

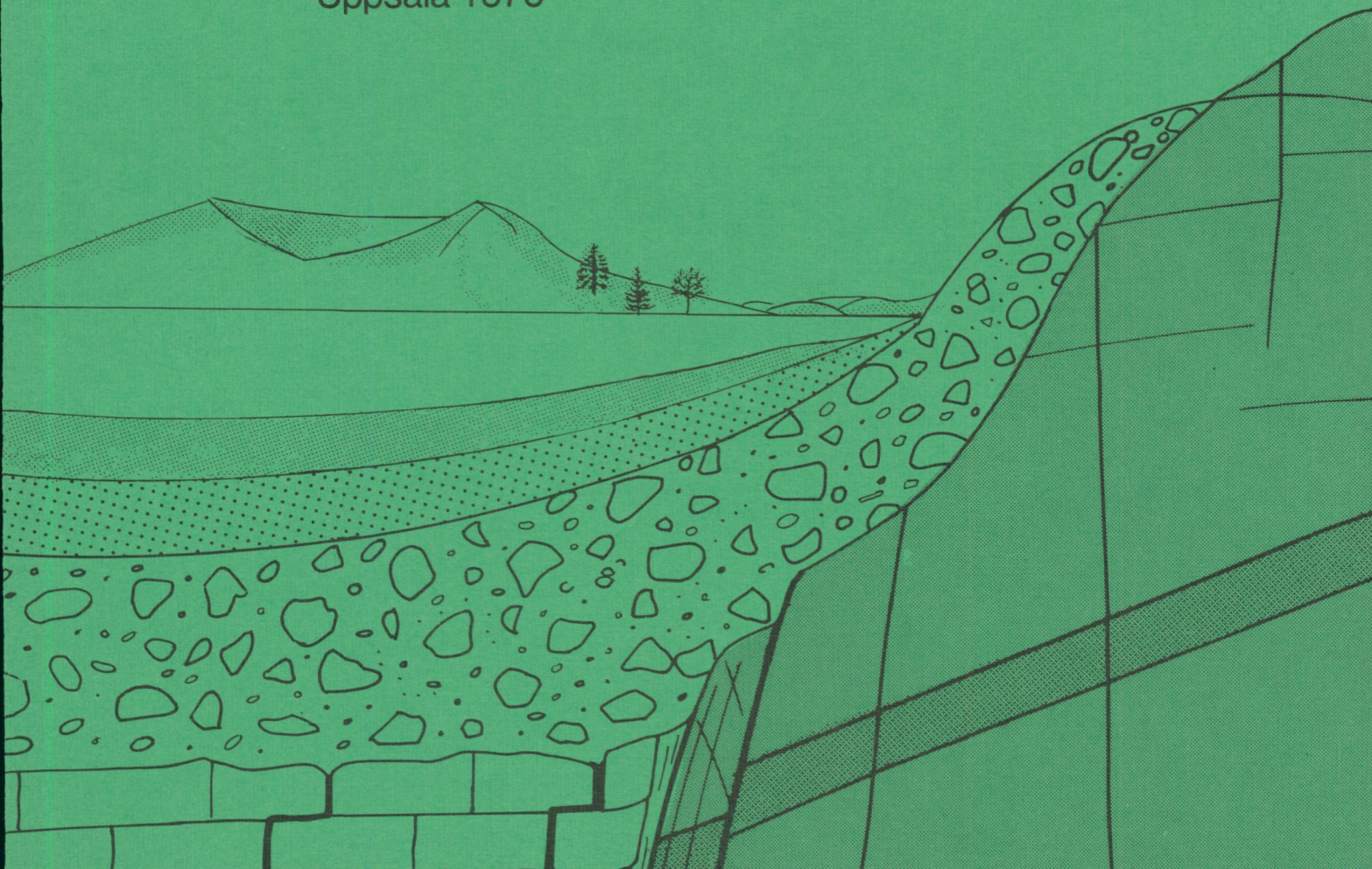


SVERIGES GEOLOGISKA UNDERSÖKNING
Rapporter och meddelanden nr 16

M. R. Wilson och N. O. Sundin

Isotopic age determinations on rocks and minerals from Sweden 1960–1978

Uppsala 1979



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ISOTOPIC AGE DETERMINATIONS ON ROCKS AND MINERALS
FROM SWEDEN 1960-1978

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ABSTRACT

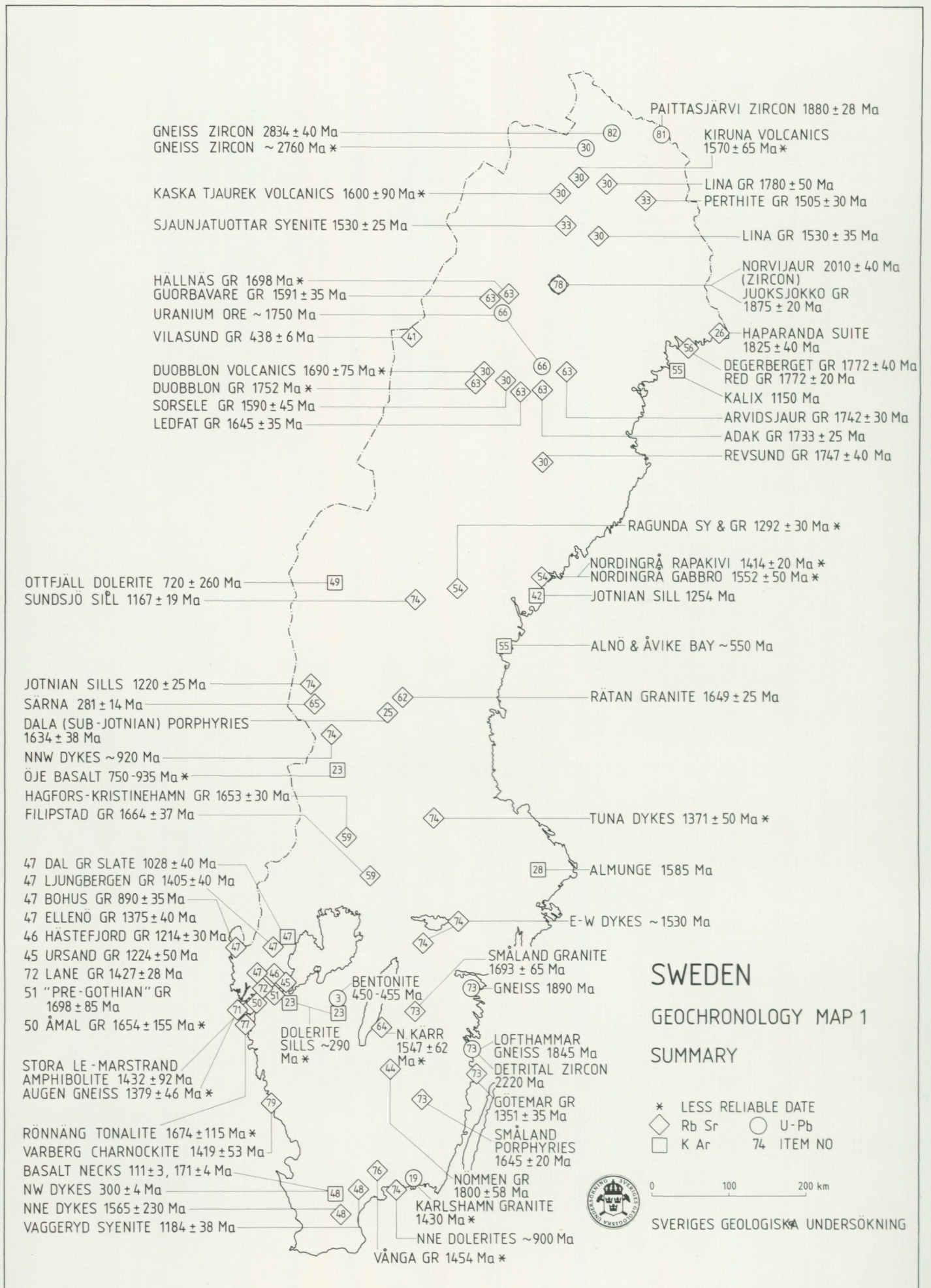
82 papers presenting isotopic age determinations on Swedish rocks and minerals are itemised and the dates recalculated in accordance with recommendations by the IUGS Subcommittee on Geochronology. Locations samples are plotted on a series of three maps, which thereby function as a geographical index. The more reliable determinations are listed separately and plotted on a single map. This compilation must not be regarded as a substitute for the original papers.

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1 INTRODUCTION

Since 1960 over eighty papers have presented isotopic age determinations on Swedish rocks and minerals. They have been published in a variety of journals and have used a wide variety of decay constants, which has meant that comparison of dates between different papers is often difficult.

In 1976 the IUGS Subcommittee on Geochronology recommended the adoption of a standard set of decay constants and isotopic abundances in isotopic geology (Steiger, R.H. & Jäger, E. Subcommittee on Geochronology: convention on the use of decay constants in Geo- and Cosmochronology. *Earth and Planetary Science Letters* 36 (1977) 359-362).

In this compilation all determinations known to have been published since 1960 have been listed and indexed, and where necessary, the ages recalculated using the recommended constants. The locations sampled are plotted on a series of three maps, the originals of which are at the scale of 1:1 Million and coincide with the 1:1 Million geological map of Sweden. It must be emphasised that this compilation is intended to be a convenient aid to the geologist and is in no way a substitute for the original papers. The geochronologist's own discussion of the validity and interpretation of the data is an essential part of each paper. This is particularly evident in the more modern papers.

The reliability of the determinations varies considerably. Single K-Ar dates must be regarded with suspicion as the samples may either have lost or gained radiogenic argon. The more reliable K-Ar determinations consist of a series of analyses, preferably interpreted in the form of a K-Ar isochron as in item 48. Rb-Sr isochrons are by no means thoroughly reliable: the Rb-Sr systematics can be affected by geochemical processes that otherwise leave little trace in the rocks. Volcanic rocks are particularly sensitive and the determinations on acid volcanics must be regarded with caution. Some Rb-Sr "isochron" plots show scatter greater than the analytical error, indicating a "geological" error, possibly disturbance of the Rb-Sr system, or the inclusion of samples from different intrusions. Such cases are noted in the items and an asterisk * attached to the date. The symbol ¶ indicates that the date is known to have been superseded.

Lists have been compiled of the more reliable age determinations, and the dates are plotted on Map 1. It must be strongly emphasised that this is a subjective selection, that none of the dates are absolutely reliable and that some of the apparently less reliable dates may prove to be valid. In making this selection several of the early U-Pb determinations have been omitted and the many precise determinations on dolerites in item 74 have been presented in summary form.

The starting date of 1960 was chosen because most of the earlier papers present non-isotopic or otherwise rather primitive determinations. Item 31 includes early references.

The 24 papers published in the 1960s gave very useful preliminary information about the geochronology of Sweden but many of the determinations were relatively primitive and in some cases the sampling, analytical precision and interpretation leave much to be desired. Many of these determinations have now been superseded. The determinations published in the 1970s are mostly of a high standard, both with respect to analytical procedure and interpretation but significant improvements in instrumentation and cleanliness (a spin-off from the lunar programme) mean that most of the determinations of the late 1970s achieve appreciably lower error figures. Dr. T. Lundqvist kindly supplied useful information about some of the earlier determinations.

Values recommended by IUGS Subcommittee on Geochronology. See Steiger & Jäger. Earth and Planetary Science Letters 36 (1977) 359-362.

Rubidium

$$\lambda = 0.142 \times 10^{-10}/a$$

Potassium

$$\lambda_e = 0.581 \times 10^{-10}/a$$

$$\lambda_\beta = 4.962 \times 10^{-10}/a$$

$$^{40}\text{K}/\text{K} = 0.01167 \text{ at. } \%$$

Uranium

$$\lambda(^{238}\text{U}) = 1.55125 \times 10^{-10}/a$$

$$\lambda(^{235}\text{U}) = 9.8485 \times 10^{-10}/a$$

$$\text{atomic ratio } ^{238}\text{U}/^{235}\text{U} = 137.88$$

Dates in items 66, 74, 80, 81 and 82 were originally presented using these constants and have not needed recalculation.

* less reliable determination

† obsolete determination

Sr(i): Initial value $^{87}\text{Sr}/^{86}\text{Sr}$

3 INDEX BY METHOD

<u>Method</u>	<u>Item</u>
Rb-Sr mineral age	1, 2, 10, 24, 74
Rb-Sr whole rock isochron (\pm mineral)	20, 23, 25, 26, 30, 33, 35, 38, 40, 41, 44, 45, 46, 47, 48, 49, 50, 51, 52, 54, 56, 59, 62, 63, 64, 65, 68, 69, 70, 71, 72, 73, 74, 76, 77, 78, 79
K-Ar	1, 3, 10, 12, 16, 23, 24, 27, 28, 29, 34, 36, 37, 39, 42, 43, 47, 48, 49, 53, 55, 57, 58, 73
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U-Pb, diverse	4, 5, 13, 14, 15, 17, 18, 19, 30, 66, 80
U-Pb zircon	19, 30, 73, 78, 81, 82
Fission-Track	32, 36, 75
Review and Reply- articles	6, 7, 11, 21, 22, 31, 60, 61, 67

4 INDEX ACCORDING TO ROCK TYPE

4.1 Sedimentary rocks

Precambrian	Mica quartzite, Västergötland	1
	Mica quartzite, Skåne	1
	Dala sandstone	1
	Dal Group slates	47
	Quartzite, Västervik	73
	Metasediment, Västervik	73
Late Precambrian	Sparagmite, Caledonian Front	1
Cambrian	Alum shales, Billingen	5
Ordovician	Bentonite, Billingen	3

4.2 Metamorphic rocks

See items 1 and 29 for single K-Ar determinations on micas from metamorphic rocks and on slates (whole rocks).

Gneissic granites have been indexed under magmatic rocks.

Stora Le-Marstrand series	71
Dal Group slates	47
Västervik metasediments	73
Köli nappe migmatite, Caledonides	69, 70
Seve nappe gneisses, Caledonides	69

4.3 Basic magmatic rocks

See items 16 and 29 for several isolated K-Ar dates on basic magmatic rocks.

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Spilites, Dal Group, Dalsland	47

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NW-SE dykes, Skåne	48
Ottfjäll dykes, Särvi, Jämtland	49, 53, 60, 61
Parallel to Sveconorwegian zone	74
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Dolerite sills

Billingen	23
Hunneberg	23
"Jotnian" Dalarna, Jämtland	74
"Jotnian" Västernorrland	42
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4.4 Alkali magmatic rocks

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Alnö	28, 36, 37, 55
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N. Kärr	29, 64
Särna	16, 65
Västervik	55
Åvike Bay	55

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Duobblon volcanics	30
Kaska Tjaurek volcanics	30
Kiruna porphyries	30
Kiruna syenite	29
Lake Mien rhyolite	43
Sub-Jotnian volcanics	see Dala volcanics
Småland porphyries	35 ¶, 73

4.6 Plutonic rocks incl. granite gneiss

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Arvidsjaur granit	63
Askersund granite	1
Askim granite	1
Bohus granite	1, 47

Degerberg granite	56
Duobblon granite	63
Ellenö granite (post E. supracrustals)	47
Fellingsbro granite	1
Filipstad granite	1, 59
Garberg granite	23, 25
Guorbavare granite	63
Götemar granite	73
Hagfors-Kristinehamn granitoids	59
Haparanda plutonic suite	1, 26, 38
Hedesunda granite	1
Hällnäs granite	63
Härnö granite	1
Härserud granite	47
Hästefjorden granite	46
Juoksajokko granite	78
Järna granite	1, 16, 29
Jörn granite	1
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Kalix - Degerberget granite	56
Kiruna - gneiss (60 km ENE of Kiruna)	82
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Kroppefjäll granite	1
Lane granite	72
Ledfat granite	63
Lina granite	1, 29, 30
Ljungbergen granite	47
Loftahammar gneissic granites	24, 41, 40, 73
Nordingrå - gabbro and anorthosite	54
Nordingrå - rapakivi granite	54
Norvijaur granodiorite	78
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Nömmen plutonic suite	44
Perthite granite, Masugnsbyn	33
"Pre-Gothian" granite gneiss	51
Ragunda syenite and granite	54
Revsund granite	1, 29, 30
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Rönnäng tonalite-granodiorite	77
Sala granite	1
Sjaunjatuottar syenite	33
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Sorsele granite	29, 30
Spinkemåla granite	74
Stockholm granite	1
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Sundsjö granite	74
Uppsala granite	1
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Vilasund granite	41
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Diverse pegmatites	14, 19
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Utö	10
Varuträsk	2
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Betlehem 13 Rävhill	13
Blanka 13 Sol	13
Håkantorps 4 Stabby	13
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	NW	NE	SW	SE
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D	48	48	19, 48	9, 48
E			9, 48	
3 B		48		
C	48	48	48	48
D		48	34, 39, 48	48
E	1, 48, 76	29, 74	48, 76	74
F	19, 52, 74	1, 52		
4 C			48	
D				23
E	23, 29		23, 48	32, 43
F			1	52
G			1	
5 B		29, 79		
E			23, 29	
F		35, 73	35, 73	
G	73	73		
6 B	1, 14	1		
C			14	14
D		74	14, 36	
E	1, 74	1, 44, 74		9
F			19, 29	1
G	1, 35, 73	9, 55, 73		73
H	73			

	NW	NE	SW	SE
7 B	1, 77	14		1
C				1
E	1	29, 64	29	73
F	73	73		
G		29, 73		19, 24, 29, 40, 73
H			19, 24, 40, 73	
8 A		47		1
B		1, 45, 46, 47, 50, 51, 72	71	2, 14, 50
C	45		23, 51	51
D	5	5, 23	5	5
E	9			
F			20	20, 73
G	29	73	1	
H			1	
J				12
9 A		47		47
B		47		47
C	1, 9, 47		47	
D			3	
E		1		
F	4, 9, 13, 74	74	18	
G		1		
H		9		
I		1, 9, 10		
10 B		47		
C	29	58	47	1
D	1	23		
E	59	1, 59		1
F	1	9	5	1
G		74		74
H			1	
I	1	9, 14		9
J	9			
11 C			29	9
D		59	1, 14	
E	1, 9, 59		59	1
F	1, 9	13	9, 13, 18	
G	1, 9		14	
H		1		
I		27, 28		
J	13, 15			
12 C				57
D		59		59
F	14, 16	9, 74	9, 75	29
G	9		1, 13	9
H	1			
I	9	13, 15	15	
J			14	
13 E				1, 16
F		9	14	8, 9, 13, 74
G	9			
H			9	
I				14

	NW	NE	SW	SE
14 D	23	16, 74	23	23
E	16, 23	1	23	9
F			9	
H	13			
15 C		16		
D	16, 74	74	16, 23, 74	
E		20, 25, 62, 74	9, 23	20, 23, 29, 74
F	1, 17, 29, 62			
16 C				9, 65, 74
E				16, 62
F	1			
G			1	
17 C		49, 53		
D	49			
F				1
H		28, 36, 37, 55		
I	42			
18 F	74			1, 14, 19
G			14, 19, 74	
I		42	1	
19 D			49	
J			42	
20 D			9	9
21 F				9
G	9	1	16	29
22 I		30		30
K	9	2, 6		
23 G	1			
I	30			9
J			29	1
K			9, 30	1
L	29		19	
24 F	9		9	
H	29, 30	30	63	63
I		30, 66, 80	63, 66, 80	9, 29, 63
J	63		63	
K	63			
L		1		
M	55	1		
25 F	41		9, 70	
G	9			
H	9	30		30
J	30			
L				56
M	56	1, 26, 38, 56	56	29, 38, 56
N	26, 38	26, 38	26, 38	
26 F			66, 80	9
H				63, 66, 80
I		30	63	
J	78	14, 30	30	
M		30		
27 I	9			
L	30			

	NW	NE	SW	SE
28 H			9	
J			33	30
K			1, 29, 30, 36, 75	
L	33			
M				29
29 I				75
J		29, 30, 75	30	
K			9, 30	19
L			19	
30 I				9
J				30
L	81	81		
K			82	

6 SELECTION OF THE MORE RELIABLE DETERMINATIONS (MAP 1)

Arranged chronologically within each group to avoid classification controversy.

6.1 Plutonic rocks

item	rock	age in Ma	Sr(i)
82	Gneiss, ENE of Kiruna	2834+40	(zircon)
30	Vuolosjärvi-Vakkojärvi gneiss	c. 2760	(zircon + apatite)
78	Norvijaur granodiorite	2010+40	(zircon)
73	Granite gneiss, Norrköping	1890 ⁻	(zircon)
78	Juoksijokko granite	1875+20	0.7025+0.0007
73	Loftahammar gneiss, Västervik	1845 ⁻	(zircon)
26	Haparanda suite	1825+40	0.706+0.002
44	Nömmen suite	1800+58	0.7023
30	Lina granite	1780+50	0.707+0.005
56	Kalix, Degerberget granite	1772+40	0.7050+0.003
56	Kalix, Red granite	1772+20	0.7051+0.0004
63	Duobblon granite	1752 ⁻ *	
30	Revsund granite	1747+40	0.707+0.002
63	Arvidsjaur granite suite	1742+30	0.705+0.002
63	Adak granite	1733+25	0.705+0.001
51	"Pre-Gothian" gneiss	1698+85	0.7027+0.0008
63	Hällnäs granite	1698 ⁻	0.7080+0.002
73	Småland granite	1693+65	0.7040+0.0030
77	Rönnäng tonalite	1674+115 *	0.7026+0.0006
59	Filipstad granite	1664+37	0.7068+0.0021
50	Amål I group granitoid	1654+155 *	0.7011+0.0017
59	Hagfors-Kristinehamn granitoids	1653+30	0.7021+0.0006
62	Rätan granite	1649+25	0.703+0.003
63	Ledfat granite	1645+35	0.705+0.005
63	Guorbavare granite	1591+35	0.712+0.002
30	Sorsele granite	1590+45	0.708+0.002
54	Nordingrå gabbro	1552+50 *	0.7059+0.0005
30	Lina granite	1530+35	0.712+0.005
33	Sjaunja syenite	1530+25	0.710+0.002
33	Perthite granite, Masugnsbyn	1505+30	0.713+0.004

item	rock	age in Ma	Sr(i)
76	Vånga granite	1454 *	
71	Stora Le-Marstrand series, amphibolite	1432 ⁺⁹²	0.7032 ^{+0.005}
19	Karlshamn granite. U-Pb pegmatite	1430	
72	Lane granite	1427 ⁺²⁸	0.704 ^{+0.003}
79	Varberg charnockite	1419 ⁺⁵³	0.7049 ^{+0.0006}
54	Nordingrå rapakivi granite	1414 ⁺²⁰ *	0.725 ^{+0.003}
47	Ljungbergen granite	1405 ⁺⁴⁰	0.704 ^{+0.003}
71	Stora Le-Marstrand series, augen gneiss	1379 ⁺⁴⁶ *	0.713 ^{+0.003}
47	Post-Ellenö granite	1375 ⁺⁴⁰	0.708 ^{+0.005}
73	Götemar granite	1351 ⁺³⁵	0.7079 ^{+0.0063}
54	Ragunda syenite and granite	1292 ⁺³⁰ *	0.718 ^{+0.006}
45	Ursand granite	1224 ⁺⁵⁰	0.708 ^{+0.008}
46	Hästefjorden granite	1214 ⁺³⁰	0.712 ^{+0.005}
48	Vaggeryd syenite	1184 ⁺³⁸	0.7055 ^{+0.0027}
74	Vaggeryd syenite	1127 ⁺⁶⁷	
47	Bohus granite	890 ⁺³⁵	0.711 ^{+0.003}
41	Vilasund granite	438 ⁺⁶	0.706 ^{+0.001}

6.2 Acid volcanic rocks

30	Duobblon volcanics	1690 ⁺⁷⁵ *	0.703 ^{+0.005}
73	Småland porphyries	1645 ⁺²⁰	0.7081 ^{+0.0014}
25	Dala porphyries	1634 ⁺³⁸	0.705
30	Kaska Tjaurek volcanics	1600 ⁺⁹⁰ *	0.714 ^{+0.005}
30	Kiruna porphyries	1570 ⁺⁶⁵ *	0.705 ^{+0.003}

6.3 Alkali intrusives

List of all published dates. See map, item 55.

Almunge 11 I NE

27	K-Ar biotite	1700 Ma *	†
28	K-Ar biotite	1585 Ma.	Preferred date.

Alnö 17 H NE

28	K-Ar biotite	585 Ma	
36	K-Ar phlogopite	565 Ma	
37	K-Ar phlogopite	575 Ma	
55	K-Ar phlogopite	545 ⁺¹⁶ Ma	

Kalix 24 M NV

55	K-Ar phlogopite	1150 ⁺³⁵ Ma	
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N. Kärr 7 E NE

29	K-Ar	980 Ma *	
64	K-Ar arfredsonite	1365 and 1460 Ma	
	Rb-Sr whole rock reference line	1547 ⁺⁶² Ma	

<u>Särna</u>	16 C SE	
16	K-Ar pyroxene	500 Ma *
65	Rb-Sr mineral isochron	281 ₋₁₄ Ma
<u>Västervik</u>	6 H NW	
55	K-Ar phlogopite	1563 ₋₅₀ Ma
<u>Åvike Bay</u>	17 H NE	
55	K-Ar phlogopite	550 ₋₁₆ Ma
6.4	<u>Basic intrusives and volcanics</u>	
	<u>NNE trending dolerite "hyperite" dykes in Skåne</u>	
48	K-Ar whole rock	700 Ma - 1600 Ma
48	Rb-Sr whole rock	1565 ₋₂₃₀ Ma
	<u>E-W dykes of central Sweden</u>	
74	Rb-Sr whole rock and mineral determination on 4 dykes	c. 1530 Ma
	<u>Tuna dykes, NNE trending, Central Sweden</u>	
74	Rb-Sr whole rock isochron (scatter > error)	1371 ₋₅₀ Ma *
	<u>Olivine dolerite sills in Västernorrland "Jotnian"</u>	
42	K-Ar isochron	1254 Ma
	<u>Olivine dolerite sills of N. Dalarna, S. Jämtland, "Jotnian"</u>	
74	Rb-Sr mineral determinations and isochrons on 8 sills. Intrusive age of	1220 ₋₂₅ Ma inferred
	<u>Dykes parallel to the Sveconorwegian tectonic zones</u>	
74	Rb-Sr mineral determinations and isochrons on 6 dykes and 2 sills (Blekinge, Almesåkra, Dalarna)	1000-850 Ma
	<u>Öje basalt, Jotnian, Dalarna</u>	
23	K-Ar whole rock	935-750 Ma *
	<u>Ottfjäll dolerites, Särvi nappe, Caledonides</u>	
49	Rb-Sr whole rock isochron	720 ₋₂₆₀ Ma
	<u>NW trending dolerites in Skåne</u>	
48	K-Ar isochron	300 ₋₄ Ma

Dolerite sills at Billingen and Hunneberg

23 K-Ar whole rock single
determinations 291 and 283 Ma *

Alkali-olivine basalt necks in Skåne

48 Göbnehäll K-Ar isochron 171₊₄ Ma
48 Lönnebjär & Rallate K-Ar isochron 111₊₃ Ma

6.5 Sedimentary rocks

73 Detrital zircon in Västervik Quartzite 2220 Ma
47 Dal Group slates K-Ar 1028₊₄₀ Ma

7 ITEMS

1. Magnusson, N.H. 1960
Age determinations of Swedish Precambrian rocks.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 82, pp. 407-432.

These dates (and those in items 16 & 29) must be regarded with extreme caution. They are single determinations on micas or slates and may be affected either by argon loss or excess radiogenic argon. Several have proved to be spurious; they are often lower than later determinations. Determined by Polkanov & Gerling or by Semenenko. No decay constants or analytical results are quoted. The dates have been recalculated assuming that the authors used the constants $\lambda_e = 0.55 \cdot 10^{-10} a^{-1}$, $\lambda_\beta = 4.72 \cdot 10^{-10} a^{-1}$, $^{40}K/K = 0.0119$ at. % which are the values used by Polkanov & Gerling according to Broch, 1964 NGU 228, pp. 94-113. No mention is made of whether whole-rock or mineral was dated but according to item 16 it is mica except for the 6 slate samples (whole rock).

Småland Granite	4 G SW	
Rb-Sr		1400 Ma
Järna Granite	13 E SE	
Rb-Sr		1900 Ma
<u>K-Ar</u>		
Red Sparagmite, Storuman	23 G NW	535 Ma
Bohus Granite, Bohuslän	8 A NE	885 and 970 Ma
Mica Quartzite, Västergötland	7 C SE	905 Ma
Augen Gneiss, Västergötland	7 B SE	930 Ma
Gneiss Granite, Värmland	10 D NW	955 Ma
Red Gneiss, Värmland	11 D SW	965 Ma
Fjärås Gneiss, Halland	6 B NE	975 Ma
Red Gneiss, Västergötland	7 C SE	990 Ma
Mica Schist, Bohuslän	7 B NW	1000, 1025 Ma
Grey banded Gneiss, Värmland	11 D SW	1015, 1025 Ma
Filipstad Granite	10 E NE	1020 Ma
Kroppefjäll Granite	8 B NE	1025 Ma
Åmål Granite	10 C SE	1040 Ma
Askim Granite	6 B NW	1075, 1090 Ma
Dala Sandstone	14 E NE	1140 Ma
Mica Quartzite, Skåne	3 E NW	1190 Ma
Filipstad Granite	10 E SE	1210, 1220 Ma
Vaggeryd Syenite	6 E NW	1220 Ma †
Karlshamn Granite	4 F SE	1365 Ma
Tving Granite	3 F NE	1405 Ma
Småland Granite	4 G SW	1415 Ma
Mica Schist, Östergötland	8 G SW	1440, 1470 Ma
Lina Granite	28 K SW	1480 Ma
Gneiss, Blekinge	3 F NE	1500 Ma
Gneiss Granite, Småland	6 F SE	1500 Ma
Askersund Granite	9 E NE	1555, 1615 Ma
Mica Schist, Västmanland	11 F NW	1575 Ma
Augen Granite, Östergötland	8 H SW	1595 Ma
Mica Schist, Medelpad	17 F SE	1615 Ma
Mica Schist, Närke	10 F SE	1635 Ma
Grey Granite Gneiss, Södermanland	9 G NE	1635 Ma
Haparanda Granite	25 M NE	1635 Ma †
Revsund Granite	21 G NE	1635 Ma †
Jörn Granite (porphyritic)	23 J SE	1640 Ma

Slate, Los	15 F NW	1660 Ma
Augen Granite Gneiss, Hälsingland	16 G SW	1670 Ma
Småland Granite	6 G NW	1680 Ma
Red biotite Granite, Västmanland	12 G SW	1680 Ma
Stockholm Granite	10 I NW	1690 Ma
Revsund Granite	18 F SE	1700 Ma
Haparanda Granite	24 L NE	1700 Ma
Garnet Gneiss, Södermanland	10 H SW	1710 Ma
Fellingsbro Granite	10 F NW	1730 Ma
Härnö Granite	18 I SW	1755 Ma
Sala Granite	11 G NE	1755 Ma
Hedesunda Granite	12 H NW	1775 Ma
Grey Jörn Granite	23 J SE	1775 Ma
Rätan Granite	16 F NW	1775 Ma
Järna Granite	13 E SW	1785, 1805 Ma
Uppsala Granite	11 H NE	1870 Ma
Slate, Almesåkra series, Småland	6 E NE	925 Ma
Slate, Visingsö series, Småland	7 E NW	950 Ma
Slate, Dalsland series, Dalsland	9 C NW	985 Ma
Slate, Saxå area, Värmland	11 E NW	1230 Ma
Slate, Grythyttre area, Västmanland	11 E SE	1325 Ma
Mica Schist, Utö, Södermanland	9 I NE	1660 Ma
Slate, Skellefte district, Västerbotten	23 K SE	2015 Ma

2. Herzog, L.F., Pinson, W.H. and Hurley, P.M. 1960
Rb-Sr analyses and age determinations of certain lepidolites, including an international interlaboratory comparison suite.
American Journal of Science, Vol. 258, pp. 191-208.

<u>Varuträsk Pegmatite</u>	22 K NE	
Rb-Sr Lepidolite		1731 ⁺ 140 Ma
		1746 [±] 60 Ma

<u>Skuleboda Pegmatite</u>	8 B SE	
Rb-Sr Lepidolite		1024 [±] 25 Ma

3. Byström-Asklund, A.M., Baadsgaard, H. and Folinsbee, R.E. 1961
K-Ar age of biotite, sanidine, and illite from Middle Ordovician bentonites at Kinnekulle, Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 83, pp. 92-96.

<u>Bentonite</u>			
K-Ar (biotite)	9 D SW	average	449 [±] 20 Ma
K-Ar (sanidine)	9 D SW	3 samples average	445 [±] 20 Ma
K-Ar whole-rock (illite)	9 D SW	1 sample average	337 Ma

4. Welin, E. 1961
Uranium mineralization in a skarn iron ore at Håkantorps, county of Örebro, Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 83, pp. 129-143. See item 22.

<u>Uraninite Skarn</u>	9 F NW	
U-Pb concordia diagram		1757 Ma

5. Cobb, J.C. and Kulp, J.L. 1961
Isotopic geochemistry of uranium and lead in the Swedish kolm and its associated shale.
Geochimica et Cosmochimica Acta, Vol. 24, pp. 226-249.

Kolm from Upper Cambrian Alum shales, Billingen and Skövde.

U-Pb

8 D and 10 F SW

≥ 500 Ma *

6. Herzog, L.F. 1961
Analyses of identical samples by more than one laboratory.
New York Academy of Sciences, Vol. 91, pp. 207-220.
See item 2.
7. Polkanov, A.A. and Gerling, E.K. 1961
The Precambrian geochronology of the Baltic Shield.
New York Academy of Sciences, Vol. 91, pp. 492-499.
8. Vinogradov, A.P. and Tugarinov, A.I. 1961
The geologic age of Precambrian rocks of the Ukrainian and Baltic Shields.
New York Academy of Sciences, Vol. 91, pp. 500-513.
- Pb-Pb isotope determination on galena from the Falun ore deposit
13 F SE
9. Wickman, F.E., Blomqvist, N.G., Geijer, P., Parwel, A., Ubisch, H.V. and Welin, E. 1962
Isotopic constitution of ore lead in Sweden.
Arkiv för Mineralogi och Geologi, Band 3, nr 11, pp. 193-257.

Pb-Pb on Lead-bearing minerals

Veins in southeastern Scania	2 D SE, 2 E SW
Veins in Stockholm and vicinity	10 I NE, SE, 10 J NW
Vanadinite	8 E NW
Siljan Ring	14 E SE, 14 F SW
Caledonian zone	16 C SE, 20 D SW, SE, 21 F SE, 21 G NW, 24 F SW, NW, 25 F SW, 25 G NW, 25 H NW, 26 F SE, 28 H SW, 30 I SE
Klintmine and Långban	11 E NW, 12 G SE
Falun-Sala group	9 H NE, 10 F NE, 11 E NW, 11 F SW, NW, 11 G NE, 12 F NE, SW, 12 G NW, 12 I NW, 13 F NE, SE, 13 G NW
Late Svecofennian	9 F NW, 9 I NE, 13 H SW
Skellefte District	22 K NW, 23 I SE, 23 K SW, 24 I SE
Ultevis District	27 I NW

- | | | |
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| Karelian rock | 29 K SW | |
| Gladhammar and Årset | 6 E SE, 6 G NE | |
| Subjotnian veins | 15 E SW | |
| Dalsland and Värmskog veins | 9 C NW, 11 C SE | |
10. Wetherhill, G.W., Kouvo, O., Tilton, G.R. and Gast, P.W. 1962
Age measurements on rocks from the Finnish Precambrian.
Journal of Geology, Vol. 70, pp. 74-88.
- | | | |
|--|--------|---------|
| <u>Pegmatite Utö</u> | 9 I NE | |
| Rb-Sr muscovite (assuming Sr(i) 0.709) | | 1860 Ma |
| K-Ar muscovite | | 1802 Ma |
11. Magnusson, N.H. 1962
De prekambrika bergarterna utanför fjällkedjan.
Sveriges geologiska undersökning, Serie Ba 16, sid. 1-110.
- A review article summarizing age determinations on Precambrian rocks.
12. Gorbatshev, R. 1962
The Precambrian sandstone of the Gotska Sandön boring core.
The Bulletin of the Geological Institutions of the University of
Uppsala, Vol. 39, pp. 1-30.
Determined by Polkanov & Gerling.
- | | | |
|---------------------------------|--------|--------------|
| <u>Sandstone, Gotska Sandön</u> | 8 J SE | |
| K-Ar | | 1470-1430 Ma |
13. Welin, E. 1963
The interpretation of discordant U-Pb age data from central Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 85, pp. 223-
235.
See item 22.
- | | | |
|--|--|---------|
| <u>Uraninite from iron ores, Sol-Wilhelm-Bastnäs and Stabby mines.</u> | | |
| 9 F NW, 11 F NE, 11 J NW, 12 G SW | | |
| U-Pb concordia | | 1757 Ma |
- | | | |
|--|--|---------|
| <u>Uraninite from iron ores, Rävhall-Kuså-Stripa-Blanka-Betlehem-Kalk and Norrsedicka mines.</u> | | |
| 11 F SW, 12 I NE, 13 F SE, 14 H NW | | |
| U-Pb concordia | | 1559 Ma |

14. Welin, E. and Blomqvist, G. 1964
Age measurements on radioactive minerals from Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 86, pp. 33-50.
See item 22.

Pegmatites in southwestern Sweden, various minerals.

6 B NW, 6 C SW, SE, 6 D SW, 7 B NE, 8 B SE, 11 D SW

U-Pb concordia 913 Ma

Pegmatites in central and northern Sweden, various minerals

10 I NW, 11 G SW, 12 F NW, 12 J SW, 13 F SW, 13 I SE, 26 J NE

U-Pb concordia 1782 Ma

Pegmatites in Östersund-Sundsvall area, various minerals

18 G SW, 18 F SE

U-Pb concordia 1356 Ma

15. Welin, E. 1964
Uranium disseminations and vein fillings in iron ores of northern
Uppland, central Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 86, pp. 51-82.
Discussion of item 13. See also item 22.

U-Pb data from Bagbols and Liäng mines, which do not fit on the
item 13 concordia. 11 J NW, 12 I NE

16. Gerling, E.K., Lobach-Zhuchenko, S.B. and Borisenko, N.F. 1965
More facts on the absolute age of the Jotnian of the Baltic Shield.
Doklady Akademii Nauk SSSR, Vol. 166, pp. 50-53.
See comments to item 1.

<u>Öje basalt</u> , Dalarna	15 D SW	see 23	
K-Ar whole-rock		780 Ma	¶
<u>Åsby dolerite</u> , Dalarna	14 E NW	item 74	
K-Ar pyroxene		1295 Ma	¶
K-Ar pyroxene and amphibole		1050 Ma	¶
<u>Dolerite</u> , Idkerberget	12 F NW		
K-Ar whole-rock		710 Ma	
<u>Rätan granite</u>	16 E SW, SE	item 62	
K-Ar biotite		1560 Ma	¶
<u>Järna granite</u>	16 E SW, SE		
K-Ar amphibole		1730 Ma	
<u>Gabbro</u> , Hoting	21 G SW		
K-Ar pyroxene		1695 Ma	
<u>Nepheline-syenite</u> , Särna	15 D NW	item 65	
K-Ar pyroxene		500 Ma	¶

17. Welin, E. 1965
Two occurrences of uranium in Sweden - the Los cobalt deposit and the iron ores of the Västervik area.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 87, pp. 492-508.
See item 22.
- Uranium-bearing mineral, Los 15 F NW 1663 Ma
U-Pb
18. Welin, E. 1965
The occurrence of asphaltite and thucholite in the Precambrian bedrock of Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 87, pp. 509-526.
See item 22.
- Thucholite, Stripa and Zink mine 9 F SW, 11 F SW
U-Pb dates highly discordant due to lead loss
19. Welin, E. and Blomqvist, G. 1966
Further age measurements on radioactive minerals from Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 88, pp. 3-18.
- Uraninite & Monazite from various mines and prospects in northern Sweden.
23 L SW, 29 K SE, 29 L SW.
U-Pb concordia 1753-1816 Ma
- Zircon and monazite from pegmatites, Östersund-Sundsvall
18 G SW
U-Pb concordia 1356 Ma
- Various minerals from pegmatites and aplites, southeastern Sweden.
U-Pb concordia 1717 Ma
- Uraninite, zircon and monazite, pegmatite assoc. with Karlshamn granites, S. Sweden.
2 D SW, 3 F NW
U-Pb concordia 1430 Ma
20. Welin, E., Blomqvist, G. and Parwel, A. 1966
Rb-Sr whole-rock age data on some Swedish Precambrian rocks.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 88, pp. 19-28.
See also items 22, 25, 73.
- Växjö granite 8 F SW, 8 F SE
Rb-Sr whole rock isochron (3 samples) 1703 Ma ¶
Date superceded by item 73 (1695±20 Ma)
- Sub-Jotnian (Dala) volcanics Los-Hamra 15 E NE, 15 E SE
Rb-Sr whole-rock isochron (3 samples) 1649 Ma ¶
Date superceded by item 25 (1634±38 Ma)

21. Welin, E. 1966
The absolute time scale and the classification of Precambrian rocks in Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 88, pp. 29-33.
22. Welin, E. 1966
Uranium mineralizations and age relationships in the Precambrian bedrock of central and southeastern Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 88, pp. 34-67.
- A review article, summarizing available age determinations in the Precambrian bedrock of central and southeastern Sweden.
Ref. to items: 4, 13, 14, 15, 17, 18, 20.
23. Priem, H.N.A., Mulder, F.G., Boelrijk, N.A.I.M., Hebeda, E.H., Verschure, R.H. and Verdurmen, E.A.Th. 1968
Geochronological and palaeomagnetic reconnaissance survey in parts of central and southern Sweden.
Physics of the Earth and Planetary Interiors, Vol. 1, pp. 373-380.
See item 25 for Dala porphyries, item 48 for NNE dolerite dykes.

Sub-Jotnian (Dala) volcanics and Garberg granite

14 E NW, SW, 15 E SW, SE, 15 D SW

Rb-Sr whole-rock isochron 1454 \pm 30 Ma †
Date shown to be spurious. See item 25.

K-Ar whole-rock (all samples have suffered argon loss)	14 E NW	925 \pm 45 Ma
	15 D SW	610 \pm 30 Ma
	15 E SW	706 \pm 35 Ma
	15 E SE	811 \pm 40 Ma

Garberg granite

K-Ar whole rock (argon loss)	14 E SW	741 \pm 36 Ma
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Öje basalt, (Jotnian) Dalarna

K-Ar whole rock	14 D NW	750 \pm 25 Ma
	14 D NW	878 \pm 45 Ma
	14 D SW	935 \pm 28 Ma
	14 D SE	878 \pm 45 Ma

Dolerite-Hyperite dykes (NNE-SSW trending), southern Sweden.

K-Ar whole rock See item 48	4 D SE	786 \pm 25 Ma
	4 E NW	891 \pm 45 Ma
	4 E SW	843 \pm 25 Ma
	5 E SW	1569 \pm 50 Ma
	10 D NE	1513 \pm 50 Ma

Dolerite sill

K-Ar whole rock, Hunneberg Billingen	8 C SW	283 \pm 8 Ma
	8 D NE	291 \pm 15 Ma

24. Priem, H.N.A., Boelrijk, N.A.I.M., Hebeda, E.H., Verschure, R.H. and Verdurmen, E.A.Th 1969
Investigations in the Västervik area, southeastern Sweden. 2. Isotopic age determinations.
Geologie en Mijnbouw, Vol. 48, pp. 545-548.
Calculated with Sr(i) 0.705 for whole rock.
See items 40 and 73.

<u>Pegmatite</u>	7 G SE	
Rb-Sr whole rock (single sample)		1477 \pm 40 Ma
<u>Gneissose biotite granite</u>	7 G SE	
Rb-Sr whole rock (single sample)		1724 \pm 80 Ma
Rb-Sr mineral (biotite)		1432 \pm 50 Ma
K-Ar mineral (biotite)		1478 \pm 30 Ma
<u>Gneiss</u>	7 G SE	
Rb-Sr whole rock (single sample)		1702 \pm 40 Ma
Rb-Sr mineral (biotite)		1435 \pm 60 Ma
K-Ar mineral (biotite)		1458 \pm 30 Ma
<u>Småland granite</u>	7 H SW	item 73
Rb-Sr whole rock (single sample)		1776 \pm 50 Ma ¶
<u>Loftahammar granite</u>	7 G SE	
Rb-Sr whole rock (single sample)		1709 \pm 50 Ma ¶
Rb-Sr mineral (biotite)		1419 \pm 60 Ma
K-Ar mineral (biotite)		1448 \pm 30 Ma
Date superseded by items 40 and 73.		

25. Welin, E. and Lundqvist, T. 1970
New Rb-Sr age data for the Sub-Jotnian volcanics (Dala porphyries) in the Los-Hamra region, central Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 92, pp. 35-39.
See items 20 and 23.

<u>Dala porphyries and Garberg granite</u>	15 E NE	
Rb-Sr whole rock isochron		1634 \pm 38 Ma
Sr(i) 0.705		

26. Welin, E., Christiansson, K. and Nilsson, Ö. 1970
Rb-Sr age dating of intrusive rocks of the Haparanda suite.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 92, pp. 336-346.
See item 38.

<u>Haparanda Granodiorite, Diorite, Gabbro</u>		
25 M NE, SE, 25 N NW, NE, SW		
Rb-Sr whole rock isochron		1840 \pm 390 Ma
Rb-Sr whole rock and mineral isochron		1825 \pm 40 Ma
Sr(i) 0.706 \pm 0.002		

27. Gorbatshev, R. 1970
K-Ar age of biotite from the Almunge alkaline intrusion.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 72, pp. 501-502.
Determined by Polkanov and Gerling.

<u>Almunge nepheline syenite</u>	11 I NE	
<u>K-Ar biotite</u>		1700 Ma

28. Doig, R. 1970
An alkaline rock province linking Europe and North America.
Canadian Journal of Earth Sciences, Vol. 7, pp. 22-28.
See also item 55.

<u>Alnö alkali complex</u>	17 H NE	
<u>K-Ar, biotite</u>		585 Ma

<u>Almunge nepheline syenite</u>	11 I NE	
<u>K-Ar, biotite</u>		1585 Ma

29. Magnusson, N.H. 1970
Stratigrafi och tektonik.
Atlas över Sverige. AB Kartografiska Institutet, Esselte AB, Stockholm.
Determined by Polkanov and Gerling in the 1950s. See comments on
item 1.

<u>K-Ar</u>			
Hyperite Dolerite, Hjortsjö	5 E SW	885 Ma	
Mica Schist, Glava	11 C SW	940 Ma	
Grännaite, Norra Kärr	7 E NE	980 Ma	see 64 ¶
Hyperite Dolerite, Sutareboda	4 E NW	1050 Ma	
Uralite Dolerite, Dalby	2 C SE	1075 Ma	
Gneiss, W. Karlshamn	3 E NE	1230 Ma	
Charnockite, S. Varberg	5 B NE	1280 Ma	
Småland Granite, E. Jönköping	7 E SW	1290 Ma	¶
Gabbro, N. Torp	10 C NW	1305 Ma	
Lina Granite, Karlsborg	25 M SE	1330 Ma	¶
Mica Schist, N. Västervik	7 G SE	1375 Ma	
Mica Schist, Noppikoski	15 G SE	1420 Ma	
Småland Granite, Roxen	8 G NW	1480 Ma	¶
Lina Granite, S. Pajala	28 M SE	1515 Ma	
Greenstone, Los	15 F NW	1535 Ma	
Revsund Granite, Jävre	23 L NW	1545 Ma	
Gabbro, Kleva nickel mine	6 F SW	1585 Ma	
Amphibolite, Dalby quarry	2 C SE	1585 Ma	
Adak Granite, E. Adak	24 I SE	1605 Ma	
Revsund Granite, W. Mensträsk	23 J SW	1605 Ma	
Amphibolite, Tryserum	7 G SE	1635 Ma	
Hornblende, Rud mine, Fagersta	12 F SE	1660 Ma	
Gabbro	21 G SE	1690 Ma	
Sorsele Granit, N.W. Sorsele	24 H NW	1690 Ma	¶
Hornblende Skarn, Koskullskulle	28 K SW	1730 Ma	
Amphibolite, Idkerberget	12 F NW	1755 Ma	
Gabbro, Dundret-Gällivare	28 K SW	1890 Ma	
Gabbro, Dundret-Gällviare	28 K SW	1950 Ma	
Syenite-porphry, Kiruna	29 J NE	2000 Ma	

30. Welin, E., Christiansson, K. and Nilsson, Ö. 1971
 Rb-Sr radiometric ages of extrusive and intrusive rocks in northern Sweden. I.
 Sveriges geologiska undersökning, Serie C, nr 666, pp. 2-38.
 The Revsund, Sorsele and Lina granites were sampled over rather large regions. Samples from several separate intrusions have been collected to make up each isochron. It is not certain that each intrusion was coeval or had the same initial Sr composition.
- Gneiss granite, Vuolosjärvi-Vakkojärvi 30 J SE
 Rb-Sr whole rock and mineral determination 1713 \pm 40 Ma *
 Sr(i) 0.716 \pm 0.002
 U-Pb mineral date zircon and sphene 2760 Ma
- Revsund granite
 22 I NE, SE, 23 I NW, 23 K SW
 Rb-Sr whole rock and mineral isochron 1747 \pm 40 Ma *
 Sr(i) 0.707 \pm 0.002
- Sorsele granite
 24 H NW, NE, 24 I NE, 25 H NE, SE
 Rb-Sr whole rock and mineral isochron 1590 \pm 45 Ma *
 Sr(i) 0.708 \pm 0.002
 (specimen 67030 belongs to a much older granite, pers. comm. Adamek).
- Lina granite (i) 28 J SE, 28 K SW
 Rb-Sr whole rock isochron 1530 \pm 35 Ma *
 Sr(i) 0.712 \pm 0.005
- Lina granite (ii)
 26 I NE, 26 J NE, SW, 26 M NE, 27 L NW, 29 K SW
 Rb-Sr whole rock isochron 1780 \pm 50 Ma *
 Sr(i) 0.707 \pm 0.005
- Duobblon acid volcanics 24 H NW
 Rb-Sr whole rock isochron 1690 \pm 75 Ma *
 Sr(i) 0.703 \pm 0.005
- Kaska Tjåurek acid volcanics 29 J SW
 Rb-Sr whole rock isochron 1600 \pm 90 Ma *
 Sr(i) 0.714 \pm 0.005
- Kiruna acid volcanics 29 J NE
 Rb-Sr whole rock isochron 1570 \pm 65 Ma *
 Sr(i) 0.705 \pm 0.003
31. Welin, E. 1971
 Radiometriska dateringar och den svenska berggrundens ålder.
 Geologiska Föreningens i Stockholm Förhandlingar, Vol. 93, pp. 261-268.
- An article reviewing radiometric age determinations of minerals and whole rocks in Sweden up to 1970. Includes reference to historical development and early determinations of Swedish rocks and minerals.

32. Storzer, D. 1971
Fission track dating of some impact craters in the age range between 6000 and 300 m.y.
Meteoritics, Vol. 6, no. 4.
See item 43.
Rhyolite from south of Lake Mien 4 E SE
Fission track 92 \pm 6 Ma ¶
Date has not been recalculated.
33. Gulson, B.L. 1972
The Precambrian geochronology of granitic rocks from northern Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 94, pp. 229-244.
- | | | |
|--------------------------------------|---------|------------------|
| <u>Perthite granite</u> , Masugnsbyn | 28 L NW | 1505 \pm 30 Ma |
| Rb-Sr whole rock isochron | | |
| Sr(i) 0.713 \pm 0.004 | | |
| <u>Syenite</u> , Sjaunjatuottar | 28 J SW | 1530 \pm 25 Ma |
| Rb-Sr whole rock isochron | | |
| Sr(i) 0.710 \pm 0.002 | | |
34. Printzlau, I. and Larsen, O. 1972
K-Ar age determinations on alkaline olivine basalts from Skåne, southern Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 94, pp. 259-269.
See also item 48 for more precise dating of Göbnehall (171 \pm 4 Ma).
- | | | |
|---------------------|------------------------------|------------------|
| <u>Basalt necks</u> | 3 D SW | |
| K-Ar | Stenkilstorp | 81 \pm 7 Ma |
| K-Ar | Snababerg | 90 \pm 13 Ma |
| K-Ar | Gärahus | 87 \pm 6 Ma |
| K-Ar | Anneklev | 95 \pm 5 Ma |
| K-Ar | Säte | 101 \pm 7 Ma |
| K-Ar | isochron for above samples | 91 \pm 2 Ma |
| K-Ar | Lönneberg | 123 \pm 3 Ma |
| K-Ar | Bolmarehus | 129 \pm 6 Ma |
| K-Ar | Göbnehall | 134 \pm 8 Ma ¶ |
| K-Ar | isochron for above 3 samples | 125 \pm 2 Ma |
| K-Ar | Sandåkra | 107 \pm 15 Ma |
35. Aberg, G. 1972
An Rb-Sr age of the Småland porphyries.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 94, pp. 311-319.
See item 73 for recalculation (1645 \pm 20 Ma).
- | | | |
|---------------------------|--------------------|--------------------|
| <u>Småland porphyries</u> | 5 F SW, NE, 6 G NW | 1660 \pm 20 Ma ¶ |
| Rb-Sr whole rock isochron | | |
| Sr(i) 0.7065 \pm 0.0012 | | |

36. Welin, E., Lundström, I. and Åberg, G. 1972
Fission track studies on hornblende, biotite and phlogopite from Sweden.
Bull. Geol. Soc. Finland, Vol. 44, pp. 35-46.
(The ^{238}U decay constants used are slightly different from those recommended by Steiger and Jäger but the dates have not been recalculated.)
- | | | |
|-----------------------------|---------|-----------------|
| <u>MalMBERGET</u> | 28 K SW | |
| K-Ar hornblende | | 1875 Ma |
| Fission track (quoted date) | | 1255 and 450 Ma |
| <u>Ingelsbo</u> | 6 D SW | |
| K-Ar biotite | | 985 Ma |
| Fission track | | 520 to 305 Ma |
| <u>Alnö</u> | 17 H NE | |
| K-Ar phlogopite | | 565 Ma |
| Fission track | | 240 and 230 Ma |
37. Kononova, V.A., Salin, L.L. and Arakeljan, M.M. 1973
Alkaline massifs and carbonatites - their time of formation.
The USSR Academy of Science, Geol. Ser. no. 5, pp. 25-36.
- | | | |
|-------------------------|---------|--------|
| <u>Alnö Carbonatite</u> | 17 H NE | |
| K-Ar phlogopite | | 575 Ma |
38. Brotzen, O. 1973
Rb-Sr dating and microclinization in dioritic rocks of the Haparanda group, northern Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 95, pp. 19-24.

A reinterpretation of the analytical data in item 26.
- | | | |
|--|--|-------------------|
| <u>Haparanda suite</u> | | |
| Rb-Sr mineral (biotite resetting time) | | 1810 \pm 35 Ma |
| Rb-Sr whole rock (primary crystallization) | | 2200 \pm 100 Ma |
39. Klingspor, I. 1973
A preliminary report on the dating by the K-Ar method of a basalt rock at Göbnehall, southern Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 95, pp. 287-289.
- | | | |
|---|--------|-------------------|
| <u>Basalt neck, Göbnehall</u> | 3 D SW | |
| K-Ar whole rock and mineral isochron (11 samples) | | 167 Ma \uparrow |
| Revised value 171 \pm 4. See item 48. | | |
40. Priem, H.N.A. and Bakker, J.D. 1973
A Rb-Sr whole rock isochron study of the Loftahammar granitic gneisses in the Västervik area, southeastern Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 95, pp. 400-403.
See item 73.
- | | | |
|------------------------------------|----------------|------------------|
| <u>Loftahammar granitic gneiss</u> | 7 G SE, 7 H SW | |
| Rb-Sr whole rock isochron | | 1655 \pm 35 Ma |
| Sr(i) 0.713 \pm 0.004 | | |

41. Gee, D.G. and Wilson, M.R. 1974
The age of orogenic deformation in the Swedish Caledonides.
American Journal of Science, Vol. 274, pp. 1-9.
- Vilasund granite. Syn-orogenic intrusion within Caledonides.
25 F NW.
Rb-Sr whole rock isochron 438₋ 6 Ma
Sr(i) 0.7055₋0.0010
42. Welin, E. and Lundqvist, T. 1975
K-Ar ages of Jotnian dolerites in Västernorrland county, central Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 97, pp. 83-88.
Supersedes determinations in item 1. See item 74 for Rb-Sr determinations of Jotnian Sills, Dalarna.
- Jotnian Dolerite, Västernorrland 17 I NW, 18 I NE, 19 J SW
K-Ar whole rock and mineral isochron, 12 samples 1254 Ma
43. Welin, E. 1975
K-Ar dating and Sr-isotope composition of rhyolitic rocks from Lake Mien in southern Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 97, pp. 307-311.
See item 32.
- Rhyolite, Lake Mien 4 E SE
K-Ar whole rock, 6 samples between 115₋2 Ma and 104₋2 Ma
K-Ar and Rb-Sr data supports hypothesis that Lake Mien structure formed through meteorite impact.
44. Röshoff, K. 1975
Some aspects of the Precambrian in southeastern Sweden in the light of a detailed geological study of the Lake Nömmen area.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 97, pp. 368-378.
Determination by P. Taylor, Oxford.
- Nömmen Plutonic Suite 6 E NE
Rb-Sr whole rock isochron 1800₋58 Ma
Sr(i) 0.7023
45. Gorbatshev, R. and Welin, E. 1975
The Rb-Sr age of the Ursand granite on the boundary between the Åmål and "Pregothian" mega-units of southwestern Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 97, pp. 379-381.
- Ursand granite 8 B NE, 8 C NW
Rb-Sr whole rock isochron 1224₋50 Ma
Sr(i) 0.708₋0.008

46. Welin E. and Gorbarshev, R. 1975
The Rb-Sr age of the Hästefjorden granite and its bearing on the Precambrian evolution of southwestern Sweden.
Precambrian Research, Vol. 3, pp. 187-195.

Hästefjorden granite 8 B NE
Rb-Sr whole rock isochron 1214₋30 Ma
Sr(i) 0.712₋0.005.

47. Skiöld, T. 1976
The interpretation of the Rb-Sr and K-Ar ages of late Precambrian rocks in southwestern Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 98, pp. 3-29.

Dal Group, Lower slate 9 B NE, SE, 9 C NW, 10 C SW
Rb-Sr whole rock isochron 1028₋40 Ma
Sr(i) 0.704₋0.023
K-Ar whole rock isochron, 21 samples 1015 Ma

Dal Group, Spilite 24 samples 9 B SE, 9 C NW, SW, 10 C SW
K-Ar whole rock between 1001₋35 and 763₋28 Ma
K-Ar hornblende between 998₋35 and 801₋29 Ma
K-Ar feldspar between 911₋32 and 726₋Ma

Bohus granite 8 A NE, 9 A NE, SE
Rb-Sr whole rock isochron 890₋35 Ma
Sr(i) 0.711₋0.003
K-Ar mineral isochron (11 samples) 890 Ma

Blomskog granite 10 B NE
Rb-Sr whole rock (one sample; Sr(i) 0.711 assumed) 945 Ma *

Härserud granite 9 C NW
Rb-Sr whole rock data plots as a wild scatter of points in an isochron diagram.

Ljungbergen granite 9 B NE
Rb-Sr whole rock isochron 1370₋80 Ma
Sr(i) 0.704₋0.003

Ellenö granite 8 B NE, 9 B SE
Rb-Sr whole rock isochron 1375₋40 Ma
Sr(i) 0.708₋0.005

48. Klingspor, I. 1976
Radiometric age determination of basalts, dolerites and related syenite in Skåne, southern Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 98, pp. 195-216.
See also item 23. Supersedes item 39. See item 74 for related studies.

<u>Göbnehall basalt</u>	3 D SW	
K-Ar whole rock and mineral isochron (11 samples)		171 ₋ 4 Ma
<u>Lönnebjär and Rallate basalts</u>	3 C SE, 3 D SW	
K-Ar whole rock and mineral isochron (11 samples)		111 ₋ 3 Ma
<u>NW trending dolerite dykes</u>		
2 C NE, SE, 2 D, 2 E SW, 3 B NE, 3 C, 3 D SW, SE, 4 C SW (61 samples)		
K-Ar whole rock and mineral isochron		300 ₋ 4 Ma
<u>Shale, Rönnarp and Odarslöv</u>	2 C NE, 3 C SW	
(a study of the effect of contact metamorphism on K-Ar datas).		
K-Ar whole rock Rönnarp		between 471 ₋ 7 and 265 ₋ 4 Ma
K-Ar whole rock Odarslöv		between 528 ₋ 18 and 376 ₋ 5 Ma
<u>Vaggeryd Syenite</u>	3 D NE, SE	
Rb-Sr whole rock isochron		1184 ₋ 38 Ma
Sr(i) 0.7055±0.0027		
K-Ar whole rock isochron	between	880 ₋ 13 and 682 ₋ 10 Ma
K-Ar mineral (hornblende)		1185 ₋ 17 Ma
<u>NNE trending dolerite dykes, Skåne</u>		
2 C SE, 2 D SW, 3 D NE, SE, 3 E NW, 4 E SW (37 samples)		
Rb-Sr whole rock isochron		1565 ₋ 230 Ma
K-Ar whole rock	between	1595 ₋ 23 and 679 ₋ 10 Ma

49. Claesson, S. 1976
The age of the Ottfjället dolerites of Särvi Nappe, Swedish Caledonides.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 98, pp. 370-374.
The Rb-Sr isochron date (720₋260 Ma) is interpreted as the age of dolerite intrusion.
The K-Ar dates are thought to be due to excess radiogenic argon.

<u>Dolerite, Ottfjället, Funäsdalsberget and Ulvberget</u>		
17 C NE, 17 D NW, 19 D SW		
Rb-Sr whole rock isochron		720 ₋ 260 Ma
Sr(i) 0.7036±0.0005		
<u>Funäsdalsberget</u>	17 C NE	
K-Ar whole rock	between	2574 ₋ 38 and 1238 ₋ 18 Ma *
<u>Ulvberget</u>	17 D NW	
K-Ar whole rock	between	1318 ₋ 19 and 863 ₋ 19 Ma *

Ottfjället 19 D SW
K-Ar whole rock 725₋10 Ma

Middagsvalen 19 D SW
K-Ar whole rock between 1035₋15 and 659₋10 Ma

See also items 53 and 60.

50. Welin, E. and Gorbatshev, R. 1976
A Rb-Sr geochronological study of the older granitoids in the Åmål tectonic mega-unit, southwestern Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 98, pp. 374-377.

Granitoids in the Åmål I group, Åmål mega-unit
8 B NE, SE
Rb-Sr whole rock determination 1654₋155 Ma *
Sr(i) 0.7011₋0.0017 (Data scatter greater than experimental error).

51. Welin, E. and Gorbatshev, R. 1976
Rb-Sr age of granitoid gneisses in the "Pregothian" area of southwestern Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 98, pp. 378-381.

Granitoid gneisses 8 C SW, SE
Rb-Sr whole rock 1698₋85 Ma
Sr(i) 0.7027₋0.0008

52. Larsen, O. and Springer, N. 1976
Radiometrisk datering af granitoider i Blekinge og på Bornholm.
Abstract, 12 Nordiska Geologvintermötet, Göteborg, 7-10 januari.
Preliminary account, no analytical details.

Småland granite 3 F NE, 4 F SE
Rb-Sr isochron 1713 Ma *

Karlshamn granite 3 F NW
Rb-Sr 1420 Ma *

53. Point, R. and Prost, A.E. 1976
Old Precambrian age of the Särsv quartzites. Structural consequences on position of the Särsv Nappe.
Abstract, 12 Nordiska Geologvintermötet, Göteborg, 7-10 januari.
Determined in Nancy.
Decay constants not quoted - dates taken as in abstract.
See items 49 and 60.

Särsv quartzite
K-Ar 2200 Ma *

Ottfjäll dolerite
K-Ar 1300 Ma *

54. Kornfält, K.A. 1976
 Petrology of the Ragunda Rapakivi Massif, Central Sweden.
 Sveriges geologiska undersökning, Series C, No 725, pp. 1-111.
- The following preliminary dates quoted on p. 102. No analytical details.
- | | | |
|---|--|---------------------------|
| <u>Ragunda syenite and granite</u> | | |
| Rb-Sr isochron | | 1292 ₋ 30 Ma * |
| Sr(i) 0.718 ₋ 0.006 | | |
| <u>Nordingrå rapakivi granite</u> | | |
| Rb-Sr isochron | | 1414 ₋ 20 Ma * |
| Sr(i) 0.725 ₋ 0.003 | | |
| <u>Nordingrå gabbro and anorthosite</u> | | |
| Rb-Sr isochron | | 1552 ₋ 50 Ma * |
| Sr(i) 0.7059 ₋ 0.0005 | | |
55. Kresten, P., Printzlau, I., Rex, D., Vartiainen, H. and Woolley, A.
 1977
 New ages of carbonatitic and alkaline ultramafic rocks from Sweden and Finland.
 Geologiska Föreningens i Stockholm Förhandlingar, Vol. 99, pp. 62-65.
 See also items 64 and 65.
- | | | |
|--------------------------------|---------|-------------------------|
| <u>Sövite ring dyke, Alnö</u> | 17 H NE | |
| K-Ar, phlogopite | | 545 ₋ 16 Ma |
| <u>Alnöite dyke, Ävike Bay</u> | 17 H NE | |
| K-Ar, phlogopite | | 550 ₋ 16 Ma |
| <u>Kimberlite dyke, Kalix</u> | 24 M NW | |
| K-Ar, phlogopite | | 1150 ₋ 35 Ma |
| <u>Dyke, Västervik</u> | 6 H NW | |
| K-Ar, phlogopite | | 1563 ₋ 50 Ma |
56. Skiöld, T. 1977
 Granite ages in the Kalix area, northern Sweden.
 Geologiska Föreningens i Stockholm Förhandlingar, Vol. 99, pp. 76-79.
- | | | |
|----------------------------------|--------------------------|-------------------------|
| <u>Degerberg granite, Kalix</u> | 25 L SE, 25 M NE, SW, SE | |
| Rb-Sr whole rock isochron | | 1772 ₋ 40 Ma |
| Sr(i) 0.7050 ₋ 0.0003 | | |
| <u>Red granite, Kalix</u> | 25 M NW, SW, SE | |
| Rb-Sr whole rock isochron | | 1772 ₋ 20 Ma |
| Sr(i) 0.7051 ₋ 0.0004 | | |
57. Lindh, A. and Kähr, A.-M. 1977
 K-Ar dating in the Mylonite Zone, southwestern Sweden.
 Geologiska Föreningens i Stockholm Förhandlingar, Vol. 99, pp. 289-291.
- | | | |
|------------------------------------|---------|--|
| <u>Micaceous gneiss (mylonite)</u> | 12 C SE | |
| K-Ar whole rock | | between 978 ₋ 14 and 899 ₋ 13 Ma |

58. Wahlgren, C.-H. and Kähr, A.-M. 1977
Mica-lamprophyres in western Värmland, southwestern Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 99, pp. 291-295.

Lamprophyric dyke
K-Ar

10 C NE K-A

915 \pm 13 Ma

59. Welin, E., Gorbatshev, R. and Lundegårdh, P.H. 1977
Rb-Sr dating of rocks in the Värmland granite group in Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 99, pp. 363-367.

Filipstad granite

10 E NW, NE, 11 D NE, 11 E NW, SW

Rb-Sr whole rock isochron

1664 \pm 37 Ma

Sr(i) 0.7068 \pm 0.0021

Granitoids, Hagfors-Kristinehamn

10 E NW, 12 D NE, 12 D SE

Rb-Sr whole rock isochron

1653 \pm 30 Ma

Sr(i) 0.7021 \pm 0.0006

60. Point, R., Ploquin, A., Prost, A., Sonet, J. and Zimmermann, J.L.
1977
The age of the Ottfjället dolerites of Särvi Nappe, Swedish Caledonides:
Some comments.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 99, pp. 402-405.
Discussion and recalculation of data from item 49 (also unpub. data).

The authors do not deny that there is some excess Ar in the Ottfjället dolerites but argue for older ages and suggest a minimum age of 1800 Ma for the dolerites.

See items 49, 53 and 61.

61. Claesson, S. 1977
The age of the Ottfjället dolerites of Särvi Nappe, Swedish Caledonides:
A reply.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 99, pp. 405-408.
See item 60.

62. Welin, E. and Lundqvist, T. 1977
Rb-Sr dating of Rätan granite, central Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 99, pp. 417-420.

Rätan granite

15 E NE, 15 F NW, 16 E SE

Rb-Sr whole rock isochron

1649 \pm 25 Ma

Sr(i) 0.703 \pm 0.003

63. Welin, E., Christiansson, K., Johansson, G. and Nilsson, Ö. 1977
Radiometric ages of intrusive rocks in northern Sweden. 2.
Sveriges geologiska undersökning, Serie C, nr 731, pp. 3-21.

Guorbavare granite 26 H SE
Rb-Sr whole rock isochron 1591 \pm 35 Ma
Sr(i) 0.712 \pm 0.002

Ledfat granite 24 I SW
Rb-Sr whole rock isochron 1645 \pm 35 Ma
Sr(i) 0.705 \pm 0.005

Adak granite 24 I SE
Rb-Sr whole rock isochron 1733 \pm 25 Ma
Sr(i) 0.705 \pm 0.001

Arvidsjaur granite 24 J NW, SW, 24 K NW
Rb-Sr whole rock isochron 1742 \pm 30 Ma
Sr(i) 0.705 \pm 0.002

Hällnäs granite 26 I SW
Rb-Sr whole rock isochron. Data scatter slightly
greater than experimental error. 1698 \pm 25 Ma *
Sr(i) 0.7080 \pm 0.002

Duobblon granite 24 H SW, SE
Rb-Sr whole rock. Data scatter greater than
experimental error. 1752 Ma *

64. Blaxland, A.B. 1977
Aqpaitic magmatism at Norra Kärr? Rb-Sr isotopic evidence.
Lithos, Vol. 10, pp. 1-8.

Arfvedsonite from Norra Kärr 7 E NE
K-Ar mineral 1460 and 1365 Ma

Pulaskite, Kaxtorpите, Lakarpите, Grennaite
Rb-Sr whole rock isochron. Data scatter greater than 1547 \pm 62 Ma *
experimental error.
Sr(i) 0.7072 \pm 0.0035

65. Bylund, G. and Patchett, P.J. 1977
Palaeomagnetic and Rb-Sr isotopic evidence for the age of the Särna
alkaline complex, western central Sweden.
Lithos, Vol. 10, pp. 73-79.

Särnaite 16 C SE
Rb-Sr mineral isochron 281 \pm 14 Ma

66. Adamek, P.M. and Wilson, M.R. 1977
Recognition of a new uranium province from the Precambrian of Sweden.
International Atomic Energy Agency, Vienna. (IAEA-TC-25/16), pp. 199-215.

Uraninite or uranium ore from epigenetic uranium mineralisations

U-Pb concordia, Pleutajokk	26 H SE	1738 ⁺¹⁰ ₋₈ Ma
U-Pb concordia, Harrejokk	26 H SW	1736 ⁺⁸¹ Ma
U-Pb concordia, Björklund	24 I SW	1748 ⁺⁴² ₋₃₀ Ma
U-Pb concordia, Rävaberget	24 I NE	1767 ⁺⁶ ₋₈ Ma

Dates adjusted following personal communication.

67. Boucot, A.J. 1977
The age of orogenic deformation in the Swedish Caledonides.
American Journal of Science, Vol. 277, pp. 1352-1354.

Discussion of item 41. Reply by Gee and Wilson.

68. Patchett, P.J. and Bylund, G. 1977
Age of Grenville belt magnetisation: Rb-Sr and palaeomagnetic evidence
from Swedish dolerites.
Earth and Planetary Science Letters, Vol. 35, pp. 92-104.
See item 74.

69. Reymer, A.P.S., Boelrijk, N.A.I.M., Hebeda, E.H., Priem, H.N.A.,
Verdurmen, E.A.Th. and Verschure, R.H. 1977
Evidence for Precambrian elements in the Caledonian Seve Nappe, Sweden.
Abstract, Fifth European Colloquium of Geochronology, Cosmochronology
and Isotope Geology, Pisa, September 5-10.

Central Scandinavian Caledonides

<u>Migmatite, Köli Nappe</u> Rb-Sr whole rock isochron		450 Ma *
<u>Gneiss, Seve Nappe</u> Rb-Sr whole rock isochrons		960, 1025, 1075 Ma *
<u>Gneiss, central part Seve Nappe</u> Rb-Sr whole rock isochron		1750 Ma *

70. Reymer, A. 1978
Precambrian elements in the Seve Nappe.
Abstract, 13 Nordiska Geologiska Vintermötet, Köpenhamn, Januari,
1978.

<u>Migmatite, Köli Nappe</u> Rb-Sr whole rock isochron	25 F SW	442 ⁺³⁰ Ma *
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71. Park, R.G. and Daly, J.S. 1978
Structure and geochronology of the Stora Le-Marstrand "Series" of Orust, SW Sweden.
Abstract, 13 Nordiska Geologiska Vintermötet, Köpenhamn, Januari 1978.
- These dates have been adjusted following pers. comm.
- | | | |
|--|--------|---------------------------|
| <u>Amphibolite, Hällevikstrand</u> | 8 B SW | |
| <u>Rb-Sr whole rock isochron</u> | | 1432 ₋ 92 Ma |
| Sr(i) 0.7032 ₋ 0.005 | | |
| <u>Augen granite, E Orust</u> | 8 B SW | |
| <u>Rb-Sr whole rock, reference line. Data scatter greater than experimental error.</u> | | 1379 ₋ 46 Ma * |
| Sr(i) 0.713 ₋ 0.003 | | |
72. Welin, E. and Gorbatshev, R. 1978
Rb-Sr age of the Lane granites in south-western Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 100, pp. 101-102.
- | | | |
|----------------------------------|--------|-------------------------|
| <u>Lane granite</u> | 8 B NE | |
| <u>Rb-Sr whole rock isochron</u> | | 1427 ₋ 28 Ma |
| Sr(i) 0.704 ₋ 0.003 | | |
73. Åberg, G. 1978
Precambrian geochronology of southeastern Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 100, pp. 125-154.
- | | | |
|--|--------|---------------------------|
| <u>Gneissic granite, Norrköping and Virserum areas</u> | 8 G NE | |
| <u>Rb-Sr whole rock isochron</u> | | 1930 ₋ 20 Ma |
| Sr(i) 0.7028 ₋ 0.0005 | | |
| Rb-Sr mineral isochron | | 1570 Ma |
| K-Ar mineral dates | | 1550 and 1543 Ma |
| U-Pb zircon concordia | | 1890 Ma |
| <u>Västervik area</u> | 7 G SE | |
| <u>Meta sediment, Västervik</u> | | |
| <u>Rb-Sr whole rock, reference line</u> | | 1586 ₋ 40 Ma * |
| Sr(i) 0.732 ₋ 0.006 Data scatter greater than experimental error. | | |
| K-Ar whole rock and mineral (12 samples) | | 1501 Ma |
| <u>Quartzite, Västervik</u> | | |
| <u>U-Pb zircon concordia</u> | | 2220 Ma |
| <u>Gneissic granites, Loftahammar, Örö-Hamnö</u> | | |
| <u>6 G NE, 6 H NW, 7 G NE, 7 G SE, 7 H SW</u> | | |
| <u>Rb-Sr whole rock isochrons</u> | | |
| Loftahammar Sr(i) 0.7117 ₋ 0.005 | | 1620 ₋ 40 Ma |
| Örö-Hamnö Sr(i) 0.7040 ₋ 0.001 | | 1630 ₋ 60 Ma |
| K-Ar mineral (biotite) reference line (13 samples) | | 1561 Ma |
| U-Pb concordia | | 1845 Ma |

- Småland Granite, Strålsnäs 7 F NW, NE, 8 F SE
 Rb-Sr whole rock isochron 1693₋65 Ma
 Sr(i) 0.7040_{+0.003}
 Supercedes determination in item 20.
- Småland porphyries 5 F NE, SW, 6 G NW
 Rb-Sr whole rock isochron 1645₋20 Ma
 Sr(i) 0.7081_{+0.0014}
 Recalculation of data in item 35.
- Småland dyke porphyries.
 An Rb-Sr whole rock date of 1620 Ma can be calculated. Refer to text.
- Högsrum-Finsjö dyke porphyries 5 G NW
 Välebo dyke porphyries 5 G NW
 Påskallavik dyke porphyries 5 G NE
- Götemar granite 6 G SE, 6 H SW
 Rb-Sr whole rock isochron 1351₋35 Ma
 Sr(i) 0.7079_{+0.0063}
 K-Ar mineral (biotite) 1437 and 1417 Ma
 (possibly excess radiogenic argon present)
- Småland granite and Vaggeryd syenite
 K-Ar biotite between 1660 and 915 Ma
 Sample locations on a map in the paper.

74. Patchett, P.J. 1978
 Rb-Sr ages of Precambrian dolerites and syenites in southern and central Sweden.
 Sveriges geologiska undersökning, Series C, no. 747, pp. 1-63.

East-West dolerite dykes from central Sweden

Author's summary of reliable age data

* indicates that data scatter exceeds experimental error.

Gåstorp	10 G SE	WR-biotite	1532 ₊₂₂
Forskilen	10 G SE	dolerite minerals	1560 ₊₇₉ *
Forskilen		WR-biotite	1510 ₊₂₃
Hällefors	10 G SE	rheomorph minerals	1518 ₊₃₈
Breven	9 F SE, SW	WR-biotite	1548 ₊₂₃
Breven		WR-biotite	1542 ₊₂₃

Intrusion at about 1530 Ma is inferred.

Tuna dykes of central Sweden (NNE trending) 12 F NE
 Rb-Sr whole rock isochron (scatter greater than error) 1371₋50 Ma *

Olivine dolerite sills of northern central Sweden: "Jotnian"

Gimån	18 G SW	rheomorph minerals	1229+19 Ma	
Gimån		dolerite minerals	1179+46 Ma	*
Sundsjö	18 F BW	rheomorph minerals	1156+15 Ma	
Sundsjö		rheomorph minerals	1167+19 Ma	
Sundsjö		WR-biotite	1213+18 Ma	
Älvho	15 E NE, SE	dolerite minerals	1290+63 Ma	*
Älvho		WR-biotite	1215+18 Ma	
Emådalen	15 E SE	WRs + minerals	1223+36 Ma	
Älvdalsåsen	14 D NE	WR-biotite	1231+18 Ma	
Mossiberg	15 D NE	WR-biotite	1217+18 Ma	
Idre	16 C SE	WR-biotite	1232+18 Ma	
Idre		WR-biotite	1228+18 Ma	
Bornåssjön	15 D NW	WR-biotite	1247+18 Ma	

Intrusion at 1220+25 Ma is inferred.

Dykes parallel to the Sveconorwegian tectonic zones

Karlshamn	3 E NE	dolerite minerals	936+56 Ma	
Karlshamn		dolerite minerals	871+25 Ma	*
Tärnö	3 E SE	xenolith minerals	880+28 Ma	
Tärnö		xenolith minerals	871+21 Ma	
Bräkne-Hoby	3 F NW	dolerite minerals	975+58 Ma	
Bräkne-Hoby		dolerite minerals	880+120 Ma	*
Forserum	6 E NW	dolerite minerals	959+18 Ma	*
Forserum		dolerite minerals	1048+35 Ma	*
Nilstorp	6 E NE	dolerite minerals	984+47 Ma	*
Ärby	10 G NE	dolerite minerals	995+65 Ma	*
Falun	13 F SE	dolerite minerals	966+20 Ma	
Falun		dolerite minerals	1105+77 Ma	*
Falun		WR-minerals	914+13 Ma	
V. Nornäs	15 D SW	dolerite minerals	901+39 Ma	*
V. Nornäs		WR-biotite	933+13 Ma	
Bunkris	15 D SW	dolerite minerals	1516+62 and 1546+84 Ma	*

See authors discussion - the Bunkris dates may be spuriously high.
For interpretation of all these dates see authors discussion.

Vaggeryd syenite of Southern Sweden

6 D NE, 6 E NE, SE
Rb-Sr whole rock isochron 1127+67 Ma *

Data scatter greater than experimental error.

Rb-Sr muscovite 928+13 and 914+13 Ma

Rb-Sr biotite 904+13, 875+13 and 858+13 Ma

See item 48 for more precise determination.

Mineral age studies on granite country rock of Southern Sweden

Växjö-granite, Almesåkra

Rb-Sr WR-biotite 1625+24 and 1614+24 Ma

Rb-Sr WR-orthoclase 1573+97 Ma

Spinkamåla granite, Blekinge

Rb-Sr WR-biotite 1364+23 and 1352+23 Ma

Rb-Sr WR-microcline 1169+68 Ma

75. Koark, H.J., Märk, T.D., Pahl, M., Purtscheller, F. and Vartanian, R. 1978
Fission track dating of apatites in Swedish Precambrian apatite iron ores.
Bulletin of the Geological Institutions of the University of Uppsala, N.S., Vol. 7, pp. 103-108.
These dates have not been recalculated.

Apatites

Fission track

Grängesberg	12 F SW	283 ₋ 73 Ma
MalMBERGET	28 K SW	191 ₋ 48 Ma
Tjärrojåkka	29 I SE	258 ₋ 53 and 212 ₋ 45 Ma
Tuolluvaara	29 K NE	486 ₋ 95 Ma
Nakerivaara	30 J SW	281 ₋ 58 and 224 ₋ 51 Ma

76. Lundegårdh, P.H. 1978
The Vånga granite in southernmost Sweden.
Sveriges geologiska undersökning, Serie C, no. 749, pp. 1-23.
Quotes Welin (pers. comm.) "A Rb-Sr whole rock dating shows a partial open system behaviour and only a reference line can be calculated".

<u>Vånga granite</u>	3 E NW, 3 E SW	1454 Ma *
Rb-Sr whole rock		

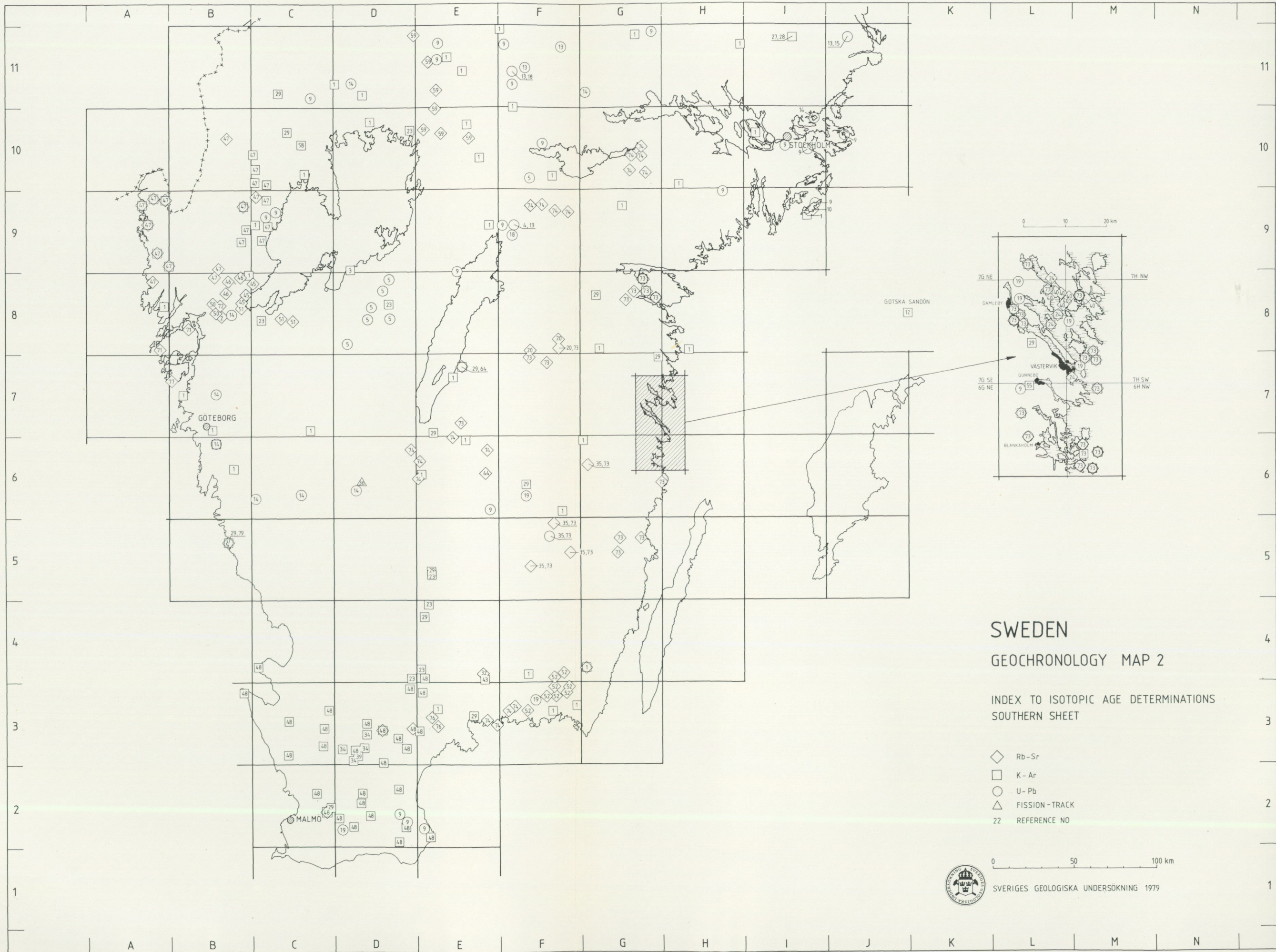
77. Welin, E. and Gorbatshev, R. 1978
Rb-Sr isotopic relations of a tonalitic intrusion on Tjörn Island, south-western Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 100, pp. 228-230.

<u>Rönnäng tonalite-granodiorite</u>	7 B NW	1674 ₋ 115 Ma *
4 out of 8 samples give a Rb-Sr whole rock isochron		
Sr(i) 0.7026+0.0006		
Whole rock Rb-Sr system disturbed by 989 ₋ 105 Ma event.		

78. Skiöld, T. and Larsson, C. 1978
Age data on Proterozoic granitoids from the Norvijaur area of Northern Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 100, pp. 171-176.

<u>Norvijaur granodiorite</u>	26 J NW	1884 ₋ 120 Ma
Rb-Sr whole rock isochron		
Sr(i) 0.7033+0.0006		
U-Pb zircon concordia		2010 ₋ 40 Ma
<u>Juoksajokko granite</u>	26 J NW	1875 ₋ 20 Ma
Rb-Sr whole rock isochron		
Sr(i) 0.7025+0.0007		

79. Welin, E. and Gorbatshev, R. 1978
The Rb-Sr age of the Varberg charnockite, Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 100, pp. 225-227.
- Varberg charnockite 5 B NE
Rb-Sr whole rock isochron 1419₋53 Ma
Sr(i) 0.7049_{+0.0006}
80. Adamek, P.M. and Wilson, M.R. 1979
The evolution of a uranium province in northern Sweden.
Phil. Trans. R. Soc. London. A 291, 355-368.
Ref. to item 66.
- Uranium ore, Rävaberget 24 I NE
U-Pb concordia 1767₋₈⁺⁶ Ma
Date adjusted after pers. comm.
81. Skiöld, T. 1979
U-Pb zircon and Rb-Sr whole rock and mineral ages of Proterozoic intrusives on map sheet Lannavaara, north-eastern Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 101, pp. 131-137.
- Granodiorite, Lake Paittasjärvi 30 L NE
U-Pb zircon 1880₊₂₈ Ma
Rb-Sr whole rock isochron 1915₋145 Ma
Sr(i) 0.7032_{+0.0005}
Rb-Sr whole rock mineral isochron 1550₋40 Ma
- Granodiorite, Juolovanjärvet area 30 L NW
Rb-Sr whole rock reference line 1705₋200 Ma *
Sr(i) 0.7030. Scatter exceeds experimental error.
Rb-Sr mineral ages 1495₋30 and 1535 Ma
U-Pb dating in progress.
- Gabbro, Juolovanjärvet area
Rb-Sr whole rock mineral isochron 1617₋107 Ma
Sr(i) 0.7029_{+0.0020}
82. Skiöld, T. 1979
Zircon ages from an Archean gneiss province in northern Sweden.
Geologiska Föreningens i Stockholm Förhandlingar, Vol. 101, pp. 169-171.
- Granodiorite gneiss, ENE of Kiruna 30 K NE
U-Pb zircon study - see authors discussion.
Metamorphic event between 2740 and 2694 Ma inferred. Primary zircon crystallisation probably 2834₋40 Ma.




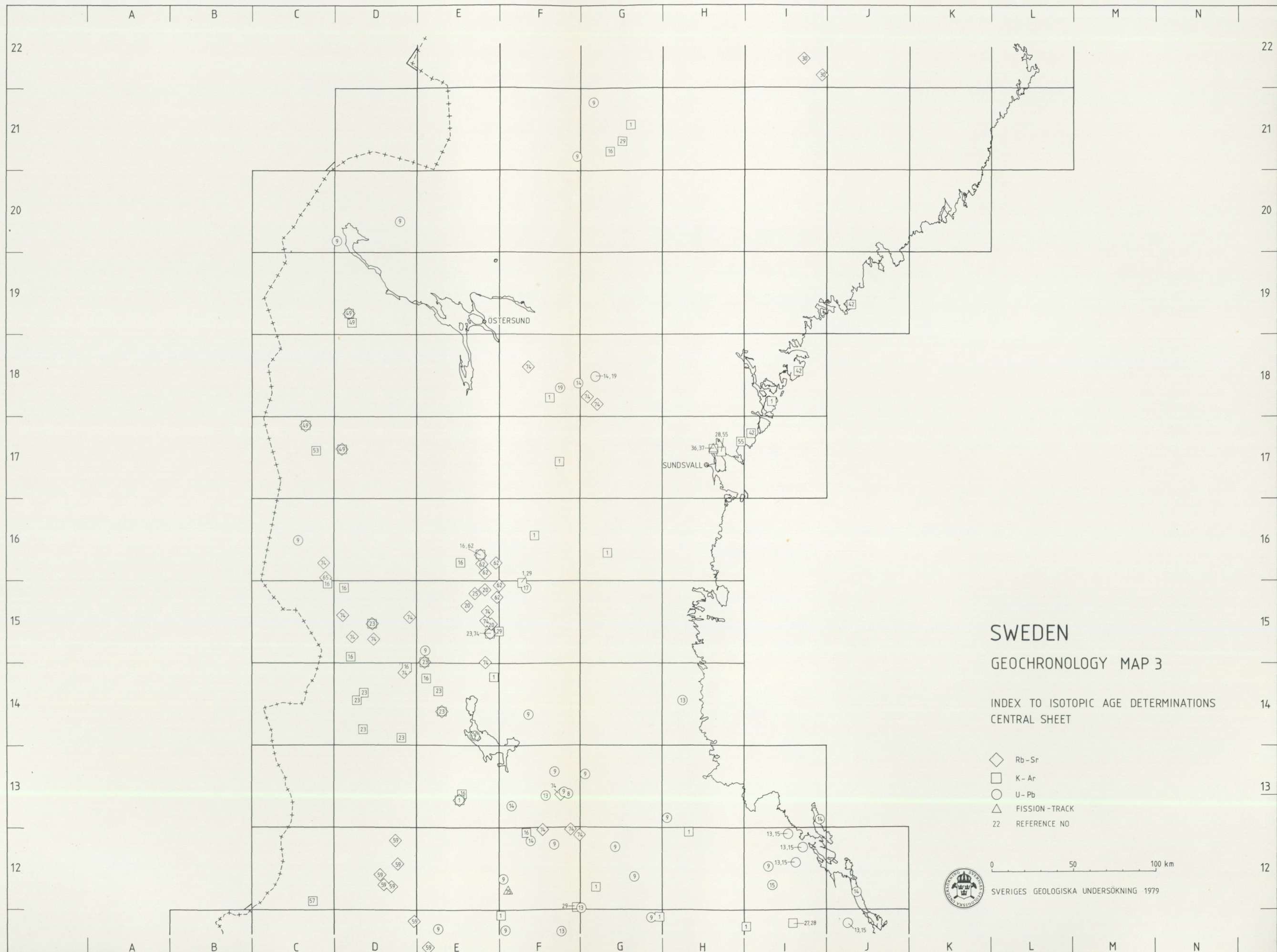
SWEDEN
GEOCHRONOLOGY MAP 2

INDEX TO ISOTOPIC AGE DETERMINATIONS
 SOUTHERN SHEET

- ◇ Rb-Sr
- K-Ar
- U-Pb
- △ FISSION-TRACK
- 22 REFERENCE NO

0 50 100 km

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SWEDEN
GEOCHRONOLOGY MAP 3

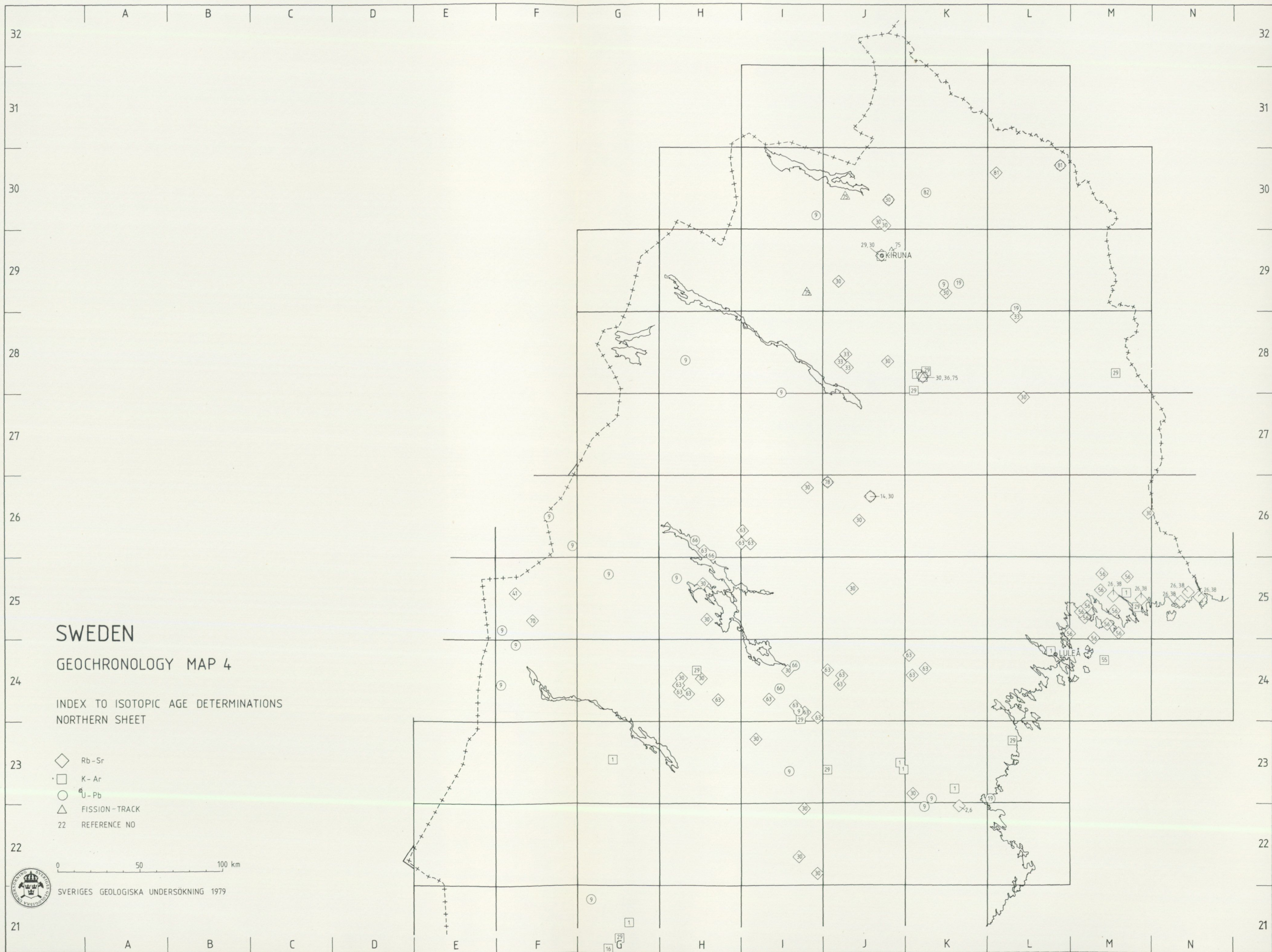
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CENTRAL SHEET

- ◇ Rb-Sr
- K-Ar
- U-Pb
- △ FISSION-TRACK
- 22 REFERENCE NO



0 50 100 km

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