops of eruptive rocks, recorded by Teller on the southern part of the Mozirje-geological map, are of triassic age, most probably Wengenian. Only the dacites near Velenje surrounded by a broad zone of dacite-tuffs, are tertiary. The phenocrysts are andesine (38—43% an), quartz, and hornblende.

The group of Laško

Specimens were taken from all three eruptive rocks showing an Alpine direction between Celje and Laško and to the South of Črnelica. All these outcrops are of Wengenian age.

To the West of Laško and in the surroundings of Govce I found only the outcrops of quartz-keratophyre and its tuff (Munda, 1953). Plagioclases contain 5—8% an. In some pieces quartz and biotite can be found as phenocrysts. These keratophyres are similar to those from the valleys of the Paka- and Dreta-rivers.

To the East of Laško there is diabase-porphyrityte with ophitic and fine-grained groundmass to be found beside the quartz-keratophyre also. The two chief elements are andesine with approx. 35—40% an and augite. Tuffs of all the mentioned rocks are predominating here too. Veliki vrh to the west of Laško is mainly composed of diabase-porphyrityte

and its tuffs. Eastwards beside augite-porphyrite quartz-keratophyre can be found in the same varieties as in the valley of the Dreta-stream. Beside the plagioclases it contains alkali feldspars as well. Tuffs are more predominating here than in the West.

The rock, marked by Dreger (1907) as "Hornfelstrachyt" — to the South of Črnomica, are actually augite-porphyrites with phenocrysts of plagioclases from 33 to 39 % an, quartz-keratophyre, andesite, tuffs of all three rocks, Pseudo-Ziljan strata, and silificied dolomite.

The two zones of eruptive rocks towards the North between Celje and Laško consist mainly of tuffs of quartz-keratophyre and various tuffic sandstones which are in close connection with the Pseudo-Ziljan strata. There are far fewer quartz-keratophyres and porphyrite tuffs to be found. The direction of all the outcrops from East to West is caused by an Alpine-trend folding.

The East Slovenian Group

To this group belong the eruptive rocks and tuffs of Rudnica, Bohor, Orlica, and Krško hills. The composition of this group of eruptive rocks is the most uniform of all. I found only the augite- and albite-porphyrites though I examined over 100 pieces. The composition of the plagioclases is changing from 0—50 % an, only in one piece it reached 70 % an. In general, the same kinds of porphyrites can be found as to the West of Laško. Beside the ophitic and grained groundmass the glassy one occurs very often. Tuffs of the augite-porphyrite and quartz-keratophyre are most varied, ranging from glassy to coarse-grained ones. On the Bohor-Hill beside the usual augite-porphyrites the porphyrites or even keratophyre appear with more acid plagioclases of albite-oligoclase composition as well.

Geologist A. Nosan has allowed me to examine a part of the Bohor specimens.

The general feature of all the Styrian eruptive spheres and of this one too is the frequent changing of various tuffs.

The basic character of the group of eruptive rocks and the appearance of amygdules accord with the deep-sea facies of one part of Wengenian sediments there, among which platy limestones containing hornstones can be found. The main trend of the sediments mentioned above as well as eruptive rocks is a transverse-alpine one.

At the same time the eruptive rocks round Rogatec and to the West thereof were examined. They are andesite-tuffs mainly with intercalations of hornblende-andesites. Andesite varieties which are more acid contain phenocrysts of andesine with 31—39 % an, while the basic varieties contain plagioclases with 45—52 % an. The zonal plagioclases have a labradorite core with 68 % an approx.

The most basic effusive rock of the Slovene Styria is andesite which probably passes into basalt near Šentilj by Dramlje. It has a glass groundmass with phenocrysts of basic plagioclases (60—80 % an), hypersthene-augite, and probably clinostatite too.

In connection with the research of Slovene Styrian eruptive rocks I examined the Wengenian eruptive rocks from the surroundings of Kamna Gorica and Nemilje just to make a comparison. Geologist A. Nosan let me have a part of the samples, and the rest was collected by me. Hornblende and biotite quartz-keratophyre with albite (1—5 % an) can be noticed. Some pieces contain quartz as phenocrysts, others as the groundmass only. Both kinds of the groundmass can be noticed just as it is the case with the quartz-keratophyre near Velika Pirešica (Germovšek, 1953). Some of the pieces show a beautiful spherulitic structure. A slightly more basic quartz-keratophyre with phenocrysts of oligoclase (10—15 % an) can be seen. The gas eruptions were very numerous. A proof for them are the most various tuffs the brecciated lava tuffs being the most characteristic among them.

Finally, I examined the so-called quartz-porphyrity South-east of Jezersko (Teller, 1895). That is the quartz-porphyrity with big andesine phenocrysts (45—50 % an).

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