



Bergvesenet

Postboks 3021, 7002 Trondheim

Rapportarkivet

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Kommer fra ..arkiv Falconbridge	Ekstern rapport nr Sul 439-76-9	Oversendt fra Sulfidmalm A/S	Fortrolig pga	Fortrolig fra dato:
Tittel Magnetic and electromagnetic (VLF) survey in the Gomsdalen west and Storevatn east grids, Geiranger 1976.				
Forfatter B Lieungh		Dato 1976	Bedrift Sulfidmalm A/S	
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Fagområde Geofysikk	Dokument type Rapport	Forekomster Gomsdalen		
Råstofftype Malm/metall	Emneord Cu Ni			
Sammendrag Se også BV 534 og BV 535				

A/S SULFIDMALM
INTER-OFFICE MEMORANDUM

Date: 14th November 1977 ✓
To: Falconbridge Nikkelverk A/S
cc: W. D. Harrison, H. T. Berry, R. Jahnsen,
F. Nixon, B. Lieungh, A. Musæus.
From: J. B. Gammon
Subject:

Report Nos. 439/76/9, 440/76/9 and 441/76/9 - Geiranger.

Please find attached Lieungh's account of work carried out in the Geiranger area during 1976. Despite the encouraging indications obtained during the geological and geophysical investigations the drilling phase of the work has demonstrated to our satisfaction that the mineralization present is too limited in extent to be of economic interest.

MOTTATT		18. 11. 77	BESV.	ARK.
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ADM. SJEF.			M.L. AVD.	
SVPR. AVD.			R. & GM. AVD.	
TEK. AVD.			EL. TEK. AVD.	
RE. & G. AVD.			INDR. AVD.	
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S. Jahnsen 27.				
3	BEARB.			Svar dato

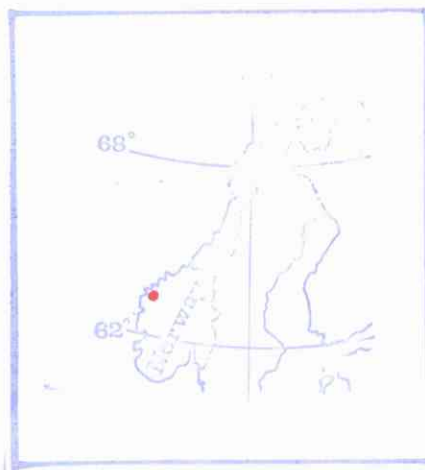
J. B. Gammon

FOR FALCONBRIDGE NIKKELVERK A/S
A/S SULFIDMALM
PROJECT 905-9

Magnetic and electromagnetic (VLF) survey
in the Gomsdalen west and Storevatn east
grids, Geiranger

1976

By
B. Lieungh



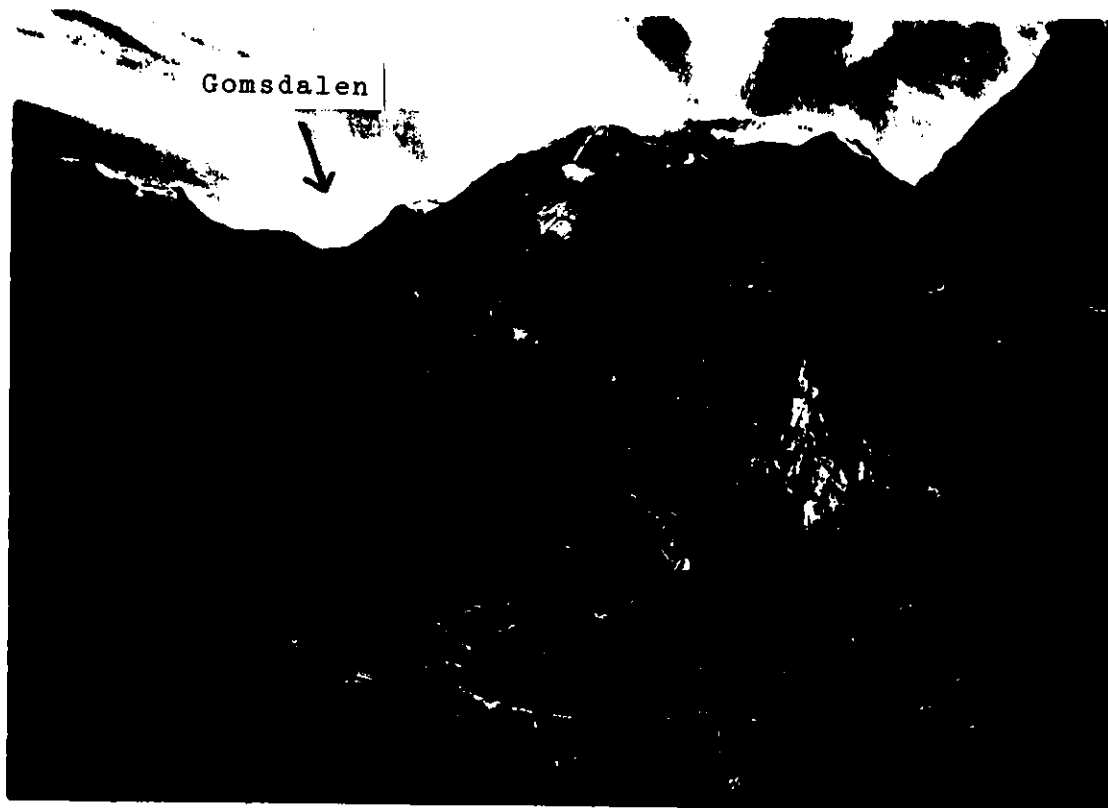


Fig.1

View from Geiranger towards Gomsdalen.

SUMMARY

The survey suggested two clear and strong VLF-EM anomalies, each of approx. 450 m length mainly inside the Gomsdalen west grid. Both anomalies are clearly connected to the known exposed mineralization. A minor VLF-anomaly is situated in the western end of Storevatn east grid at a known mineralized outcrop. The anomaly presumably continues to the west outside this grid. The magnetic picture gives anomalies that normally do not follow the VLF-EM anomaly and are possibly connected with the observed magnetite impregnation in the surrounding gneisses.

LOCATION

The Gomsdalen (Gausdal) area is situated 650-900 m above sea level approx. 6.5 km from the Geiranger village on the north-west coast of S-Norway. Steep mountains of 1400-1600 m height surround the valley. No road leads to the valley - only a bad path which is walkable only in summer time under good weather conditions. All equipment has to be brought into the valley by helicopter. See map no.1.

PRIOR AVAILABLE INFORMATION

A rough VLF-EM survey was carried out in 1973 mainly in the Gomsdalen grid (see report no. 271/73/5).

Mineralized rocks were known from three different outcrops:

- | | | |
|-------------------|---------------------|------------|
| 1. Sleddalselva | Gomsdalen west grid | 10E-10N |
| 2. Pilsbekken | " | 490W-12.5S |
| 3. Storevasshytta | Storevatn east grid | 6E-12.5S |

THE GRIDS

Two base lines were put out using a tripod mounted compass to cover the area around the known mineralizations. The baseline was marked by $\frac{1}{2}$ m long pickets every 25 m. Profiles were put out by compass and marked with yellow ribbons in the birch forest area and pickets every 50 m above tree limit. Profile spacing was 25 m.

Gomsdalen west baseline, length 1000 m, direction N297°
Storevatn east baseline, " 600 m, " N281°

The two grids have for practical reasons been given a common point at Gomsdalen west 800W-625S or Storevatn east 600E-0.

Map 2 shows the two grids plotted on the existing topographic map.

INSTRUMENTS

For directions in the field a Silva geologist compass with 360° circle scale was used.

The magnetic survey was carried out by a McPhar M-700 Flux-gate magnetometer reading the vertical component of the magnetic field. For the electromagnetic survey a Geonics EM-16 VLF-EM instrument was used reading the dip angle in %, using the station B.O.F.

THE SURVEY

The Mag and VLF-EM readings were carried out with readings every 12.5 m along the profiles.

Calibration point for the magnetic survey was Gomsdalen west grid 375W-62.5S.

The B.O.F. was chosen as station for the VLF-EM readings. It had a bad direction due to the general strike/dip of the rocks in the area, but the sender gave a steady continuous signal.

WORKING PROGRESS

A two man team completed the survey totalling 11.6 profile kms during 12 working days. This gave an average speed of 0.96 profile kms per day in an area close to the camp but in very steep terrain where it was partly necessary to do mountain climbing. Profile staking and readings were carried out in the same operation.

Northern light activity during part of the survey prevented Mag-reading of profiles 50W-225W in Gomsdalen west grid.

RESULTS

VLF-EM

The result of the VLF-EM survey was 3 different conductors over a strike length of 1550 m. See map no. 3.

The easternmost conductor which is situated around Sleddalselva has a total strike length of 400 m. The strongest part of the anomaly is very restricted and does not extend more than 50 m along strike. The maximum of the anomaly is situated close to the known mineralized outcrop.

Previous assays from this spot gave a Ni content ranging from 1.55% Ni - 0.30% Ni and Cu ranging from 1.15% Cu - 0.23% Cu.

A very weak connection can be traced on the dip angle profiles - westwards to the VLF-EM anomaly in the Pilsbekken area (see map 4).

This eastern anomaly is a much stronger VLF-EM anomaly with a strike length of 450 m on the weak part and a 250 m strike length on the strongest part. The maximum of the anomaly is located in a small outcrop of sulphide impregnated gabbro.

Previous assays from this location gave 0.37% Ni and 0.14% Cu. The main part of the anomaly is situated in a very steep mountain slope with scree material.

It is no clear continuation between this anomaly and the westernmost one at the Storevatn.

The westernmost anomaly has a surveyed strike length of only 75 m - but the grid stops here which means that a further extension of the survey westwards would possibly extend the strike length of the anomaly.

The strongest part of the VLF-EM anomaly is again located to a known outcrop of mineralized basic rock. Assays from this spot gave 0.54% Ni and 0.60% Cu.

On map no. 4 all the crossovers and similar changes in the dip angle have been taken into consideration, roughly classified and plotted as black dots. The connection between them has been drafted on the basis of the similarity in the form of the dip angle curves from profile to profile. By stressing the data in this way we got a structural picture of the area.

MAG

The magnetic picture is not as simple as the VLF-EM picture and there is no good correlation between Mag- and VLF-EM anomalies.

The lowest Mag-values are found in the same area as the presumably thickest overburden.

Magnetite grains have been observed in the gneisses at Gomsdalen west 575E-60N and can possibly explain most of the anomaly westwards from this point.

A coarse grained garnet-rich rock (eclogite-like) is situated at Gomsdalen 675W-12.5S and can explain the strong mag in this restricted area.

The easternmost VLF anomaly at Sleddalselva follows a strong magnetic ridge half the way westwards where we then have the break in Mag data due to magnetic storm.

The VLF-EM conductor at Pilsbekken has in part a weak magnetic ridge following only the eastern part of the anomaly.

The VLF-EM anomaly also contains a limited Mag. anomaly in the eastern part of the Storevatn grid.

CONCLUSIONS

The strong VLF-EM anomalies more or less follow the strike direction of the foliation and the dominant early lineation in the area.

The known mineralization correlates with the strong part of the VLF-EM anomalies in all cases. Magnetic anomalies do not show such a correlation. VLF-EM methods are therefore the most useful tool in the prospecting in this area.

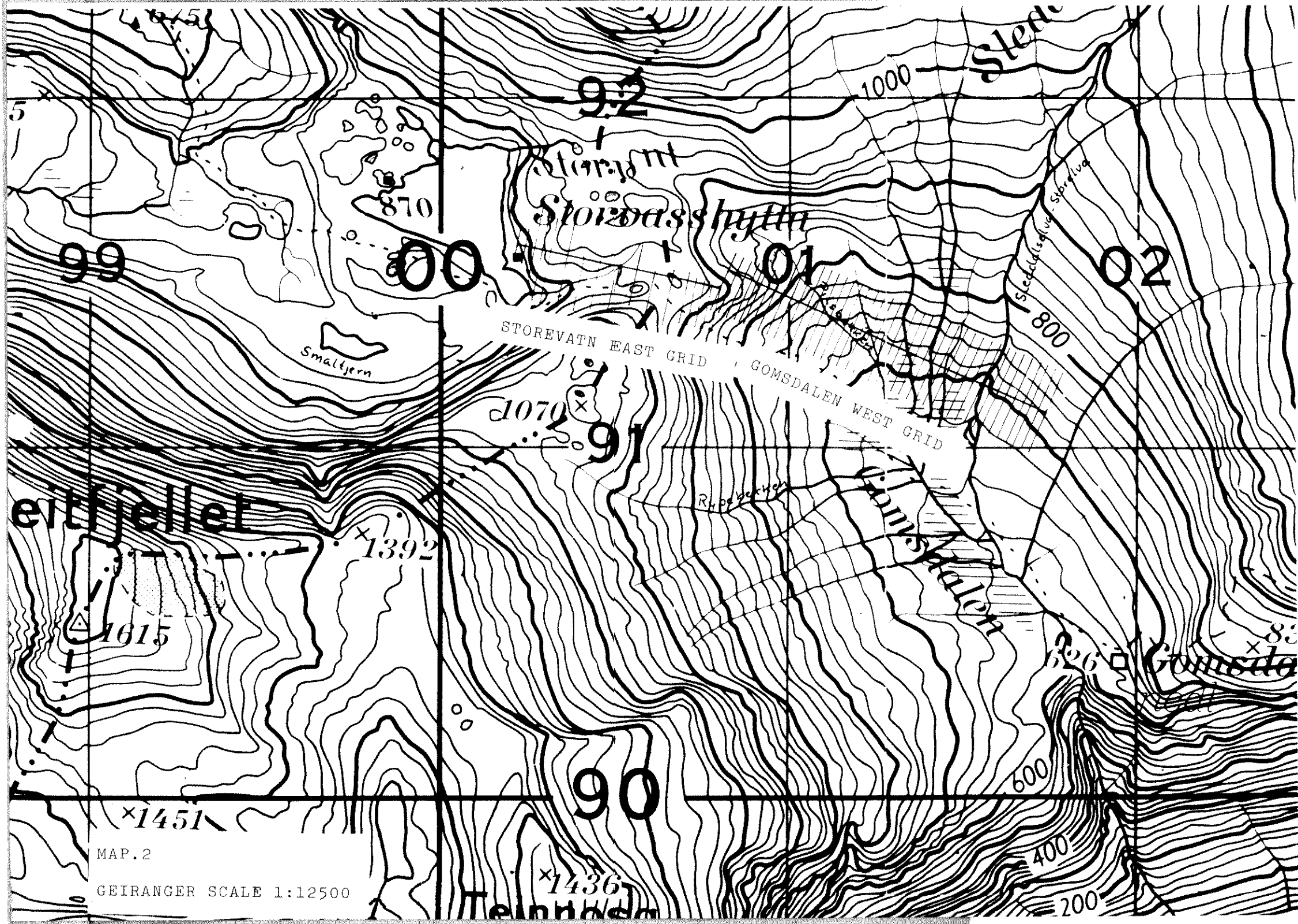
The westernmost VLF-EM anomaly at Storevatn needs following up in western direction.

A selection of drill targets purely on the basis of the VLF-EM anomalies can not be carried out in this area. One has to take the difficult and steep terrain into consideration.

Enclosures:

- Fig.1 Location of Gomsdalen on M-711 1:50.000 map.
- " 2 Location of the grid in the terrain 1:12.500 enlarged M711.
- " 3 VLF-EM Fraser maps.
- " 4 VLF-EM Crossover (stressed map)
- " 5 Magnetic map
- " 6 Mag-VLF compilation.





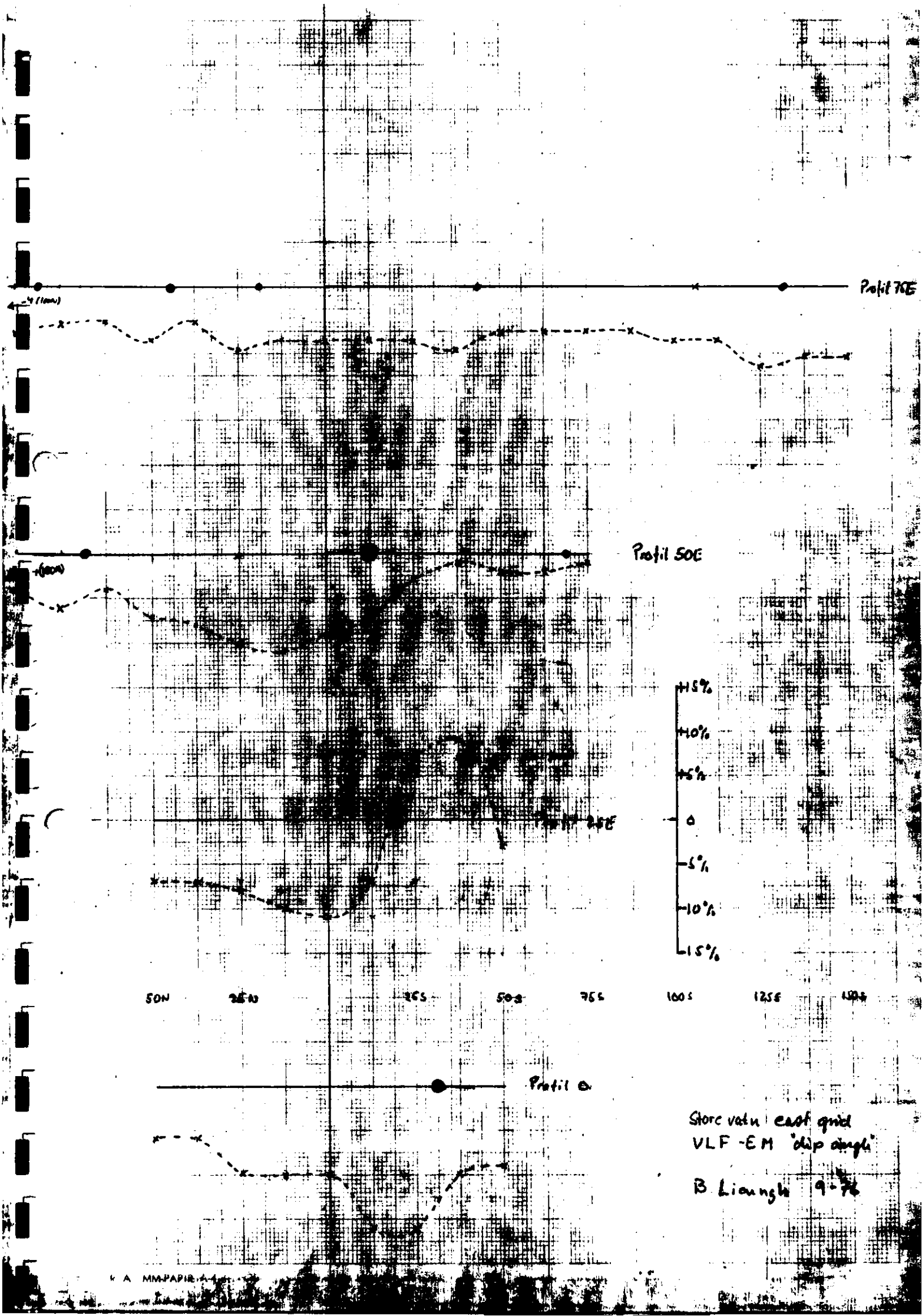
Storvasshytta

STOREVATN EAST GRID
GOMSDALEN WEST GRID

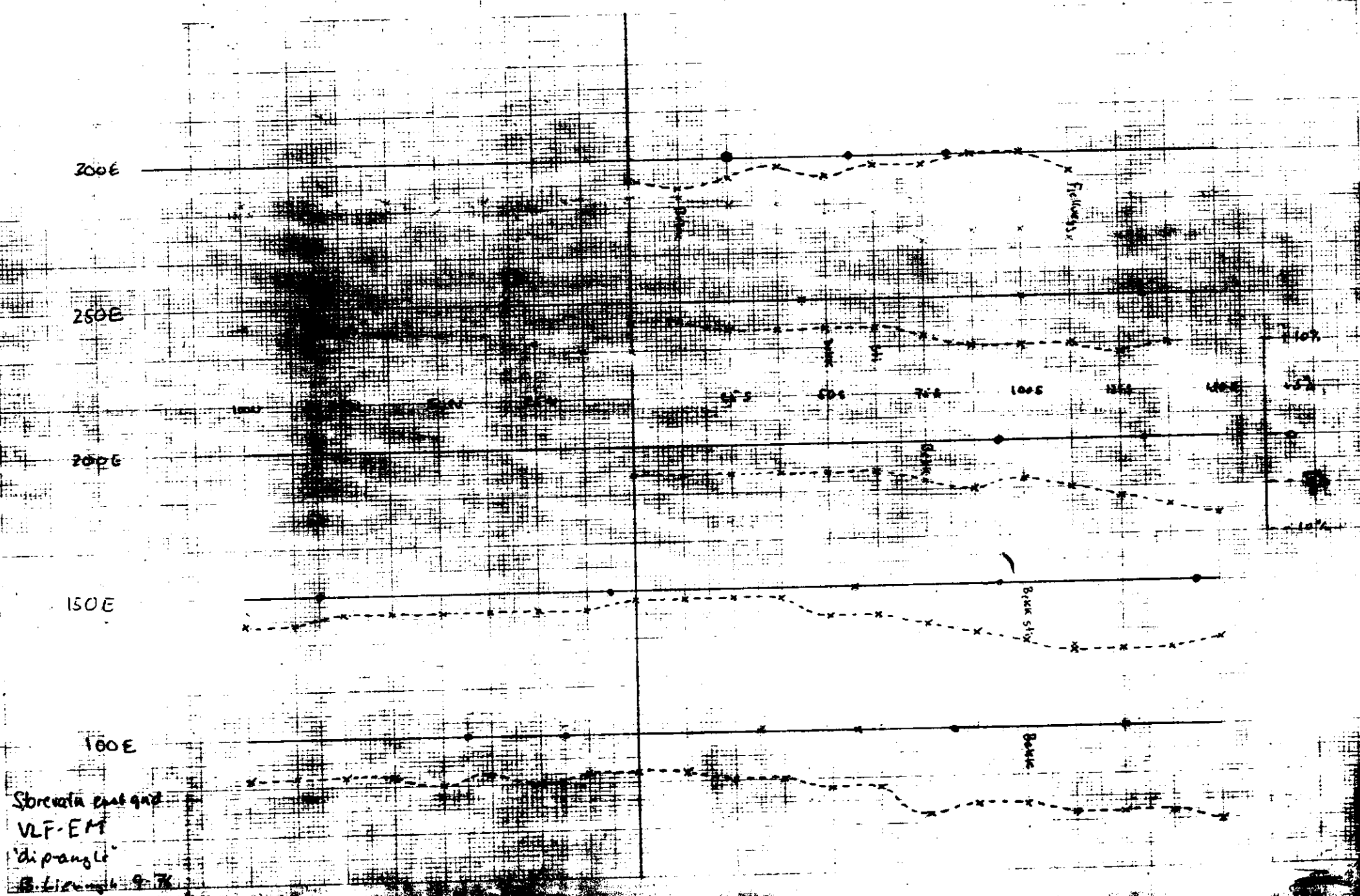
Geiranger

MAP.2

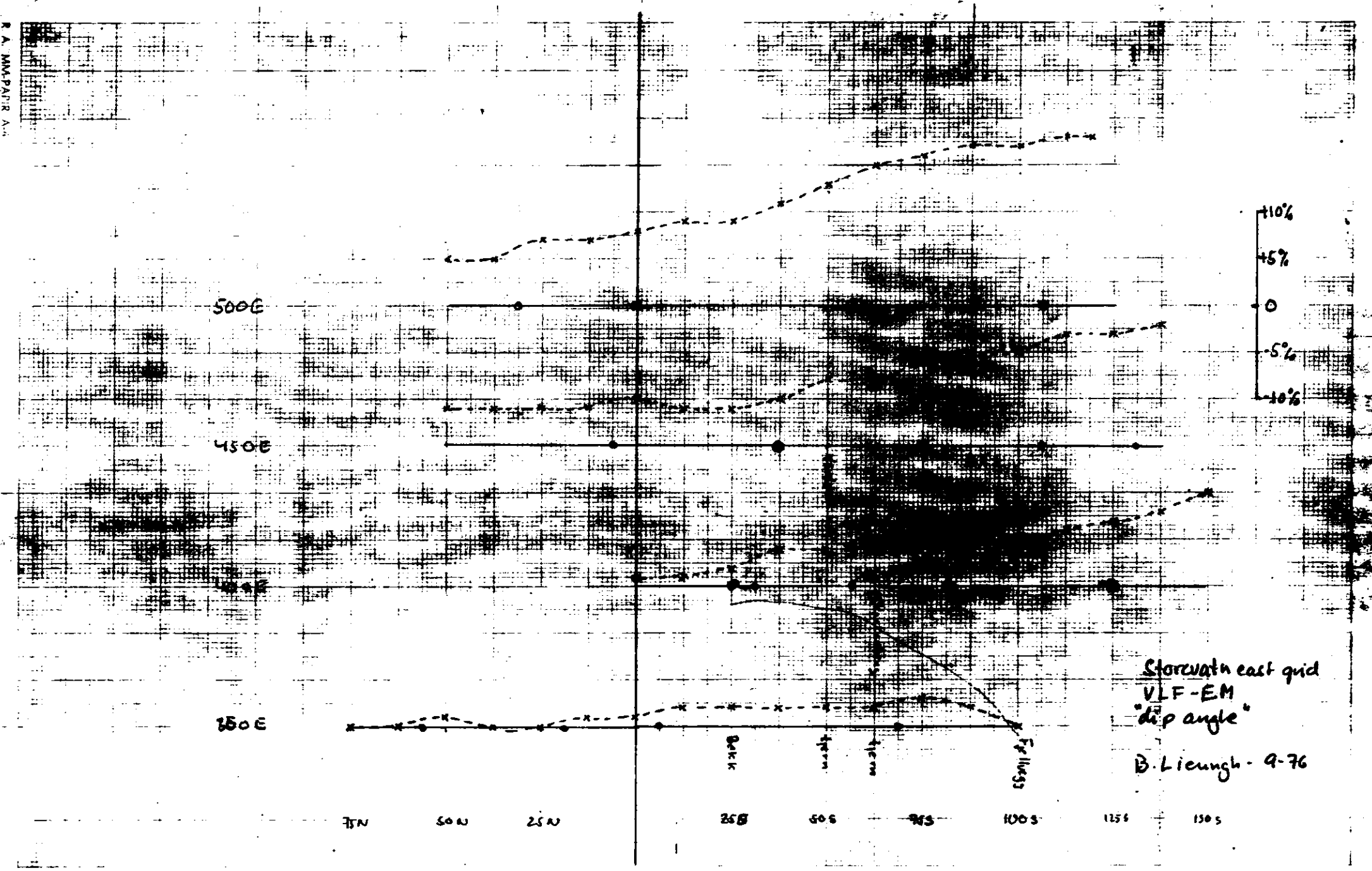
GEIRANGER SCALE 1:12500



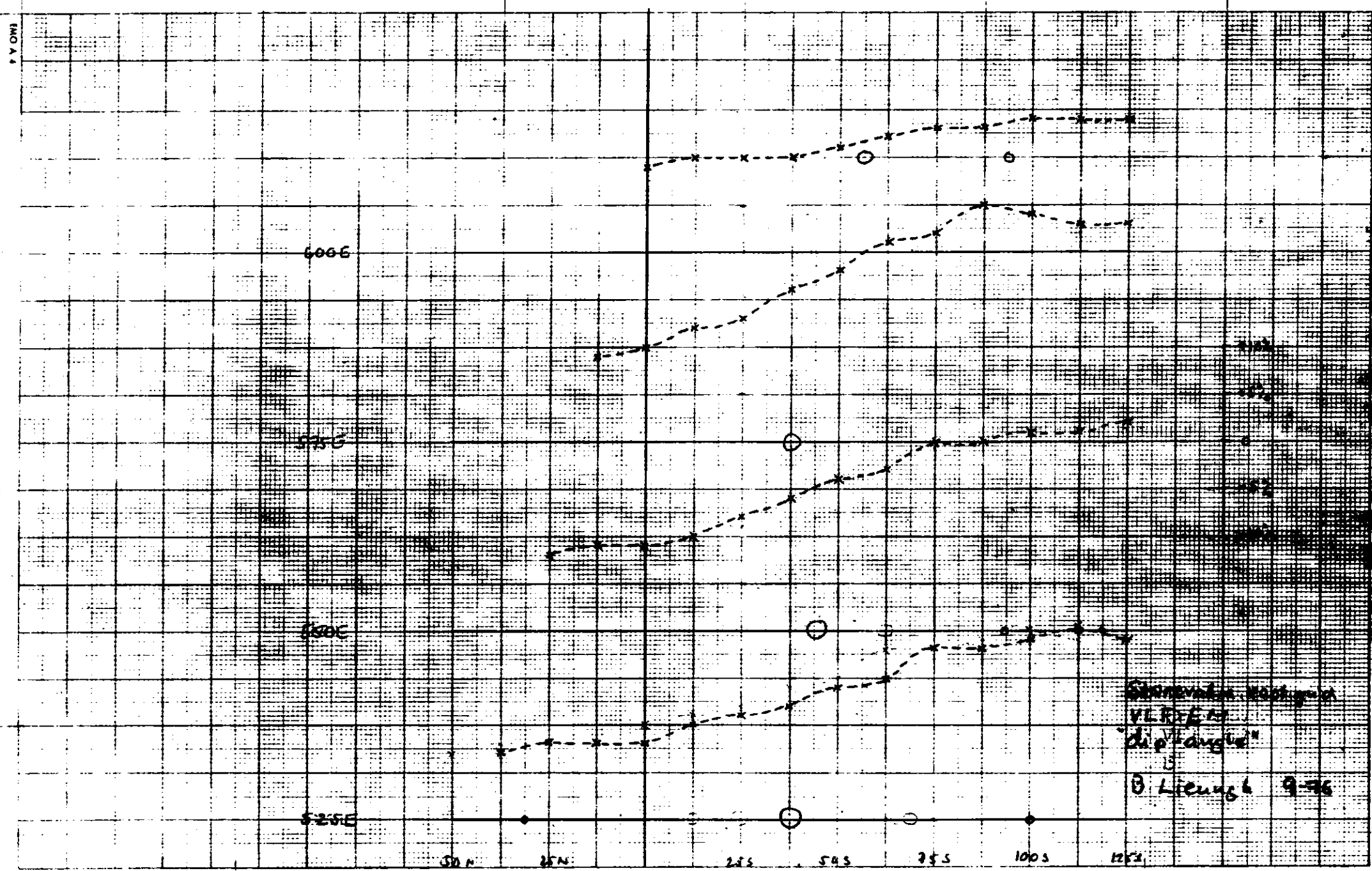
STAT 101 44



R. A. MM-PARIR A-6



Storevath east grid
VLF-EM
"dip angle"
B. Lieungh - 9-76



Stereonet reduction
VLR/E-M
dip angle
B. Lieng 9-76

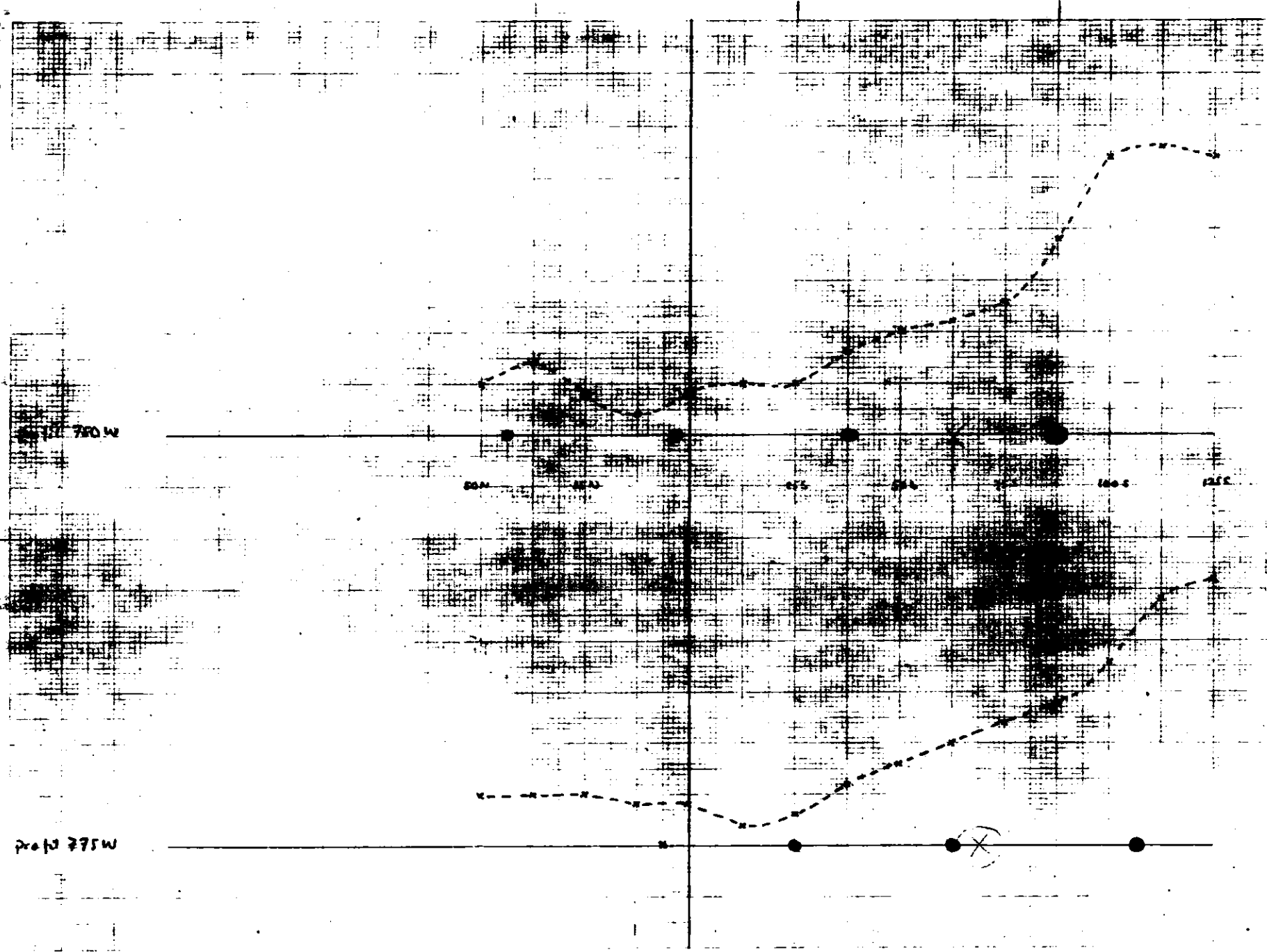
Profile 800W

253

1002

VLF-EM
dip-angle
Gons delennest qm
B. Liemph 9-76

MAPIR A4



VLF-EM
"dip-angle"
Gomdalen west of
B. Liengh 9-76

profil 700W

50N

25N

25S

50S

75S

100S

125S

150S

15%

10%

5%

0%

-5%

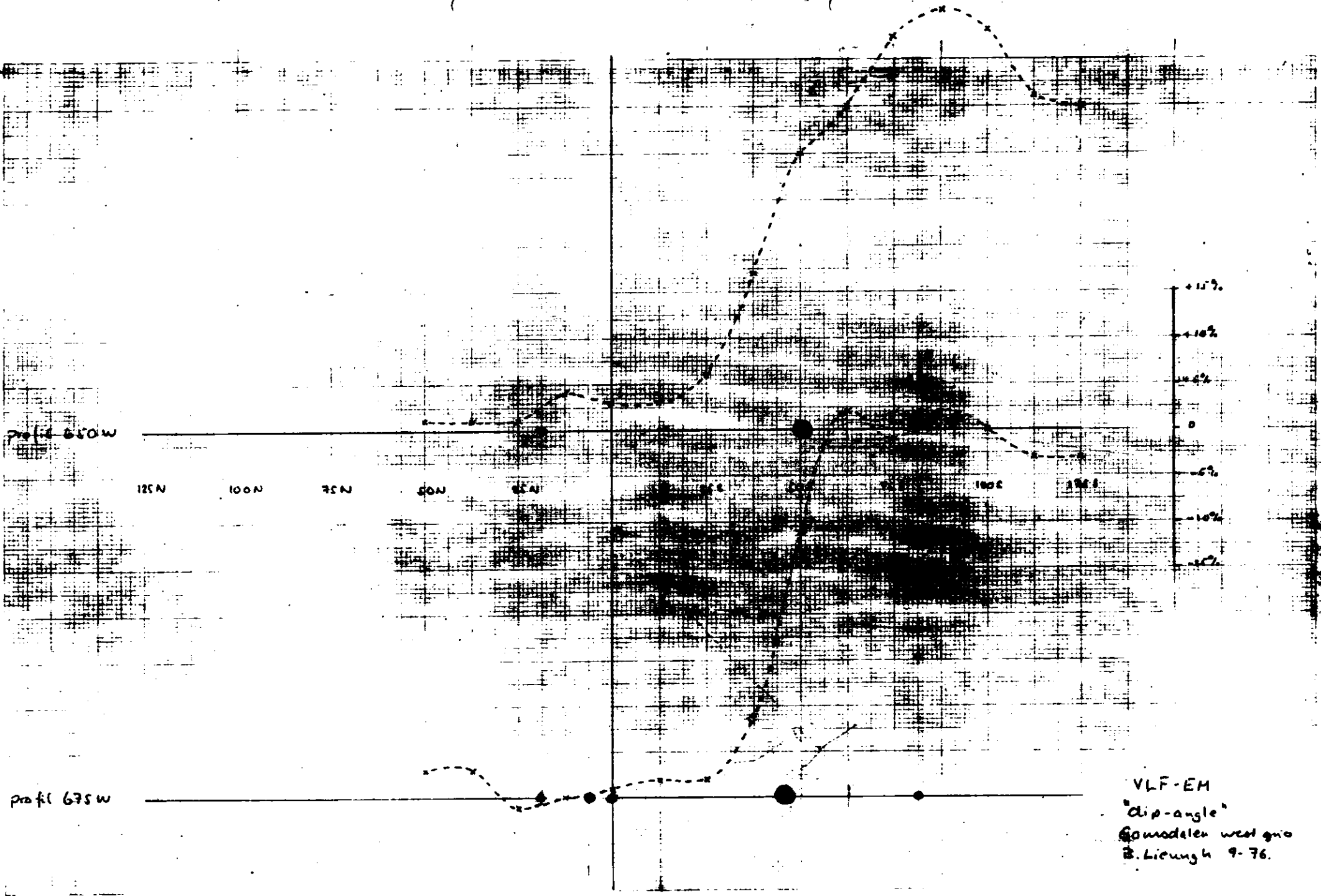
-10%

profil 725W

VLF-EM
"dip-angle"

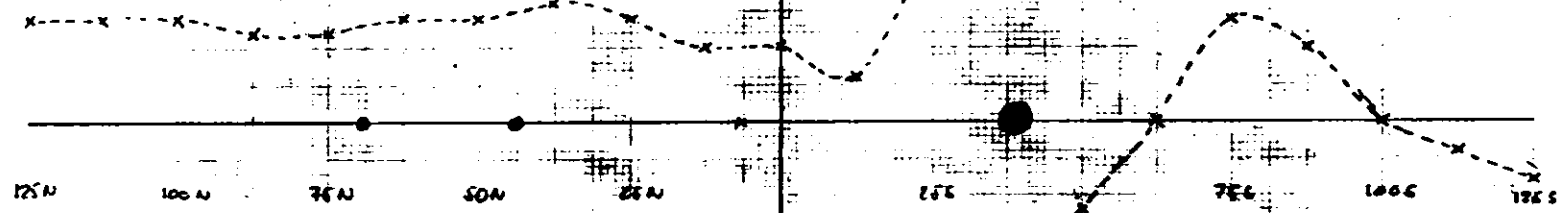
Consdalen west side
B. Lieung 9-76

R. A. N. PAP - A. 1

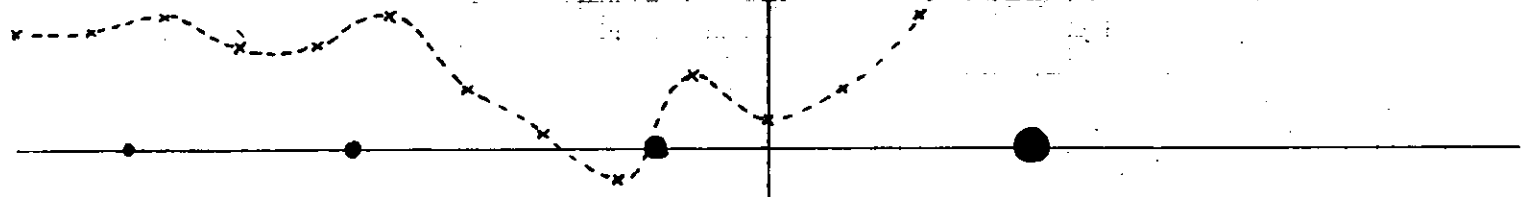


VLF-EM
"dip-angle"
Gomodelen west grio
B. Lieung 9-76.

Profil 600w

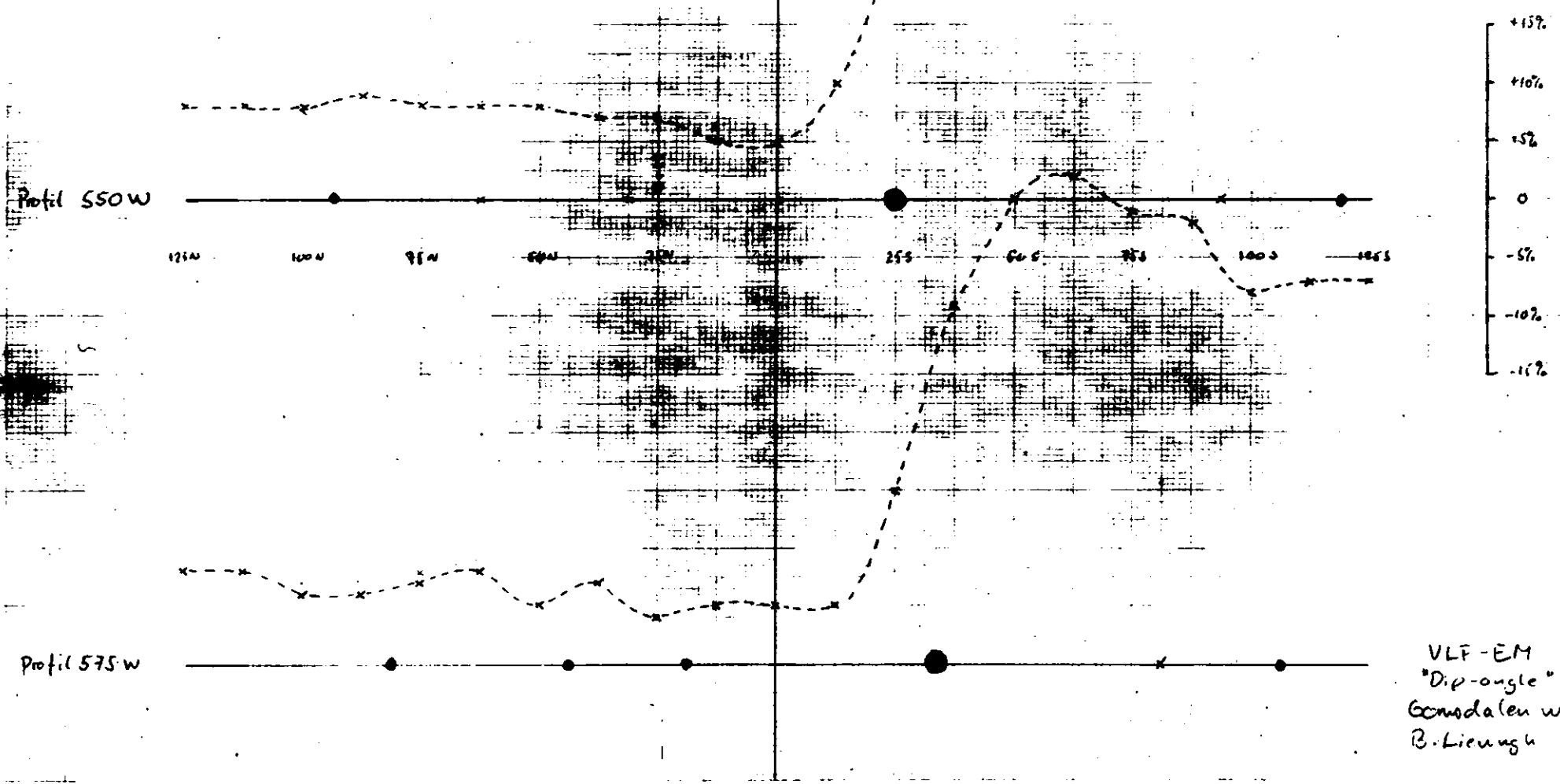


Profil 625w



VLF-EM
 "Dip-angle"
 60msdalen west
 B Lieung 9-76

R. A. M. M. T. 1976



VLF-EM
"Dip-angle"
Gondalen west
B. Lieningh 9.76

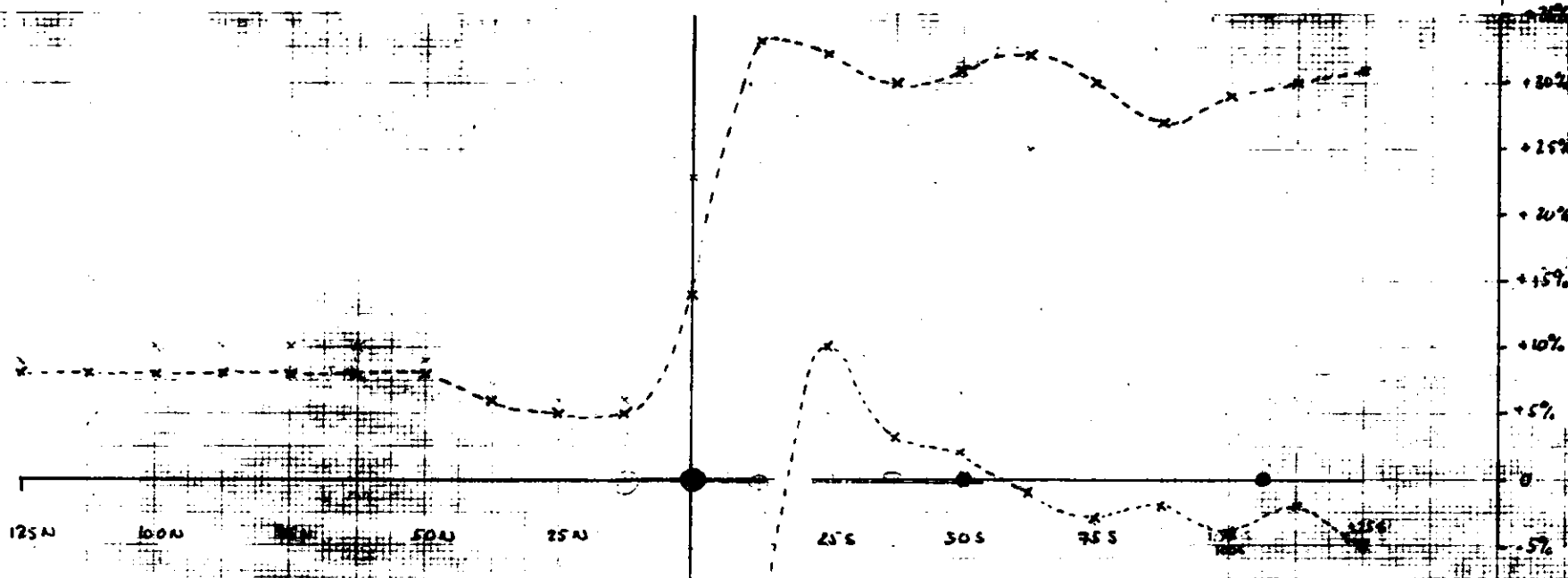
R A MANTPATIR A

525W

125 N 100 N 75 N 50 N 25 N 0 25 S 50 S 75 S 100 S 125 S

Gomsdalen west gnd
VLF-EM
dip-angle
B. Licungh 9-76

475 W



500 W

"Dip-angle"
 VLF-EM station BOF
 Gonsdale west grid
 B. Kierulff 9-76

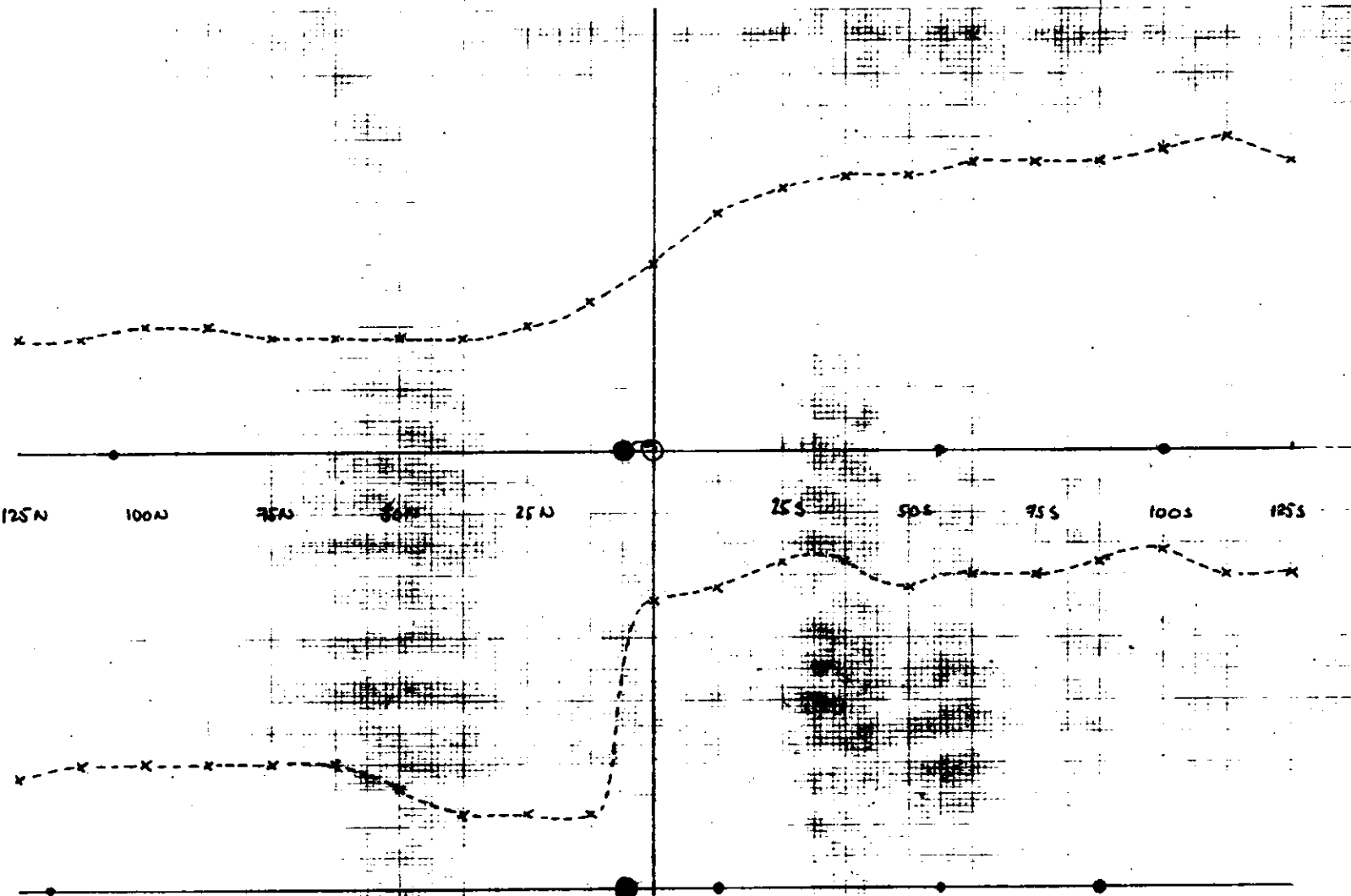
425 W

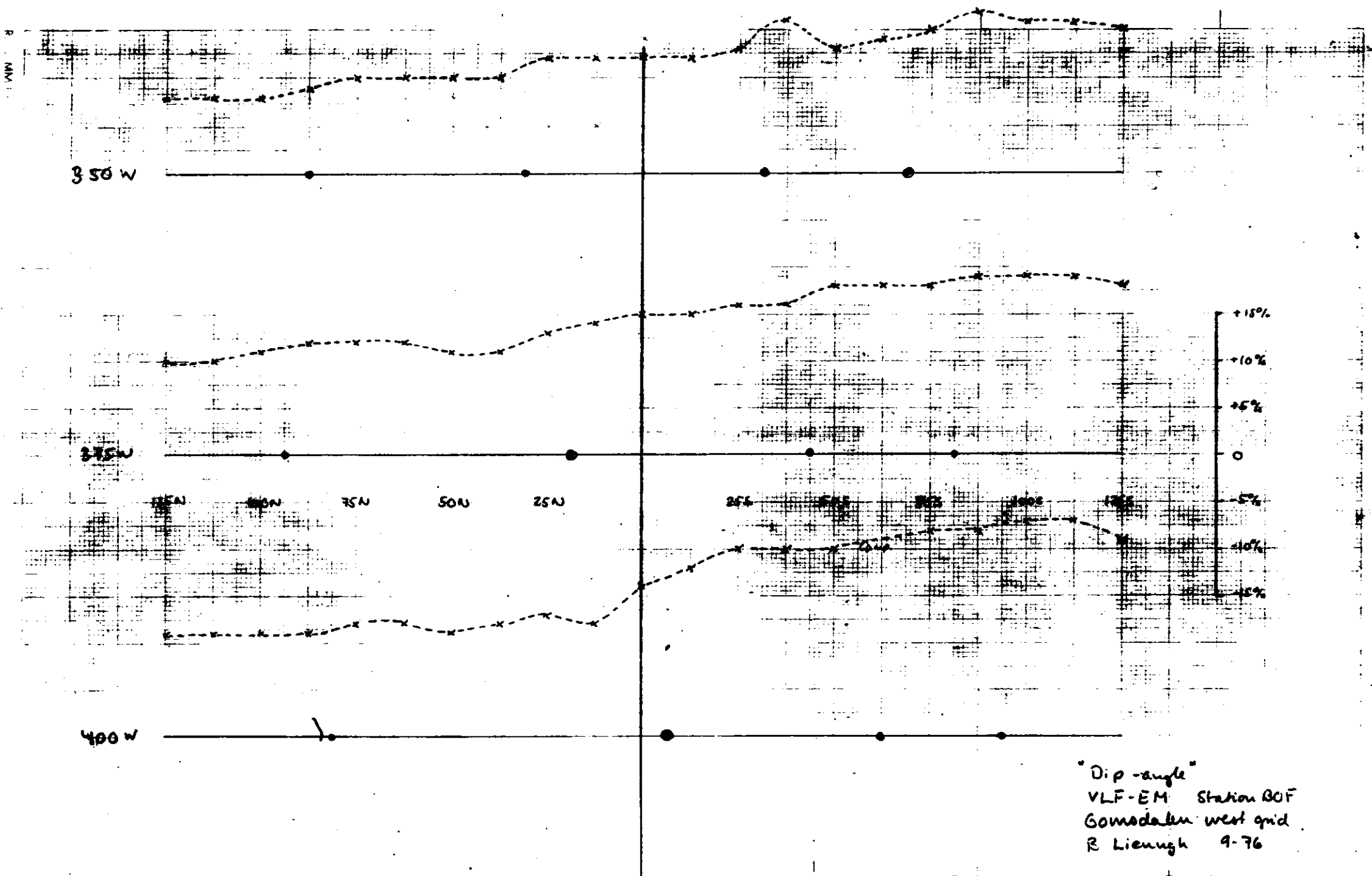
125 N 100 N 75 N 50 N 25 N 25 S 50 S 75 S 100 S 125 S

450 W

30%
25%
20%
15%
10%
5%
0
-5%

"Dip-angle"
VLF-EM station 80F
Gonsdalen west grid
B. Lieung 9-76





275W

300W

325W

125N

100N

75N

50N

25N

0N

25S

50S

75S

100S

125S

"Dip-angle"
VLF-EM Station B01
Gomdalen west grid
B. Liewing 9-76

profil 200w

Fraser values p-225w

6 6 1 -1 0 0 6 11 2 -3 2 2 1 -1 -4 -4

profil 225w

185 N

225 N

250

500

25 N

0

25 S

50 S

75 S

100 S

125 S

profil 250w

"Dip-angle"
VLF-EM station BOF
Gomsdalen west grid
B. Lieungh 8-76

profil 125W

profil 150W

profil 175W

125N

100N

75N

50N

25N

25S

25S

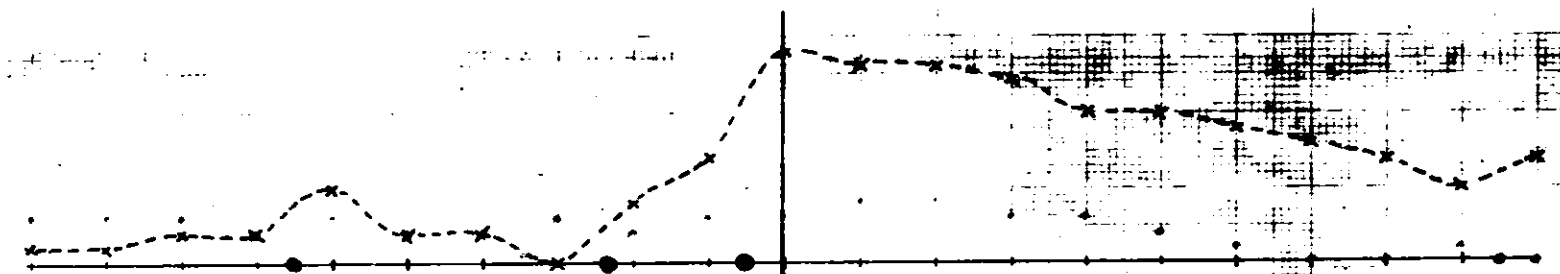
25S

25S

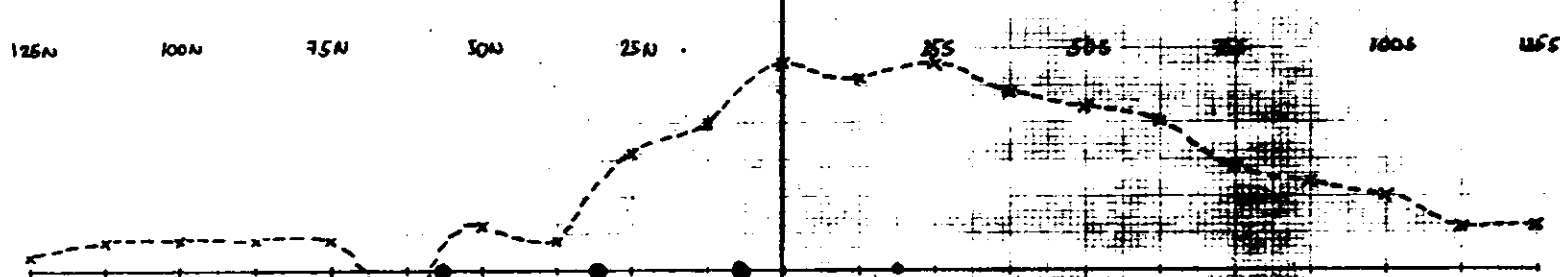
+ 15%
10%
5%
0
-5%
-10%
-15%

"Dip-angle"
VLF-EM. station 30F
Gomochalen west grid
B. Lieung h. 8-76

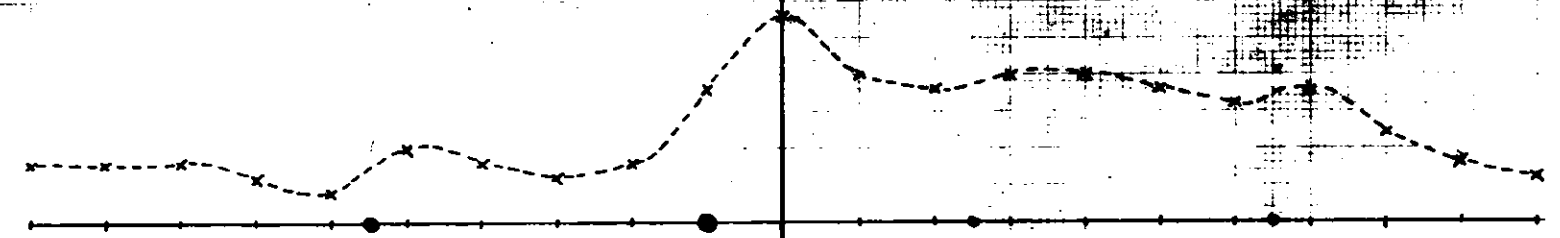
Profil 50W



Profil 75W



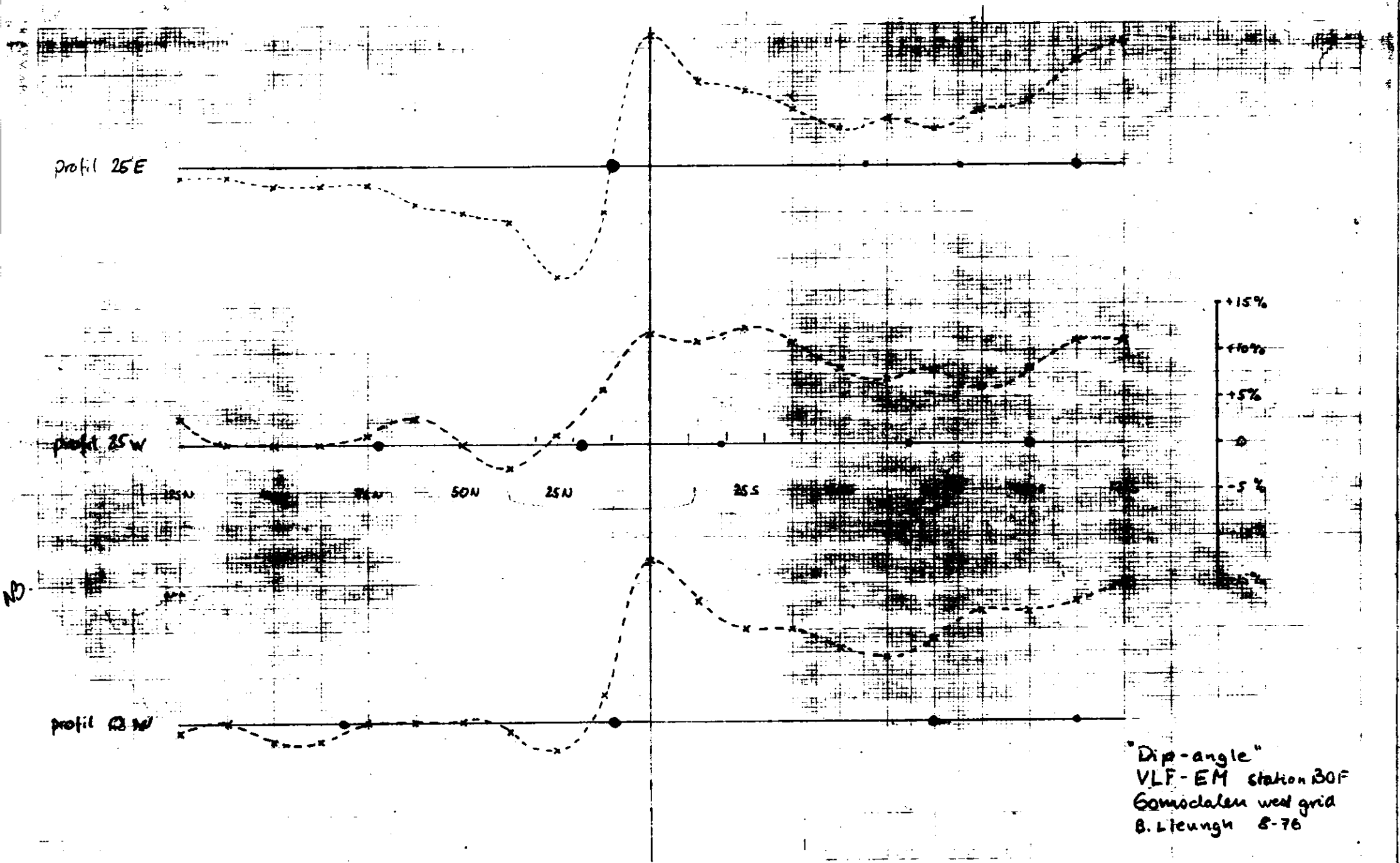
Profil 100W



+ 15%
10%
5%
0
-5%
-10%
-15%

→ BOF

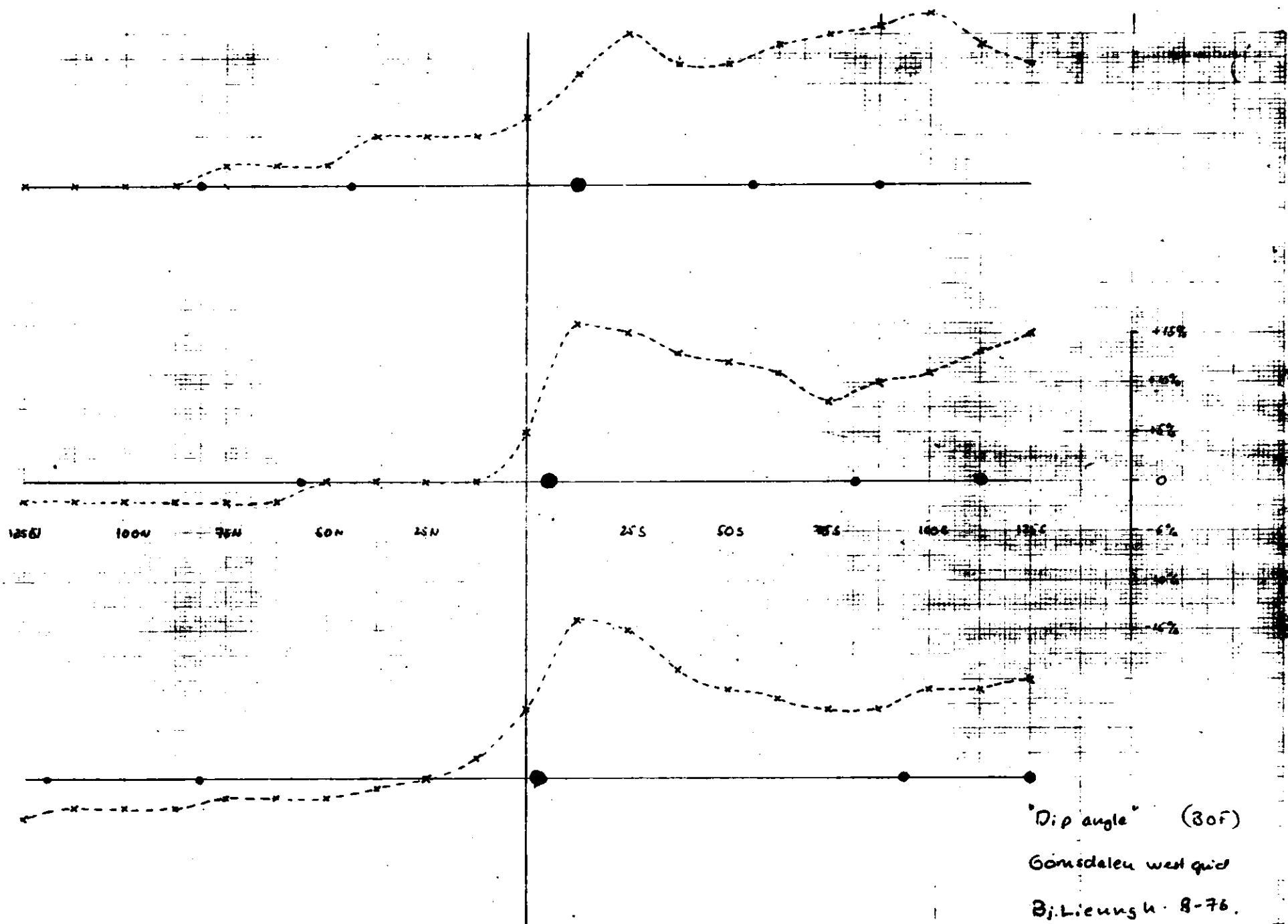
"Dip-angle"
VLF-EM station 30F
Gomsdalen west grid
B. Liengh. 8-76



Profil 100E

profil 75E

Profil 50E



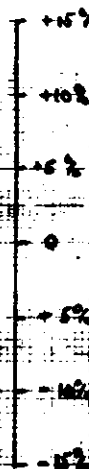
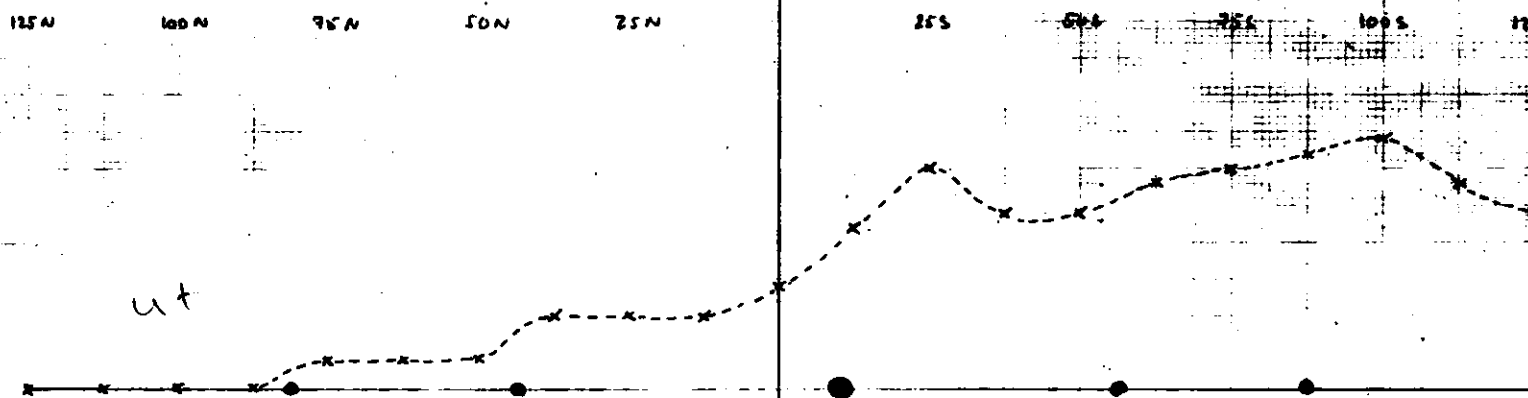
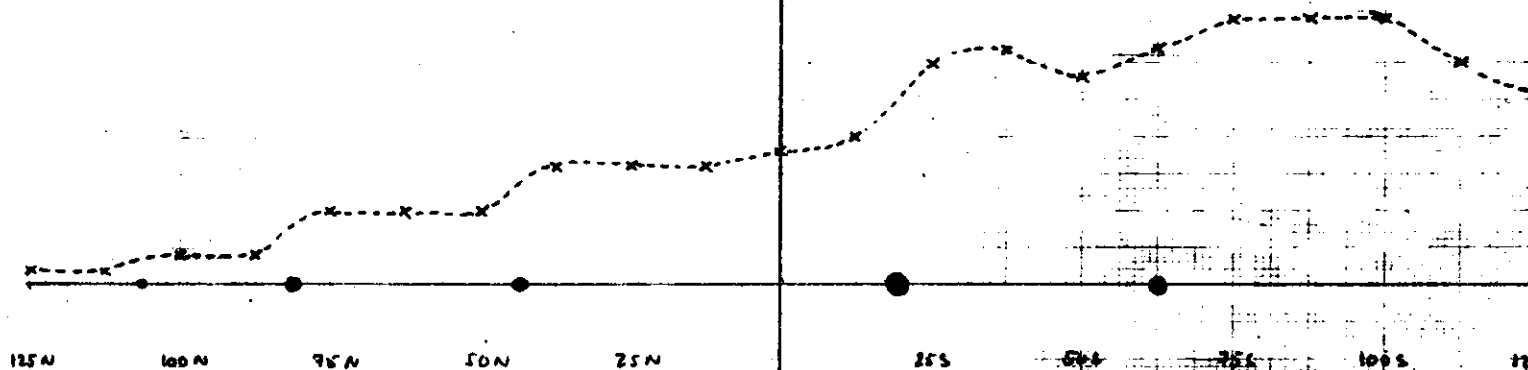
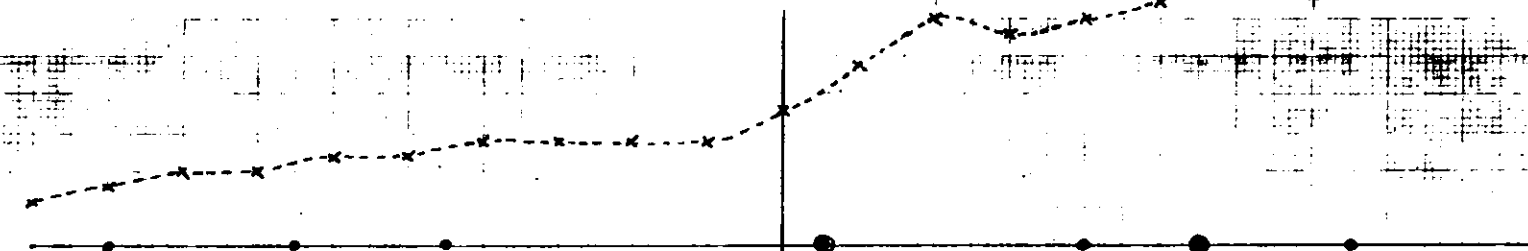
'Dip angle' (30r)

Görsdalen west side

Bj. Liungu 8-76.

150E

125E



ut

100E

Gomadalen west grid

VLF-EM
dip-angle

B. Lienh 9-76

200-E

185N

190N

195N

200N

205N

210N

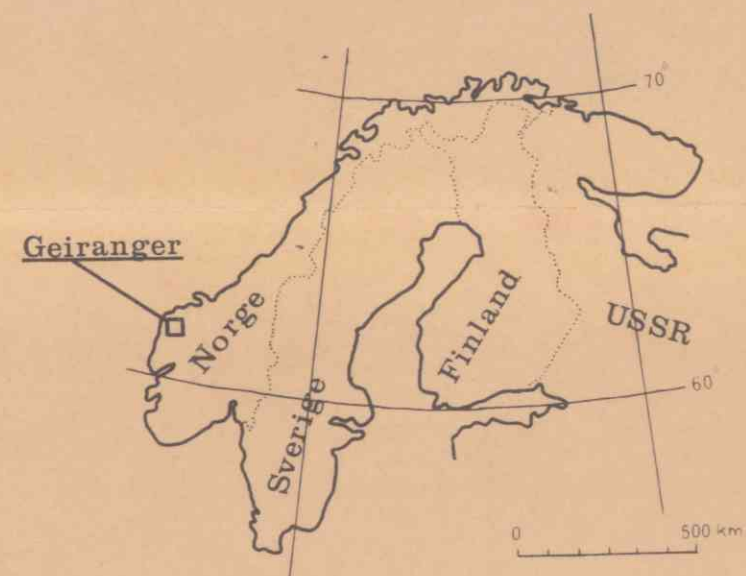
215N

175-E

Gomodelen west gnd

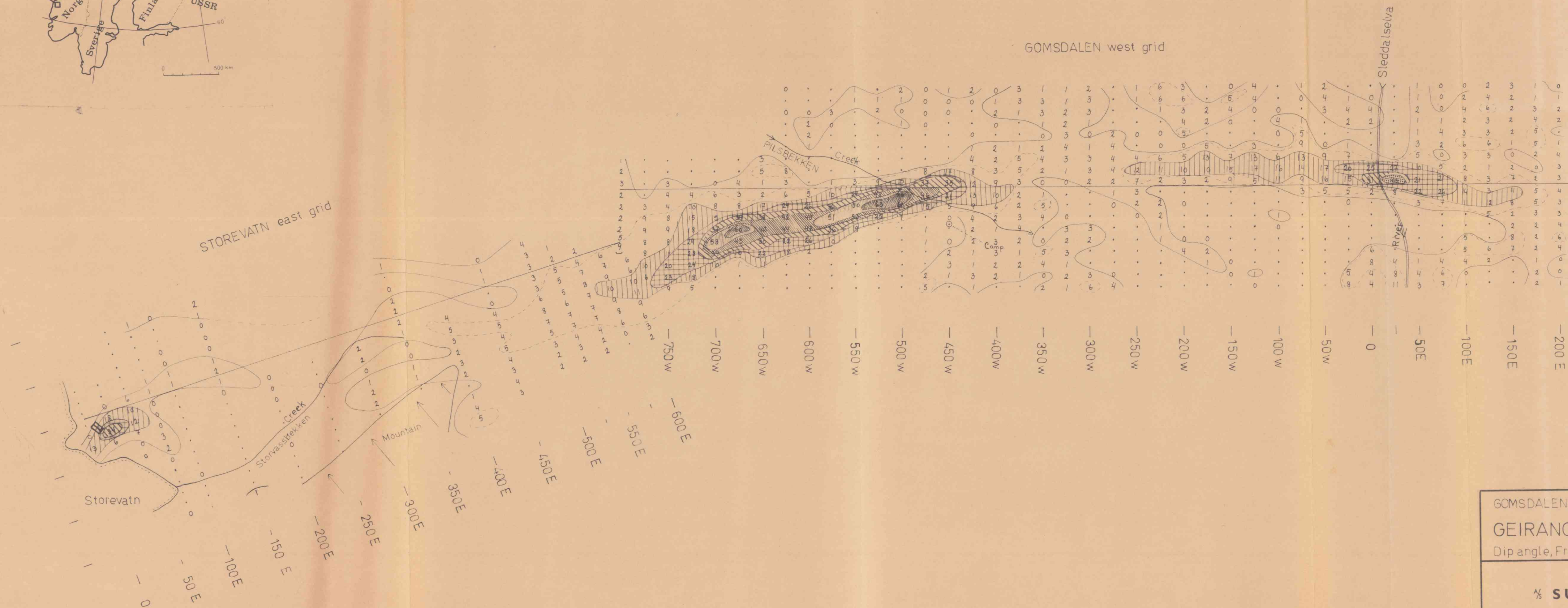
VLF-EM
dip-angle

Bj Licungh 9-76



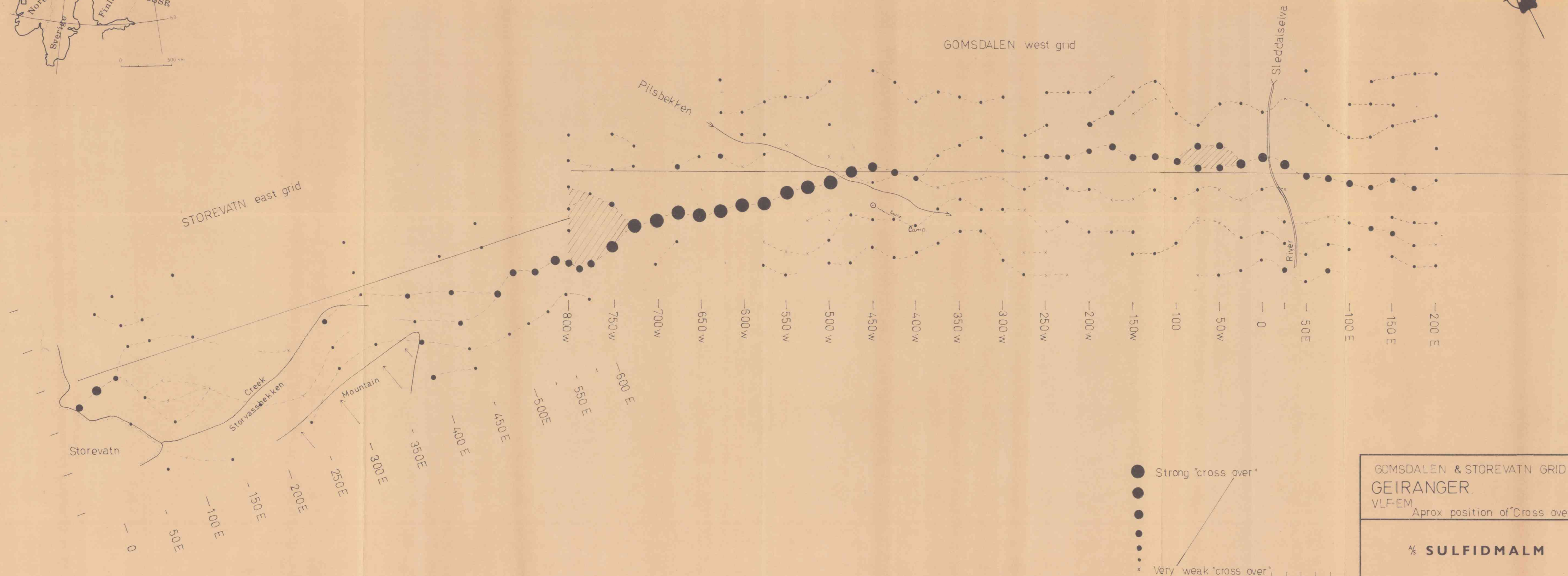
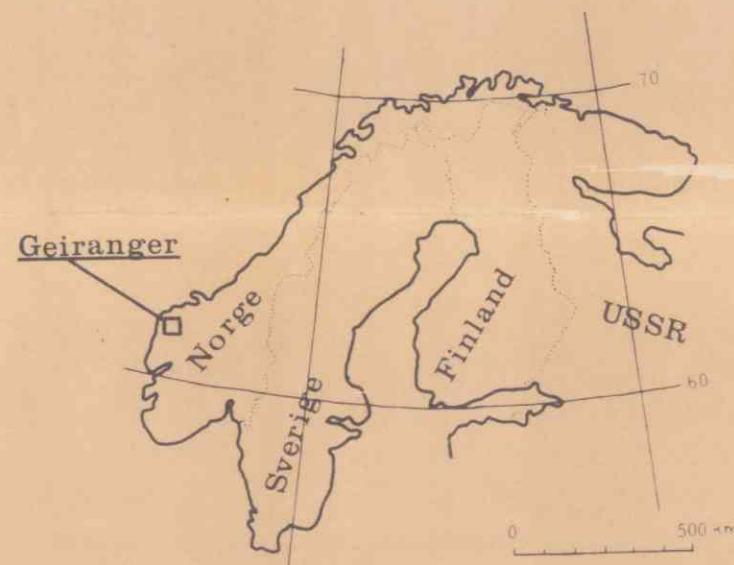
GOMSDALEN west grid

STOREVATN east grid



125 N
100 N
75 N
50 N
25 N
0
25 S
50 S
75 S
100 S
125 S

GOMSDALEN & STOREVATN GRID GEIRANGER Dip angle, Fraser values.	SCALE	OBS. BjL	976
	1:2500	DRAW. BjL	---
		TRAC. BB	---
		CHK.	---
$\frac{1}{2}$ SULFIDMALM	MAP NO.		
	MAP SHEET		



125 N
100 N
75 N
50 N
25 N
0
25 S
50 S
75 S
100 S
125 S

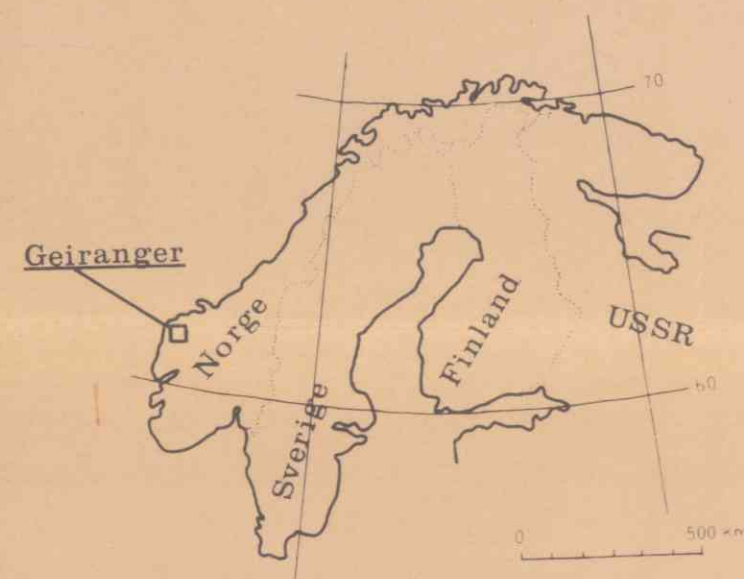
GOMSDALEN & STOREVATN GRID
GEIRANGER.
VLF-EM
Aprox position of "Cross overs"

$\frac{1}{2}$ SULFIDMALM

SCALE	OBS. BIL	9-76
1:2500	DRAW. BIL	---
	TRAC. BB	---
	CHK.	

MAP NO.

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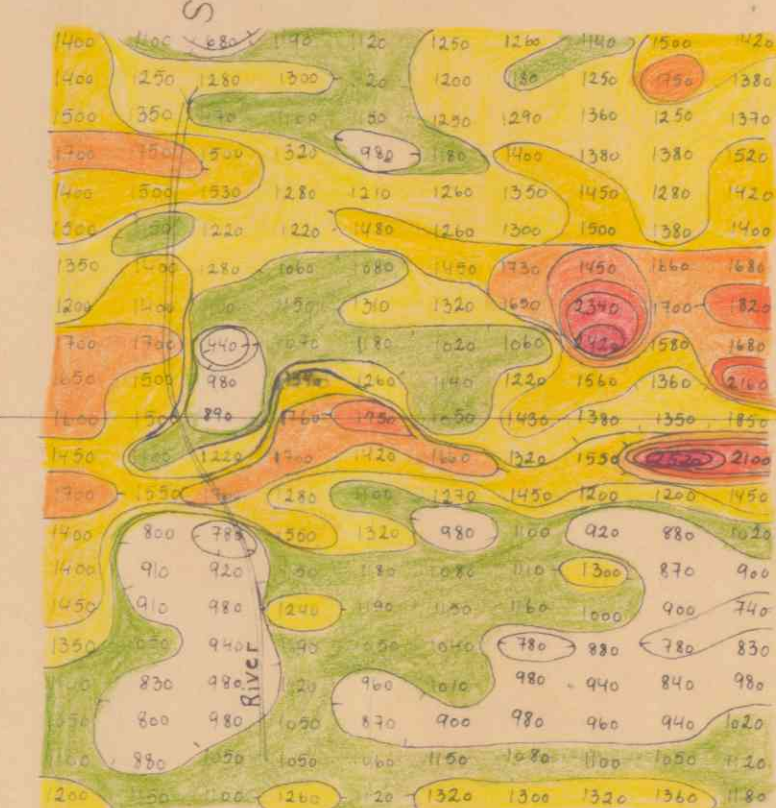
GOMSDALEN west grid

Sleddalselva

STOREVATN east grid

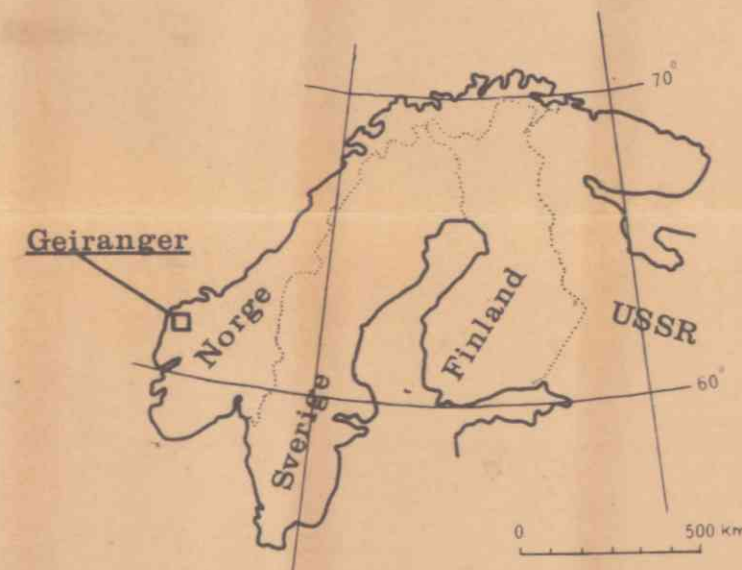


Mag. values



125 N
100 N
75 N
50 N
25 N
0
25 S
50 S
75 S
100 S
125 S

GOMSDALEN & STOREVATN GRID GEIRANGER. Magnetic vertical field	SCALE		OBS. BjL	9-76
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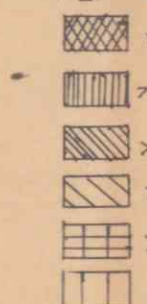


GOMSDALEN west grid

STOREVATN east grid

125 N
100 N
75 N
50 N
25 N
0
25 S
50 S
75 S
100 S
125 S

VLF-EM Fraser values



Mag γ

> 2000 γ

> 1600 γ

GOMSDALEN & STOREVATN GRID

GEIRANGER

Mag/VLF-EM Compilation map

1/2 Sulfidmalm

SCALE	OBS.	BjL	976
1:2500	DRAW.	BjL	---
	TRAC.	BB	---
	CHK.		

MAP NO.

MAP SHEET