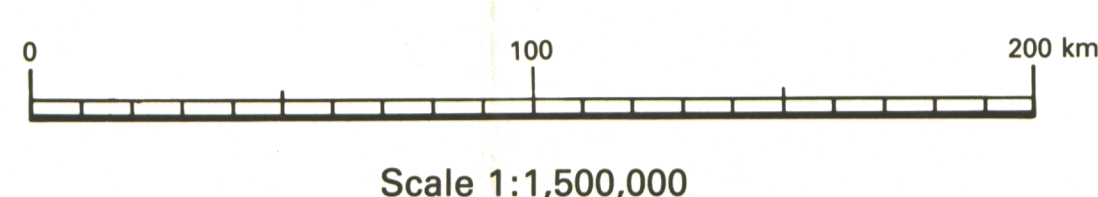


SCANDINAVIAN CALEDONIDES STRATABOUND SULPHIDE DEPOSITS

Compiled by E. Zachrisson, 1986



GEOLOGY

TECTONOSTRATIGRAPHIC UNITS

- POST-CALEDONIAN**
Devonian (ORS), minor Carboniferous (sedimentary) and Permian (igneous) rocks.
- UPPERMOST ALLOCHTHON**
Troms, Ningen Group, Beirn, Helgeland
Dyrøy, Nordmannvik, Lyngen, Narvik Group, Salangen Group, Fauske, Rødingfjellet
- UPPER ALLOCHTHON**
Köli equivalents, undifferentiated: Magerøy, Vaddas, Kärfjord, Skibotn, Senja, Rombak Group, SW Norway
Upper Köli: Steren
Upper Köli: Gaskan, Storfjället (Kruftfjället, Jofjället), Gula
Middle Köli: Vesten, Salo, Atofjället, Stikke, Gelvenkko, Laipikvatnet, Giersvik, Meråker
Lower Köli: Joesjö, Björkvatnet, Duved, Otta
- SEVE**: Kalak (upper part: Storekoransen, Gildetun-Navidalen), Sveve Nappes in Sweden, Skjotland, Surma, Båhne
- MIDDLE ALLOCHTHON**
Laksefjord, Kalak (lower part: Kriby, Gargis, Skillefjord, Naiganas, Sprey-Sjælland), Ålasko, Åksjø, Stalon, Offerdal, Leksdal, Tännäs Augren, Gneiss, Vemur, Sår, Kivivola, Sætra, Røderget, Valdres, Rondanø, Jostu, Upper Bergedalen, Bergen anorthosite, Hardangervidda-Ryfylke
- LOWER ALLOCHTHON**
Gaisas, Jera, Rautas, Gargatis, Blak, Jämtandian, Vemdalen, Ösen-fas, Symbfjell, Lower Bergedalen
- AUTOCHTHON, PARAUTOCHTHON**
Vendian to Silurian cover
Precambrian basement: autochthonous, parautochthonous, or of uncertain tectonic position along the western coast of Norway

PALAEOTECTONIC ZONES

Nappes derived from a western Laurentia-Greenland? and its southeastern margin

Nappes containing vestiges of oceanic crust and successions related to ensimatic rifted arcs and locally ensialic arcs

Nappes derived from the continent Baltica and its northwestern margin

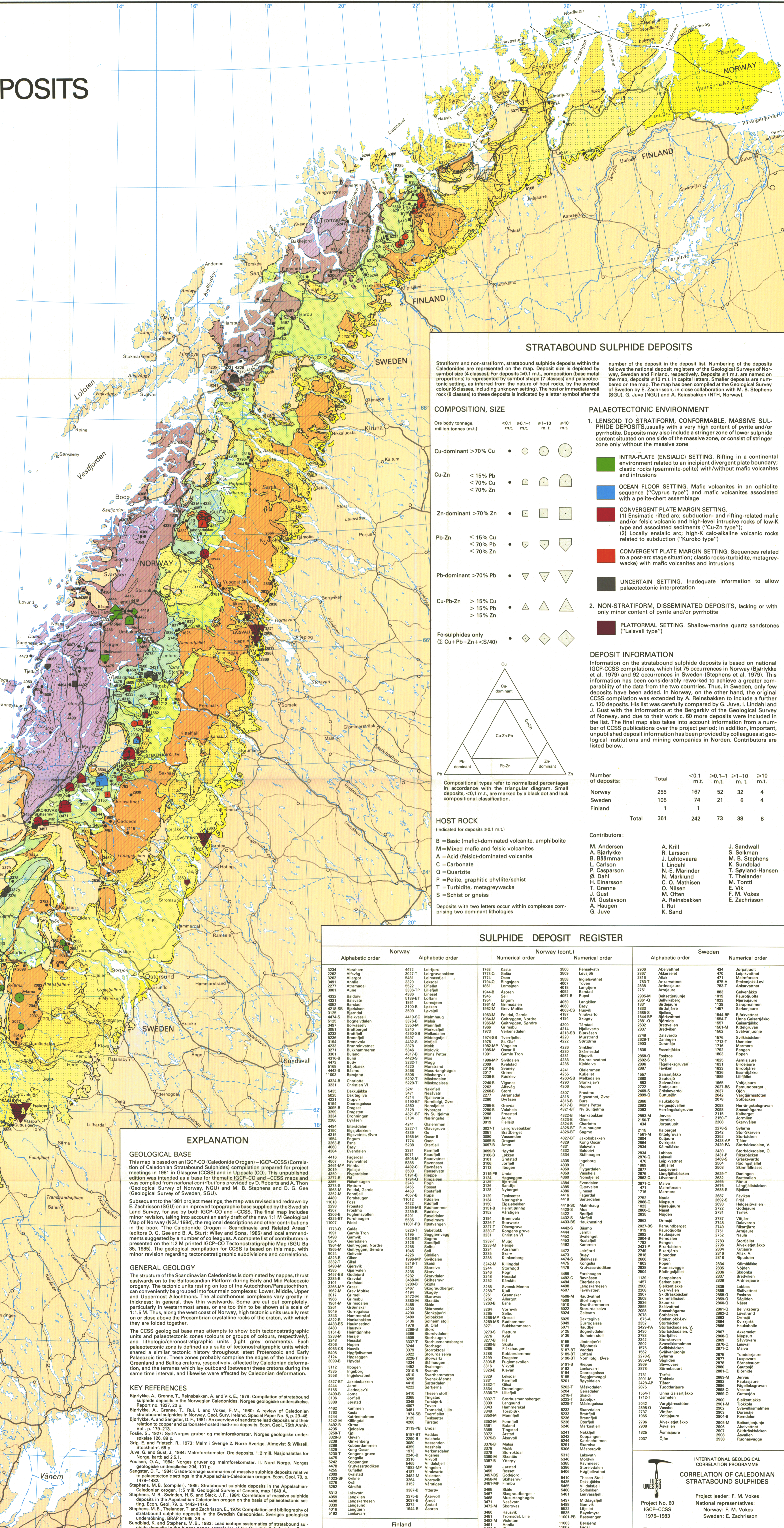
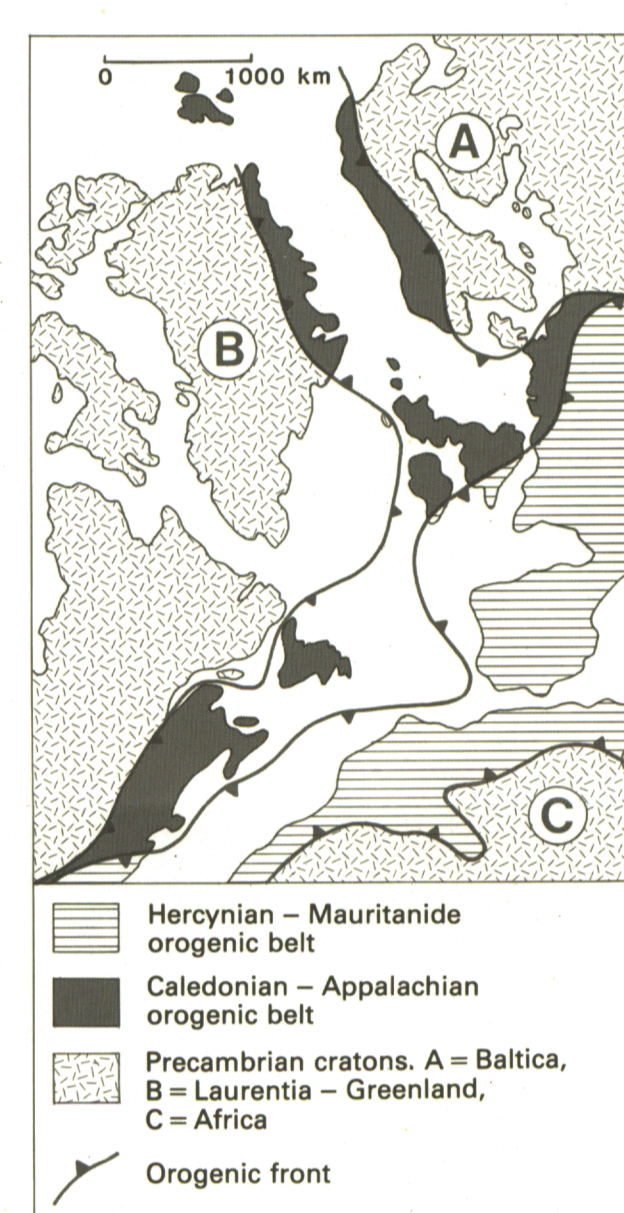
Continent Baltica and platform cover

LITHOLOGY AND CHRONOSTRATIGRAPHY ZONES

- Permian igneous rocks and minor Carboniferous sedimentary rocks in Oslo Paleorift
- Molasse-type sediments (Old Red Sandstone) of latest Silurian and Devonian age
- Major plutons of Early Palaeozoic age (including basal parts of ophiolites)
- Variably metamorphosed rocks, often medium and high-grade, of uncertain age
- Variably metamorphosed sediments, volcanics and high-level intrusions of Cambrian (and locally Vendian) to Silurian age
- Variably metamorphosed sediments, volcanics and high-level intrusions of Late Proterozoic (and locally Early Cambrian) age
- Precambrian crystalline rocks, incorporated in Caledonian nappes
- Precambrian crystalline rocks of Sveconorwegian (Grenvillian) and older age, westwards increasingly affected by Caledonian metamorphism.

STRUCTURAL SYMBOLS

- Major faults
- Thrusts, separating major tectonostratigraphic units
- Other low-angle thrusts
- Depositional or intrusive contacts



STRATABOUND SULPHIDE DEPOSITS

Stratiform and non-stratiform, stratabound sulphide deposits within the Caledonides are represented on the map. Deposit size is depicted by symbol size (4 classes). For deposits ≥ 0.1 m.t., composition (base metal proportions) is represented by shape (7 classes) and palaeotectonic setting, as inferred from the nature of host rocks, by the symbol colour (8 classes, including unknown setting). The host or immiscible rock (8 classes) to these deposits is indicated by a letter symbol after the number of the deposit in the deposit list. Numbering of the deposits follows the national deposit registers of the Geological Surveys of Norway, Sweden and Finland, respectively. Deposits ≥ 1 m.t. are named on the map; deposits < 0.1 m.t. are not. Smaller deposits are numbered on the map. The map has been compiled at the Geological Survey of Sweden by E. Zachrisson, in close collaboration with M. B. Stephens (SGU), G. Juve (NGU) and A. Reinshakken (NTH, Norway).

COMPOSITION, SIZE

- One body tonnage, million tonnes (m.t.)
- < 0.1 m.t.
 - ≥ 0.1 m.t.
 - $\geq 1-10$ m.t.
 - ≥ 10 m.t.
- Cu-dominant $> 70\%$ Cu
- $< 15\%$ Pb
 - $< 70\%$ Cu
 - $< 70\%$ Zn
- Zn-dominant $> 70\%$ Zn
- $< 15\%$ Cu
 - $> 70\%$ Zn
 - $< 70\%$ Zn
- Pb-dominant $> 70\%$ Pb
- $> 15\%$ Cu
 - $> 15\%$ Pb
 - $> 15\%$ Zn
- Cu-Pb-Zn
- $> 15\%$ Cu
 - $> 15\%$ Pb
 - $> 15\%$ Zn
- Fe-sulphides only (Σ Cu + Pb + Zn + $< S/40$)

PALAEOTECTONIC ENVIRONMENT

- LENSOID TO STRATIFORM, CONFORMABLE, MASSIVE SULPHIDE DEPOSITS**, usually with a very high content of pyrite and/or pyrrhotite. Deposits may include a stringer zone of lower sulphide content situated on one side of the massive zone, or consist of stringer zone only without the massive zone.
 - INTRA-PLATE (ENSIALIC) SETTING**. Rifting in a continental environment related to an incipient divergent plate boundary; clastic rocks (psammite-pelite) with/without mafic volcanics and intrusions
 - OCEAN FLOOR SETTING**. Mafic volcanics in an ophiolite sequence ("Cyprus type") and mafic volcanics associated with a pelite-chert assemblage
 - CONVERGENT PLATE MARGIN SETTING**. (1) Ensimatic rifted arc; subduction- and rifting-related mafic and/or felsic volcanic and high-level intrusions of low-K type and associated sediments ("Cu-Zn type"); (2) Locally ensialic arc; high-K calc-alkaline volcanic rocks related to subduction ("Kurukoto type")
 - CONVERGENT PLATE MARGIN SETTING**. Sequences related to a post-arc stage situation; clastic rocks (turbidite, metagreywacke) with mafic volcanics and intrusions
- NON-STRATIFORM, DISSEMINATED DEPOSITS**, lacking or with only minor content of pyrite and/or pyrrhotite.
 - UNCERTAIN SETTING**. Inadequate information to allow palaeotectonic interpretation
 - PLATFORM SETTING**. Shallow-marine quartz sandstones ("Laisvall type")

DEPOSIT INFORMATION

Information on the stratabound sulphide deposits is based on national IGC-CSS compilations, which list 75 occurrences in Norway (Björlykke et al., 1979) and 82 occurrences in Sweden (Stephens et al., 1979). This information has been considerably reworked to achieve a greater comparability of the data from the two countries. Thus, in Sweden, only few deposits have been added to the original IGC-CSS compilation; on the other hand, the original IGC-CSS compilation was extended by a further c. 120 deposits. His list was carefully compared by G. Juve, I. Lindahl and J. Gust with the information at the Bergarkiv of the Geological Survey of Norway, and due to their work c. 80 more deposits were included in the list. The final map also takes account of information from a number of CCS publications over the project period; in addition, important, unpublished deposit information has been provided by colleagues at geological institutions and mining companies in Norden. Contributors are listed below.

Number of deposits:	Total	< 0.1 m.t.	≥ 0.1 m.t.	$\geq 1-10$ m.t.	≥ 10 m.t.
Norway	255	167	52	32	4
Sweden	105	74	21	6	4
Finland	1	1			
Total	361	242	73	38	8

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SULPHIDE DEPOSIT REGISTER

Norway		Norway (cont.)		Sweden	
Alphabetic order	Numerical order	Alphabetic order	Numerical order	Alphabetic order	Numerical order
3234 Aabakam	4472 Leirfjord	1103 Karna	3620 Ranaevan	2006 Akashestet	434 Jorpelvoll
3235 Aabakam	4473 Leirfjord	1104 Karna	3621 Ranaevan	2007 Akashestet	435 Jorpelvoll
3236 Aabakam	4474 Leirfjord	1105 Karna	3622 Ranaevan	2008 Akashestet	436 Jorpelvoll
3237 Aabakam	4475 Leirfjord	1106 Karna	3623 Ranaevan	2009 Akashestet	437 Jorpelvoll
3238 Aabakam	4476 Leirfjord	1107 Karna	3624 Ranaevan	2010 Akashestet	438 Jorpelvoll
3239 Aabakam	4477 Leirfjord	1108 Karna	3625 Ranaevan	2011 Akashestet	439 Jorpelvoll
3240 Aabakam	4478 Leirfjord	1109 Karna	3626 Ranaevan	2012 Akashestet	440 Jorpelvoll
3241 Aabakam	4479 Leirfjord	1110 Karna	3627 Ranaevan	2013 Akashestet	441 Jorpelvoll
3242 Aabakam	4480 Leirfjord	1111 Karna	3628 Ranaevan	2014 Akashestet	442 Jorpelvoll
3243 Aabakam	4481 Leirfjord	1112 Karna	3629 Ranaevan	2015 Akashestet	443 Jorpelvoll
3244 Aabakam	4482 Leirfjord	1113 Karna	3630 Ranaevan	2016 Akashestet	444 Jorpelvoll
3245 Aabakam	4483 Leirfjord	1114 Karna	3631 Ranaevan	2017 Akashestet	445 Jorpelvoll
3246 Aabakam	4484 Leirfjord	1115 Karna	3632 Ranaevan	2018 Akashestet	446 Jorpelvoll
3247 Aabakam	4485 Leirfjord	1116 Karna	3633 Ranaevan	2019 Akashestet	447 Jorpelvoll
3248 Aabakam	4486 Leirfjord	1117 Karna	3634 Ranaevan	2020 Akashestet	448 Jorpelvoll
3249 Aabakam	4487 Leirfjord	1118 Karna	3635 Ranaevan	2021 Akashestet	449 Jorpelvoll
3250 Aabakam	4488 Leirfjord	1119 Karna	3636 Ranaevan	2022 Akashestet	450 Jorpelvoll
3251 Aabakam	4489 Leirfjord	1120 Karna	3637 Ranaevan	2023 Akashestet	451 Jorpelvoll
3252 Aabakam	4490 Leirfjord	1121 Karna	3638 Ranaevan	2024 Akashestet	452 Jorpelvoll
3253 Aabakam	4491 Leirfjord	1122 Karna	3639 Ranaevan	2025 Akashestet	453 Jorpelvoll
3254 Aabakam	4492 Leirfjord	1123 Karna	3640 Ranaevan	2026 Akashestet	454 Jorpelvoll
3255 Aabakam	4493 Leirfjord	1124 Karna	3641 Ranaevan	2027 Akashestet	455 Jorpelvoll
3256 Aabakam	4494 Leirfjord	1125 Karna	3642 Ranaevan	2028 Akashestet	456 Jorpelvoll
3257 Aabakam	4495 Leirfjord	1126 Karna	3643 Ranaevan	2029 Akashestet	457 Jorpelvoll
3258 Aabakam	4496 Leirfjord	1127 Karna	3644 Ranaevan	2030 Akashestet	458 Jorpelvoll
3259 Aabakam	4497 Leirfjord	1128 Karna	3645 Ranaevan	2031 Akashestet	459 Jorpelvoll
3260 Aabakam	4498 Leirfjord	1129 Karna	3646 Ranaevan	2032 Akashestet	460 Jorpelvoll
3261 Aabakam	4499 Leirfjord	1130 Karna	3647 Ranaevan	2033 Akashestet	461 Jorpelvoll
3262 Aabakam	4500 Leirfjord	1131 Karna	3648 Ranaevan	2034 Akashestet	462 Jorpelvoll
3263 Aabakam	4501 Leirfjord	1132 Karna	3649 Ranaevan	2035 Akashestet	463 Jorpelvoll
3264 Aabakam	4502 Leirfjord	1133 Karna	3650 Ranaevan	2036 Akashestet	464 Jorpelvoll
3265 Aabakam	4503 Leirfjord	1134 Karna	3651 Ranaevan	2037 Akashestet	465 Jorpelvoll
3266 Aabakam	4504 Leirfjord	1135 Karna	3652 Ranaevan	2038 Akashestet	466 Jorpelvoll
3267 Aabakam	4505 Leirfjord	1136 Karna	3653 Ranaevan	2039 Akashestet	467 Jorpelvoll
3268 Aabakam	4506 Leirfjord	1137 Karna	3654 Ranaevan	2040 Akashestet	468 Jorpelvoll
3269 Aabakam	4507 Leirfjord	1138 Karna	3655 Ranaevan	2041 Akashestet	469 Jorpelvoll
3270 Aabakam	4508 Leirfjord	1139 Karna	3656 Ranaevan	2042 Akashestet	470 Jorpelvoll
3271 Aabakam	4509 Leirfjord	1140 Karna	3657 Ranaevan	2043 Akashestet	471 Jorpelvoll
3272 Aabakam	4510 Leirfjord	1141 Karna	3658 Ranaevan	2044 Akashestet	472 Jorpelvoll
3273 Aabakam	4511 Leirfjord	1142 Karna	3659 Ranaevan	2045 Akashestet	473 Jorpelvoll
3274 Aabakam	4512 Leirfjord	1143 Karna	3660 Ranaevan	2046 Akashestet	474 Jorpelvoll
3275 Aabakam	4513 Leirfjord	1144 Karna	3661 Ranaevan	2047 Akashestet	475 Jorpelvoll
3276 Aabakam	4514 Leirfjord	1145 Karna	3662 Ranaevan	2048 Akashestet	476 Jorpelvoll
3277 Aabakam	4515 Leirfjord	1146 Karna	3663 Ranaevan	2049 Akashestet	477 Jorpelvoll
3278 Aabakam	4516 Leirfjord	1147 Karna	3664 Ranaevan	2050 Akashestet	478 Jorpelvoll
3279 Aabakam	4517 Leirfjord	1148 Karna	3665 Ranaevan	2051 Akashestet	479 Jorpelvoll
3280 Aabakam	4518 Leirfjord	1149 Karna	3666 Ranaevan	2052 Akashestet	480 Jorpelvoll
3281 Aabakam	4519 Leirfjord	1150 Karna	3667 Ranaevan	2053 Akashestet	481 Jorpelvoll
3282 Aabakam	4520 Leirfjord	1151 Karna	3668 Ranaevan	2054 Akashestet	482 Jorpelvoll
3283 Aabakam	4521 Leirfjord	1152 Karna	3669 Ranaevan	2055 Akashestet	483 Jorpelvoll
3284 Aabakam	4522 Leirfjord	1153 Karna	3670 Ranaevan	2056 Akashestet	484 Jorpelvoll
3285 Aabakam	4523 Leirfjord	1154 Karna	3671 Ranaevan	2057 Akashestet	485 Jorpelvoll
3286 Aabakam	4524 Leirfjord	1155 Karna	3672 Ranaevan	2058 Akashestet	486 Jorpelvoll
3287 Aabakam	4525 Leirfjord	1156 Karna	3673 Ranaevan	2059 Akashestet	487 Jorpelvoll
3288 Aabakam	4526 Leirfjord	1157 Karna	3674 Ranaevan	2060 Akashestet	488 Jorpelvoll
3289 Aabakam	4527 Leirfjord	1158 Karna	3675 Ranaevan	2061 Akashestet	489 Jorpelvoll
3290 Aabakam	4528 Leirfjord	1159 Karna	3676 Ranaevan	2062 Akashestet	490 Jorpelvoll
3291 Aabakam	4529 Leirfjord	1160 Karna	3677 Ranaevan	2063 Akashestet	491 Jorpelvoll
3292 Aabakam	4530 Leirfjord	1161 Karna	3678 Ranaevan	2064 Akashestet	492 Jorpelvoll
3293 Aabakam	4531 Leirfjord	1162 Karna	3679 Ranaevan	2065 Akashestet	493 Jorpelvoll
3294 Aabakam	4532 Leirfjord	1163 Karna	3680 Ranaevan	2066 Akashestet	494 Jorpelvoll
3295 Aabakam	4533 Leirfjord	1164 Karna	3681 Ranaevan	2067 Akashestet	495 Jorpelvoll
3296 Aabakam	4534 Leirfjord	1165 Karna	3682 Ranaevan	2068 Akashestet	496 Jorpelvoll
3297 Aabakam	4535 Leirfjord	1166 Karna	3683 Ranaevan	2069 Akashestet	497 Jorpelvoll
3298 Aabakam	4536 Leirfjord	1167 Karna	3684 Ranaevan	2070 Akashestet	498 Jorpelvoll
3299 Aabakam	4537 Leirfjord	1168 Karna	3685 Ranaevan	2071 Akashestet	499 Jorpelvoll
3300 Aabakam	4538 Leirfjord	1169 Karna	3686 Ranaevan	2072 Akashestet	500 Jorpelvoll

EXPLANATION

GEOLOGICAL BASE
This map is based on an IGC-CO (Caledonide Orogen) - IGC-CSS (Correlation of Caledonian Stratabound Sulphides) compilation prepared for project meetings in 1981 in Glasgow (CCS) and in Uppsala (CO). This unpublished edition was intended as a base for thematic IGC-CO and -CSS maps and was compiled from national compilations provided by D. Roberts and A. Thon (Geological Survey of Norway, NGU) and M. B. Stephens and D. G. Gee (Geological Survey of Sweden, SGU).

Subsequent to the 1981 project meetings, the map was revised and redrawn by E. Zachrisson (SGU) on an improved topographic base supplied by the Swedish Land Survey, for use by both IGC-CO and -CSS. The final map includes minor revision, taking into account an early draft of the new 1:1 M Geological Map of Norway (NGU 1984), the regional descriptions and other contributions in the book "The Caledonide Orogen - Scandinavia and Related Areas" (editors D. G. Gee and B. A. Sturt; Wiley and Sons, 1985) and local amendments suggested by a number of colleagues. A complete list of contributors is presented on the 1:2 M printed IGC-CO Tectonostratigraphic Map (ISU 1985, 1986). The geological compilation for CCS is based on this map, with minor revision regarding tectonostratigraphic subdivisions and correlations.

GENERAL GEOLOGY
The structure of the Scandinavian Caledonides is dominated by nappes, thrust eastwards on to the Baltoscandian Platform during Early and Mid Palaeozoic orogenic. The tectonic units resting on top of the Autochthon/Parautochthon, can conveniently be grouped into four main complexes: Lower, Middle, Upper and Uppermost Allochthons. The allochthonous complexes vary greatly in thickness; in general, they thin westwards. Some are cut out completely, particularly in westernmost areas, or are too thin to be shown at a scale of 1:1.5 M. Thus, along the west coast of Norway, high tectonic units usually rest on or close above the Precambrian crystalline rocks of the craton, with which they are folded together.

The CCS geological base map attempts to show both tectonostratigraphic units and palaeotectonic zones (colours or groups of colours, respectively), and lithological and tectonostratigraphic units (light grey ornaments). Each palaeotectonic zone is defined as a suite of tectonostratigraphic units which shared a similar tectonic history throughout latest Proterozoic and early Palaeozoic time. These zones probably comprise the edges of the Laurentia-Greenland and Baltica cratons, respectively, affected by Caledonian deformation, and the terranes which lay outside (between) these cratons during the same time interval, and likewise were affected by Caledonian deformation.

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