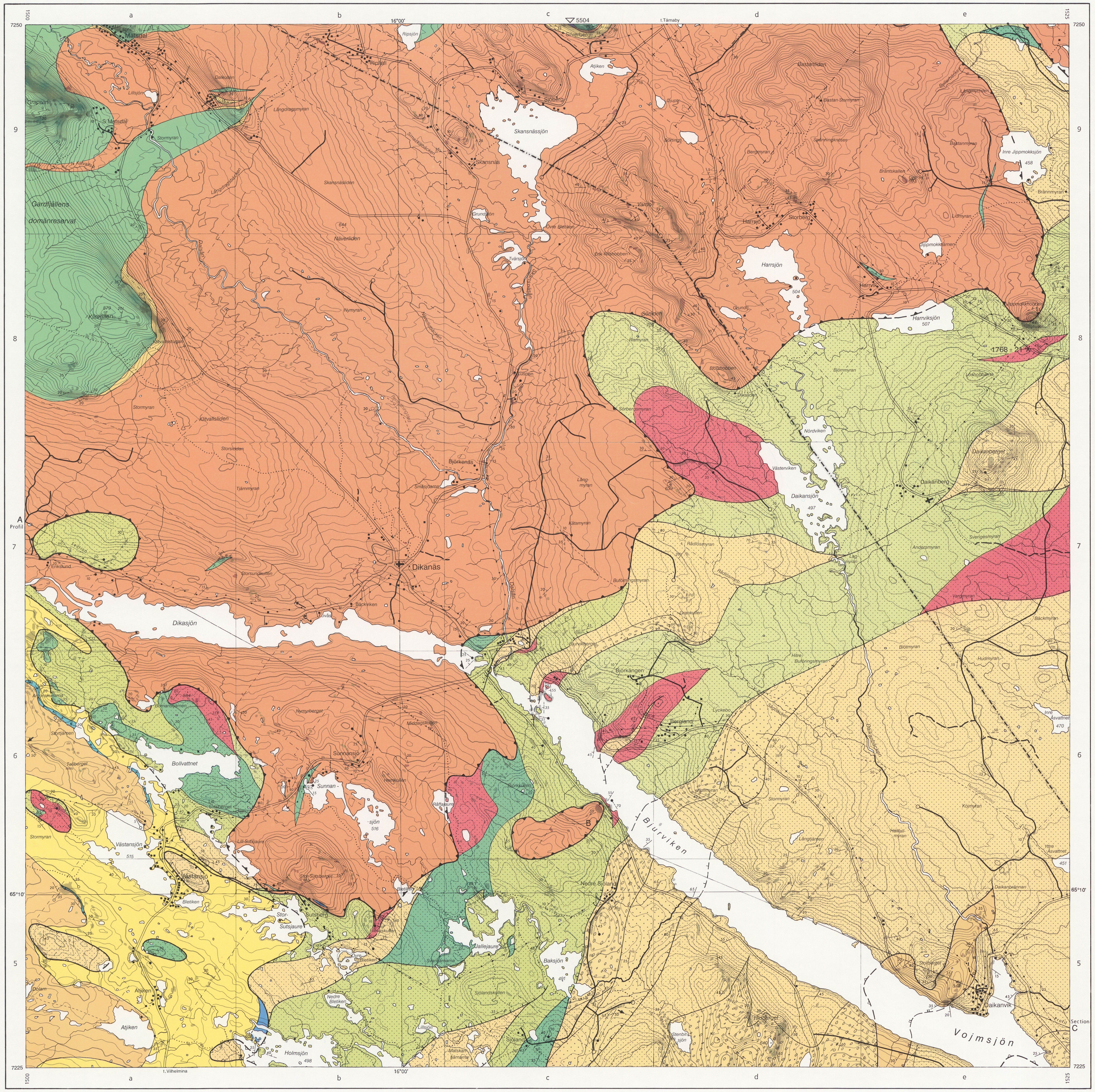
SVERIGES GEOLOGISKA UNDERSÖKNING



FJÄLLBERGGRUNDEN / *CALEDONIDES*

ÖVRE SKOLLBERGGRUNDEN / *UPPER ALLOCHTHON*

SEVEBERGARTER / *SEVE ROCKS*

- Ultramafiska bergarter (täljsten) — *Ultramafic rocks (soapstone)*
- Amfibolit, mindre inslag av gnejs eller glimmerskiffer — *Amphibolite, minor intercalations of gneiss or mica schist*
- Kvartsit, fältspatkvartsit, meta-arkos, kvartsitisk gnejs — *Quartzite, feldspathic quartzite, meta-arkose, quartz-rich gneiss*
- Marmor, i allmänhet kalcitisk, kalksilikatbergarter — *Marble, generally calcitic, calc-silicate rocks*
- Glimmerskiffer, gnejs, i allmänhet granat-biotit-muskovit(±fengit)-förande; mindre inslag av amfibolit — *Mica schist, gneiss, generally garnet-biotite-muscovite(±phengite)-bearing; minor intercalations of amphibolite*
- Överskjutning vid basen av Seve skollkomplexet — *Low-angle thrust at the base of the Seve Nappe Complex*

MELLERSTA SKOLLBERGGRUNDEN / *MIDDLE ALLOCHTHON*

STALONSKOLLAN / *STALON NAPPE*

- Kvartsit, fältspatkvartsit, pelitiska inlagringar — *Quartzite, feldspathic quartzite, pelitic intercalations*
- Meta-arkos, smärre konglomeratiska och pelitiska inlagringar — *Meta-arkose, minor conglomeratic and pelitic intercalations*
- Konglomerat — *Conglomerate*
- Mylonit, grönskifferaktig — *Mylonite, greenish, schistose*
- Metagabbro, amfibolit, diabas (proterozoisk) — *Metagabbro, amphibolite, dolerite (Proterozoic)*
- Granit till syenit, gnejs (proterozoisk) — *Granite to syenite, gneiss (Proterozoic)*
- Överskjutning vid basen av mellersta skollberggrunden — *Low-angle thrust at the base of the Middle Allochthon*

UNDRE SKOLLBERGGRUNDEN / *LOWER ALLOCHTHON*

BLAIKSKOLLAN / *BLAIK NAPPE COMPLEX*

Kvartsit med lerskifferinlagringar — *Quartzite with shale intercalations*	Gärdsjöformationen — *Gärdsjön Formation*	Sjoutälvsgruppen — *Sjoutälven Group*
Tillit, varvskiffer — *Tillite, glacial claystone*	Långmarkbergsformationen — *Långmarkberg Formation*	Sjoutälvsgruppen — *Sjoutälven Group*
Dolomit, delvis oren med kvartsrika inslag — *Dolomite, partly impure quartzite*	Kalvbergsformationen — *Kalvberget Formation*	Risbäcksgruppen — *Risbäck Group*
Arkos (sparagmit) med skifferinlagringar — *Arkose with shale intercalations*		Risbäcksgruppen — *Risbäck Group*

- Överskjutning vid basen av undre skollberggrunden (endast i profilen) — *Low-angle thrust at the base of the Lower Allochthon (only in the cross-section)*

BETECKNINGAR / *SYMBOLS*

- Radiometrisk åldersbestämning — *Isotopic age determination*
- Uppåtbestämning — *Way-up determination*
- 20 Lineation p.g.a. mineralorientering eller skärande förskiffringar med gradtal för stupning — *Mineral lineation or intersection lineation, plunge in degrees*
- 10 Veckaxel med gradtal för stupning / horisontell — *Fold axis, plunge in degrees / horizontal*
- 25 Förskiffring med gradtal för stupning — *Foliation, schistosity, dip in degrees*
- 50 Lagring med gradtal för stupning — *Bedding, compositional layering, dip in degrees*
- Överskjutning repeterande tidigare skollgränser — *Out-of-sequence thrust, breaching thrust*
- Överskjutning mellan delskollor, mindre överskjutning — *Minor low-angle thrust*
- Bergartsgräns — *Lithologic boundary*
- Häll, observerad yta av blottat berg — *Observed outcrop*
- Höjdkurvor, 10 m ekvidistans — *Contour lines, interval 10 metres*
- Mineralförekomst, stenbrott; nr enl. SGUs förekomstregister — *Mineral deposit, quarry; no. acc. to SGU mineral deposit register*

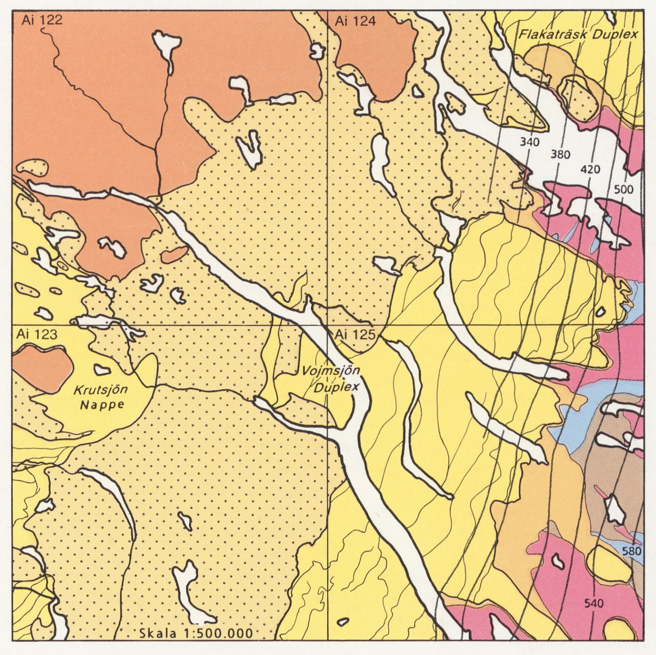
0 1 2 3 4 5 km

Skala 1:50 000

Detaljkartor i skala 1:20 000 samt annat grundmaterial finns tillgängligt på SGU.
Detailed maps at 1:20 000 and other information are available for study at SGU.

Topografiskt underlag enligt avtal med Lantmäteriverket. Geografiska längden är räknad från Greenwich. Gauss' projektion. Godkänd från sekretessynpunkt för spridning. Lantmäteriverket 1996-10-30

STRUKTURELLA ENHETER / *STRUCTURAL UNITS*



FJÄLLBERGGRUNDEN
CALEDONIDES

Övre skollberggrund
- Seveskollan

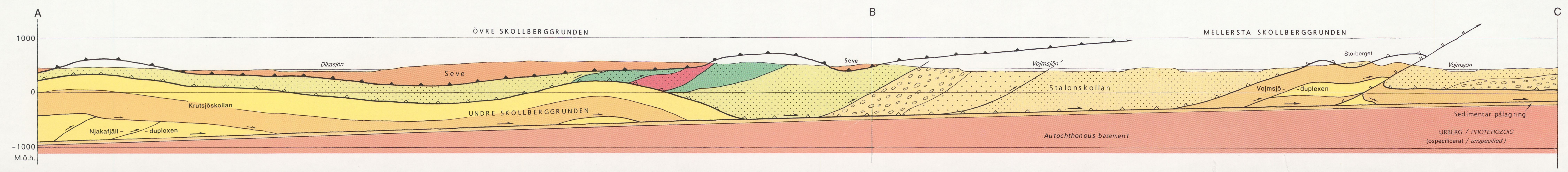
Mellersta skollberggrund
- Stalonskollan

Undre skollberggrund
- Blaikskollan med delskollor

AUTOKTONA SEDIMENTBERGARTER
AUTOCHTHONOUS
- Fjällrandzonen

URBERGET
PROTEROZOIC
- 460 Isolinjer för urbergsytan (40 m ekv.)
- Revsundssviten
- Jörnsviten
- Svekofenniska ytbergarter

Referens till kartan: Greiling, R.O. & Zachrisson, E., 1999: Berggrundskartan 23G Dikanäs NV, 1:50.000. *Sveriges geologiska undersökning Ai 122.*



Kartering och sammanställning av det geologiska kartbladet 23G Dikanäs NV bygger i huvudsak på de geologiska karteringar som periodvis mellan 1979 och 1997 bedrivits av R.O. Greiling, universitetet i Heidelberg, och hans studenter. Arbetet har utförts i samarbete med SGU. I fältarbetena på detta blad har J. Andersson, J. Bartusch, S. Febbroni, R.O. Greiling, M.A. Günther, S. Hutt, J. Paquin, T. Satzke, T. Vainio-Mattila, R. Wagner och E. Zachrisson deltagit.

Den slutliga sammanställningen och beskrivningen har skett i samarbete mellan R.O. Greiling och E. Zachrisson. E. Zachrisson svarar för design- och layoutarbeten. Reproduktionsarbetet har utförts av Ingemar Källberg, skrivarbeten av Kerstin Finn och stilsättning av Agneta Ek.

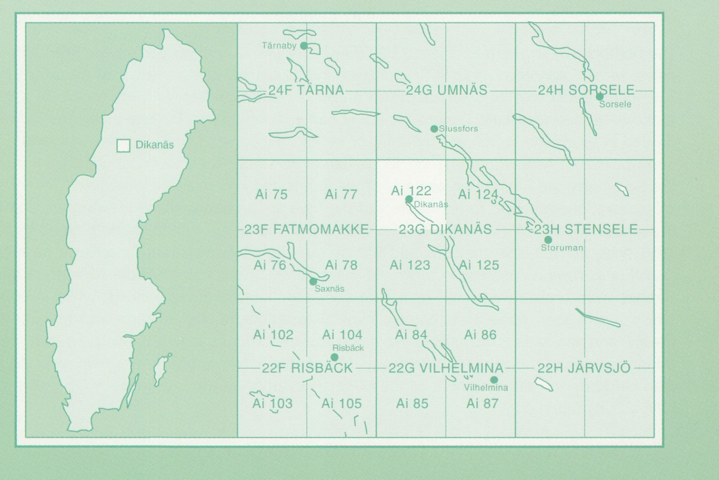
SGU serie Ai nr 122

Berggrundskartan

23G Dikanäs NV

Bedrock map

Skala 1:50 000



1999

KORTFATTAD BESKRIVNING

Kartbladen 23G Dikanäs (Ai 122–125) täcker ett område, som består av både urberg och fjällberggrund. En översikt över de strukturella enheterna inom kartbladen lämnas i kartdiagrammet nedanför teckenförklaringen. Berggrunden inom de två västliga bladen tillhör helt den kaledoniska fjällkedjan, medan de båda östliga bladen även innefattar en zon av urbergsbergarter öster om fjällkedjan. Dessa är av tidigproterozoisk ålder (2500–1600 miljoner år), medan fjällkedjans bergarter och den tunna, underlagrande zonen av odeformerade sedimentbergarter (se profilen) avsattes för ca 700–450 miljoner år sedan. Fjällberggrundens deformation, metamorfos och framskjutning mot öster och sydost, ut över urbergsunderlaget, ägde rum under kaledonisk tid och avslutades för ca 400 miljoner år sedan. Kartbladet 23G NV består således uteslutande av fjällberggrund.

FJÄLLBERGGRUNDEN

Berggrunden inom den kaledoniska fjällkedjan är resultatet av en bergskedjebildning för ca 520–400 miljoner år sedan. Iapetus, det hav som i senproterozoisk tid gränsade till kontinenten Baltica, började då att minska i bredd. Havsbottenskorpan sjönk ner i subduktionszoner, och kontinenterna Baltica, Laurentia (Nordamerika och Grönland) och eventuellt andra, mindre fragment av kontinentalskorpa kolliderade och pressades ihop. Genom storstilade överskjutningar kom därvid omfattande bergartskomplex att skjutas upp över den fennoskandiska urbergsskölden, vars västra randzoner samtidigt kraftigt deformerades. Sådana överskjutna enheter benämnes skollor och kan ha transporterats flera hundratals kilometer åt öster eller sydost. De översta skollorna har i regel de längsta transportavstånden, medan de undre enheterna är mer lokala och ofta innehåller bergarter, som med stor sannolikhet tillhört det fennoskandiska urbergsunderlaget.

Ur topografisk synpunkt är den nuvarande fjällkedjan betydligt yngre och i huvudsak relaterad till den tertiära uppsprickning för ca 65 miljoner år sedan, som ledde till bildandet av den nuvarande Atlanten.

Tektonisk indelning

Fjällberggrunden, som i regel vilar på en tunn zon av rotfasta (autoktona), sedimentära bergarter (se profilen), uppbygges internt av ett stort antal tektoniskt överskjutna (alloktona) enheter. Dessa kan indelas i den undre, mellersta, övre och översta skollberggrunden. Den senare är ej representerad inom de nu aktuella kartbladen.

De tektoniskt sett lägsta enheterna tillhör den undre skollberggrundens Blaikskolla, i bladets sydvästra del representerad av Krutsjöskollan. Den undre skollberggrunden återkommer även i bladets sydöstligaste hörn genom en uppressad skiva, ingående i den s.k. Vojmsjöduplexen. Däremellan, i ett synformartat stråk med nordnordöstlig riktning, löper mellersta skollberggrundens Stalonskolla, som mot nordväst reduceras i omfång och överlagras av den övre skollberggrundens Seveskolla. Denna senare enhet täcker bladets nordvästra del, tillhör undre Seve och domineras av glimmerskiffer.

Bergarternas ålder

Utifrån påträffade fossil samt genom geologiska bedömningar och jämförelser med angränsande områden kan man bestämma eller uppskatta bergarternas ålder.

I den undre skollberggrunden, som ibland innehåller medrivna rester av urbergsunderlaget, dominerar senproterozoiska arkoser med tillit samt senproterozoiska–underkambriska kvartsiter. Lagerföljden inom Krutsjöskollan når ingenstans upp till den mellan–överkambriska alunskiffernivån.

Den mellersta skollberggrunden består huvudsakligen av meta-arkoser och fältspatkvartsiter, troligen av senproterozoisk ålder, men innehåller även medrivna rester av det äldre, kristallina underlaget. Syenitiska bergarter i sådana linser, tillhörande den undre (ruta 3a) och mellersta (ruta 8e) skollberggrunden, har genom U/Pb-bestämningar på zirkoner daterats till 1798±6 resp. 1768±21 miljoner år.

Seveskollans glimmerskiffrar bildades troligen ur senproterozoiska sandstenar och skiffrar, medan inslagen av amfibolit representerar mafiska magmabergarter, som trängde upp vid Iapetus-havets öppnande.

Metamorfos

I samband med bergskedjeveckningen och överskjutningarna utsattes bergarterna för ökat tryck och förhöjd temperatur, vilket ledde till att de omvandlades genom den process, som kallas metamorfos (omkristallisation och mineralnybildning). Den undre skollberggrunden karakteriseras av ringa eller låg metamorfos (anchi-zon), vilken bäst kan mätas genom graden av kristallinitet hos lermineralet illit (och klorit). Mellersta skollberggrunden föreligger i grönskifferfacies (delvis lägre amfibolitfacies) men har i regel utsatts för retrograd metamorfos, relaterad till överskjutningarna. Sevebergarterna uppvisar högre metamorfos och har i allmänhet nått amfibolitfacies.

Bergarter

Beroende på utgångsmaterialet och som följd av variationer i deformation och metamorfos föreligger inom kartbladsområdet följande huvudbergarter:

Arkos, som dominerar den pre-tillitiska lagerföljden i den undre skollberggrunden, har bildats ur fältspatrika, relativt grova, delvis konglomeratiska sandstenar. Innehållet av kalifältspat och hematit ger vissa av dem en rödaktig färgton, men även grå eller mörkare varianter är vanligt förekommande. Ljusare, kvartsitiska led ingår också. I äldre tid användes beteckningen "sparagmit" för dessa senproterozoiska bergarter.

Tillit är beteckningen på en förstenad morän i den senproterozoiska lagerföljden. Dess förekomst indikerar en istid för ca 600 miljoner år sedan. Varvskiffer, som kan uppträda i anslutning till tilliterna, representerar en glaciallera, ofta med identifierbara droppstenar, som lossnat från smältande isberg.

Kvartsit utgör huvuddelen av den post-tillitiska lagerföljden i den undre skollberggrunden. Den är lokalt mycket ren (>98% kvarts) men i regel något fältspatförande. Till skillnad från arkoserna (se ovan) utgöres dock fältspaten nästan enbart av plagioklas, som vid vittring ofta ger vita fläckar. I vissa horisonter, främst i den undre delen, är kvartsiten grövre, ibland konglomeratisk.

Meta-arkos betecknar en något omvandlad, fältspatrik sandsten, som dominerar inom Stalonskollan. På grund av metamorfosen har de från början troligen rödaktiga sandstenarna antagit en grå-grönaktig färgton. Ljusa, mera kvartsitiska led och konglomeratiska inlagringar ingår. I äldre tid använde man beteckningen 'sparagmit' även för dessa senproterozoiska bergarter.

Mylonit är inom kartbladet en hård, flintig, tätbandad bergart, som bildats genom nedkrossing och rekristallisation i utpräglade rörelsezoner. De grönskifferaktiga myloniterna inom Stalonskollan tros ha uppkommit ur gabbroida–intermediära bergarter från urbergsunderlaget.

(Fortsättning på kartans baksida. *Continued on the back of this map sheet*)

MALMER, INDUSTRIELLA MINERAL OCH BERGARTER

SGU för ett register över malmer och mineraliseringar, vilka i fjällkedjan har beteckningen OREC, i urberget ORED, och över förekomster av industriella mineral och bergarter med beteckningen ORED.

Inom kartområdet saknas intressanta malm- och mineraluppslag.

Silverberget (ORED 5504, ruta 9c) är namnet på en täljstensförekomst. Den var känd redan på 1880-talet (Svenonius 1883) och utnyttjades delvis ända in på 1920-talet, men är nu troligen utbruten och brottet igenvuxet. Täljstenen användes enligt Kai Kristoffersson, Sjöberg, till gravvårdar och öppna spisar.

Glimmerskiffer och gnejs utgör huvuddelen av Seven. Utgångsmaterialet har mestadels utgjorts av sandiga och lerhaltiga sediment, vilket lett till att den nuvarande mineralogin domineras av kvarts, något fältspat, glimrar (biotit och muskovit) samt granat.

Amfibolit är en väsentlig bergartskompoment inom Seven. Sannolikt representerar amfiboliten basiska intrusioner och/eller vulkaniter. Ursprunglig pyroxen har ersatts av hornblände (amfibol), vilken i kombination med stark deformation gett bergarten dess bandade, gröna utseende. Även andra mineral har omkristalliserat eller nybildats.

Ultramafiska bergarter uppträder i Seve-enheterna. De kan utgöras av duniter (huvudsakligen bestående av olivin), peridotiter (olivin och pyroxen), serpentiniter (serpentin) eller täljstenar (talk). Endast en mindre talkförekomst finns nära kartbladets nordgräns vid Silverberg.

DESCRIPTION

General geology

The bedrock within the map sheet 23G Dikanäs NV (Ai 122) forms part of the Scandinavian Caledonides. Most Caledonian rocks in Scandinavia and all units in the present area are allochthonous and have been thrust east- or southeastwards onto the Fennoscandian platform, on top of a thin, autochthonous sequence of Late Proterozoic–Cambrian sedimentary rocks. Regionally, the Caledonides are divided in ascending tectonostratigraphic order into the Lower, Middle, Upper (Seve and Köli Nappes) and Uppermost Allochthons (Kulling 1972, Gee et al. 1985). The lowermost units, up to and including the Seve units, are interpreted as parts of the imbricated and shortened margin of Fennoscandia. The metabasic, igneous rocks (amphibolites) of the Seve are probably related to extension and opening of the Iapetus Ocean. Within the area, the Lower and Middle Allochthon are dominated by clastic cover sequences, derived from the continent Baltica, but also contain slices of Proterozoic basement.

All units have a complex tectonic and metamorphic history. The Middle Allochthon and the Seve Nappes were probably affected by a Late Cambrian–Early Ordovician event, which produced greenschist- and higher grade metamorphic mineral assemblages. Deformation and metamorphism continued, and the various complexes were successively brought together along a suture zone formed during collision of the continents Baltica and Laurentia. After nappe emplacement onto the Fennoscandian platform and establishment of the Lower Allochthon in the Silurian–Early Devonian, the Caledonian activity faded out.

Tectonostratigraphic units

The geological units distinguished on the map are principally lithological or lithostratigraphic in character. Tectonic units are separated by major and minor thrusts, as demonstrated by the main map, the cross-section and the structural inset map. Three major allochthons occur within the present map sheet, described in ascending order below. The autochthonous basement and the thin, autochthonous, sedimentary cover are only shown as undifferentiated units in the cross-section. For additional information, reference is made to the map sheet adjacent to the east (23G NO).

LOWER ALLOCHTHON

The Lower Allochthon is built up of structural slices or horses, mostly composed of sedimentary (cover) sequences and minor parts of underlying, crystalline rocks, derived from the basement.

The *crystalline, basement-derived rocks* are invariably represented by coarse-grained granites or syenites, which are comparable with the Revsund granite, exposed in the autochthonous basement. This similarity has been confirmed by radiometric dating results of 1798 ± 6 Ma (U/Pb on four fractions of separated zircons, P.-O. Persson, pers. comm.) from a syenite at Mörrösjöbäcken (23G SV, 3a). Mafic, crystalline rocks are restricted to one occurrence of medium-grained amphibolite, enclosed within granitoid rocks at Matskanån (23G SV, 4b).

The *sedimentary succession* of the Lower Allochthon is correlated with the Jämtland Supergroup in the type area further south (Gee et al. 1974, 1978, Kumpulainen 1982). The Risbäck Group (with arkose units and the Kalvberget Formation) and the Sjoutälven Group (with Långmarkberg and Gärdsjön Formations) are represented within the map sheet. The thickness of the sedimentary rocks is, in general, lower than in the type area.

The **Risbäck Group** at the southern border of the map sheet is contiguous with the type area further south (Kumpulainen 1982, Zachrisson 1997) and broadly comparable. The sequence is from several metres to at least several hundred metres thick. It is characterized by arkoses with dark to light reddish colours, sometimes coarse or fine-conglomeratic. They represent the upper part of the Risbäck Group, but their correlation with the proposed stratigraphy in the type area (Kumpulainen 1982: Stor-Raijan (bottom), Tvärselet and Mångmanberget Formations) is uncertain. In the Bäckstrand area (4–5, e–f, at the corner of all four 23G map sheets), Kulling (1942) discussed the red conglomerates as part of the Stalon Nappe. It is worth noting that the present interpretation involves a subdivision with an upper part of greenish-greyish colour belonging to the Stalon Nappe, underlain by horses of reddish Risbäck arkoses and conglomerates of the Vojmsjön Duplex (see below), as part of the Lower Allochthon. The conglomerates of the Lower and Middle Allochthon are distinct both by their different degrees of metamorphism and their pebble contents (see Middle Allochthon, below).

At the western end of Lake Holmsjön (5b) dolomites of the overlying **Kalvberget Formation** are exposed. They comprise both relatively pure, quartz-bearing dolomite and barely dolomite-matrix supported, coarse-grained quartzite or quartz breccia.

Generally the dolomites are missing in the area, and the Risbäck arkoses are directly overlain by tillites of the **Långmarkberg Formation**. The tillites vary considerably both in facies development and in thickness (up to ca 30 metres). The most comprehensive description as yet of the area's tillites is by Kulling (1942). Varved 'clays' with grain sizes up to silt and fine sand occur, probably beneath the tillites 'sensu stricto'. The overlying tillites contain angular to sub-angular, metre-sized boulders of crystalline, granitoid rocks and arkoses in a psammo-pelitic matrix. Locally, pelite or dolomite fragments also occur.

The **Gärdsjön Formation** is dominated by massive, often white to light grey-coloured quartzites, composed mainly of quartz (>90%), with minor amounts of feldspar, detrital mica, clay minerals and chlorite. The grain size varies between coarse and very fine-grained; particles are well rounded in graded units, and generally angular in poorly sorted beds. A characteristic, layer of conglomeratic and coarse-grained quartzite, ca 10 metres thick, occurs near the base of the Gärdsjön Formation. It is composed of generally well-rounded pebbles of milky or bluish quartz and white feldspar, up to 1.5 cm in diameter. Within the quartzite, irregular layers of silt- and mudstone and grey and green shale occur. These fine-grained layers are also composed of at least 90% quartz. Some layers are more than 10 metres thick and can be followed along strike for several kilometres, as shown on the map. Towards the top of the Gärdsjön Formation, psammites show graded bedding and a general fining upwards.

Structurally, the Lower Allochthon is represented by the Blaik Nappe Complex (Kulling 1942) and has been divided earlier, on the map sheets adjacent to the south and west (e.g. Zachrisson and Greiling 1993, 1996), into different thrust systems: marginal ones at the eastern Caledonian margin and the Njakafjäll Duplex to the west. On the present map sheet, the Lower Allochthon is exposed in parts of two major regional antiforms trending NNE–SSW, which were caused by the stacking of the Njakafjäll Duplex (Gayer and Greiling 1989) in the west and the Vojmsjön Duplex (see below) in the east. These two antiforms are separated by a synform, which is occupied by the overlying Middle and Upper Allochthons. Northwards, the Njakafjäll Duplex is overlain by the Krutsjön Nappe sheet (Zachrisson and Greiling 1993), which represents the highest unit of the Lower Allochthon in the area and covers all of the Lower Allochthon as exposed in the southwest (23G SV).

In the southeastern corner of the present map sheet, a number of imbricate units (horses) could be mapped out, which have the base of the Middle Allochthon as their common roof thrust. Therefore, this structure can be demonstrated to be a duplex. It is called the Vojmsjön Duplex here and extends towards east and south into the adjacent map sheets (23G NO, SO, SV).

Towards the south, the Blaik Nappe Complex is more widely developed and merges into the huge complex of the Jämtlandian Nappes. Northwards, it pinches out completely along strike, before reaching the south shore of Lake Storuman on the map sheet 23G NO. There, no traces of the Lower Allochthon have been found between the underlying, autochthonous, sedimentary succession and the overlying Middle Allochthon.

The structural and metamorphic evolution involves a single, pre-thrusting deformation phase, which produced small-scale, isoclinal or drag folds and a penetrative foliation in incompetent rocks, synchronous with illite recrystallization (Greiling 1985). Subsequent shearing and thrusting relate to nappe transport and stacking of horses, and the latter also led to folding in the overlying units. Stretching lineations and branch line geometry suggest a tectonic transport direction towards ESE (ca 110°), which is consistent for all the horses in the Lower Allochthon (Gayer and Greiling 1989). Subsequently, a late out-of-sequence, reverse fault breached the roof of the Vojmsjön Duplex and transported a slice of Risbäck Group arkoses (Lower Allochthon) over the Middle Allochthon (Daikanvik, 5e). Illite crystallinity data define a 'metamorphic' grade between lower anchizone and epizone (Greiling 1985, Warr et al. 1996).

MIDDLE ALLOCHTHON

The Middle Allochthon is represented by the Stalon Nappe (Kulling 1942, 1955), which is widely distributed and generally present between the Lower and Upper Allochthons. The area around the village of Stalon with the mountains Lill- and Stor-Stalonberget (23G SV, 0-1, a-b) gave rise to the name of the Stalon Nappe (Kulling 1951). It can be divided lithologically into crystalline, pre-Caledonian, basement-derived rocks in various degrees of deformation, including mylonites, and metasedimentary, generally psammitic rocks. The different lithological units are separated by shear zones, and primary basement/cover relationships are not preserved (Greiling 1985, 1989). The only primary contacts encountered are those of discordant, mafic dykes cutting the crystalline rocks (see below).

The *crystalline basement-derived rocks* are represented by abundant greenish mylonites, metagabbros, metasyenites and subordinate felsic gneisses (Günther 1984, Greiling 1985, Zachrisson and Greiling 1996, Roos 1997). The greenish mylonites ("green schists of Ullisjaur type" of Kulling 1942; see 23G NO) consist of plagioclase, epidote, chlorite and subordinate mica-minerals, quartz, and opaque minerals. They were probably derived mainly from crystalline, pre-Caledonian rocks, as determined from microscopic and geochemical studies (Greiling 1985, 1992). The mylonites vary from relatively homogeneous and weakly foliated rocks to distinctly banded (dark green–light green) and foliated. Because of their aesthetic appeal, they have been quarried as potential dimension stones at Korpkullen (2b, Einarsson and Greiling 1997, Greiling and Febbroni 1997).

Less deformed, crystalline rocks appear as coarse-grained metagabbros with lens-shaped, dark and light mineral grains or pseudomorphs. Microscopic studies show a complete change of the primary mineralogy into chlorite, epidote, albite and accessory minerals. A strongly foliated metasyenite from the road to the east of Harrvik (8e) is characterized by orthoclase, plagioclase and subordinate quartz. Radiometric dating revealed an age of 1768 ± 21 Ma (U/Pb on five fractions of separated zircons, P.-O. Persson, pers. comm.). Subordinate felsic gneisses are exposed in the Bollvatnet area (5a) and interlayered with cm-to dm-thick bands of intermediate and mafic composition. At Västansjön (5a), to the west and north of Bollvatnet (6a), at the eastern tip of Dikasjön (7a), and east of Stor Sutsjaure (5b) a number of dolerite dykes has been observed, which are cross-cutting the crystalline, basement-derived rocks, but have nowhere been observed in connection with metasedimentary rocks. Therefore, and because of their alkaline geochemical characteristics, they have been correlated with Jotnian age dykes of the Fennoscandian shield (Greiling et al. 1984; Greiling 1985, 1992).

The overlying *metasedimentary rocks* consist of coarse meta-arkoses with subordinate, pelitic interlayers and coarse-grained, polymict conglomerates. The lower part of the metasedimentary sequence is dominated by coarse conglomerates in a psammitic, competent matrix. These conglomerates are fining upwards in that psammitic interlayers become more frequent. Higher up, the conglomeratic beds become thinner and are restricted to the base of dm–m thick psammitic beds. Eventually, there is a transition towards thick-bedded, homogeneous, coarse meta-arkoses with rare, metapelitic beds as thin (mm–cm), dark grey interlayers or occasionally as angular fragments within the psammites.

Apparently overlying the metapsammites but with no primary contact exposed is another type of conglomerate with less abundant boulders in a relatively fine-grained, shaly or phyllitic matrix. However, the matrix sometimes shows transitions into a psammitic composition so that no clear distinction can be made between the two types of conglomerates.

Lithological similarities suggest a correlation of the sedimentary sequence of the Stalon Nappe with the Risbäck Group of the Lower Allochthon. However, the Stalon units are distinct by their higher degree of metamorphism (greenschist versus sub-greenschist grade, see below), the intensity of deformation and by the conglomerate's pebble contents. According to pebble statistics (Kulling 1942), the conglomerates in both allochthons are dominated by boulders of granite, syenite, felsic gneiss, vein quartz, feldspar megacrysts and rhyolite. In contrast, conglomerates of the Lower Allochthon are distinct by containing up to 20% of boulders derived from clastic, metasedimentary rocks (pelites–psammites). No metasedimentary fragments are reported from Middle Allochthon conglomerates. Instead, the latter may contain up to 30% of mafic boulders, whereas in the Lower Allochthon the content of mafic boulders is 10% or less.

Across Lake Vojmsjön, a sequence of alternating, greenish pelites and cm–dm thick, light grey quartzites and arkoses is exposed. The unit is at least ca 20 m thick, and can be followed along strike in both directions for several kilometres. To the east of Sjöland (4c–5d), this sequence is inverted and apparently stratigraphically overlying the bulk of metasedimentary rocks of the Stalon Nappe. The lithologic character strongly resembles, and may be speculatively correlated with, the Gärdsjön Formation of the Lower Allochthon. Such a correlation is consistent with the position as the highest, lithostratigraphic unit of the Middle Allochthon. However, this sequence is clearly epimetamorphic, in contrast to the very low-grade Lower Allochthon.

Structure. Early Caledonian deformation in the Middle Allochthon is documented by recumbent, isoclinal folds with a penetrative schistosity, deformed by generally open folds attributed to a second structural phase. These latter folds are associated with an axial planar crenulation cleavage, that may be penetrative in incompetent rocks. Subsequent deformation led to intense shearing and development of a penetrative, mylonitic fabric in some structural units. In other units, penetrative deformation was restricted to their margins or to distinct, internal shear zones with only a weak overprinting by a fracture cleavage. Associated with the planar, mylonitic fabric is a strong lineation, enclosing both relic mineral grains and newly formed minerals, indicating a tectonic transport direction towards the SE–SSE (ca 140°). As a consequence of the stacking of different lithological units, the internal structure of the Middle Allochthon is that of a duplex (Bartusch 1995, Febbroni 1997). Later fault-bend folding occurred, when the Middle Allochthon was transported as the roof of the Lower Allochthon.

Mineral assemblages, representing an early peak of *metamorphism,* are characterized by coexisting almandine garnet, biotite and muscovite in pelitic rocks and are indicative of the transition between greenschist and amphibolite facies metamorphism with minimum P-T conditions of about 500°C and 4 kb. Subsequent mylonitization is associated with retrogression of garnet and brown biotite into coexisting muscovite, chlorite, green biotite and rare stilpnomelane in pelitic rocks, indicating lower greenschist facies metamorphic conditions. Less deformed domains still retain higher grade assemblages, that remained apparently unaffected by retrogression.

UPPER ALLOCHTHON

The higher-grade rocks in the structurally lower part of the Upper Allöchton are included within the Seve Nappes. Within the map area, they are dominated by mica schist and amphibolite with minor quartzite, gneiss, marble, and ultramafic rock. The Seve rocks of the 23F Fatmomakke area immediately to the west were studied and described by Trouw (1973). The present map area is covered by what he called the Eastern Schist and Amphibolite Belt, which in this context includes the Dikanäs schists (Zachrisson and Greiling 1993). The schists vary from muscovite-dominated mica schists with abundant biotite and garnet porphyroblasts to more quartzo-feldspathic, gneissic varieties or more quartz-rich, metapsammitic rocks.

Particularly the quartz-rich metapsammitic units of the Seve and Stalon Nappes are lithologically very similar. However, they can be distinguished by the following criteria: in the Seve units, muscovite is well recrystallized (mm–cm size), biotite and garnet porphyroblasts are visible with a hand-lens (or even without); quartz and feldspar are recrystallized, in general there are no primary textures preserved; foliation surfaces appear as (medium) grey with brownish hue (from biotite). In the Stalon Nappe (Middle Allochthon), foliation surfaces are 'phyllitic' and appear dark grey with greenish hue (from chlorite or epidote). Macroscopically, there are neither muscovite nor biotite crystals visible. Biotite or garnet can only exceptionally be observed in thin sections; quartz is recrystallized, but the primary shape of clastic grains can often be observed; feldspar clasts are often well preserved. Locally, primary features such as cross-bedding or graded bedding can be discerned.

Cross-section

Contouring of the top of the peneplained, Proterozoic basement at the Caledonian front indicates a west-northwesterly dip in the interval 0.6°–1.7°. The Caledonian, basal décollement surface generally developed within the sedimentary cover sequence, a few tens of metres above and broadly parallel with the basement surface. Therefore, the section is drawn assuming a sole thrust with a general dip of 1.5° (cf. Gee et al. 1978, Bierlein and Greiling 1993) from the eastern Caledonian margin towards the west-northwest. It trends at a low angle to the tectonic transport direction of the Lower Allochthon (110°). Previous sections across the Njakafjäll Duplex have been published by Kulling (1972), Gayer and Greiling (1989) and Zachrisson and Greiling (1993, 1996). The present section shows the buried, northern termination of the Njakafjäll Duplex, which is overlain by the Krutsjön Nappe sheet (Zachrisson and Greiling 1993). In the eastern part of the section, the trailing end of the Vojmsjön Duplex is visible. The synform between the two antiformal stacks of the Lower Allochthon is occupied by the Stalon Nappe of the Middle Allochthon, probably riding directly on top of the autochthonous, sedimentary sequence. The dominating metapsammites of the Stalon Nappe are imbricated together with horses of mylonites and crystalline, basement-derived rocks.

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