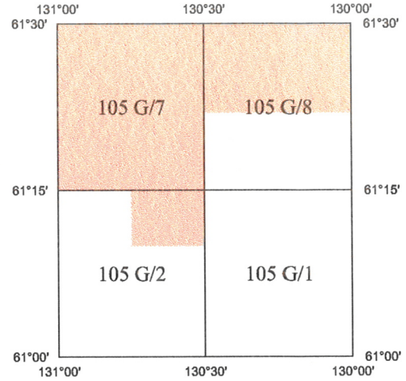
GEOLOGICAL SURVEY OF CANADA

COMMISSION GÉOLOGIQUE DU CANADA

LOCATION MAP - CARTE DE LOCALISATION



INDEX MAP - CARTE INDEXE

Airborne Geophysical Survey
Levé géophysique aéroporté

Grass Lakes Area

Yukon Territory / Territoire du Yukon

NTS / SNRC 105 G/2, 7, 8

Contents include: gamma ray spectrometric, magnetic and VLF colour maps; base map, flight path map, VLF profile maps and accompanying stacked profiles.

Contient des cartes en couleur spectrométriques (rayons gamma), magnétiques et TBF; une carte de base, une carte des lignes de vol et des cartes TBF sous forme de profils ainsi que des profils multi-paramétriques.

Scale 1: 150 000 Échelle

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GEOLOGICAL SURVEY OF CANADA
COMMISSION GÉOLOGIQUE DU CANADA
OTTAWA

1998

AIRBORNE GEOPHYSICAL SURVEY

In 1997, a multi-parameter airborne geophysical survey of the Grass Lakes area, Yukon Territory, was flown by Sander Geophysics Limited (SGL) for the Geological Survey of Canada. The purpose of the survey was to obtain quantitative gamma-ray spectrometric, VLF-EM and aeromagnetic data. The survey was flown from August 26th to August 31st using an Aérospatiale AS350D AStar helicopter. Funding for this survey was provided under the Yukon Geology Program, a cost-shared agreement between the Department of Indian and Northern Development and the Yukon Territorial Government.

Gamma-ray Spectrometric Data

The airborne gamma-ray measurements were made with an Exploranium GR820 gamma-ray spectrometer using ten 102 x 102 x 406 mm NaI(Tl) crystals. The main detector array consisted of eight crystals (total volume 33.8 litres). Two crystals, shielded by the main array, were used to detect variations in background radiation. The system constantly monitored the natural potassium peak for each crystal, and using a Gaussian least squares algorithm, adjusted the gain for each crystal.

Potassium is measured directly from the 1460 keV gamma-ray photons emitted by ^{40}K, whereas uranium and thorium are measured indirectly from gamma-ray photons emitted by daughter products (^{214}Bi for uranium and ^{208}Tl for thorium). Although these daughters are far down their respective decay chains, they are assumed to be in equilibrium with their parents; thus gamma-ray spectrometric measurements of uranium and thorium are referred to as equivalent uranium and equivalent thorium, i.e. eU and eTh. The energy windows used to measure potassium, uranium and thorium are:

Potassium (^{40}K)	1360 - 1560 keV
Uranium (^{214}Bi)	1660 - 1860 keV
Thorium (^{208}Tl)	2410 - 2810 keV

Gamma-ray spectra were recorded at one second intervals at a mean terrain clearance of 120 m and an air speed of 120 km/h. During processing, the spectra were energy calibrated, and counts were accumulated into the windows described above. The window counts were corrected for dead time, and for background activity from cosmic radiation, the radioactivity of the aircraft and atmospheric radon decay products. The window data were then corrected for spectral scattering in the ground, air and detectors. Corrections for deviations of altitude from the planned terrain clearance and for variation of temperature and pressure were made prior to conversion to ground concentrations of potassium, uranium and thorium, using factors determined from flights over a calibration range near Ottawa.

Potassium	59.6 cps/%
Uranium	7.8 cps/ppm
Thorium	4.3 cps/ppm

Corrected data were interpolated to yield 100 m grids using a minimum curvature gridding technique. The results of an airborne gamma-ray spectrometer survey represent the average surface concentrations which are influenced by varying amounts of outcrop, overburden, vegetation cover, soil moisture and surface water. As a result the measured concentrations are usually lower than the actual bedrock concentration.

The exposure rate in microRoentgens per hour was computed from the measured ground concentration of potassium, uranium and thorium. To compare this exposure rate with older total count maps contoured in Ur (units of radioelement concentration) the conversion factor is 1 μR/h = 1.67 Ur.

VLF Data

VLF total field and quadrature components for two stations were recorded using a Hertz Totem 2A system. The line station was tuned to station NAA at Cutler, ME which transmits at a frequency of 24.0 kHz. The ortho station was tuned to station NLK at Seattle, WA which transmits at a frequency of 24.8 kHz.

Magnetic Data

The AStar helicopter was equipped with a Geometrics G-822A cesium vapour magnetic sensor in a bird towed 30 metres below the aircraft, connected to a Sander phase lock loop magnetometer system installed in a microcomputer. The system recorded half second readings with a noise level of less than 0.05 nT. Diurnal variations were recorded using SGL's ground station magnetometer.

After editing the survey data, low pass filtered diurnal readings were subtracted from each unfiltered aeromagnetic reading. The International Geomagnetic Reference Field was calculated and removed using the date and altitude of each data point. The intersections of traverse and control lines were determined and the differences in the magnetic values were computer analyzed and manually verified to obtain the levelled network. The corrected magnetic data was interpolated to a 100 m grid using a minimum curvature algorithm. Vertical gradient was calculated from the total magnetic intensity grid using a FFT based frequency domain filtering algorithm.

Positional Data

The survey lines were planned and flown using SGL's GPSNAV microcomputer-based GPS navigation system. GPS ground station data were combined with airborne GPS data to produce differentially corrected positional data with an accuracy of 2 to 5 m.

Data Presentation

Colour levels and contours were calculated for each grid and combined with map surround information to create a Postscript plot file, which was plotted using an HP DesignJet 2000CP colour plotter. Flight path maps and stacked profile plots were also produced using the same plotter.

LEVÉ GÉOPHYSIQUE AÉROPORTÉ

En 1997, la société Sander Geophysics Limited (SGL) a réalisé un levé géophysique aéroporté multi-paramétrique pour le compte de la commission géologique du Canada dans la région de Grass Lakes, Territoire du Yukon. Le but du levé était d'obtenir des données spectrométriques gamma, TBF-EM et aéromagnétiques quantitatives. Le levé a été effectué du 26 août au 31 août avec un hélicoptère de type Aérospatiale AS350D AStar. Les fonds pour ce levé proviennent du programme Yukon Geology, une entente à coûts partagés entre le ministère des affaires indiennes et du nord canadien et le gouvernement du Territoire du Yukon.

Données spectrométriques gamma
Les mesures spectrométriques gamma aériennes ont été effectuées avec un système de commande Exploranium GR820 et un spectromètre à huit détecteurs de 102 x 102 x 406 mm (33,8 litres) NaI(T1) orientés vers le bas et deux détecteurs orienté vers le haut. Ce système surveille constamment le pic naturel du potassium pour chaque détecteur à commande par cristal, et au moyen d'un algorithme gaussien à moindre carré, ajuste individuellement le gain de chaque cristal.

On mesure directement le potassium à partir des photons gamma de 1460 keV émis par le ^{40}K, tandis que l'on mesure l'uranium et le thorium indirectement à partir des photons gamma émis par les produits de filiation (^{214}Bi pour l'uranium et ^{208}Tl pour le thorium). Puisque ces produits de filiation sont situés loin en aval dans leurs chaînes de désintégration respectives et peuvent ne pas être en équilibre avec leurs parents, les mesures spectrométriques gamma de l'uranium et du thorium sont désignées du nom d'uranium équivalent et de thorium équivalent, à savoir eU et eTh. Les fenêtres d'énergie employées pour mesurer le potassium, l'uranium et le thorium sont:

Potassium (^{40}K)	1360 - 1560 keV
Uranium (^{214}Bi)	1660 - 1860 keV
Thorium (^{208}Tl)	2410 - 2810 keV

On a enregistré les spectres gamma à des intervalles d'une seconde, à une hauteur moyenne de 120 m au-dessus du sol et à une vitesse de vol de 120 km/h. Pendant le traitement des données, on a étalonné en fonction de valeurs d'énergie les spectres, et l'on a accumulé les comptes dans les fenêtres décrites plus haut. On a corrigé ces comptes en fonction des périodes de conversion, et de l'activité de fond résultant du rayonnement cosmique, de la radioactivité de l'hélicoptère et des produits de désintégration du radon atmosphérique. On a ensuite corrigé les données de la fenêtre en fonction de la diffusion spectrale dans le sol, dans l'atmosphère et dans les détecteurs. On a effectué des corrections tenant compte des écarts, d'altitudes par rapport à la hauteur prévue du terrain, de la température et de la pression, avant de procéder à la conversion des valeurs obtenues en concentrations du potassium de l'uranium et du thorium dans le sol, au moyen de facteurs déterminés durant des vols effectués au-dessus d'un intervalle d'étalonnage à proximité d'Ottawa.

Potassium	59,6 cps/%
Uranium	7,8 cps/ppm
Thorium	4,3 cps/ppm

On a interpolé les données corrigé pour obtenir des grilles de 100 m par une technique de courbure minimum. Les résultats d'un levé spectrométrique gamma aéroporté représentent les concentrations moyennes de surface, qui sont influencées par les diverses quantité d'affleurements, de mort-terrain, de couverture végétale, d'humidité du sol et d'eau de surface. De ce fait, les concentrations mesurées sont habituellement plus faibles que les concentrations réelles dans le sousbassement rocheux.

On a calculé le taux d'exposition en microRoentgens par heure à partir des concentrations de potassium, d'uranium et de thorium mesurées dans le sol. Pour comparer ce taux d'exposition à des cartes plus anciennes d'isogrammes d'Ur (unité de concentration du radioélément), le facteur de conversion est 1 µR/h = 1,67 Ur.

Données TBF
Les composantes TBF du champ total et de quadrature de deux stations ont été enregistrées au moyen d'un système Herz Totem 2A. La station de ligne a été sytonisée à la station NAA de Cutler (ME), qui émet des signeaux de fréquence 24,0 kHz. La station ortho a été syntonisée à la station NLK de Seattle (WA), qui émet des signeaux de fréquence 24,8 kHz.

Données magnétiques
On a équipé l'hélicoptère Astar d'un capteur magnétique Geometrics G-822A à vapeurs de césium placé dans un oiseau remorqué à 30 mètres sous l'appareil et relié à un système de magnétomètre Sander avec boucle à verrouillage de phase, installé dans un microordinateur. Ce système de magnétomètre nous donne des lectures toutes les demi-secondes, avec un niveau de bruit inférieur à 0,05 nT.

Après avoir édité les données du levé, on a soustrait de chaque lecture aéromagnétique la valeur diurne enregistrée à la station terrestre de SGL. On a filtré les valeurs diurnes pour éliminer le bruit de haute fréquence. On n'a appliqué aucun filtrage aux données aéroportées. On a calculé le réseau international géomagnétique de référence et on l'a enlevé en utilisant la date et l'altitude de chaque point-image. On a déterminéles intersections des lignes de cheminement et des lignes de canevas et analysé par ordinateur les différences des valeurs magnétique, puis on les a manuellement vérifiées pour obtenir le réseau nivelé. On a interpolé les données magnétiques corrigées en les reportant sur une grille (100 m) d'intensité magnétique totale en employant un algorithme à filtrage FFT (par tranformé de fourrier rapide) de l'espace de fréquence.

Données de position
On a planifié les lignes de levé et on les a survolées en employant le système de navigation GPSNAV avec positionnement par satellite (GPS) du SGL, qui est commandé par microordinateur. On a combiné les données GPS acquises par la station terrestre avec celles acquises par le système aéroporté, pour produire des positions corrigées en mode différentiel avec une précision de 2 à 5 m.

Présentation des données
On a calculé les séparations de couleur et les courbes de niveau pour chaque grille, et on les a combinées à l'information périférique des cartes, afin de créer un fichier des tracés,que l'on a représenté au moyen d'un traceur couleurs HP DesignJet 2000CP. On a créé les cartes des trajets de vol et les diagrammes de profils séquentiels en employant le même traceur.

131°00'W 400000 130°45'W 410000 130°30'W 430000 130°15'W 440000 130°00'W

61°30'N

6810000

61°20'N

6800000

6790000

61°10'N

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Base Map
Carte de base

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Grass Lakes

Yukon Territory / Territoire du Yukon

NTS / SNRC 105 G/2, 7, 8

Scale 1 : 150 000 Échelle

km 3 0 6 12 km

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Flight Lines
Lignes de Vol

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6810000

61°20'N

6800000

6790000

61°10'N

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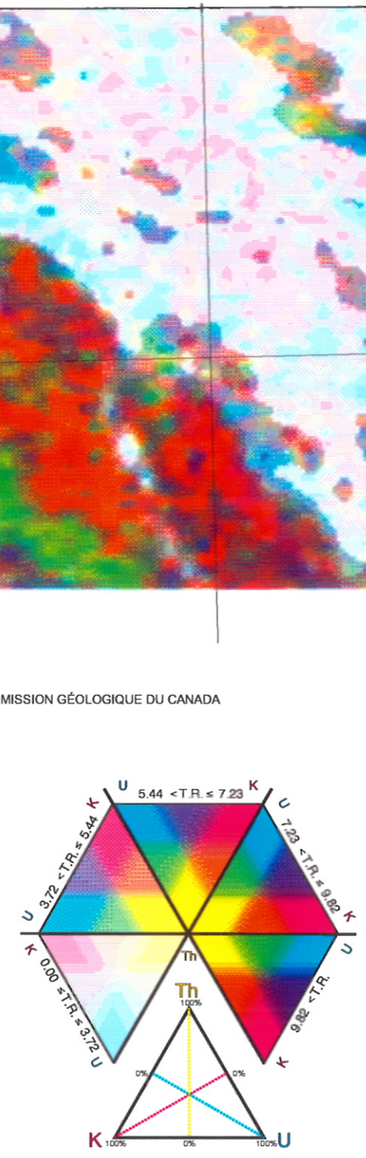
Ternary Radioelement Map
Carte Ternaire des Radioéléments



Relative Concentrations

Total Radioactivity(T.R.) = K(%) + eU(ppm) + eTh/4(ppm)

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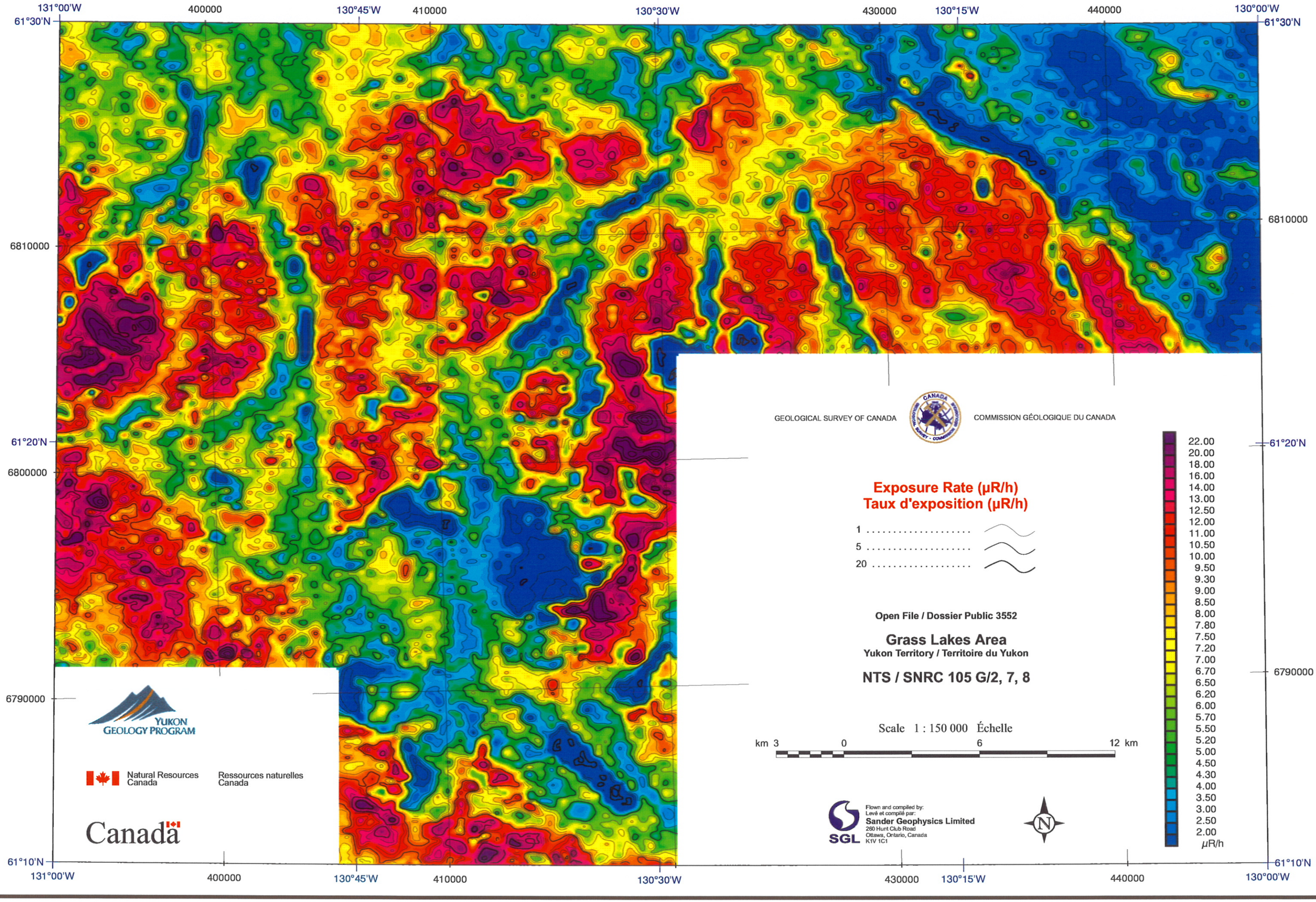
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400000
130°45'W
410000
130°30'W
430000
130°15'W
440000
130°00'W
61°30'N
6810000
61°20'N
6800000
6790000
61°10'N
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Exposure Rate (µR/h)
Taux d'exposition (µR/h)
1
5
20
22.00
20.00
18.00
16.00
14.00
13.00
12.50
12.00
11.00
10.50
10.00
9.50
9.30
9.00
8.50
8.00
7.80
7.50
7.20
7.00
6.70
6.50
6.20
6.00
5.70
5.50
5.20
5.00
4.50
4.30
4.00
3.50
3.00
2.50
2.00
µR/h
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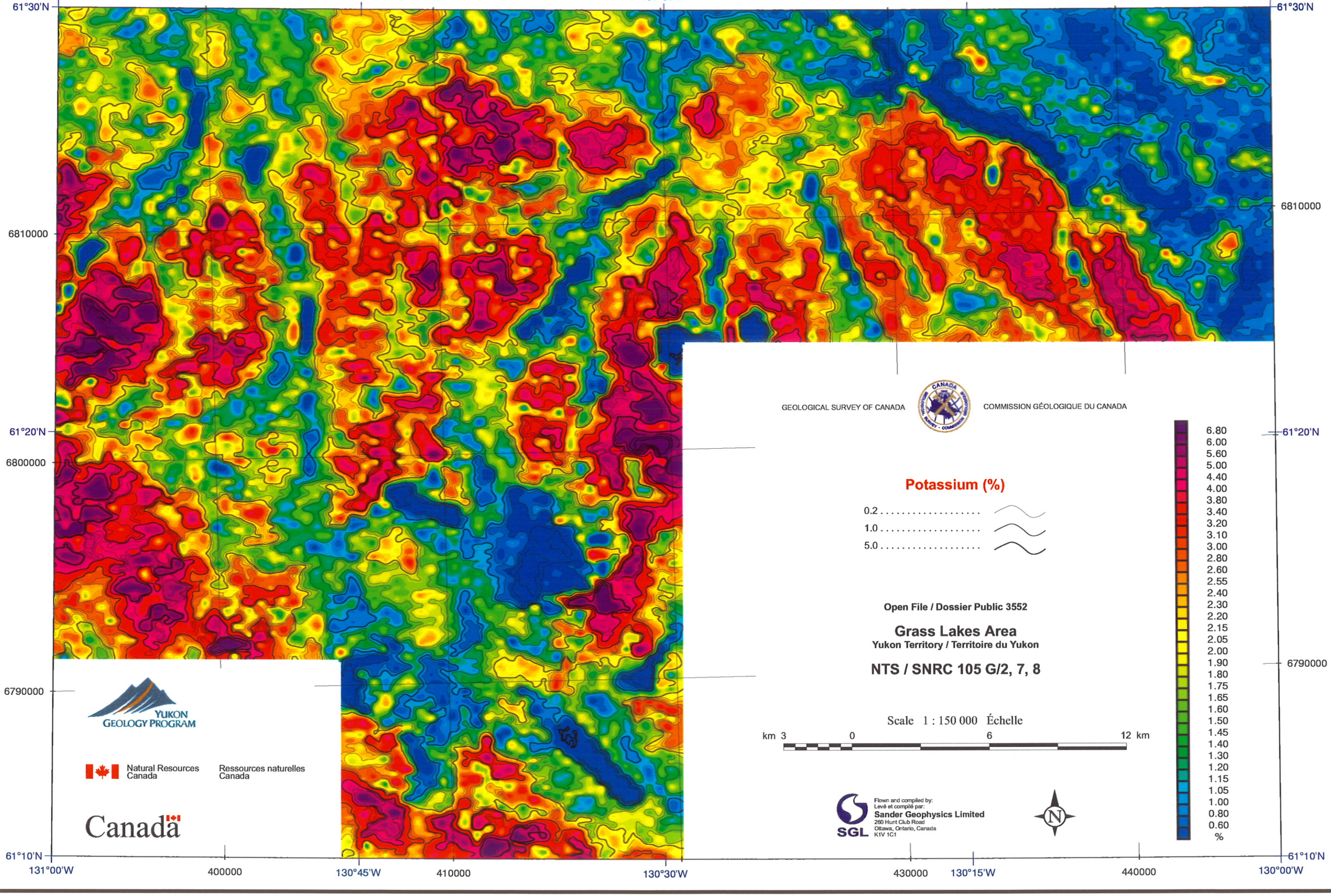

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Potassium (%)

0.2 .....

1.0 .....

5.0 .....

6.80
6.00
5.60
5.00
4.40
4.00
3.80
3.40
3.20
3.10
3.00
2.80
2.60
2.55
2.40
2.30
2.20
2.15
2.05
2.00
1.90
1.80
1.75
1.65
1.60
1.50
1.45
1.40
1.30
1.20
1.15
1.05
1.00
0.80
0.60
%

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61°30'N

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61°20'N

6800000

6790000

61°10'N

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eUranium (ppm)

0.5 .....

2.0 .....

10.0 .....

ppm
10.00
8.00
7.00
5.00
4.50
4.00
3.50
3.35
3.20
3.00
2.85
2.80
2.60
2.50
2.40
2.35
2.25
2.20
2.10
2.00
1.95
1.90
1.80
1.75
1.70
1.60
1.55
1.50
1.40
1.35
1.25
1.20
1.10
1.00
0.50

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GEOLOGICAL SURVEY OF CANADA

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eThorium (ppm)

1 .....

5 .....

25 .....

25.00
24.00
22.00
20.00
18.00
17.00
16.00
15.00
14.40
14.00
13.00
12.60
12.00
11.60
11.00
10.60
10.00
9.80
9.40
9.00
8.60
8.20
8.00
7.60
7.20
7.00
6.40
6.00
5.80
5.20
5.00
4.20
4.00
3.00
2.00
ppm

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6790000

61°10'N

GEOLOGICAL SURVEY OF CANADA

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eUranium / eThorium

0.02 .....

0.1 .....

0.5 .....

0.800
0.700
0.640
0.520
0.460
0.420
0.380
0.360
0.340
0.330
0.320
0.309
0.300
0.289
0.280
0.270
0.260
0.255
0.250
0.240
0.235
0.230
0.225
0.220
0.213
0.206
0.200
0.195
0.190
0.185
0.180
0.175
0.170
0.160
0.140

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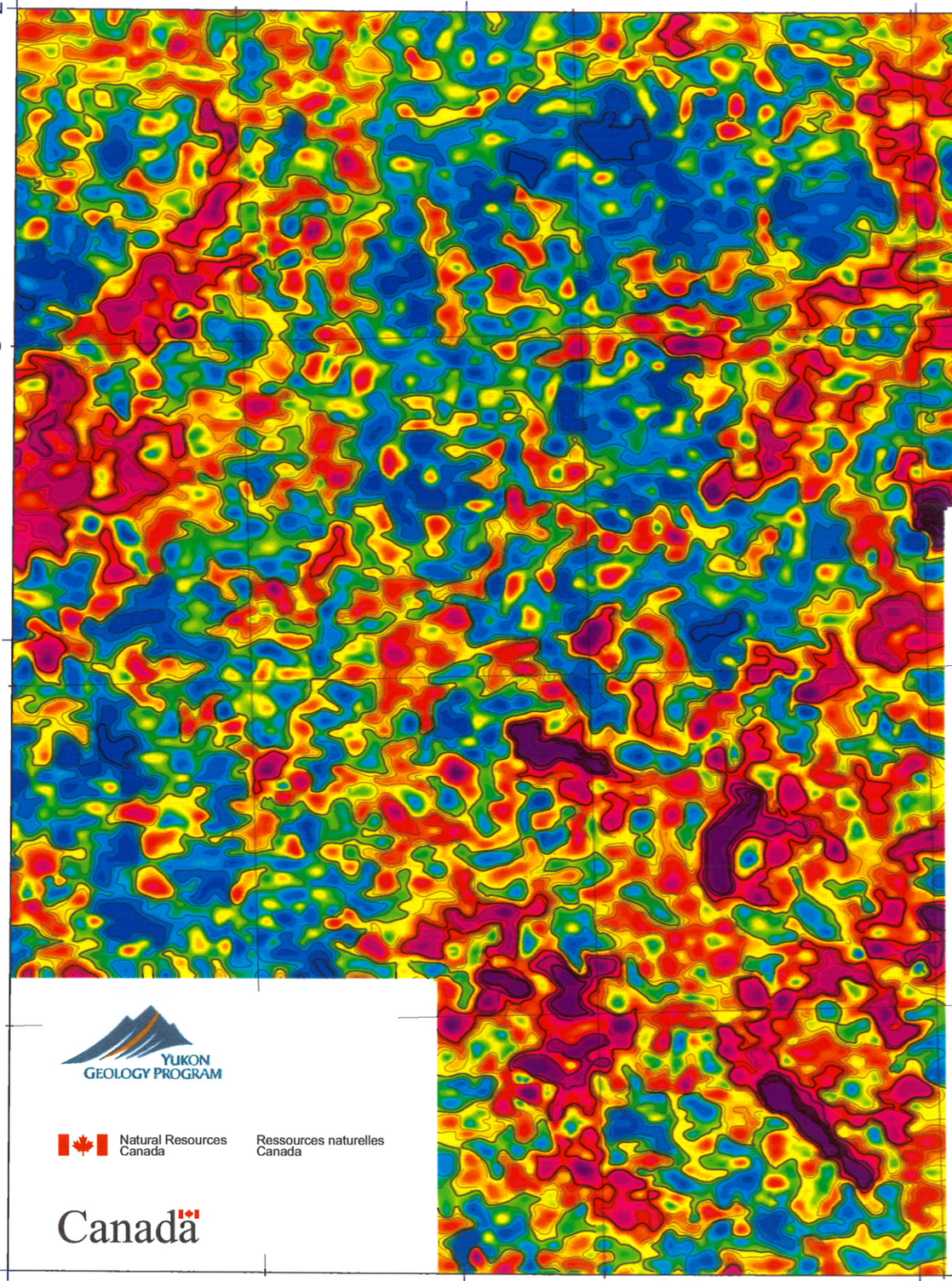

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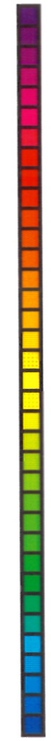
eUranium / Potassium (10^4)

0.1 .....
0.5 .....
2.5 .....



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61°20'N

6800000

6790000

61°10'N

GEOLOGICAL SURVEY OF CANADA

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eThorium / Potassium (10^4)

0.2 .....

1.0 .....

5.0 .....

9.00
8.00
7.40
6.60
6.20
6.00
5.80
5.60
5.50
5.40
5.20
5.10
5.00
4.90
4.80
4.70
4.60
4.55
4.50
4.40
4.30
4.26
4.20
4.10
4.00
3.96
3.90
3.80
3.70
3.60
3.50
3.40
3.30
3.00
2.60

10^4

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km 3 0 6 12 km

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61°30'N — 6810000 — 61°20'N — 6800000 — 6790000 — 61°10'N

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Residual Magnetic Total Field (nT)
Champ Total Magnétique Résiduel (nT)

5 .....
20 .....
100 .....

180
100
40
30
25
20
15
10
5
0
−5
−10
−15
−20
−25
−30
−35
−40
−45
−50
−55
−60
−65
−70
−75
−80
−85
−90
−95
−100
−105
−110
−115
−120
−160
nT

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Grass Lakes Area

Yukon Territory / Territoire du Yukon

NTS / SNRC 105 G/2, 7, 8

Scale 1 : 150 000 Échelle

km 3 0 6 12 km

YUKON GEOLOGY PROGRAM

Natural Resources Canada Ressources naturelles Canada

Canada

Flown and compiled by:
Levé et compilé par:
Sander Geophysics Limited
280 Hunt Club Road
Ottawa, Ontario, Canada
K1V 1C1

SGL

N

131°00'W 400000 130°45'W 410000 130°30'W 430000 130°15'W 440000 130°00'W

61°30'N

6810000

61°20'N

6800000

6790000

61°10'N

GEOLOGICAL SURVEY OF CANADA COMMISSION GÉOLOGIQUE DU CANADA

0.450
0.225
0.150
0.125
0.100
0.080
0.075
0.065
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
−0.005
−0.010
−0.015
−0.020
−0.025
−0.030
−0.035
−0.040
−0.045
−0.050
−0.055
−0.065
−0.075
−0.090
−0.100
−0.125
−0.150
−0.225
−0.400
nT/m

Calculated Magnetic Vertical Gradient (nT/m)
Gradient Vertical Magnétique Calculé (nT/m)

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Grass Lakes Area

Yukon Territory / Territoire du Yukon

NTS / SNRC 105 G/2, 7, 8

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km 3 0 6 12 km

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6810000

61°20'N

6800000

6790000

61°10'N

GEOLOGICAL SURVEY OF CANADA

COMMISSION GÉOLOGIQUE DU CANADA

VLF Total Field - Ortho Station (%)
Champ Total TBF - Station Ortho (%)

2 .....

10 .....

50 .....

VLF Station Information
Information de la station TBF

Seattle, Washington, U.S.A. (NLK)
Frequency/Fréquence: 24.8 kHz
Location/Lieu: 48°12'N, 122°55'W
Bearing to station/Orientation á la station: 158°
Distance to station/Distance á la station: 1550 km

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Grass Lakes Area

Yukon Territory / Territoire du Yukon

NTS / SNRC 105 G/2, 7, 8

Scale 1 : 150 000 Échelle

km 3 0 6 12 km

120.0
115.0
113.0
111.0
110.0
108.0
107.0
106.0
105.0
104.0
103.0
102.5
102.0
101.0
100.0
99.5
99.0
98.0
97.5
97.0
96.5
96.0
95.0
94.5
94.0
93.0
92.0
91.0
90.5
90.0
89.0
87.0
85.0
84.0
81.0
%

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Canada

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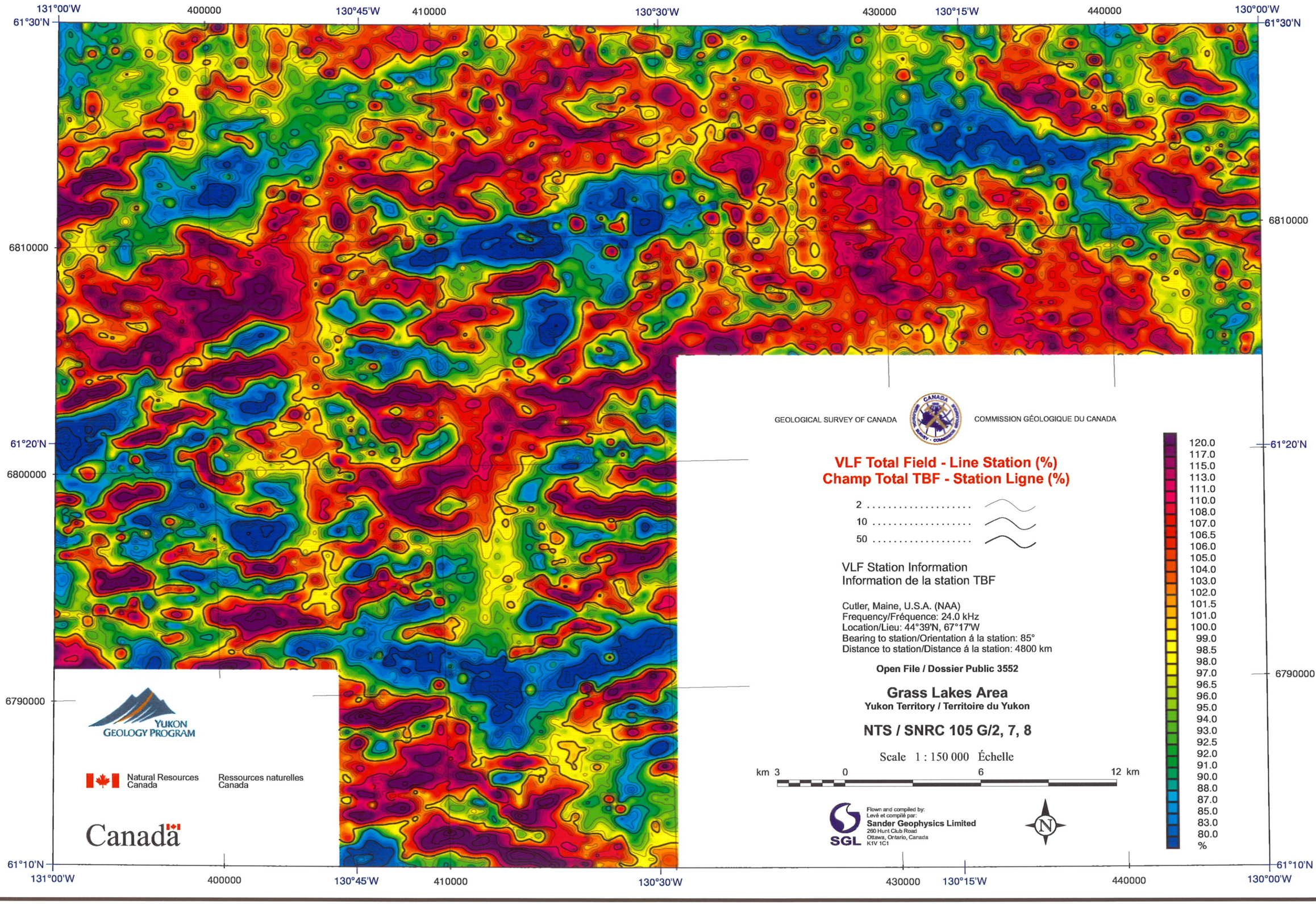
K1V 1C1

SGL

N


131°00'W
400000
130°45'W
410000
130°30'W
430000
130°15'W
440000
130°00'W
61°30'N
6810000
61°20'N
6800000
6790000
61°10'N
GEOLOGICAL SURVEY OF CANADA
COMMISSION GÉOLOGIQUE DU CANADA
VLF Total Field - Line Station (%)
Champ Total TBF - Station Ligne (%)
2
10
50
VLF Station Information
Information de la station TBF
Cutler, Maine, U.S.A. (NAA)
Frequency/Fréquence: 24.0 kHz
Location/Lieu: 44°39'N, 67°17'W
Bearing to station/Orientation á la station: 85°
Distance to station/Distance á la station: 4800 km
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Grass Lakes Area
Yukon Territory / Territoire du Yukon
NTS / SNRC 105 G/2, 7, 8
Scale 1 : 150 000 Échelle
km 3
0
6
12 km
120.0
117.0
115.0
113.0
111.0
110.0
108.0
107.0
106.5
106.0
105.0
104.0
103.0
102.0
101.5
101.0
100.0
99.0
98.5
98.0
97.0
96.5
96.0
95.0
94.0
93.0
92.5
92.0
91.0
90.0
88.0
87.0
85.0
83.0
80.0
%
YUKON GEOLOGY PROGRAM
Natural Resources Canada
Ressources naturelles Canada
Canada
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61°30'N

6810000

61°20'N

6800000

6790000

61°10'N

GEOLOGICAL SURVEY OF CANADA

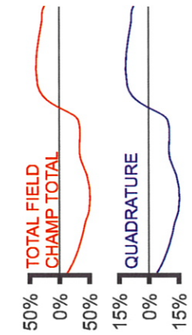
COMMISSION GÉOLOGIQUE DU CANADA

Data scale / Échelle des données

Total field: 100% / cm
Champ total:

Quadrature: 30% / cm

VLF Ortho Station (%)
TBF Station Ortho (%)



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Grass Lakes Area

Yukon Territory / Territoire du Yukon

NTS / SNRC 105 G/2, 7, 8

Scale 1 : 150 000 Échelle

km 3 0 6 12 km

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61°30'N

6810000

61°20'N

6800000

6790000

61°10'N

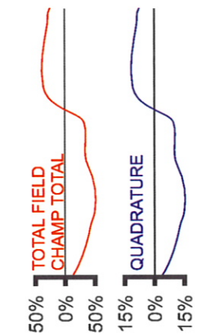
GEOLOGICAL SURVEY OF CANADA

COMMISSION GÉOLOGIQUE DU CANADA

Data scale / Échelle des données

Total field: 100% / cm Quadrature: 30% / cm
Champ total:

VLF Line Station (%)
TBF Station Ligne (%)



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Grass Lakes Area

Yukon Territory / Territoire du Yukon

NTS / SNRC 105 G/2, 7, 8

Scale 1 : 150 000 Échelle

km 3 0 6 12 km

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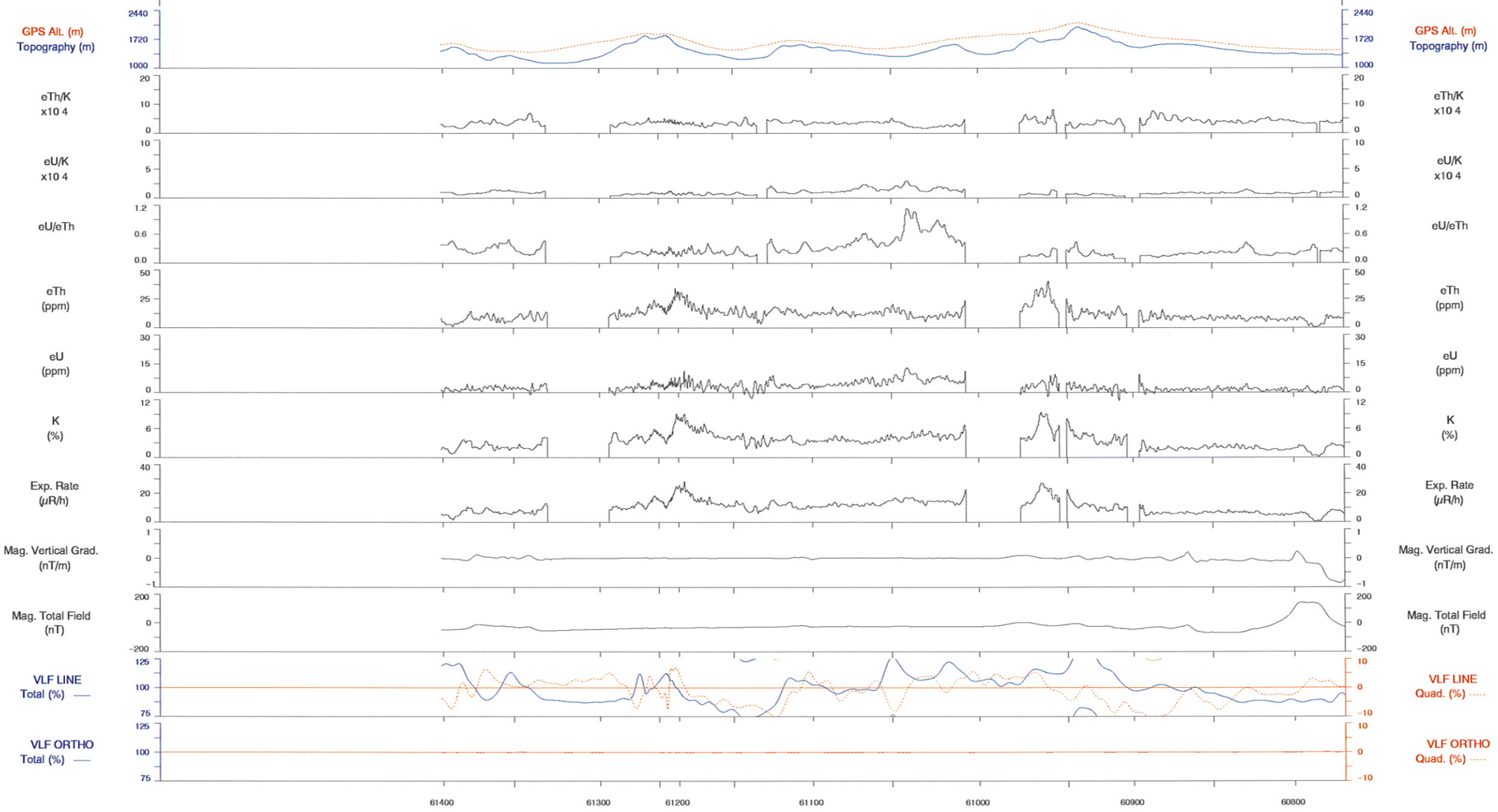
61°10'N

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/7

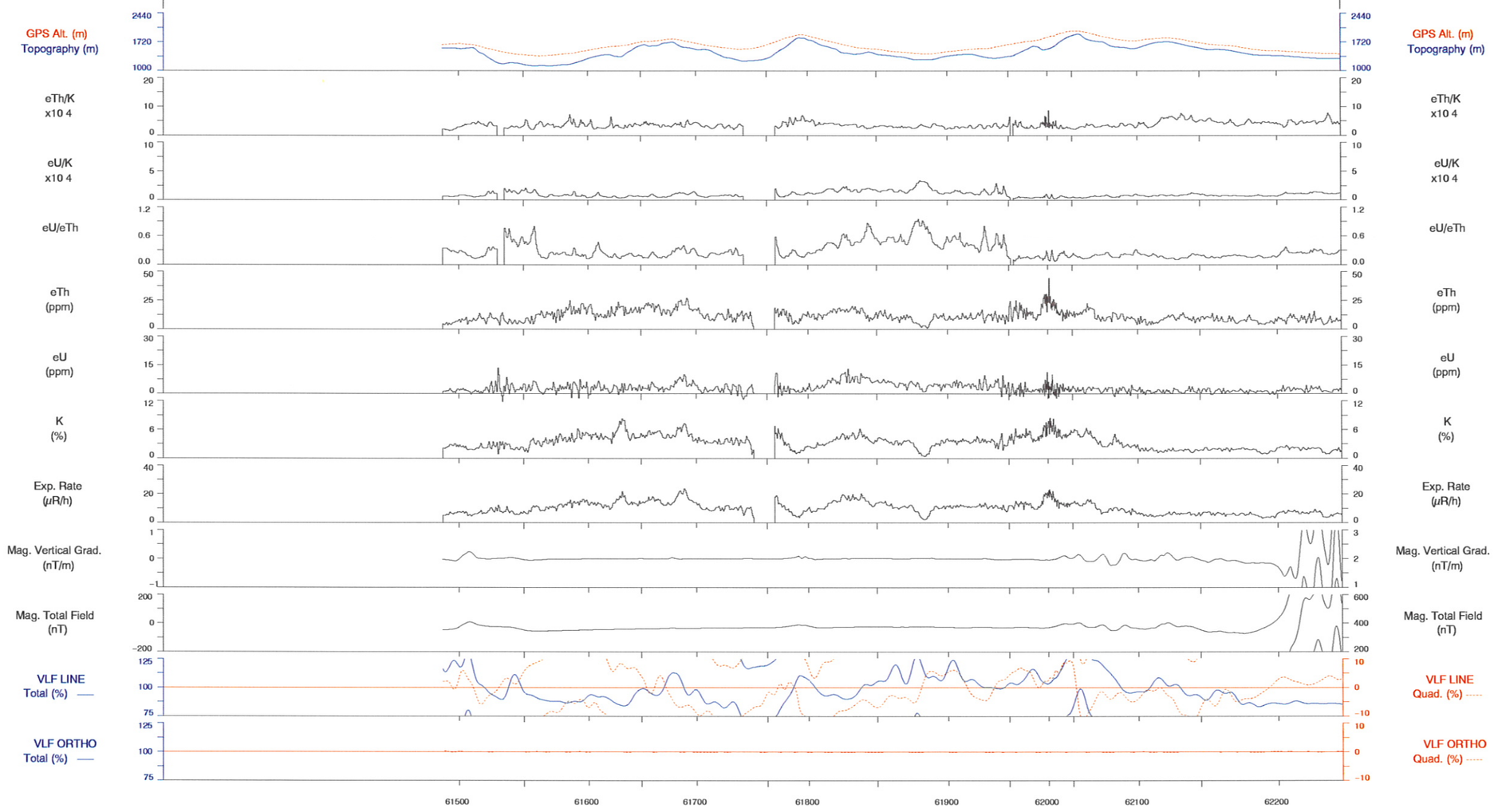
S N



LINE 1002 Scale 1:150000 3 KM azimuth 0°

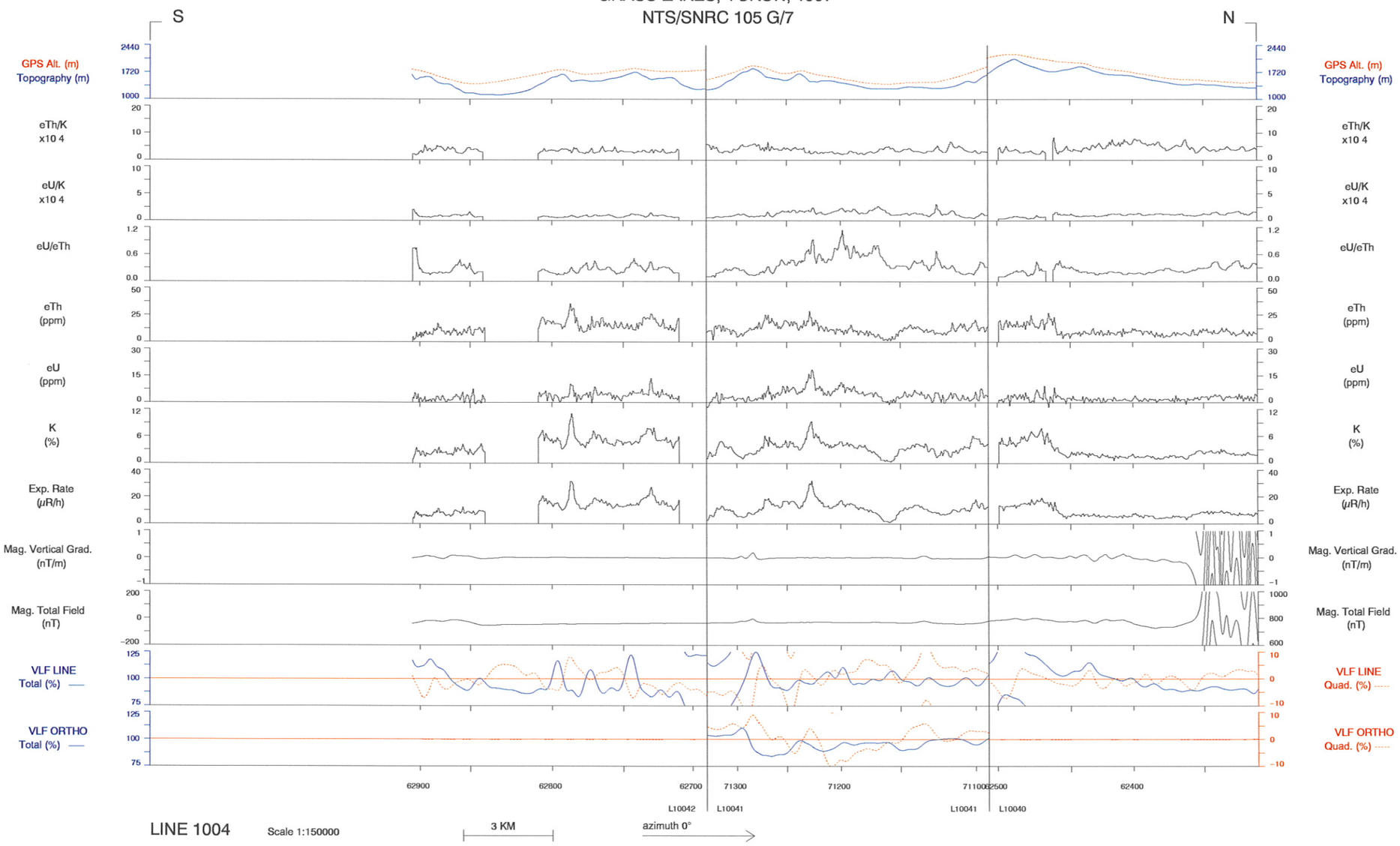
GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/7

S N



LINE 1003 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/7



LINE 1004 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/7

S

N

GPS Alt. (m)
Topography (m)

eTh/K
x10 4

eU/K
x10 4

eU/eTh

eTh
(ppm)

eU
(ppm)

K
(%)

Exp. Rate
(μR/h)

Mag. Vertical Grad.
(nT/m)

Mag. Total Field
(nT)

VLF LINE
Total (%) ——

VLF ORTHO
Total (%) ——

VLF LINE
Quad. (%) ----

VLF ORTHO
Quad. (%) ----

63000 63100 63200 63300 63400 63500 70800 70700

L10050 L10052

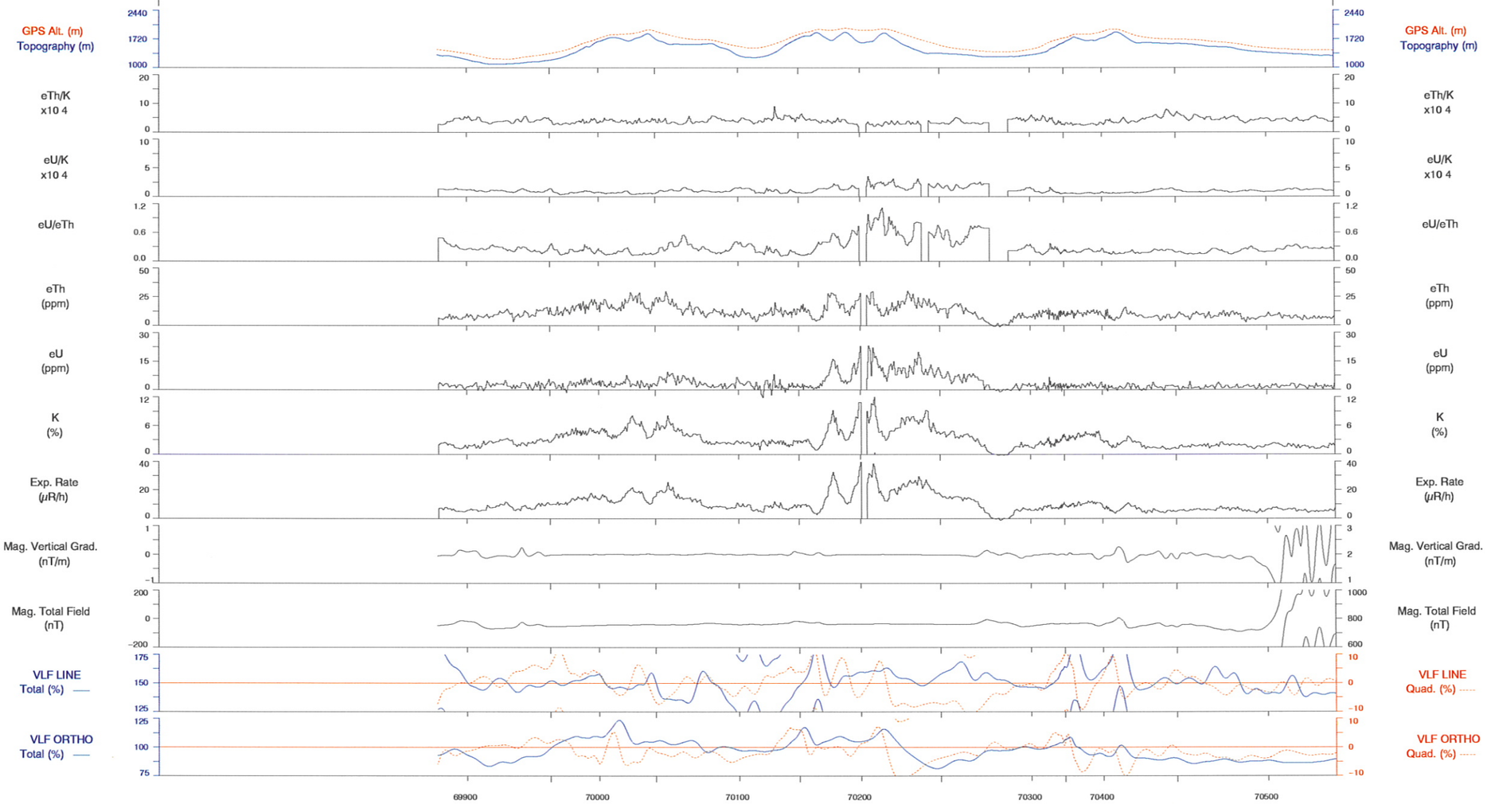
LINE 1005 Scale 1:150000

3 KM

azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/7

S N

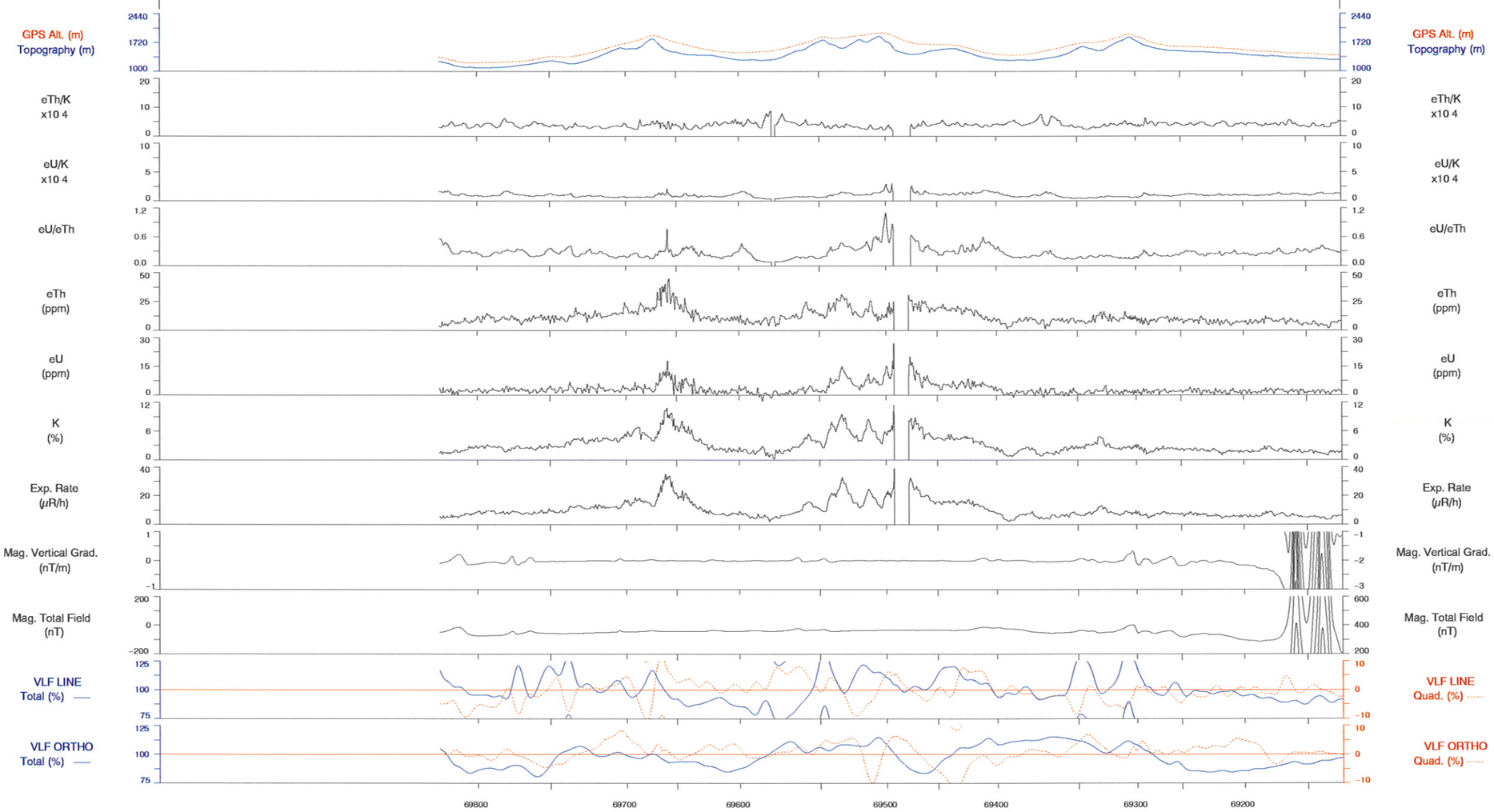


LINE 1006 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/7

S

N



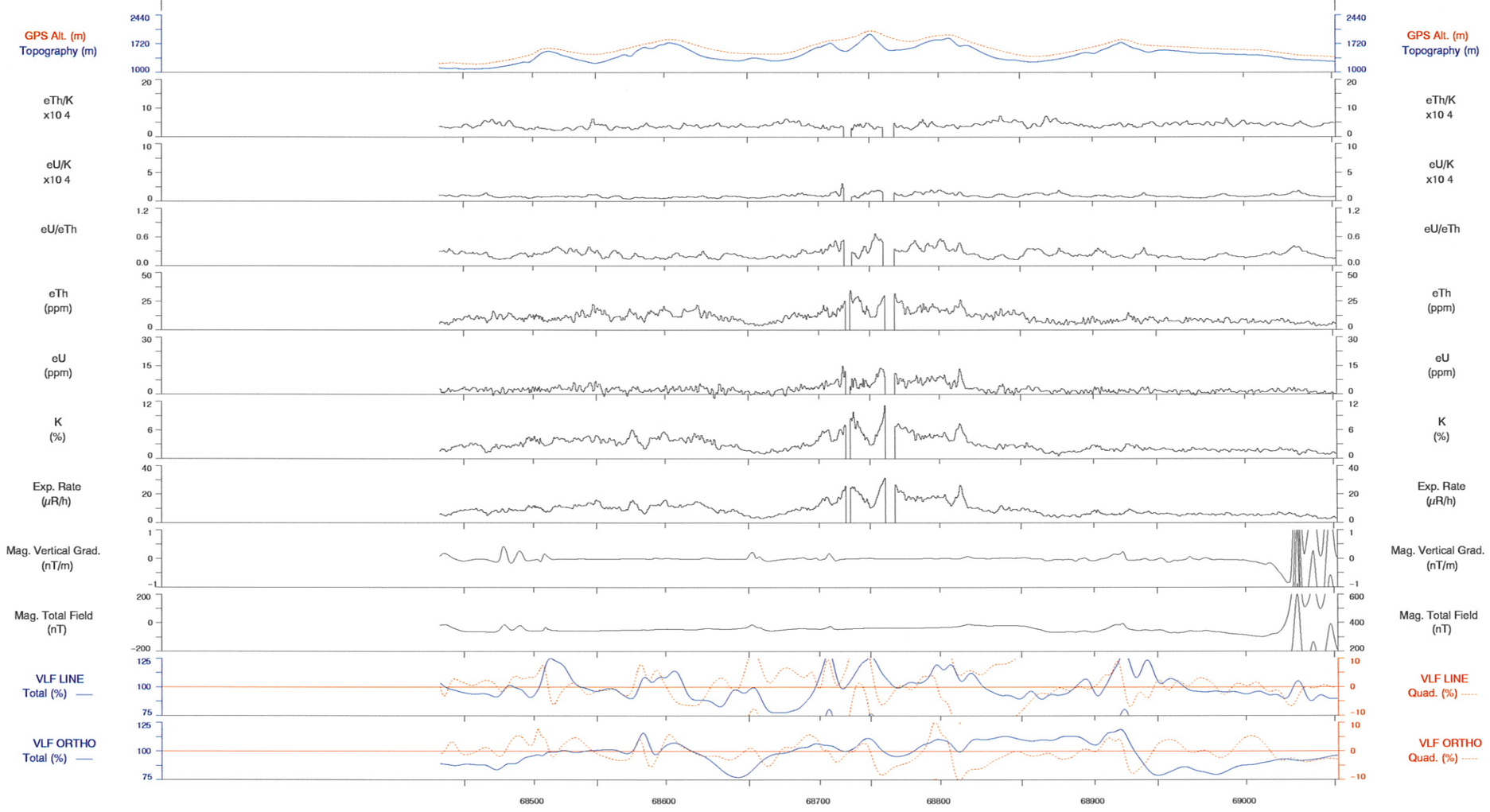
LINE 1007 Scale 1:150000

3 KM

azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/7

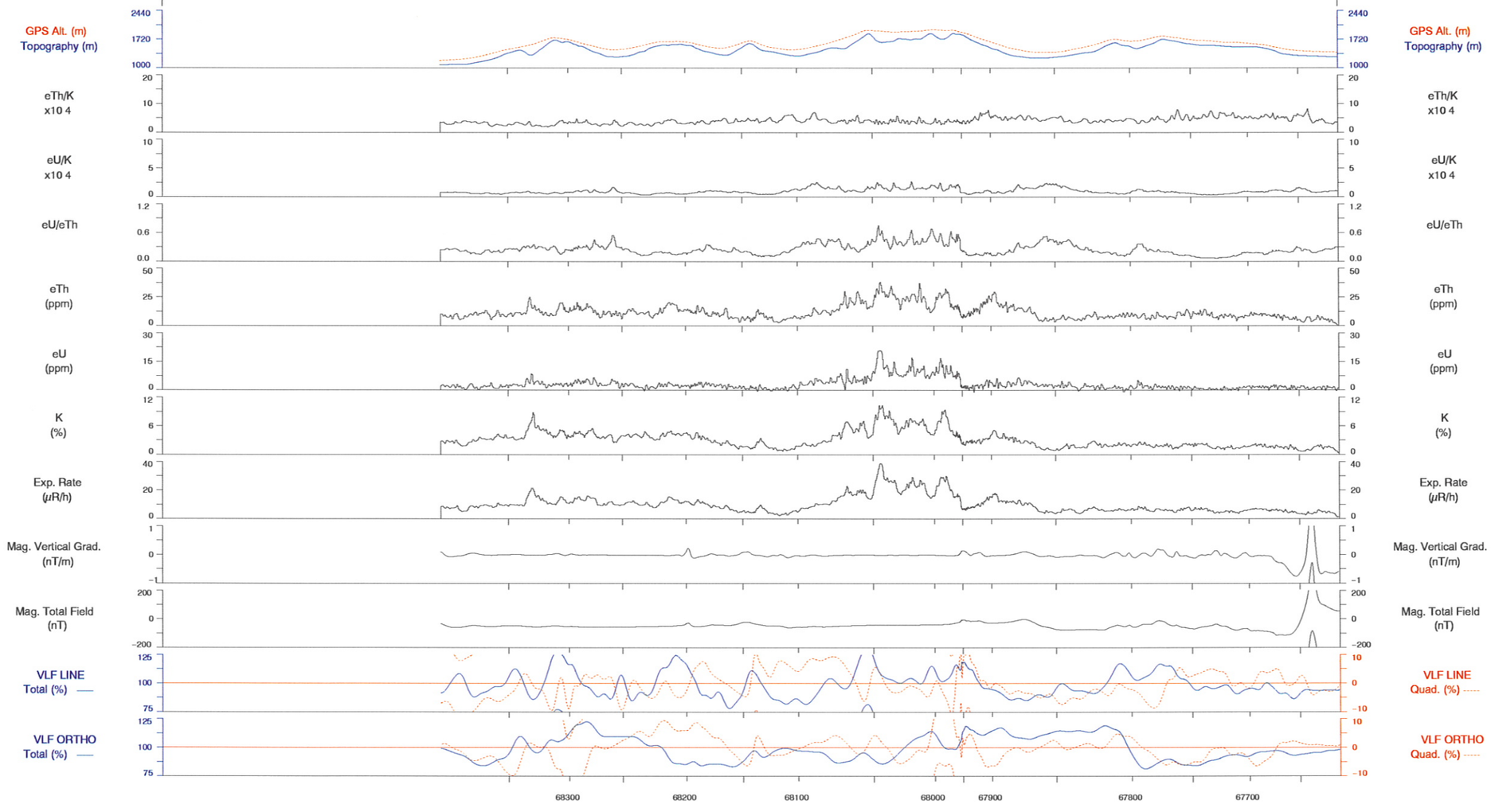
S N



LINE 1008 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/7

S N



LINE 1009 Scale 1:150000

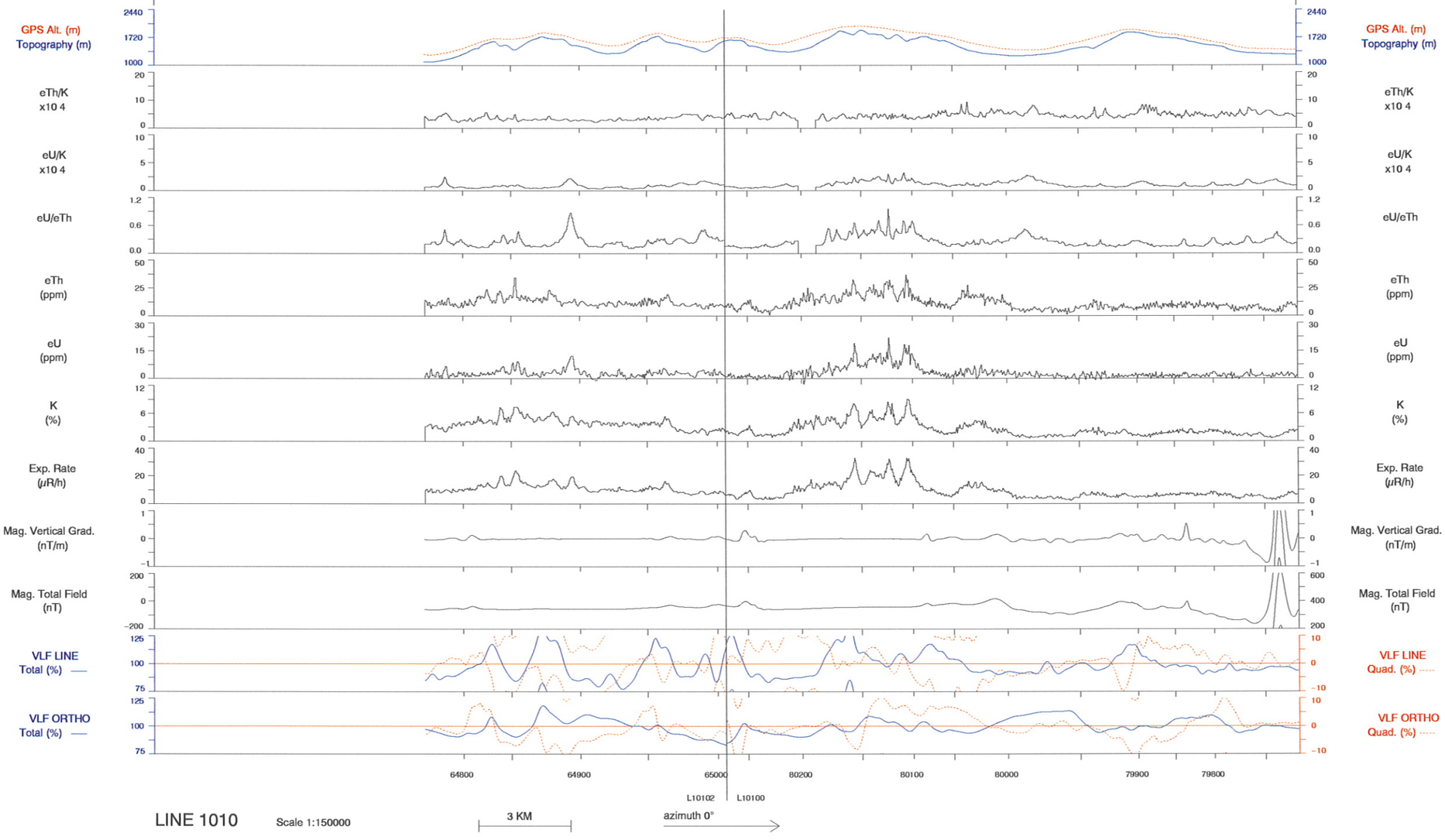
3 KM

azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/7

S

N



LINE 1010 Scale 1:150000

3 KM

azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/7

S

N

GPS Alt. (m)
Topography (m)

2440
1720
1000

eTh/K
x10 4

20
10
0

eU/K
x10 4

10
5
0

eU/eTh

1.2
0.6
0.0

eTh
(ppm)

50
25
0

eU
(ppm)

30
15
0

K
(%)

12
6
0

Exp. Rate
(μR/h)

40
20
0

Mag. Vertical Grad.
(nT/m)

1
0
−1

3
2
1

Mag. Total Field
(nT)

200
0
−200

1000
800
600

VLF LINE
Total (%) ——

VLF LINE
Quad. (%) ----

125
100
75

10
0
−10

VLF ORTHO
Total (%) ——

VLF ORTHO
Quad. (%) ----

80800
80900
65200
65300
65400
65500

L10110
L10114

LINE 1011

Scale 1:150000

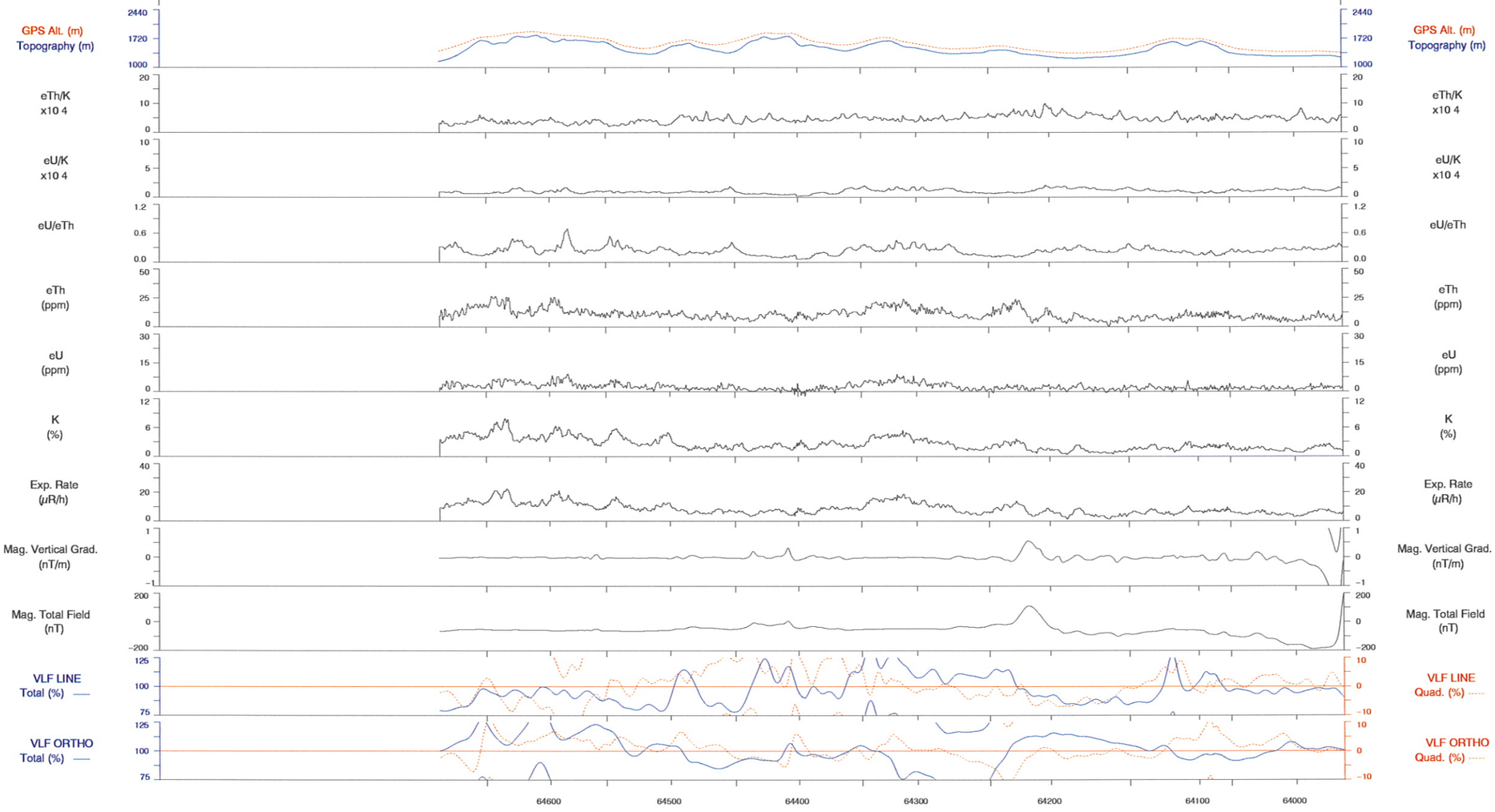
3 KM

azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/7

S

N



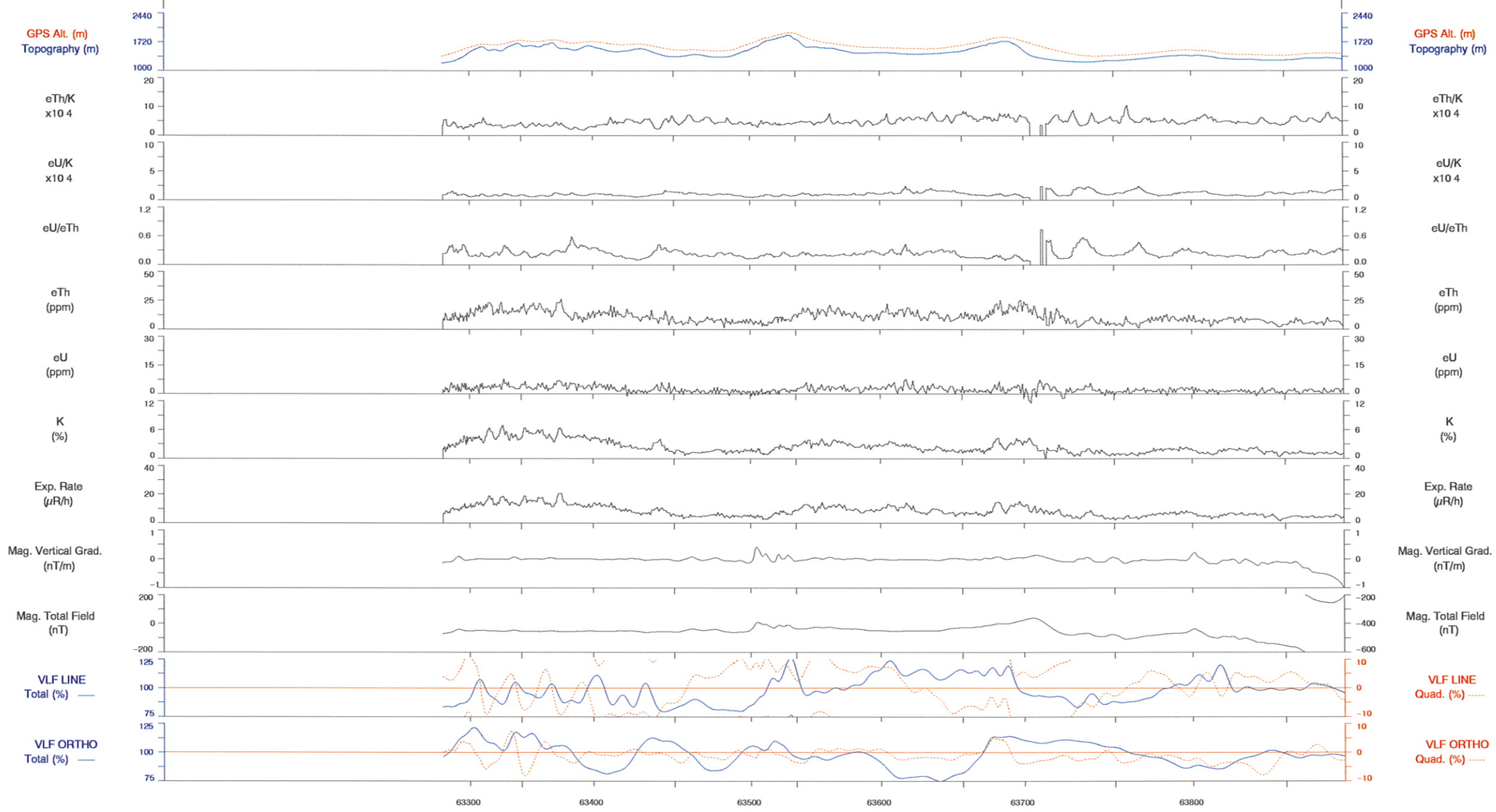
LINE 1012 Scale 1:150000

3 KM

azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/7

S N



LINE 1013 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/7

S

N

GPS Alt. (m)
Topography (m)

2440
1720
1000

eTh/K
x10 4

20
10
0

eU/K
x10 4

10
5
0

eU/eTh

1.2
0.6
0.0

eTh
(ppm)

50
25
0

eU
(ppm)

30
15
0

K
(%)

12
6
0

Exp. Rate
(μR/h)

40
20
0

Mag. Vertical Grad.
(nT/m)

1
0
-1

Mag. Total Field
(nT)

200
0
-200

-200
-400
-600

VLF LINE
Total (%) ——

125
100
75

VLF LINE
Quad. (%) ----

10
0
-10

VLF ORTHO
Total (%) ——

VLF ORTHO
Quad. (%) ----

63200
63100
63000
62900
62800
62700
62600

LINE 1014

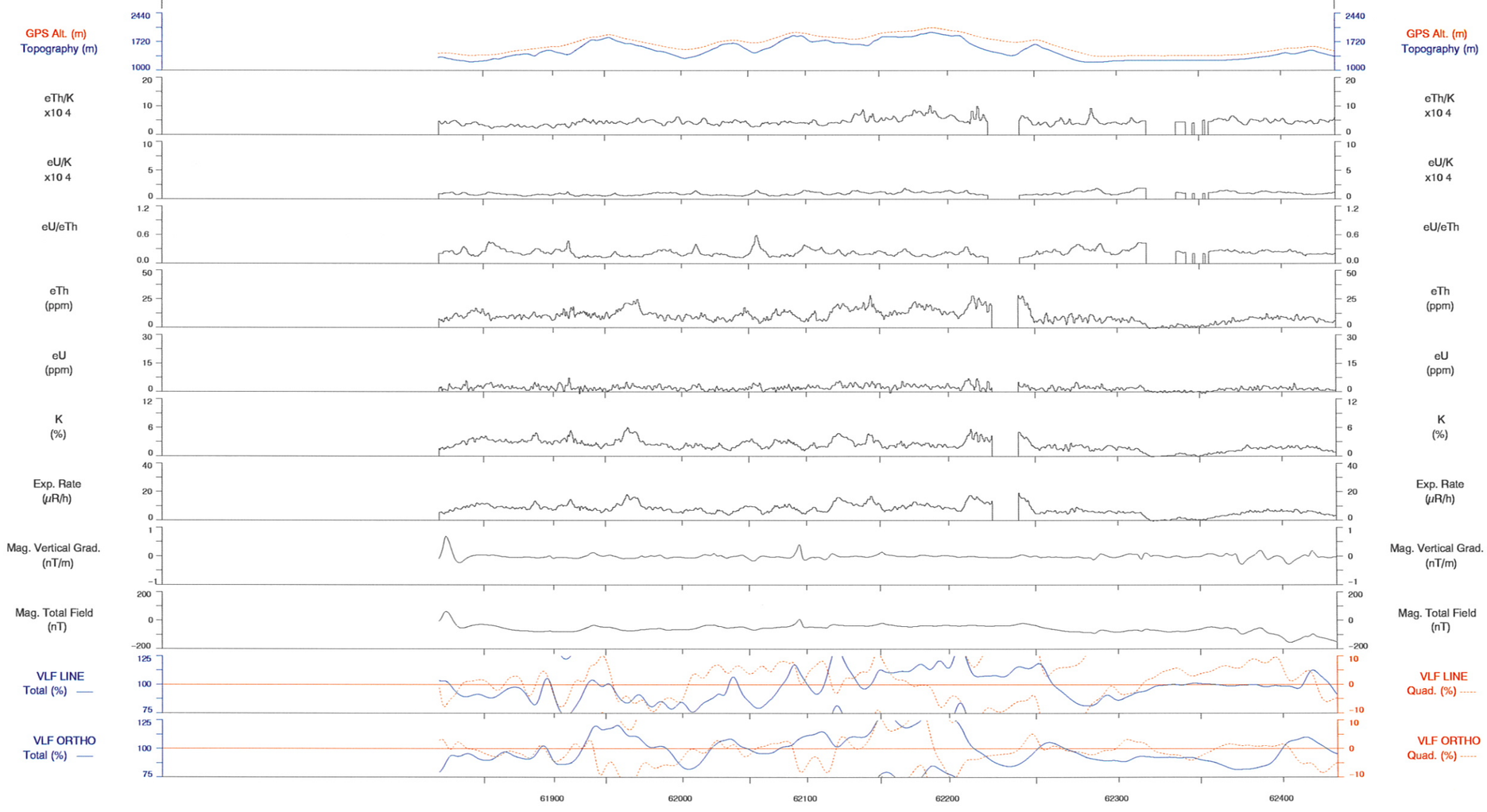
Scale 1:150000

3 KM

azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/7

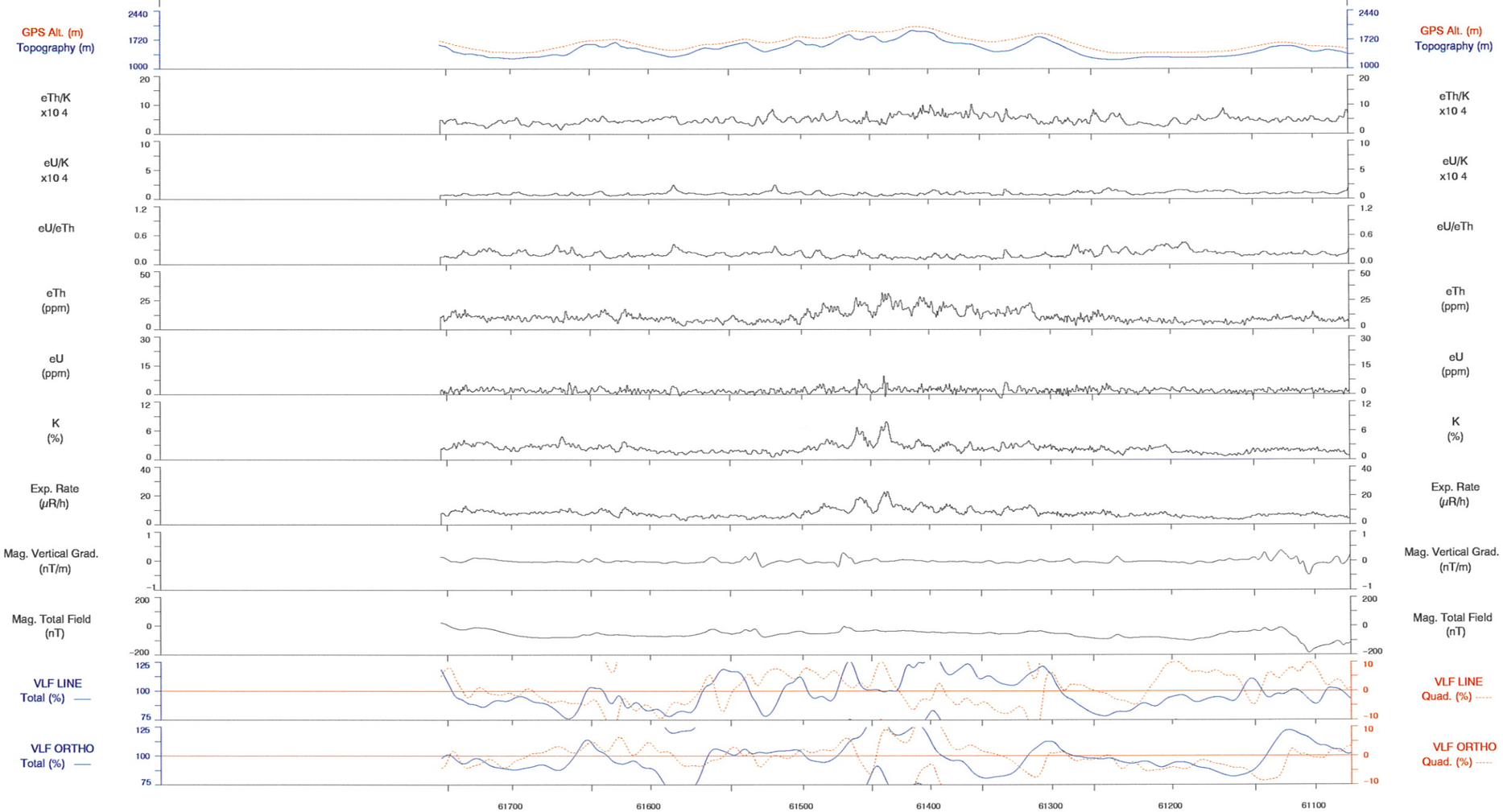
S N



LINE 1015 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/7

S N

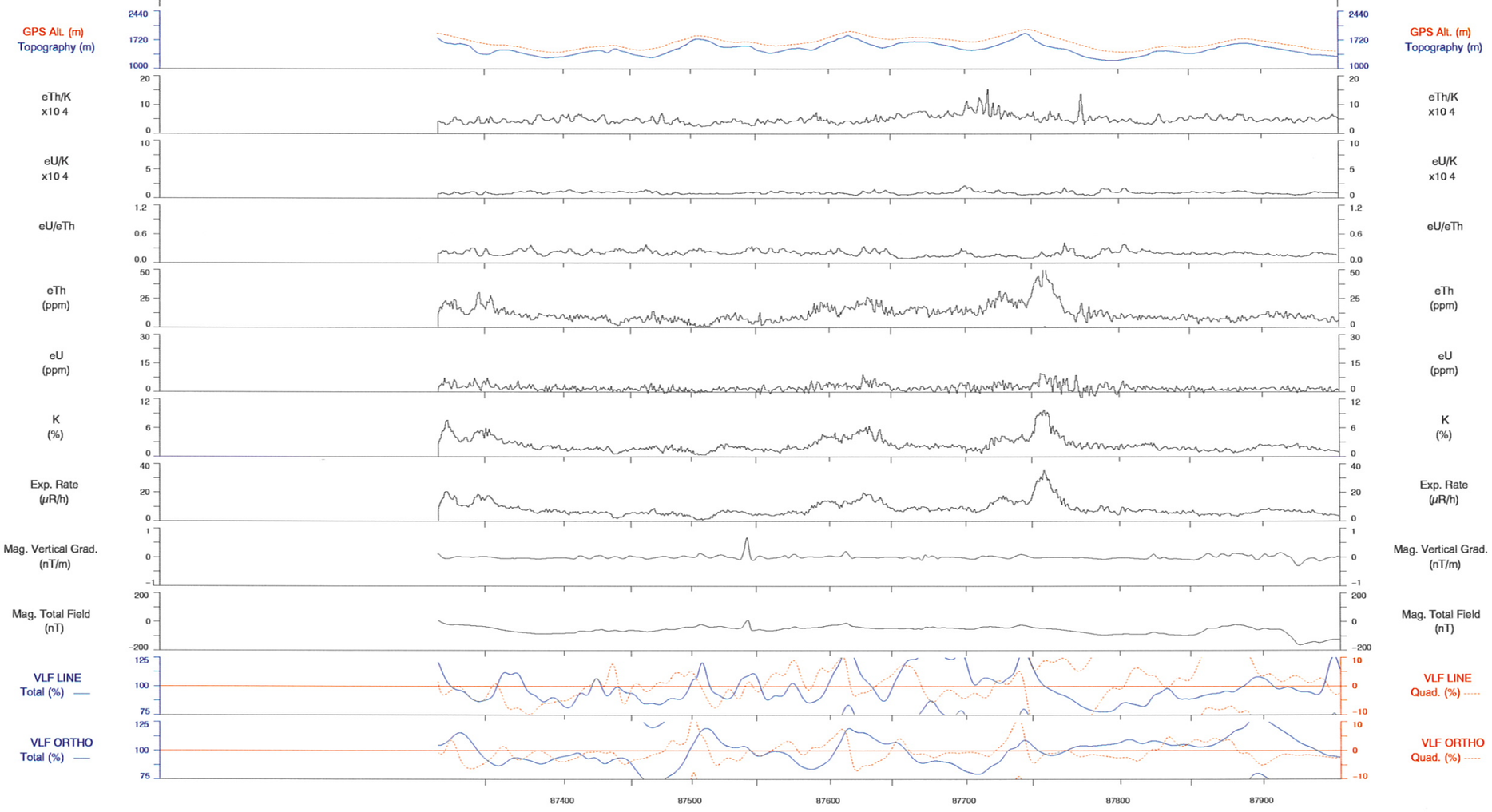


LINE 1016 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/7

S

N

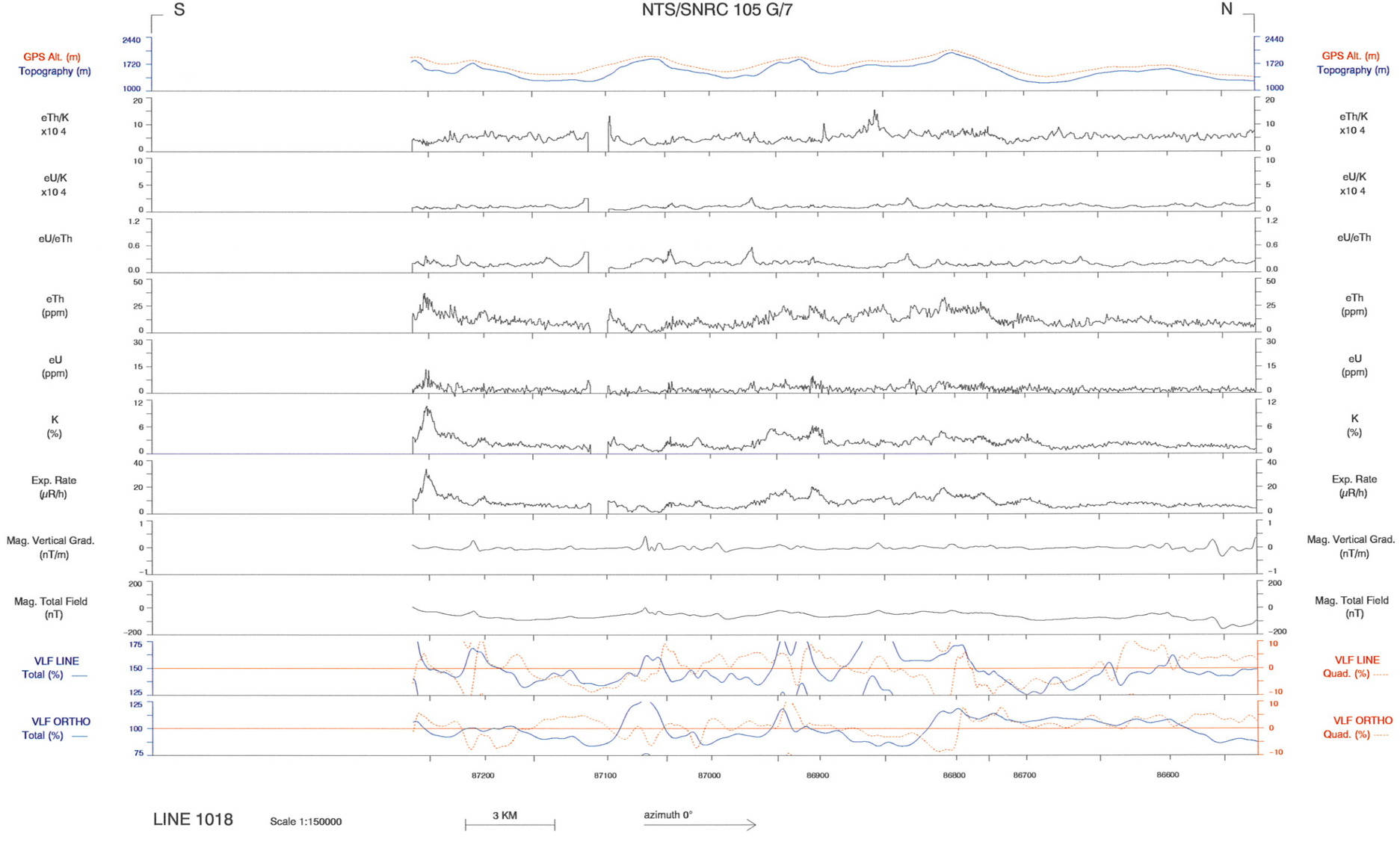


LINE 1017 Scale 1:150000

3 KM

azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/7

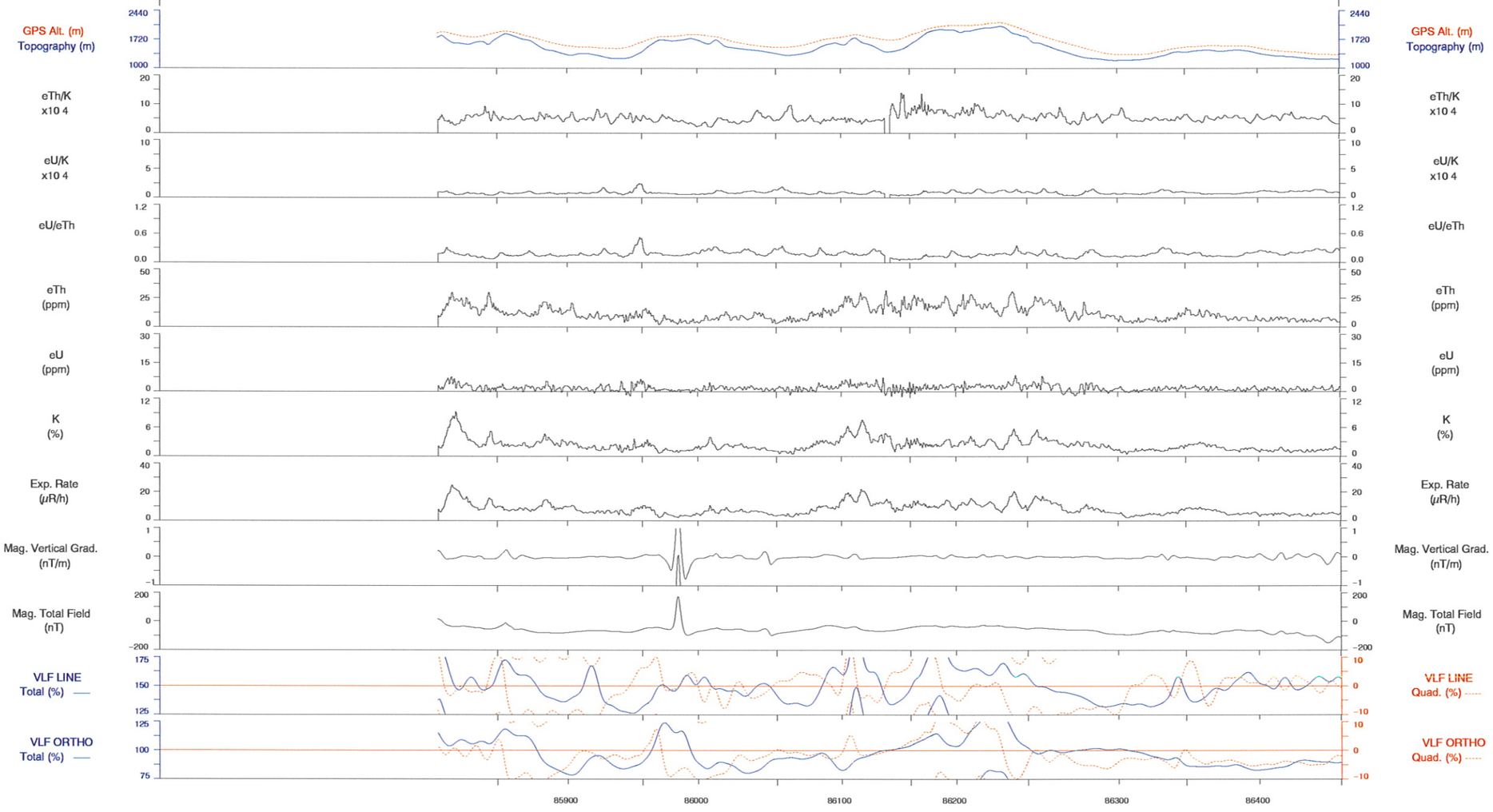


LINE 1018 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/7

S

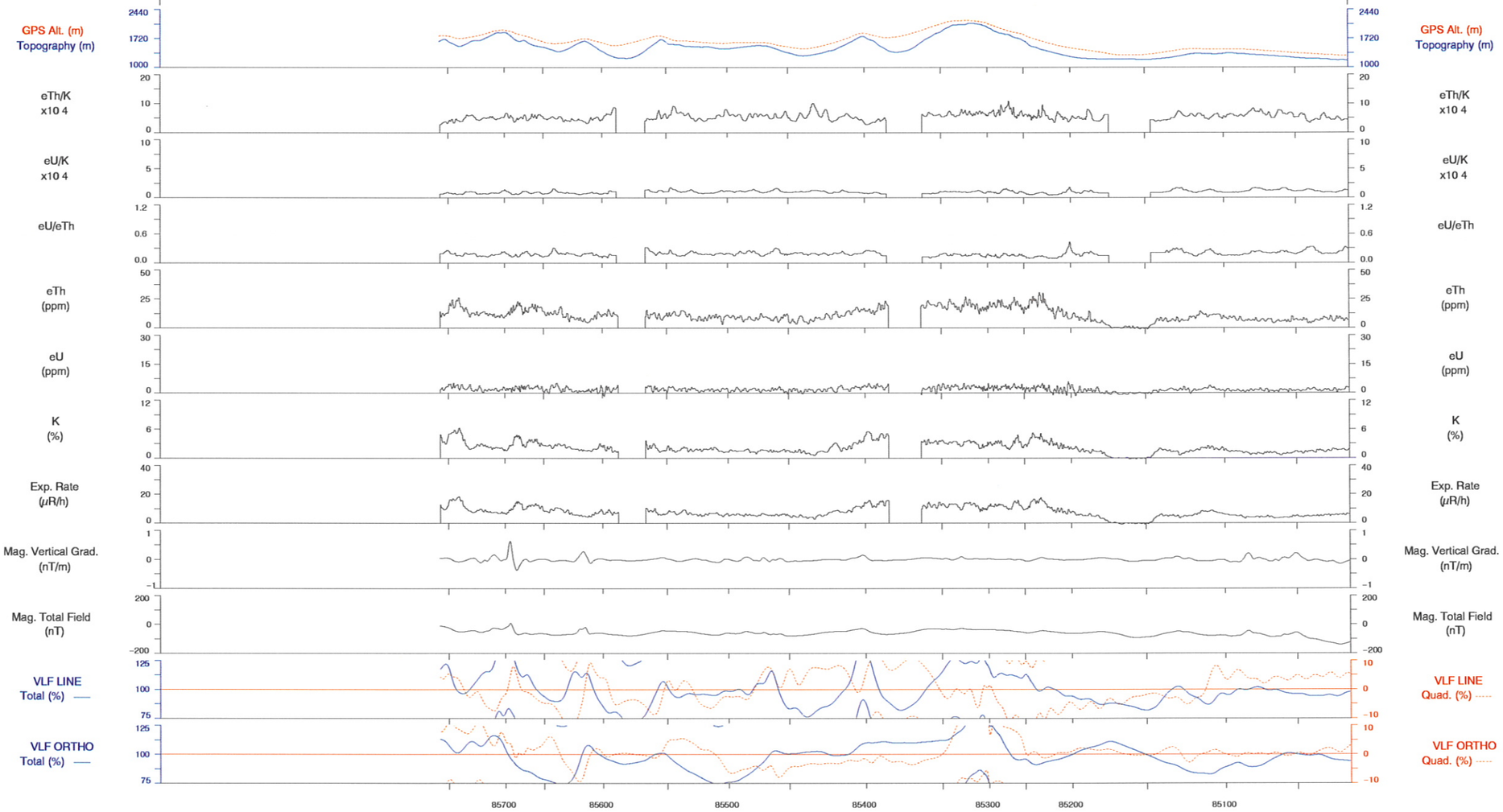
N



LINE 1019 Scale 1:150000 3 KM azimuth 0°

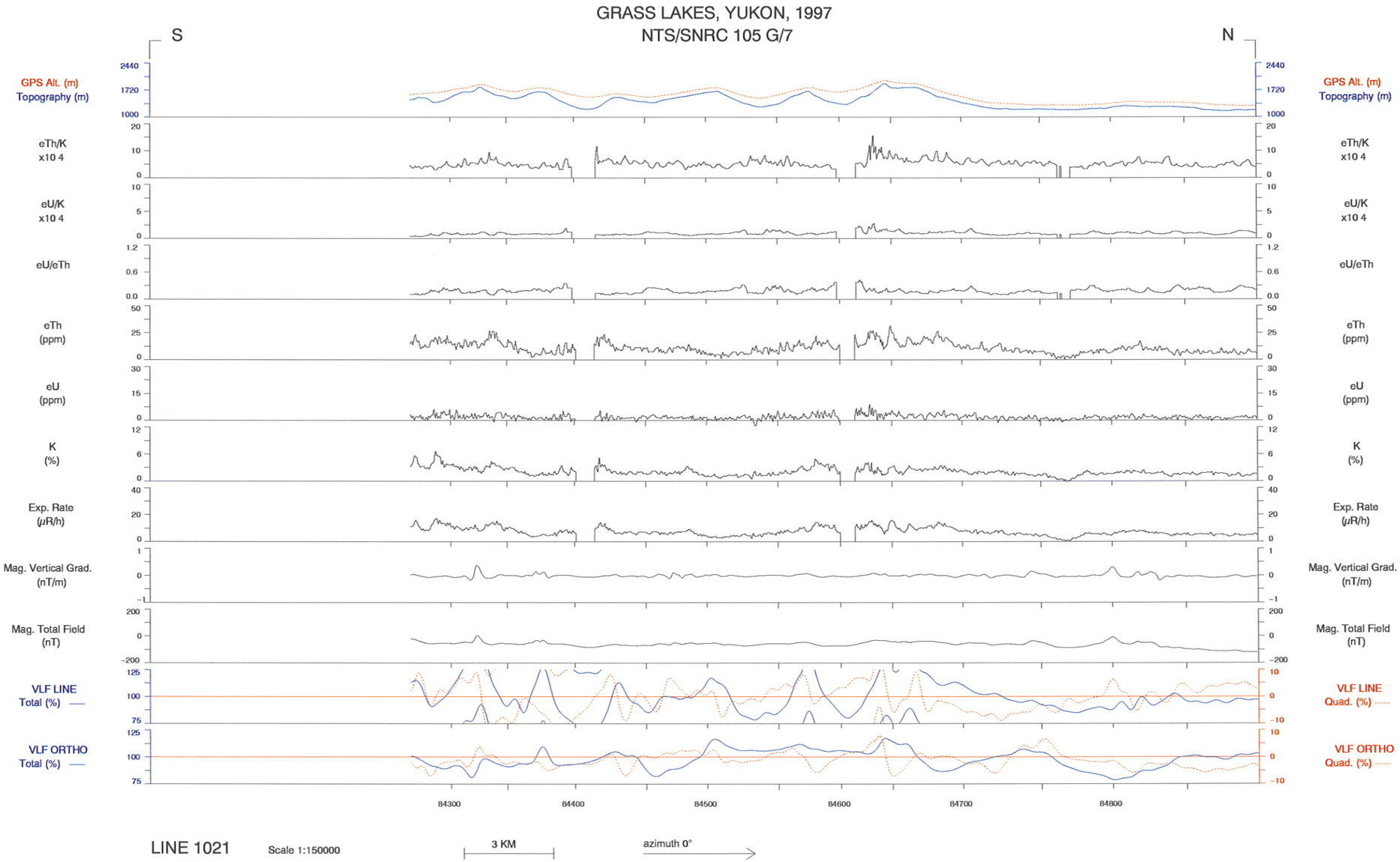
GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/7

S N



LINE 1020 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/7

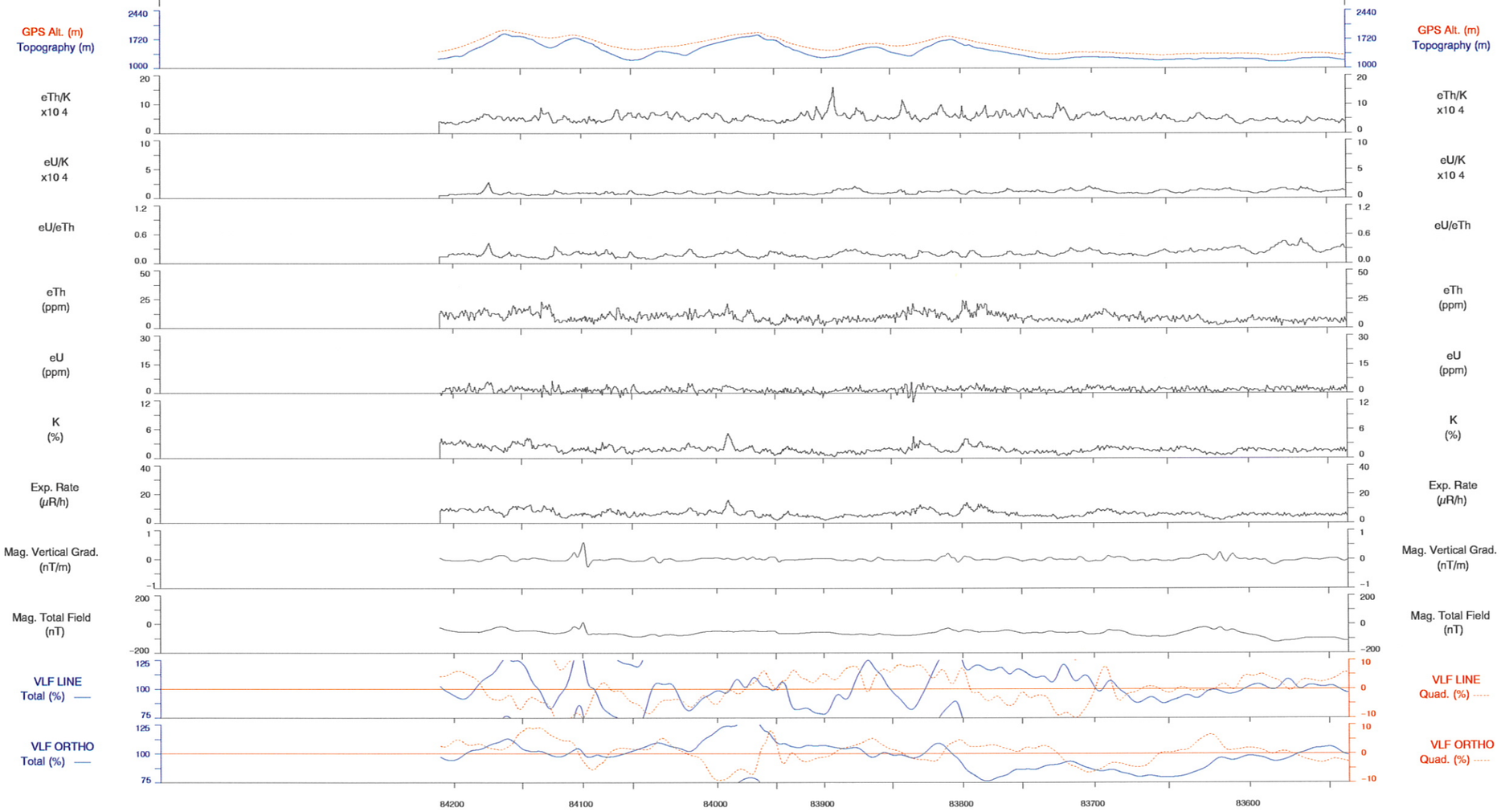


LINE 1021 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/7

S

N



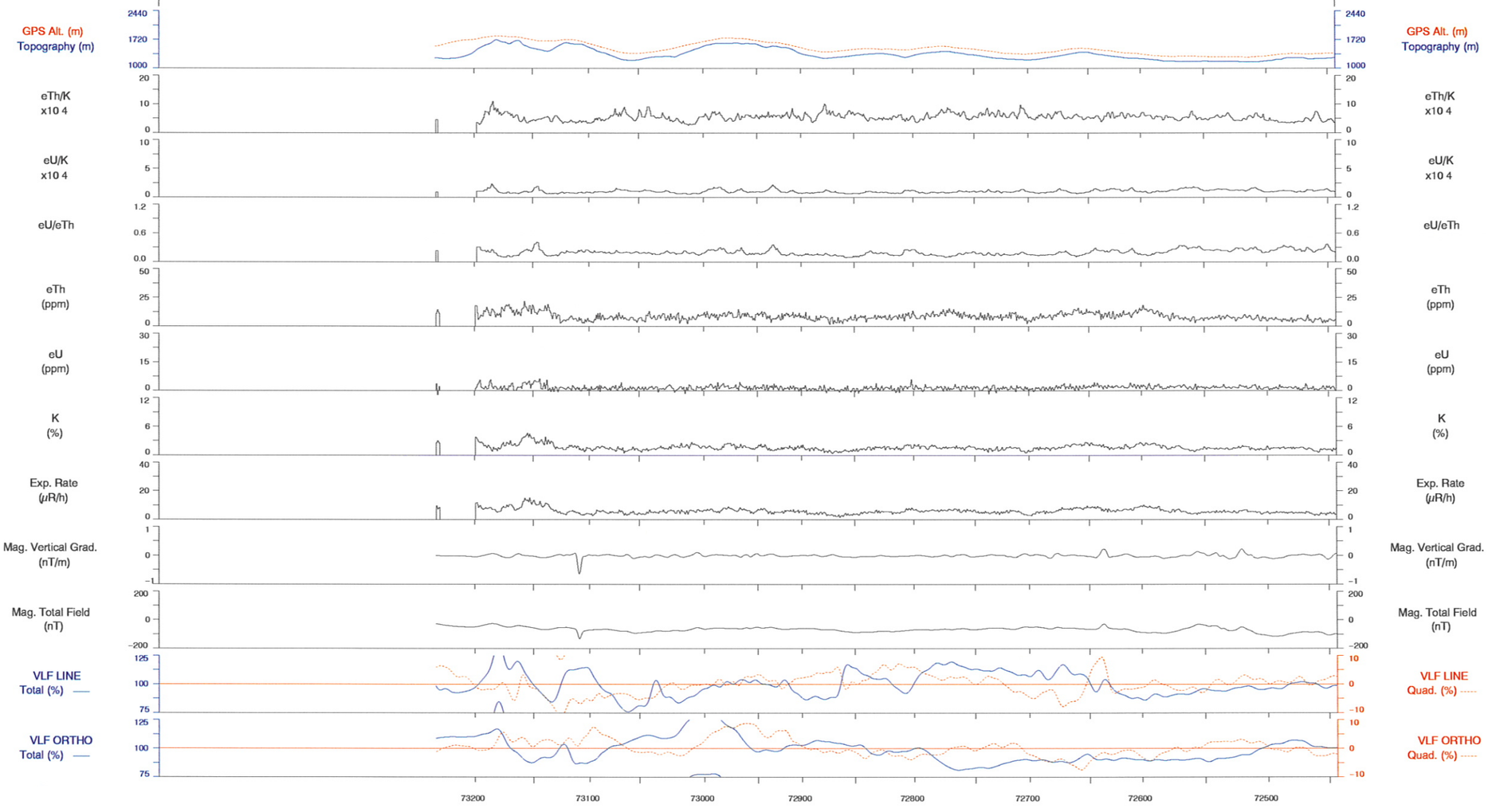
LINE 1022 Scale 1:150000

3 KM

azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/7

S N



LINE 1023 Scale 1:150000

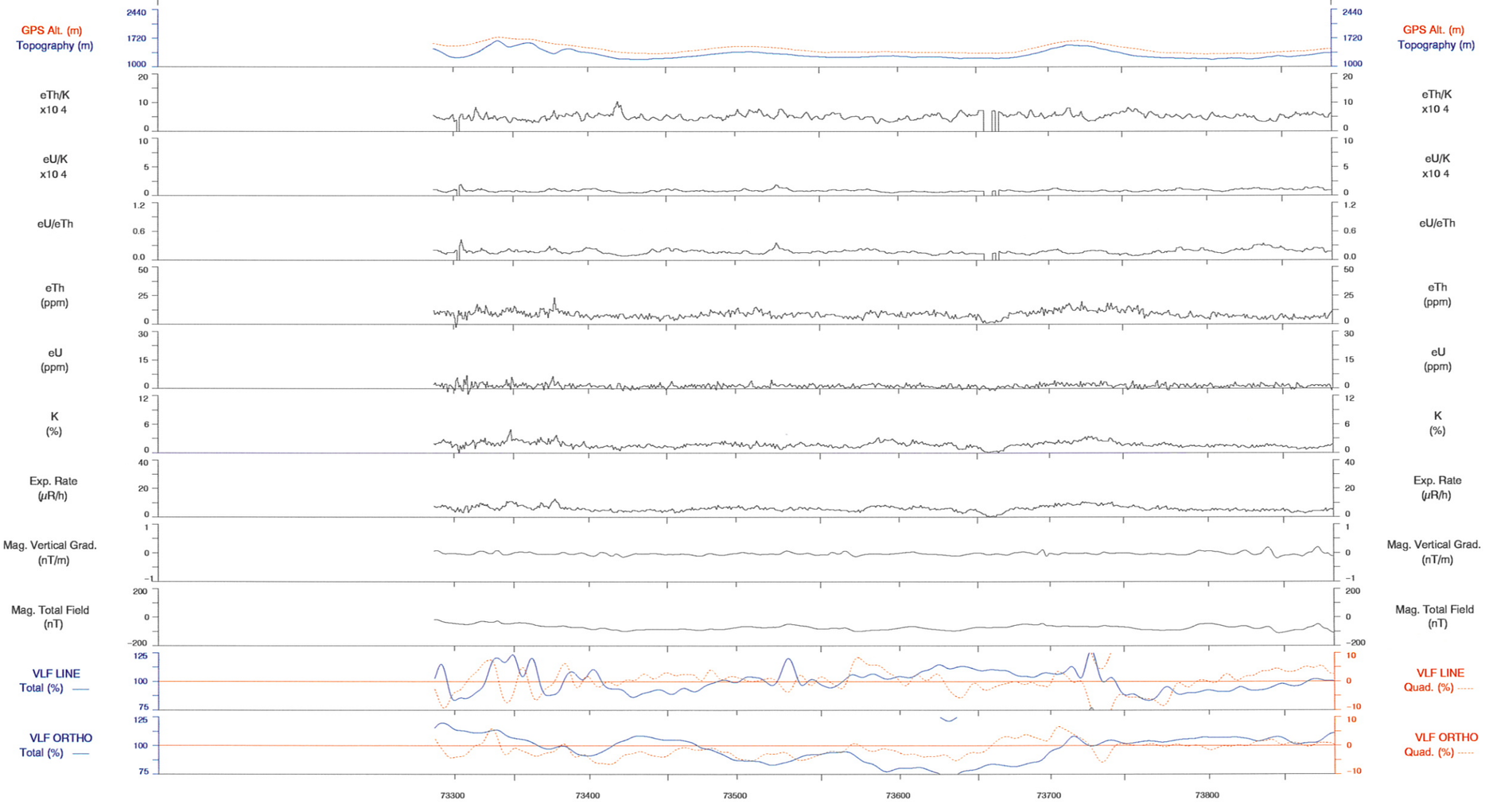
3 KM

azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/7

S

N



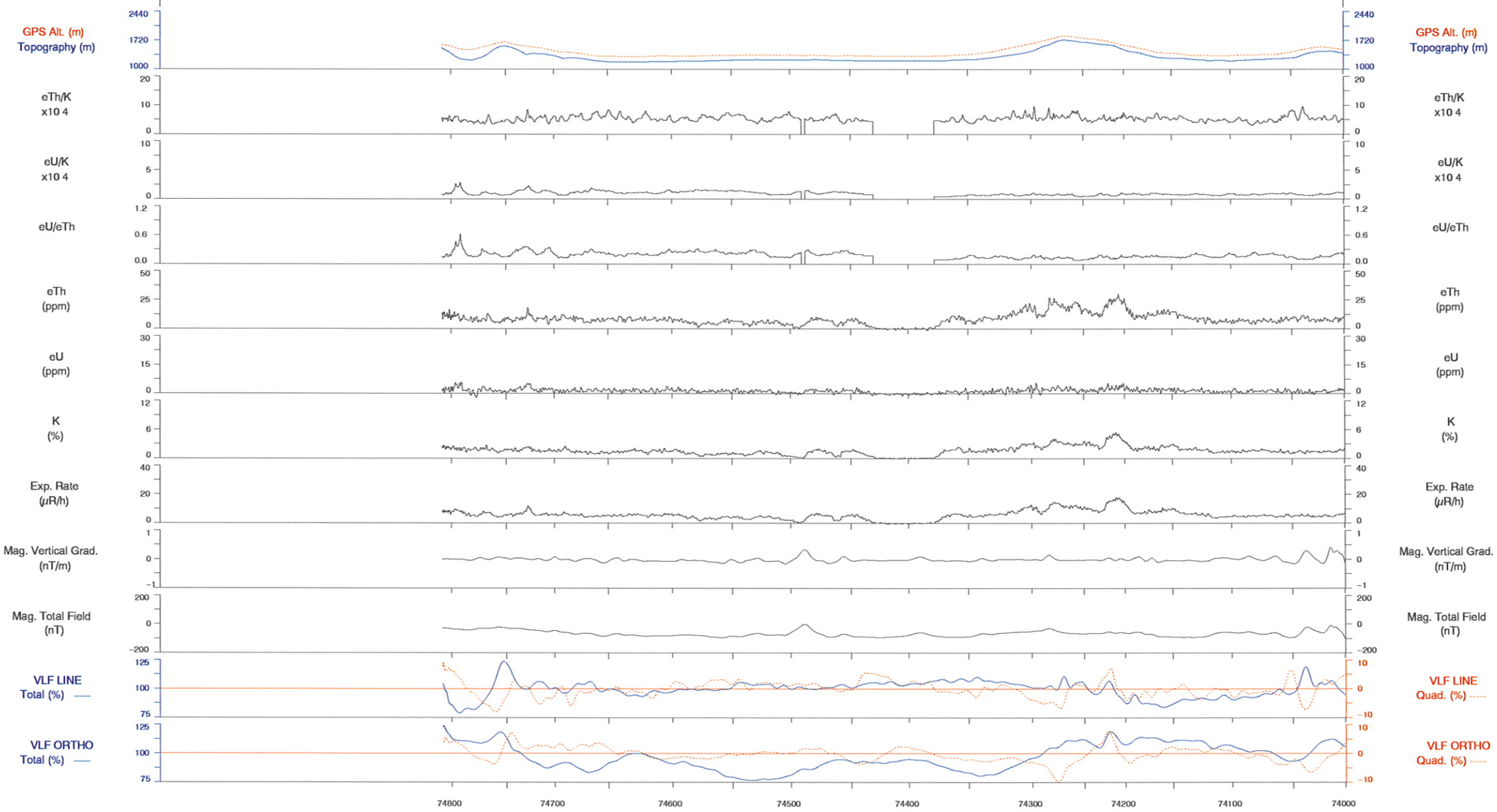
LINE 1024 Scale 1:150000

3 KM

azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/7

S N

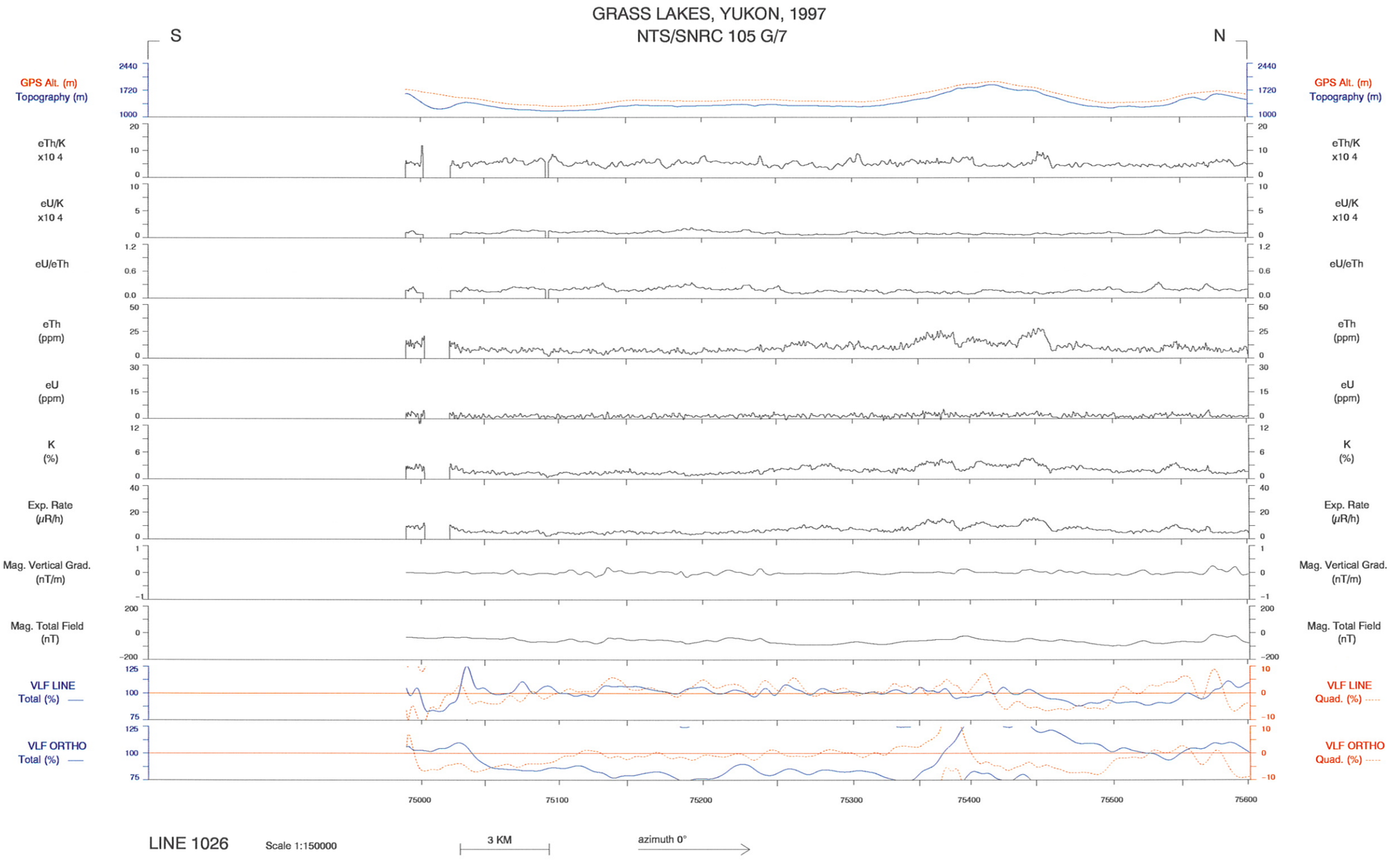


LINE 1025 Scale 1:150000

3 KM

azimuth 0°

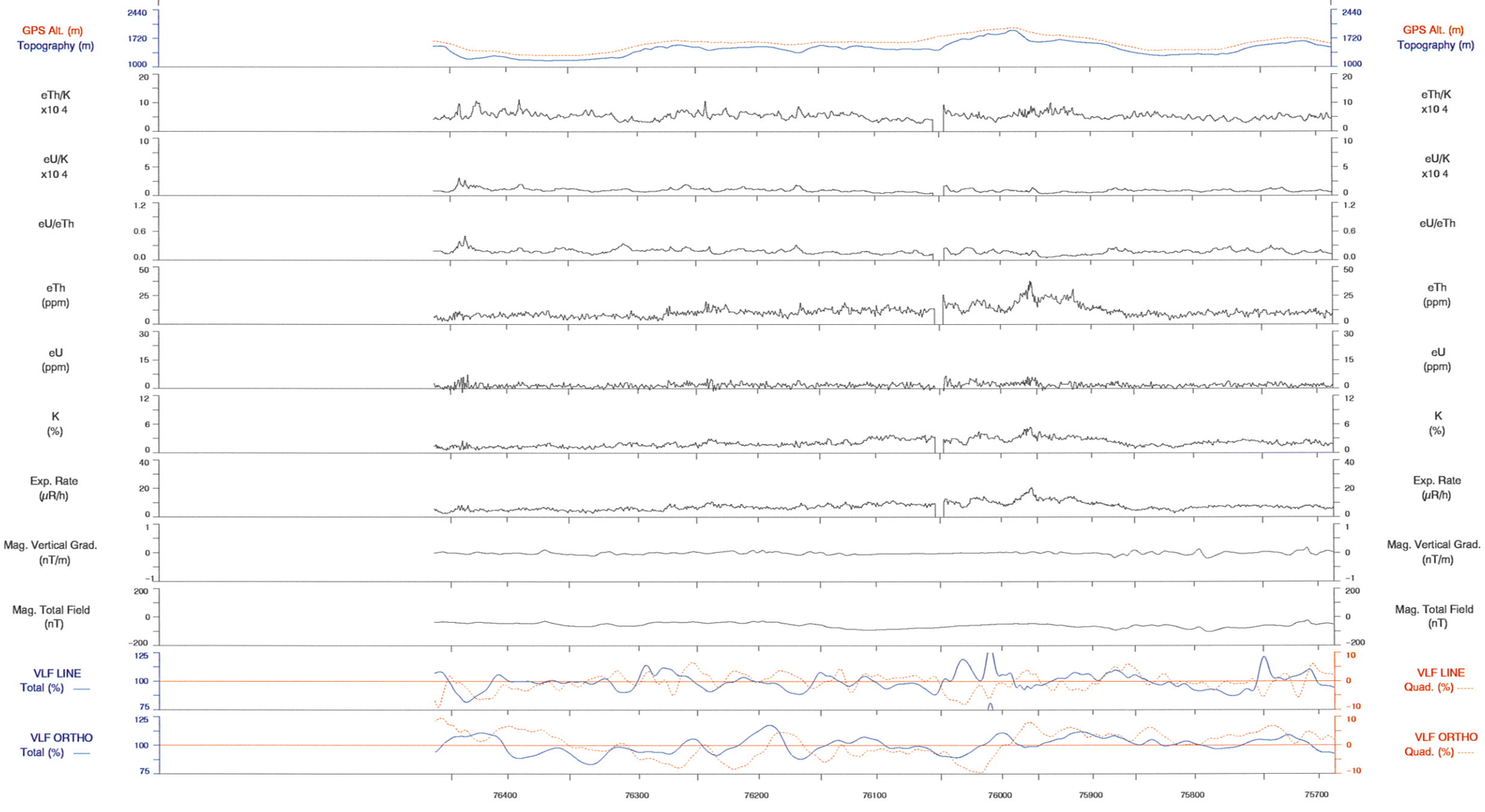
GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/7



LINE 1026 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/7

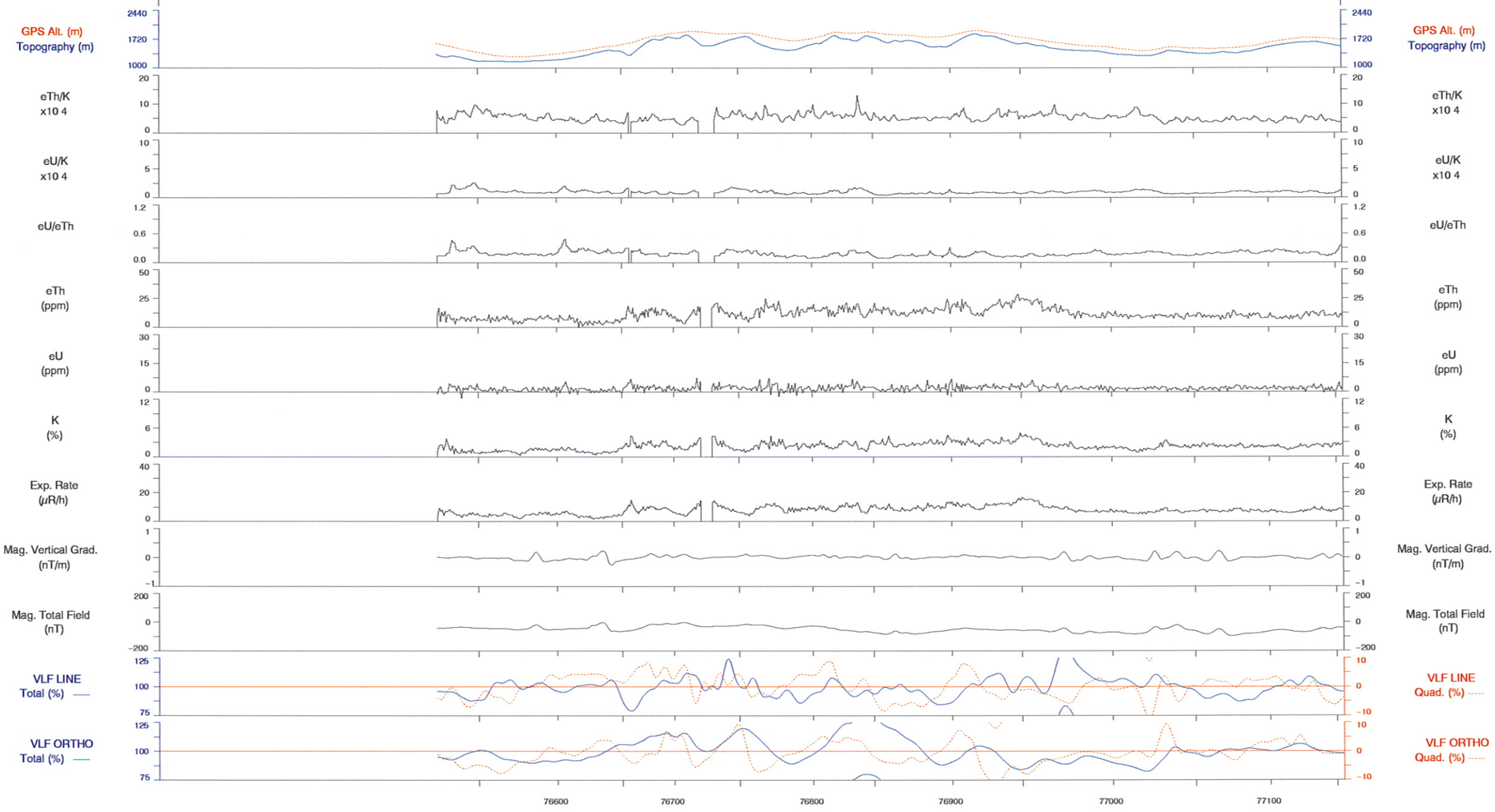
S N



LINE 1027 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/7

S N



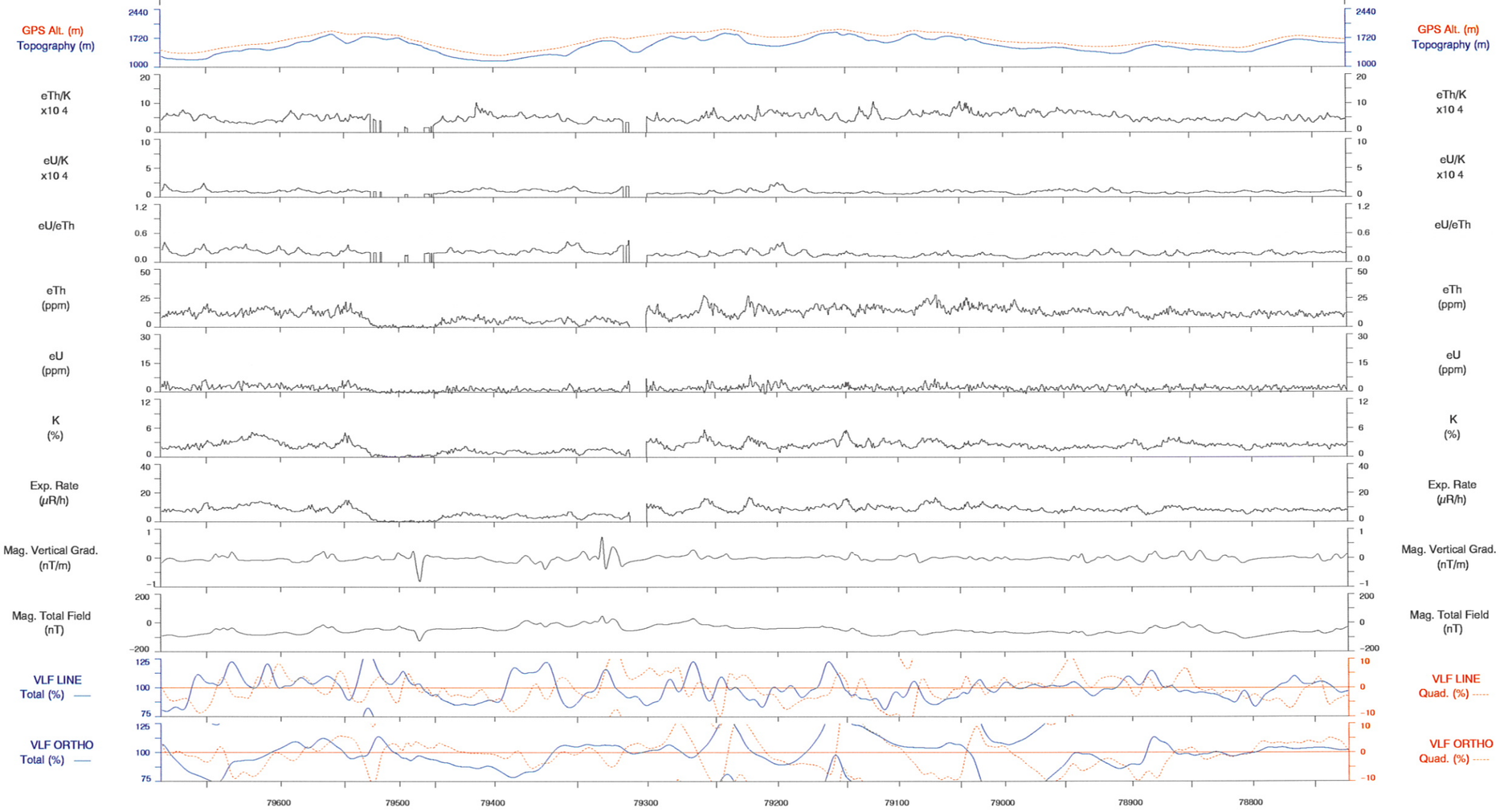
LINE 1028 Scale 1:150000

3 KM

azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/2, 7

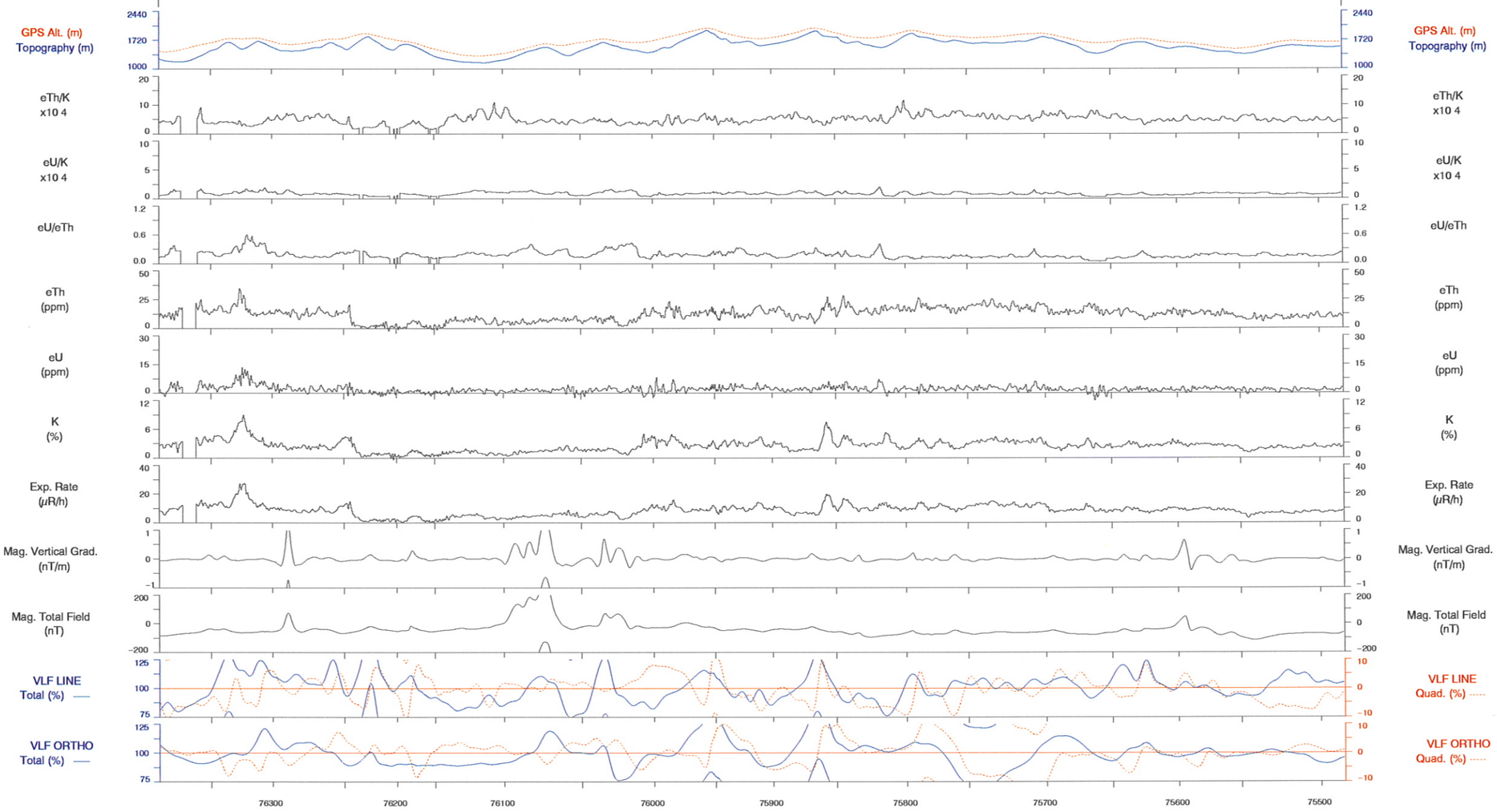
S N



LINE 1029 Scale 1:150000 3 KM azimuth 0°

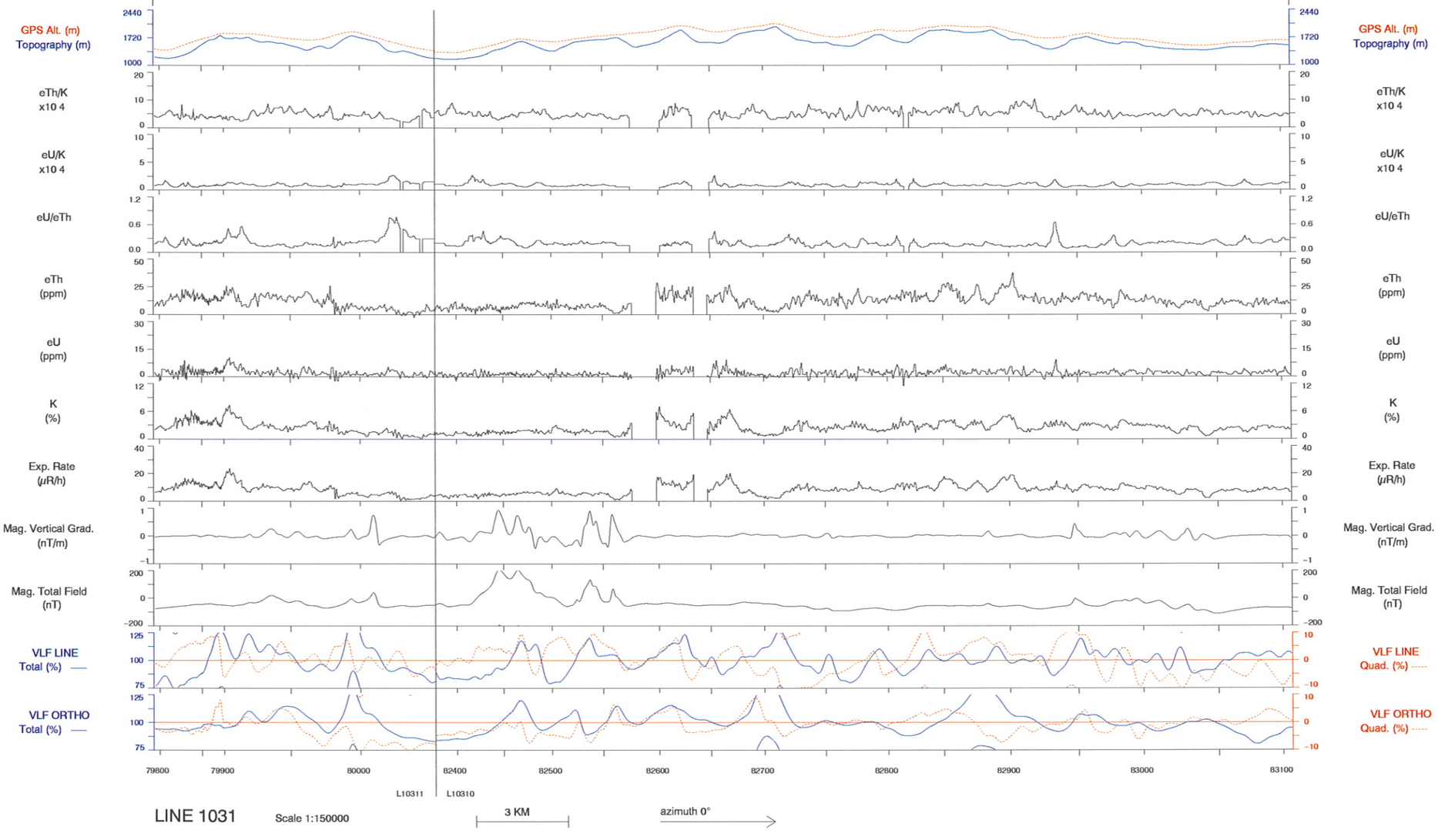
GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/2, 7

S N



LINE 1030 Scale 1:150000 3 KM azimuth 0°

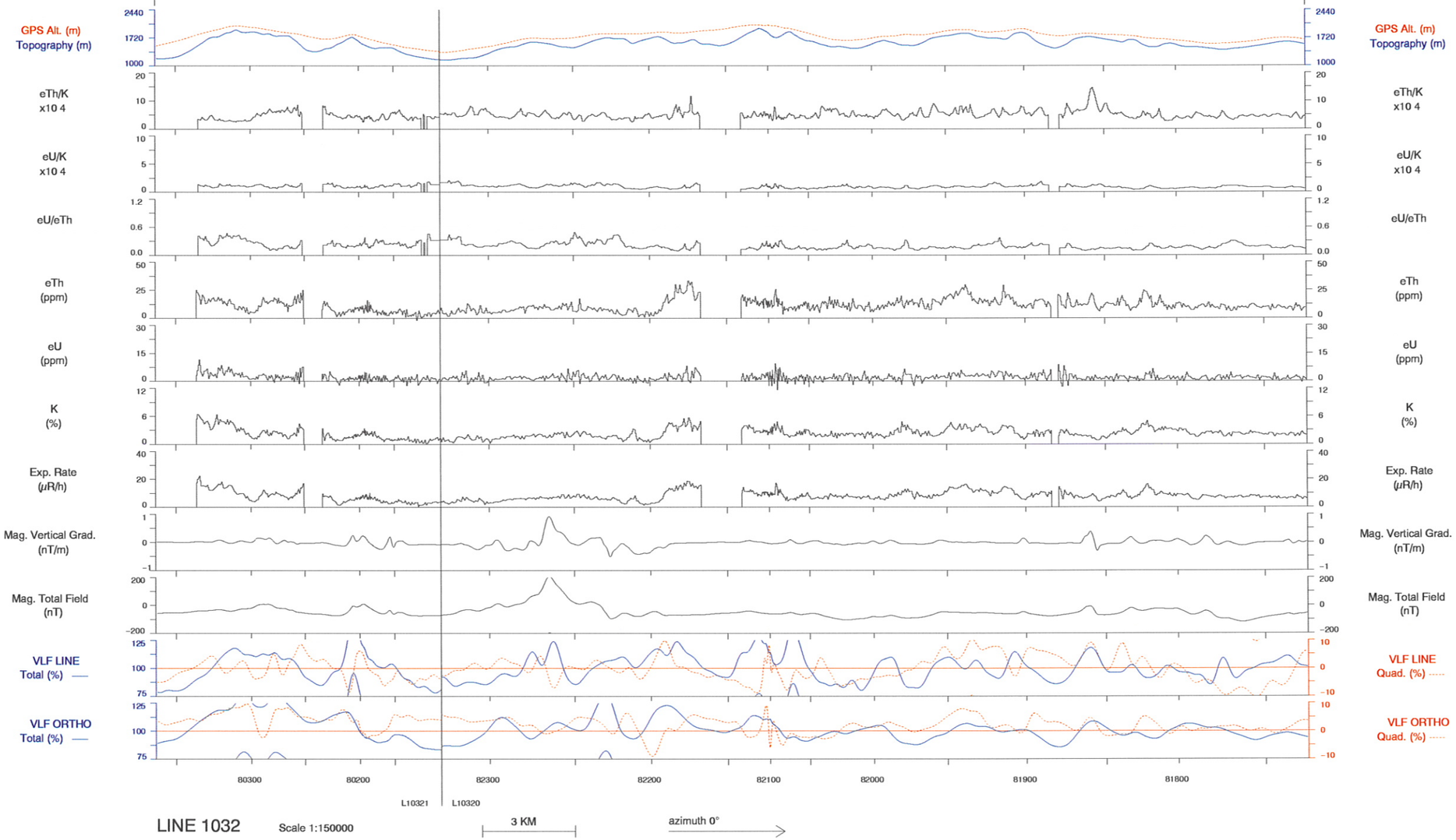
GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/2, 7



LINE 1031 Scale 1:150000 3 KM azimuth 0°

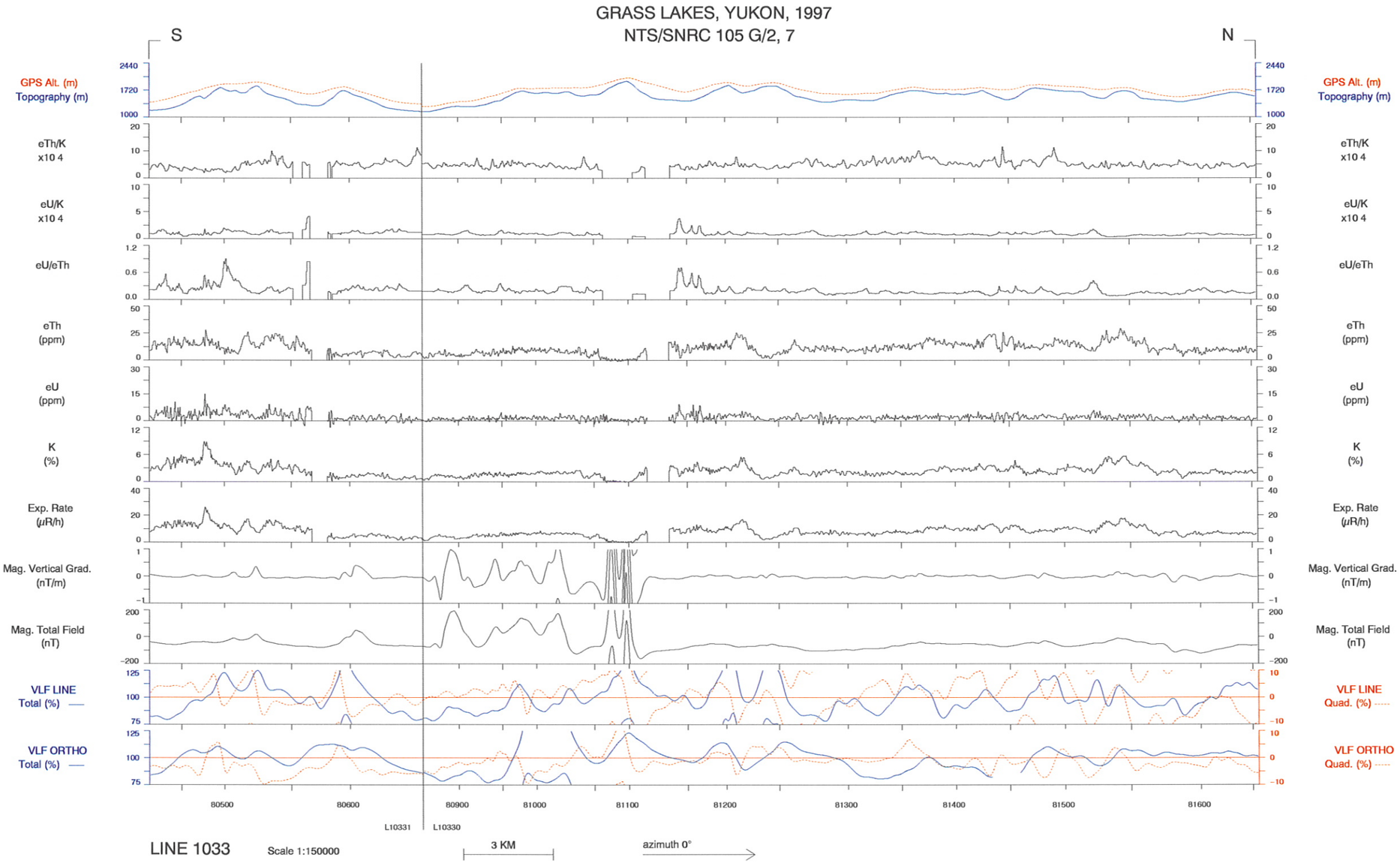
GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/2, 7

S N



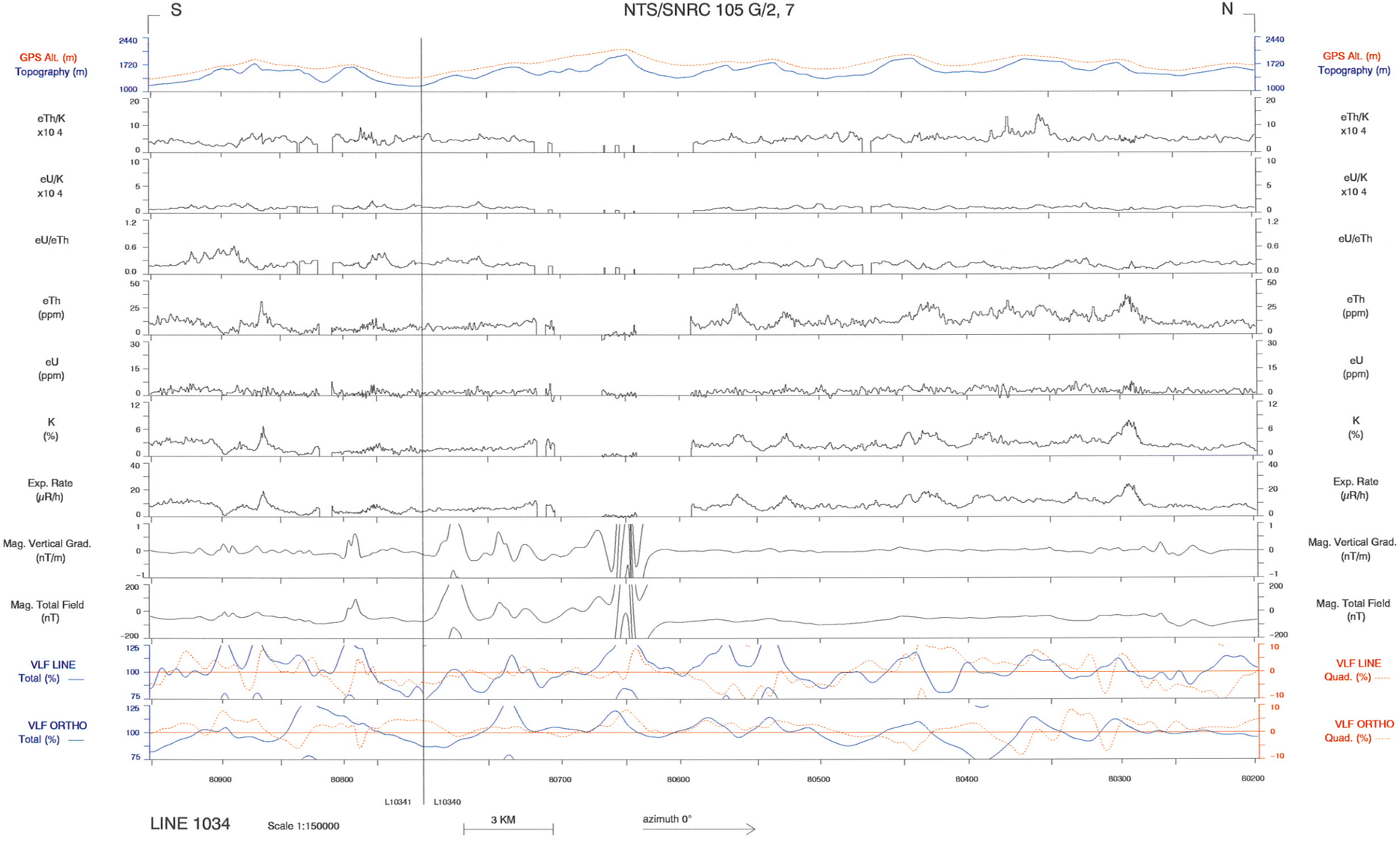
LINE 1032 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/2, 7



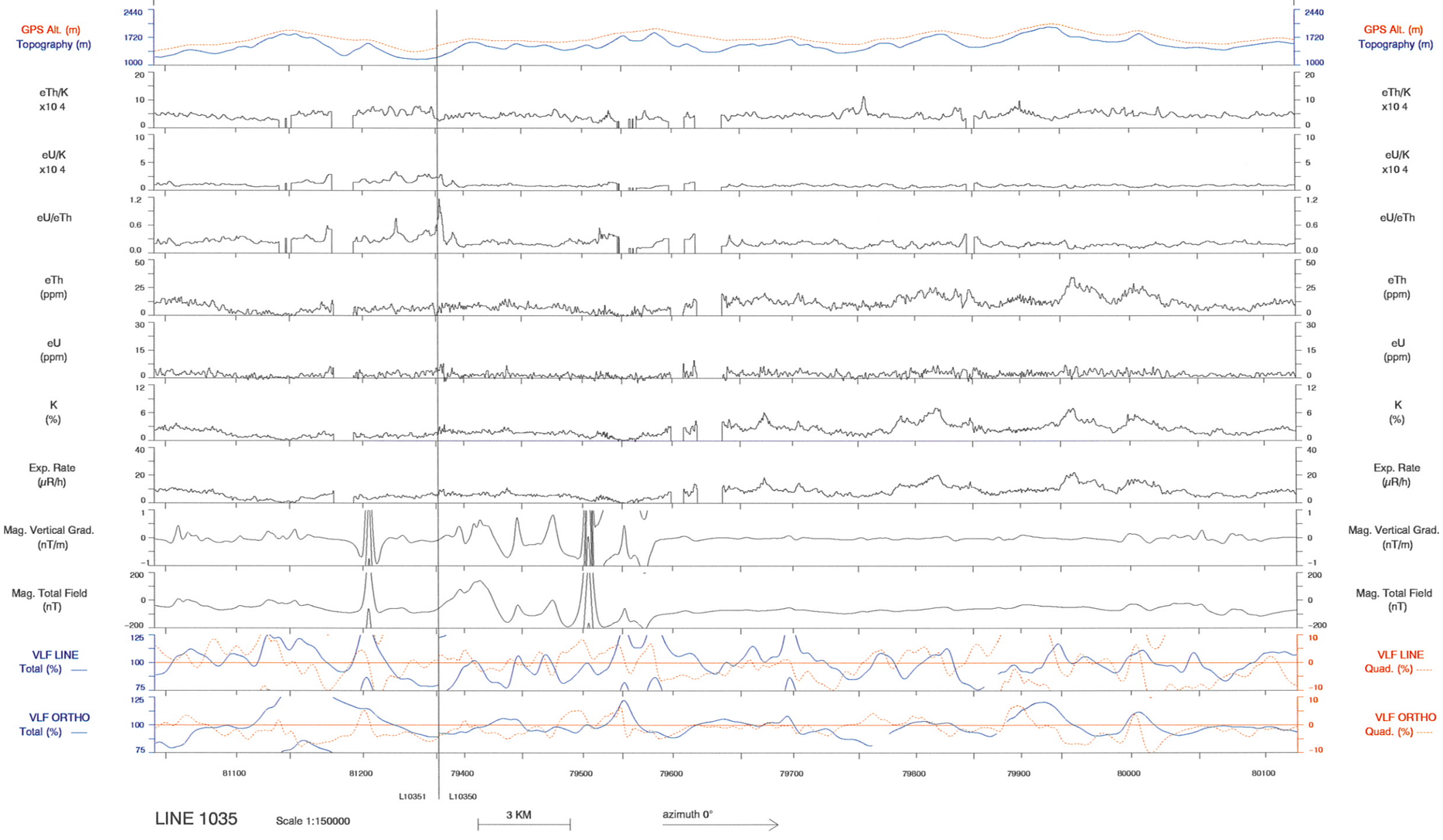
LINE 1033 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/2, 7



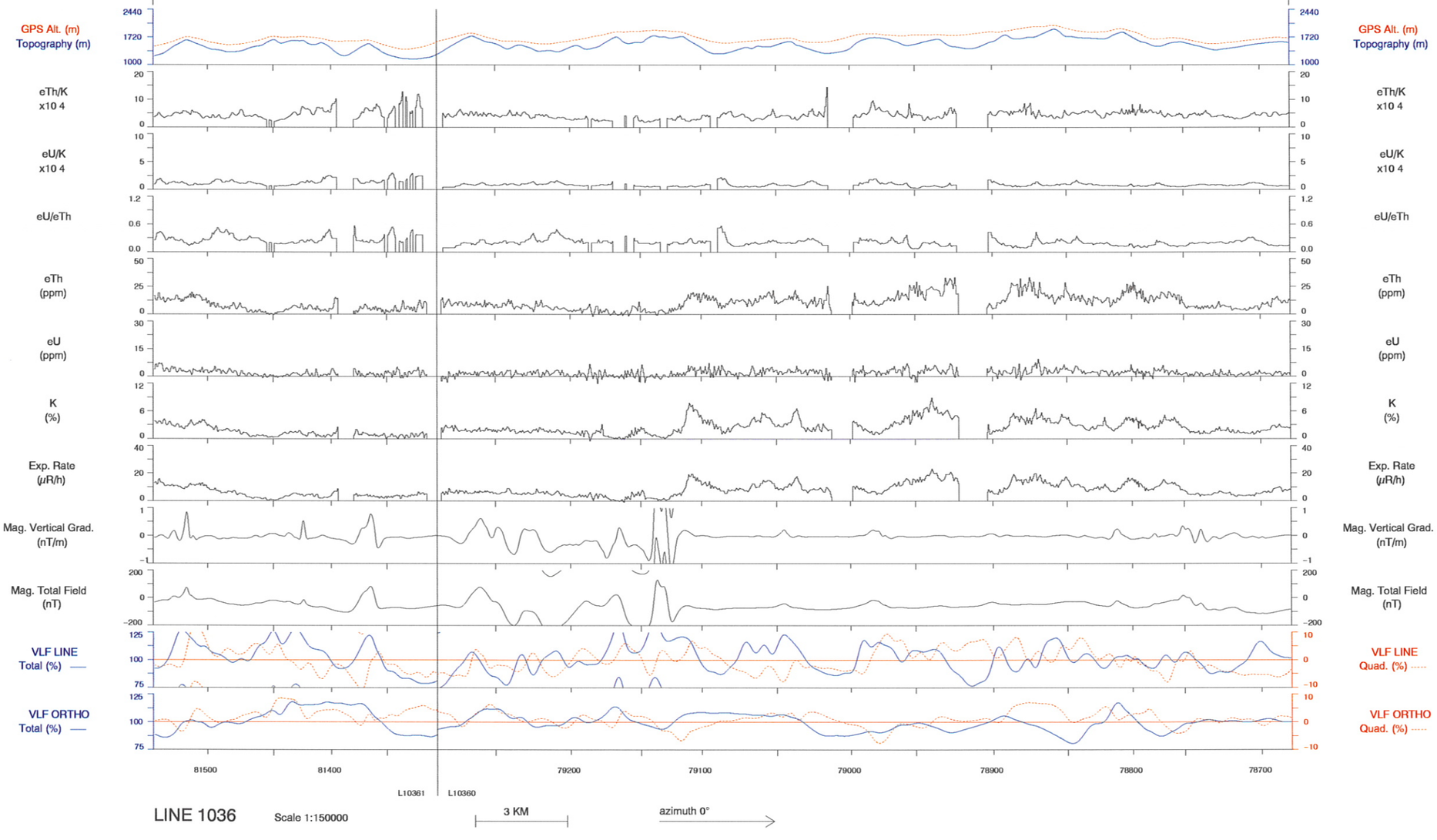
LINE 1034 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/2, 7



LINE 1035 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/2, 7



LINE 1036 Scale 1:150000

3 KM

azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/2, 7

S N

GPS Alt. (m)
Topography (m)

eTh/K x10 4

eU/K x10 4

eU/eTh

eTh (ppm)

eU (ppm)

K (%)

Exp. Rate (μR/h)

Mag. Vertical Grad. (nT/m)

Mag. Total Field (nT)

VLF LINE Total (%) —— Quad. (%) -----

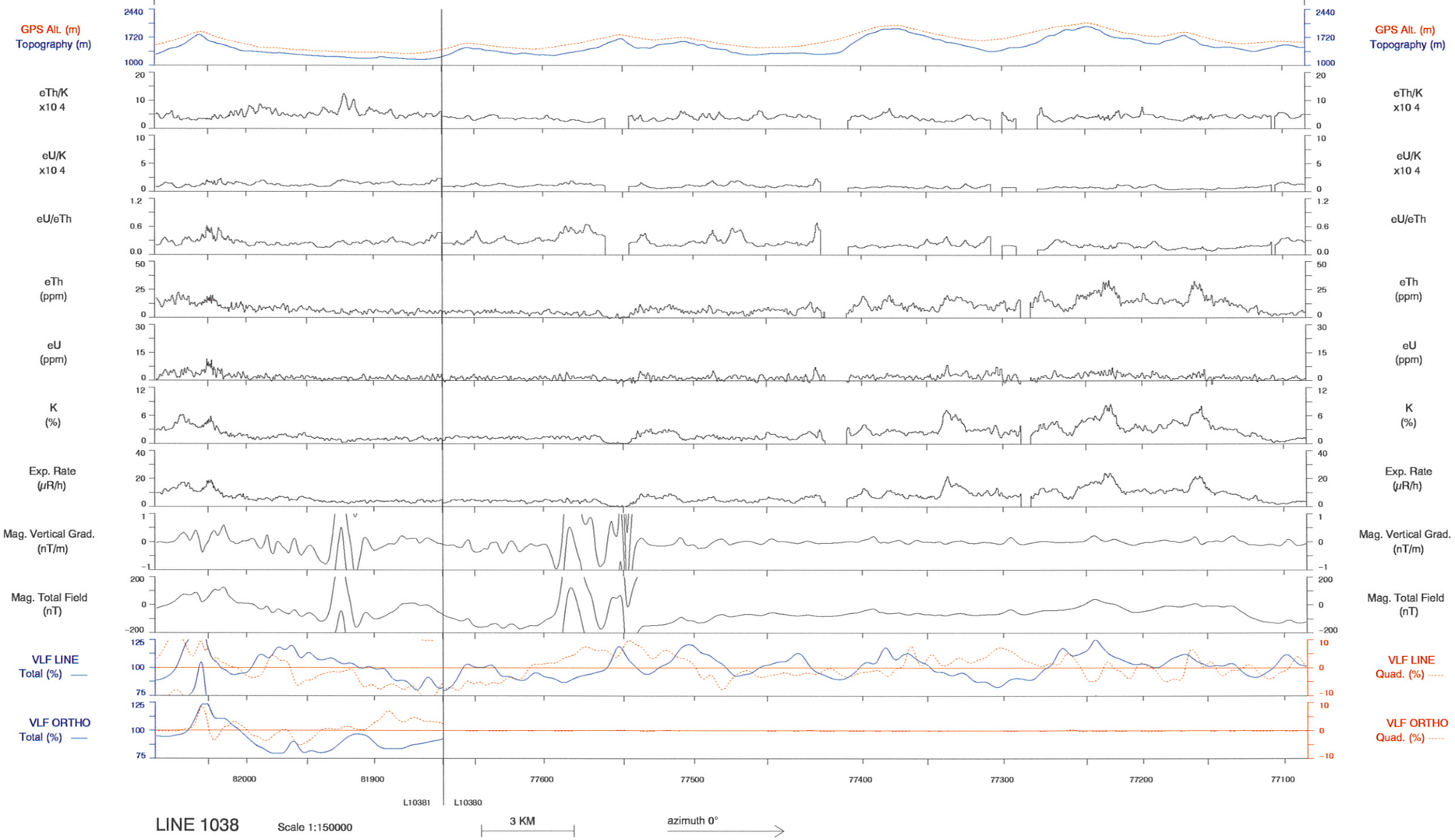
VLF ORTHO Total (%) —— Quad. (%) -----

81700 81800 77800 77900 78000 78100 78200 78300 78400 78500 78600

L10371 L10370

LINE 1037 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/2, 7



LINE 1038 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/2, 7

S

N

GPS Alt. (m)
Topography (m)

eTh/K
x10 4

eU/K
x10 4

eU/eTh

eTh
(ppm)

eU
(ppm)

K
(%)

Exp. Rate
(μR/h)

Mag. Vertical Grad.
(nT/m)

Mag. Total Field
(nT)

VLF LINE
Total (%) ——

VLF ORTHO
Total (%) ——

VLF LINE
Quad. (%) -----

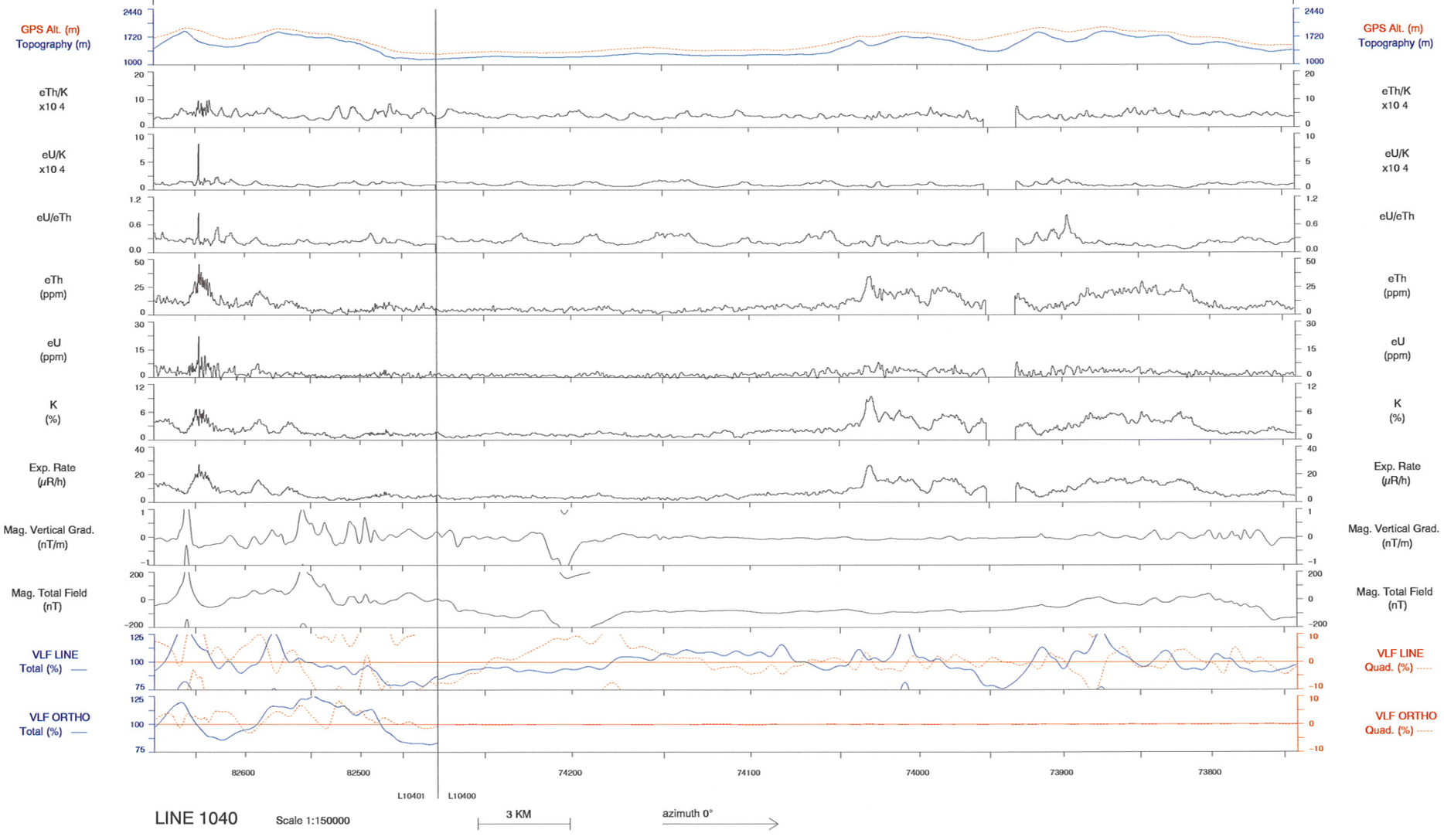
VLF ORTHO
Quad. (%) -----

82200 82300 74400 74500 74600 74700 74800 74900 75000 75100

L10391 L10390

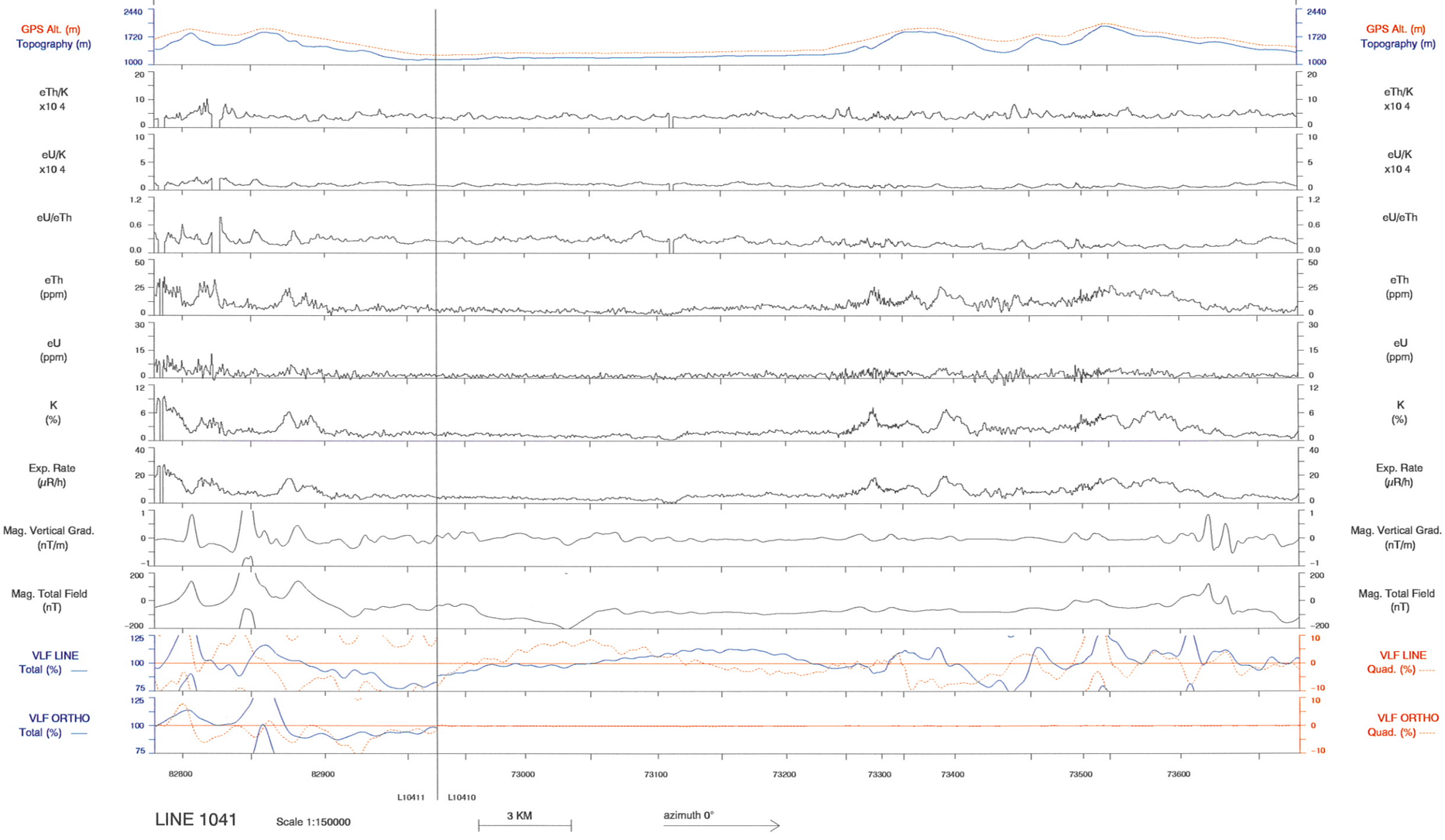
LINE 1039 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/2, 7



LINE 1040 Scale 1:150000 3 KM azimuth 0°

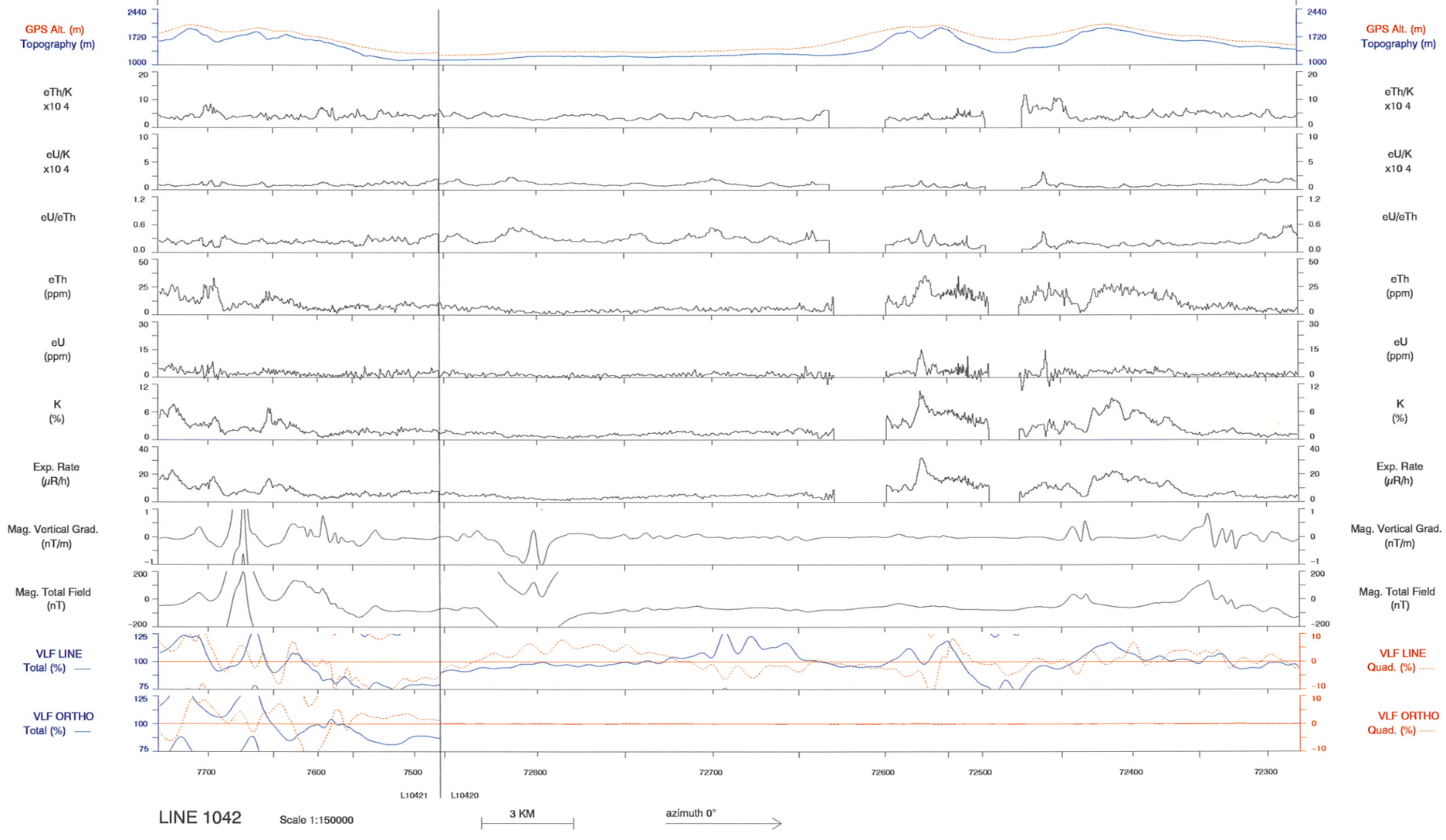
GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/2, 7



LINE 1041 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/2, 7

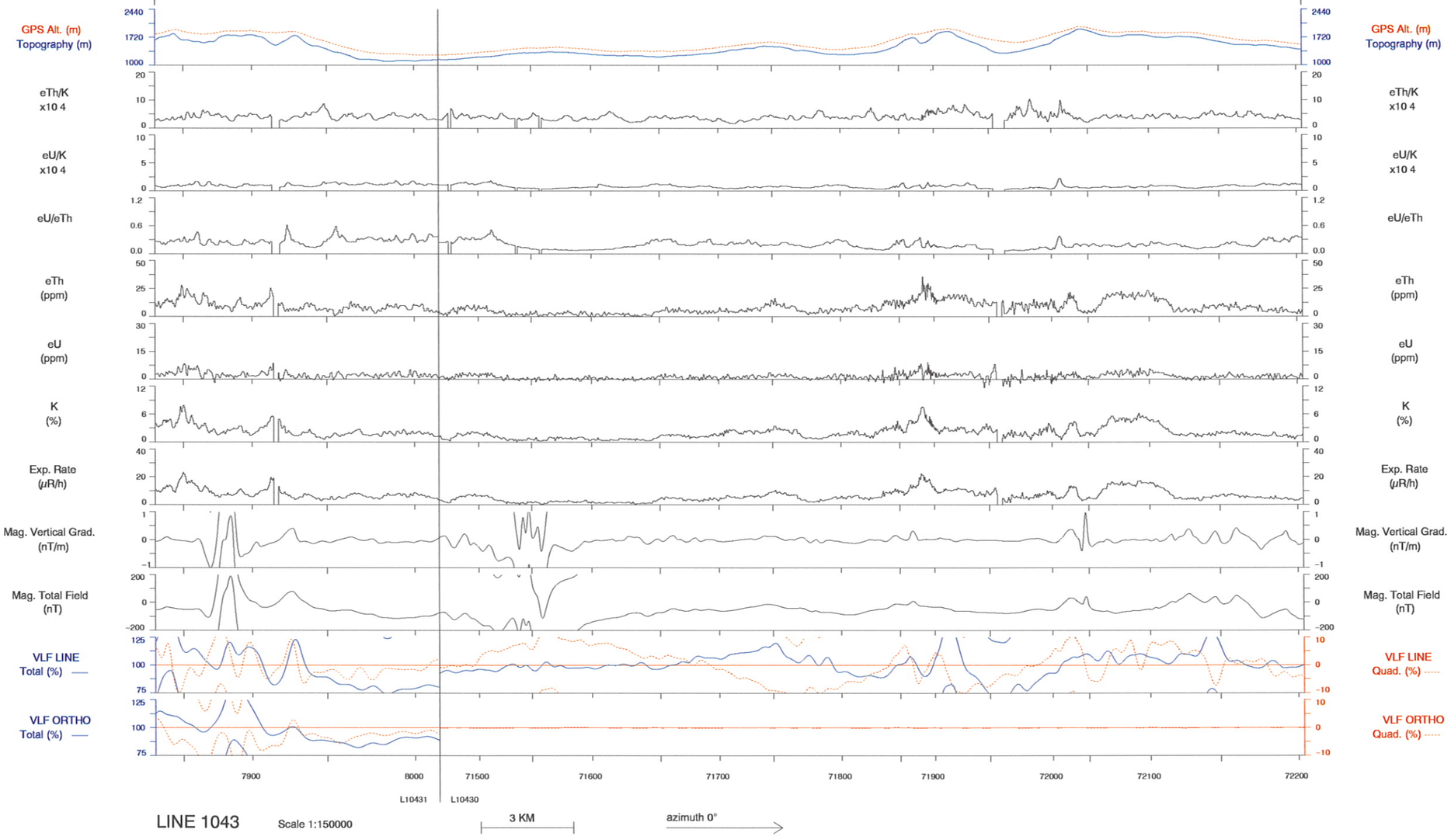
S N



LINE 1042 Scale 1:150000 3 KM azimuth 0°

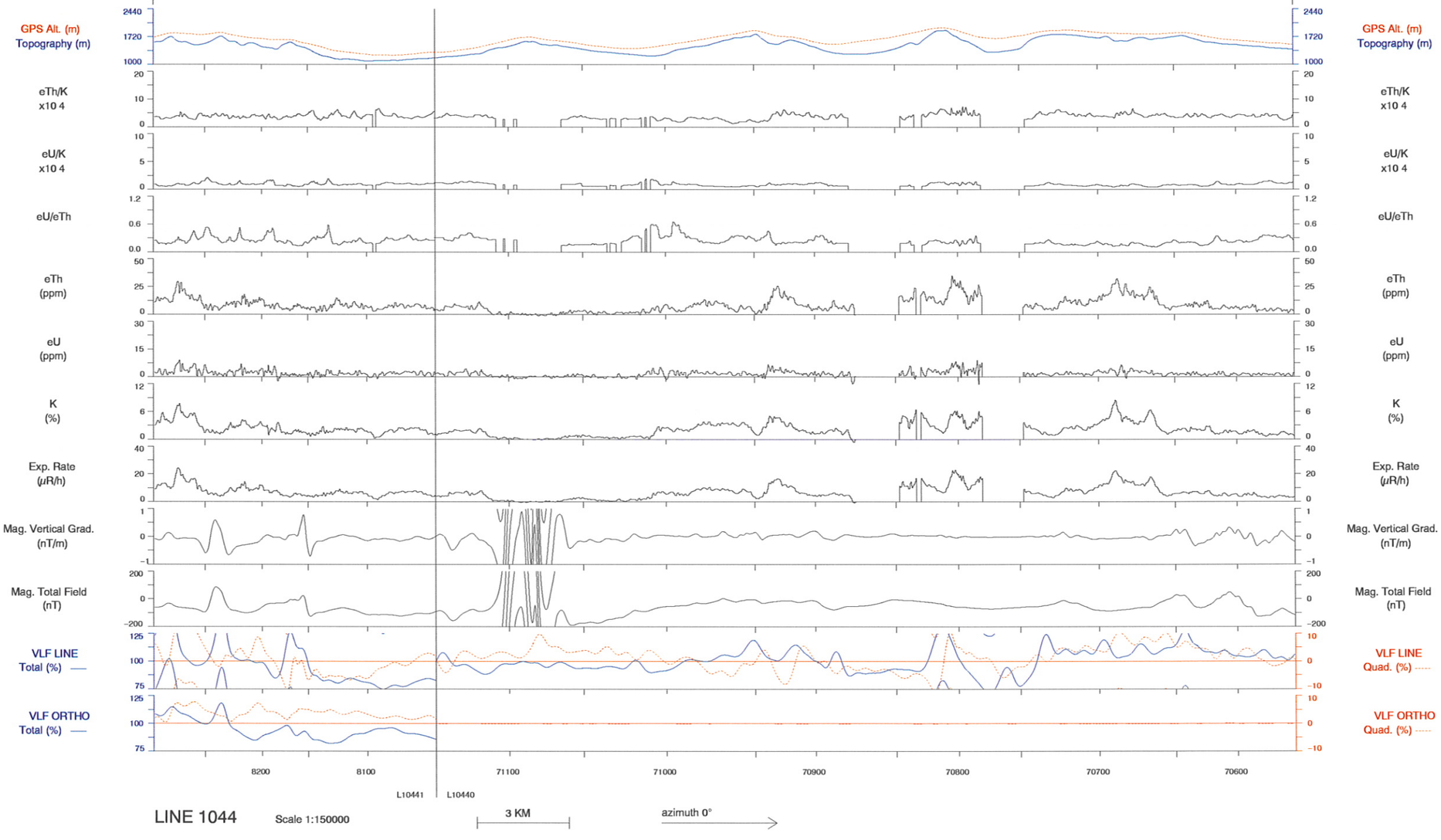
GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/2, 7

S N



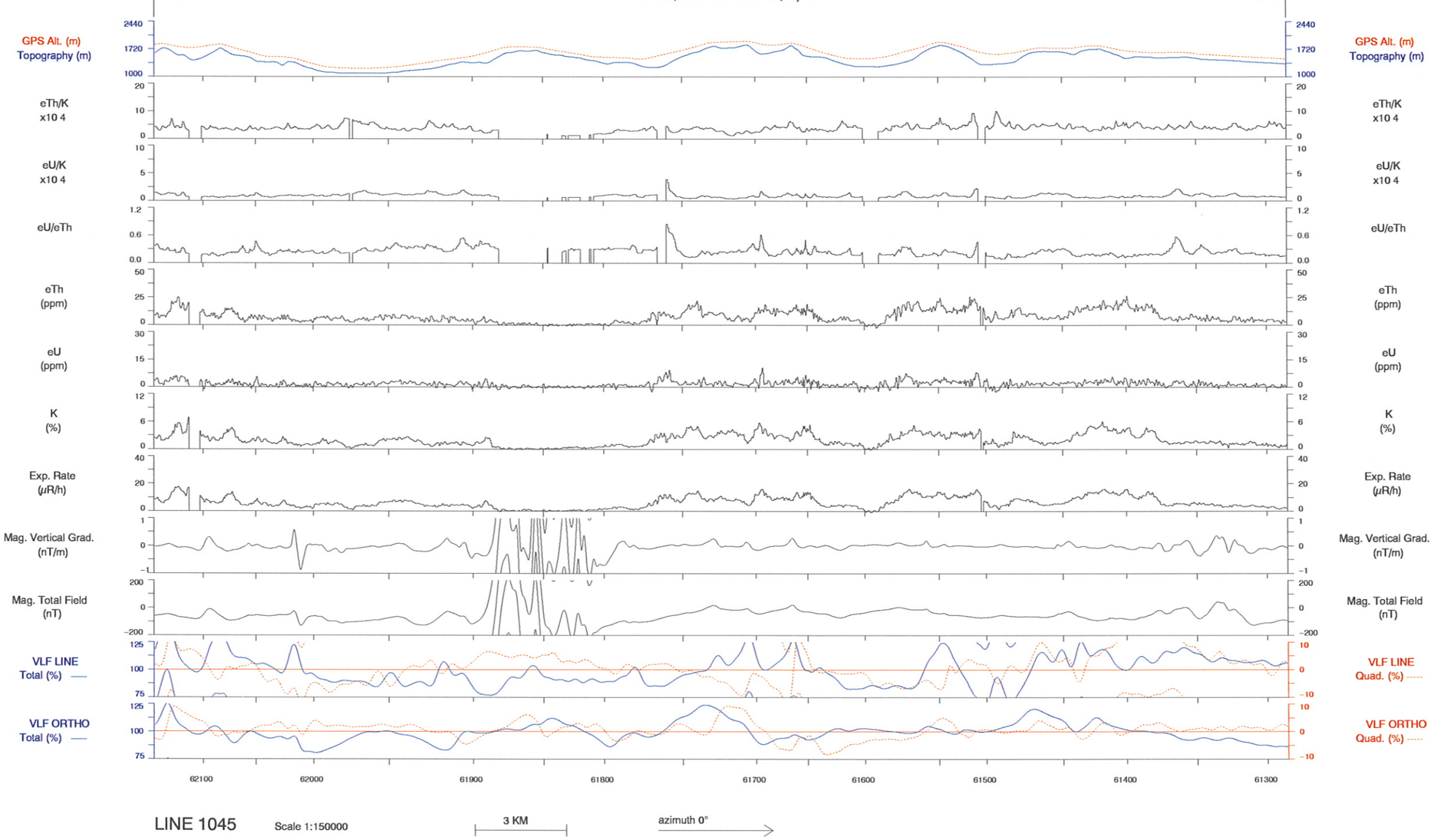
LINE 1043 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/2, 7



LINE 1044 Scale 1:150000 3 KM azimuth 0°

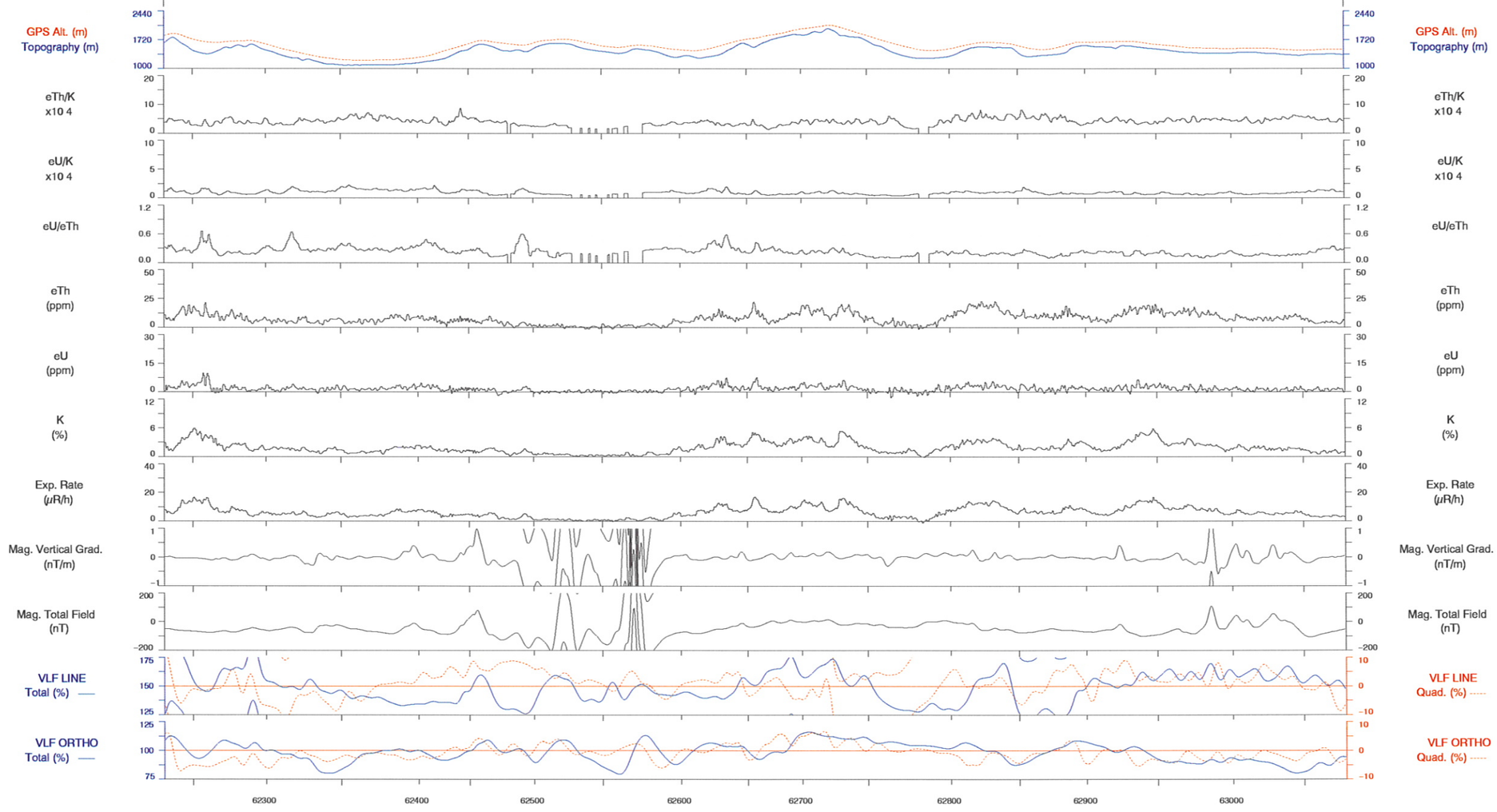
GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/2, 7



LINE 1045 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/2, 7

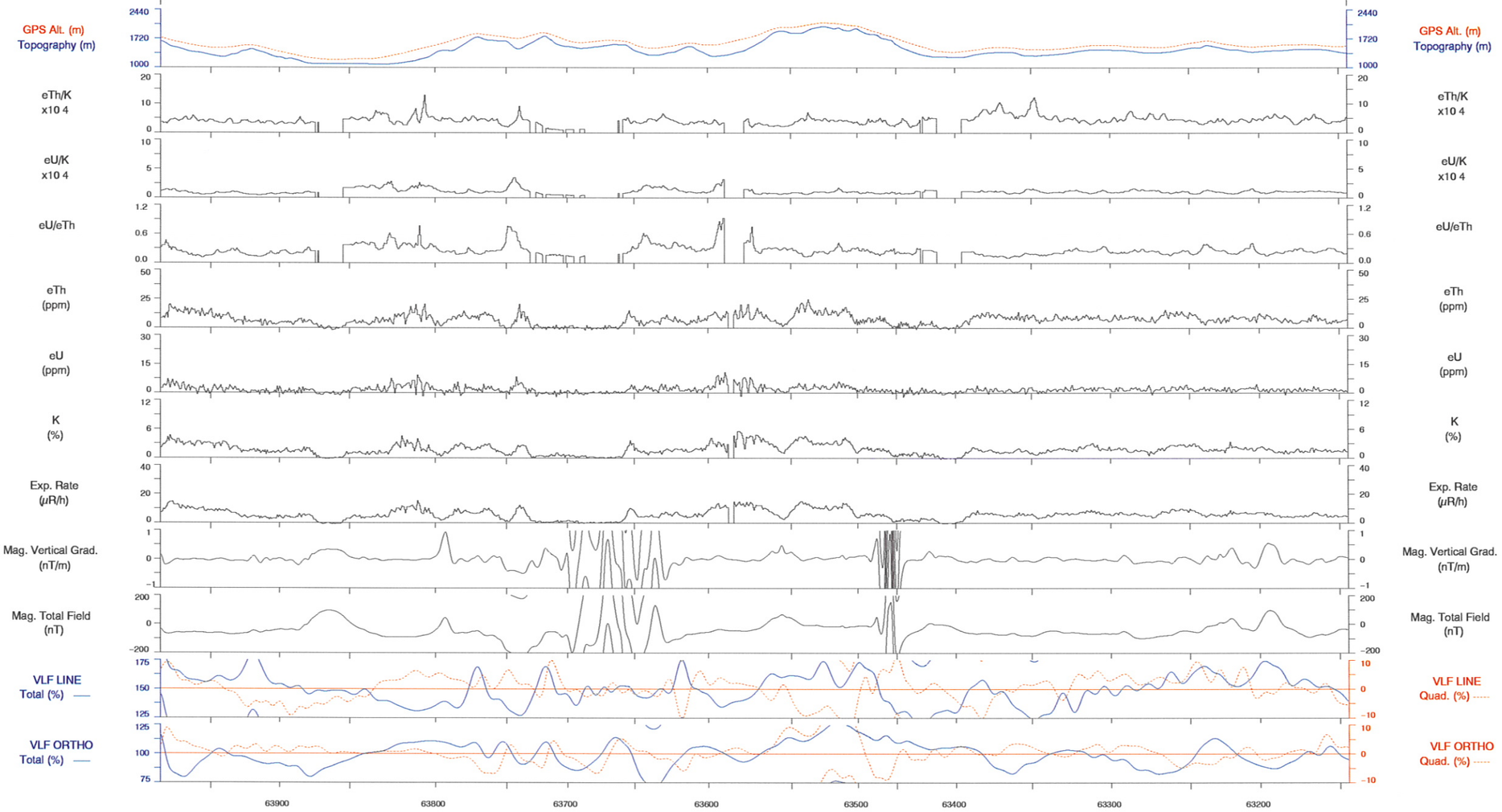
S N



LINE 1046 Scale 1:150000 3 KM azimuth 0°

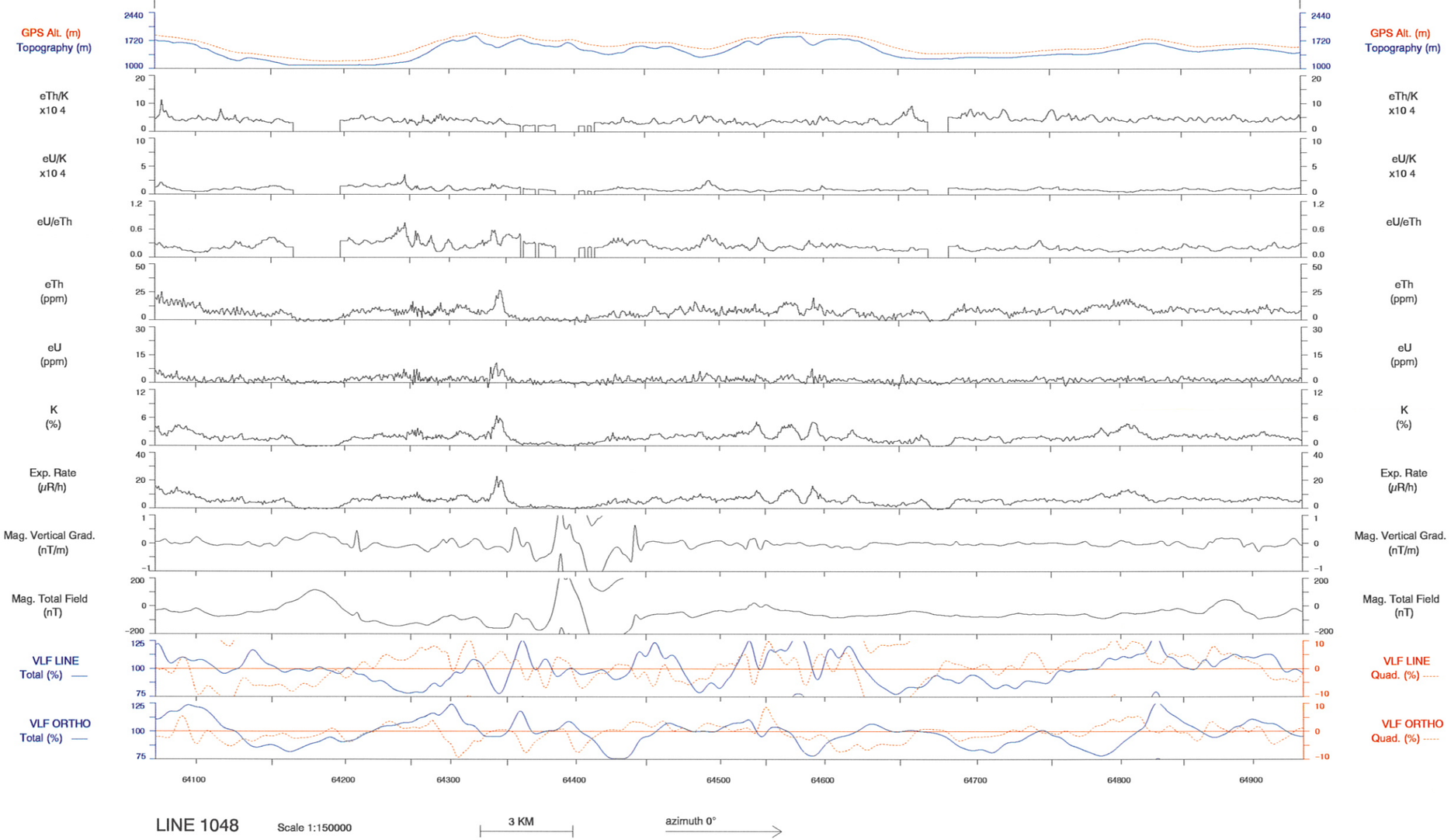
GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/2, 7

S N



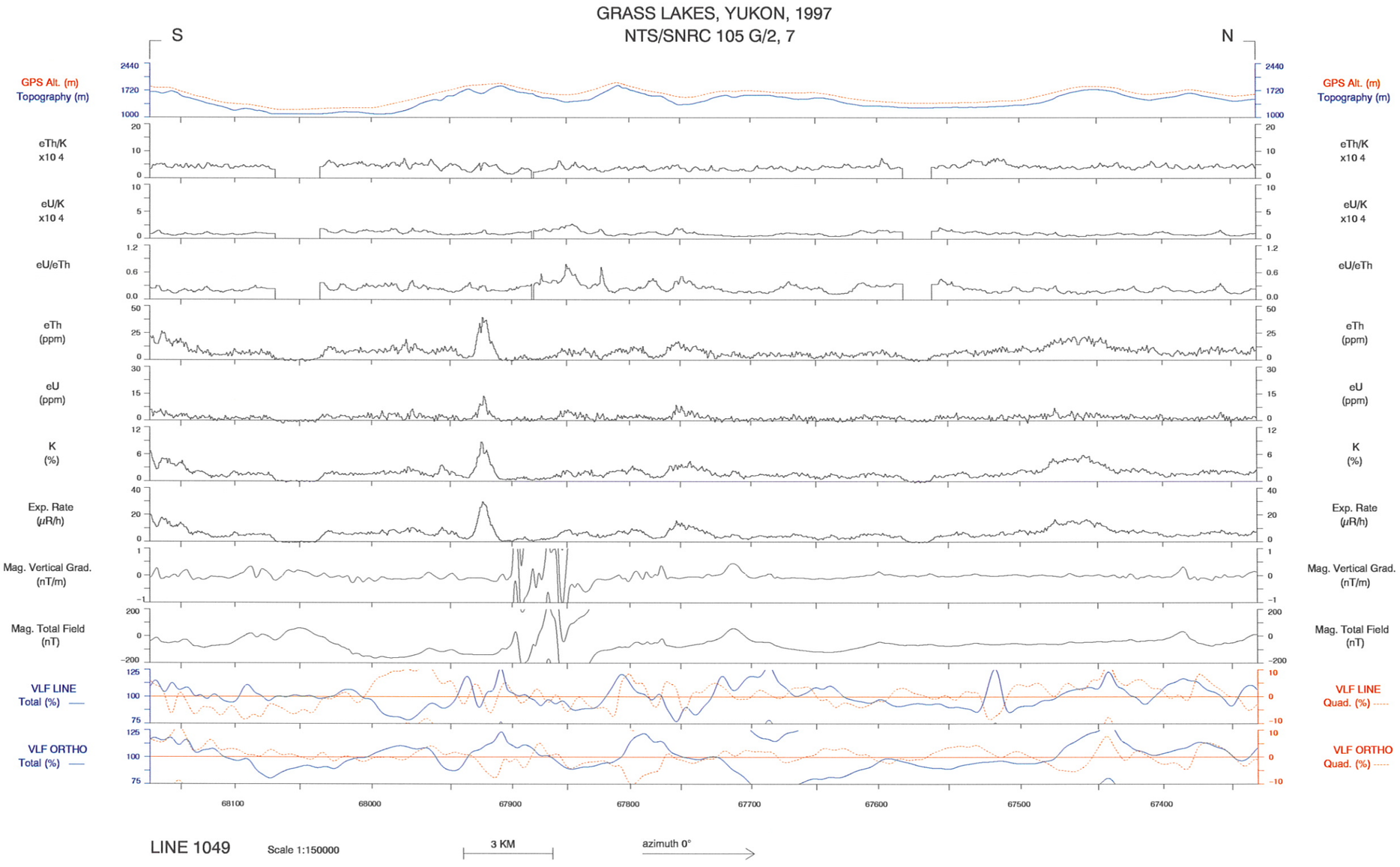
LINE 1047 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/2, 7



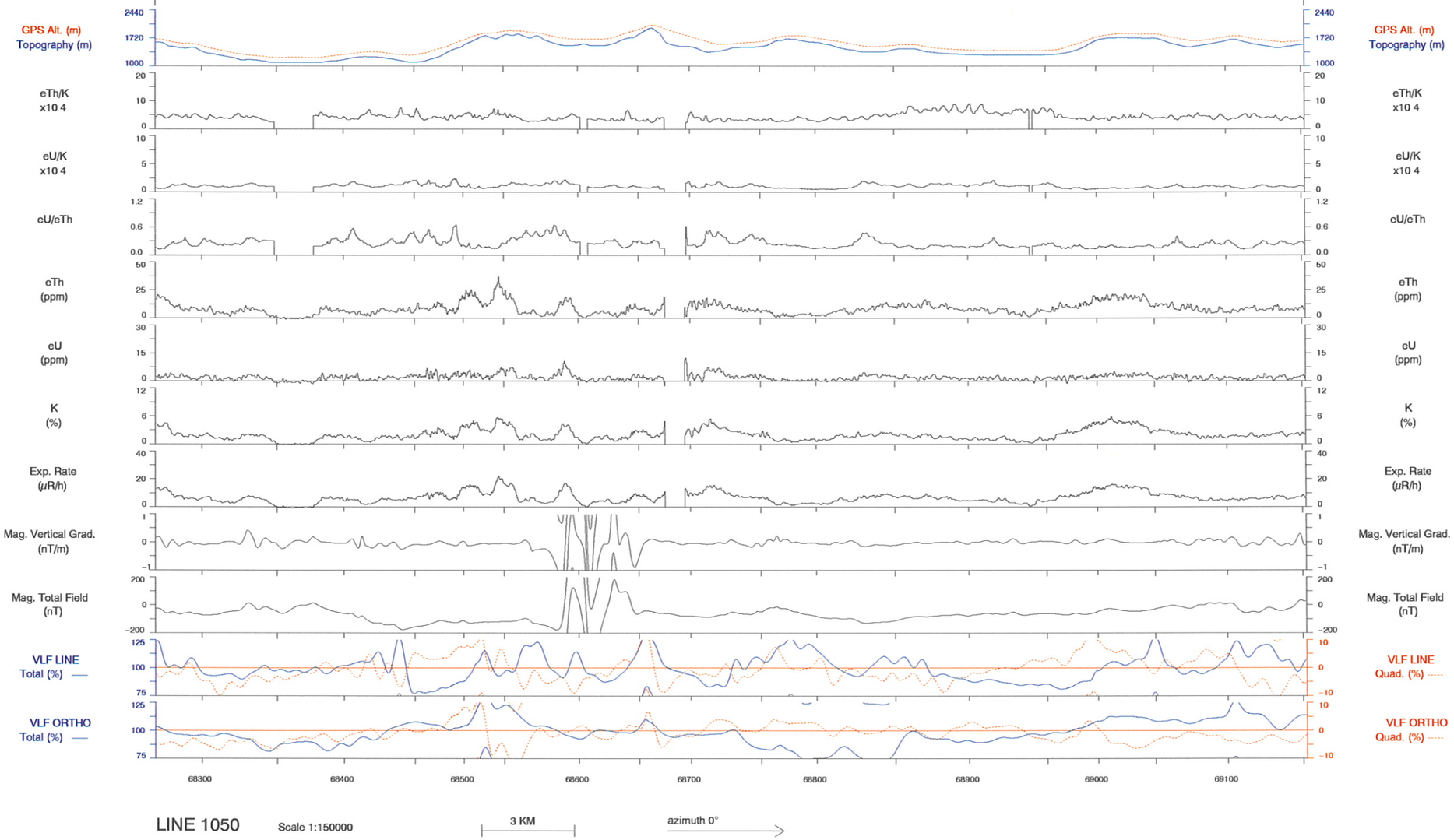
LINE 1048 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/2, 7



LINE 1049 Scale 1:150000 3 KM azimuth 0°

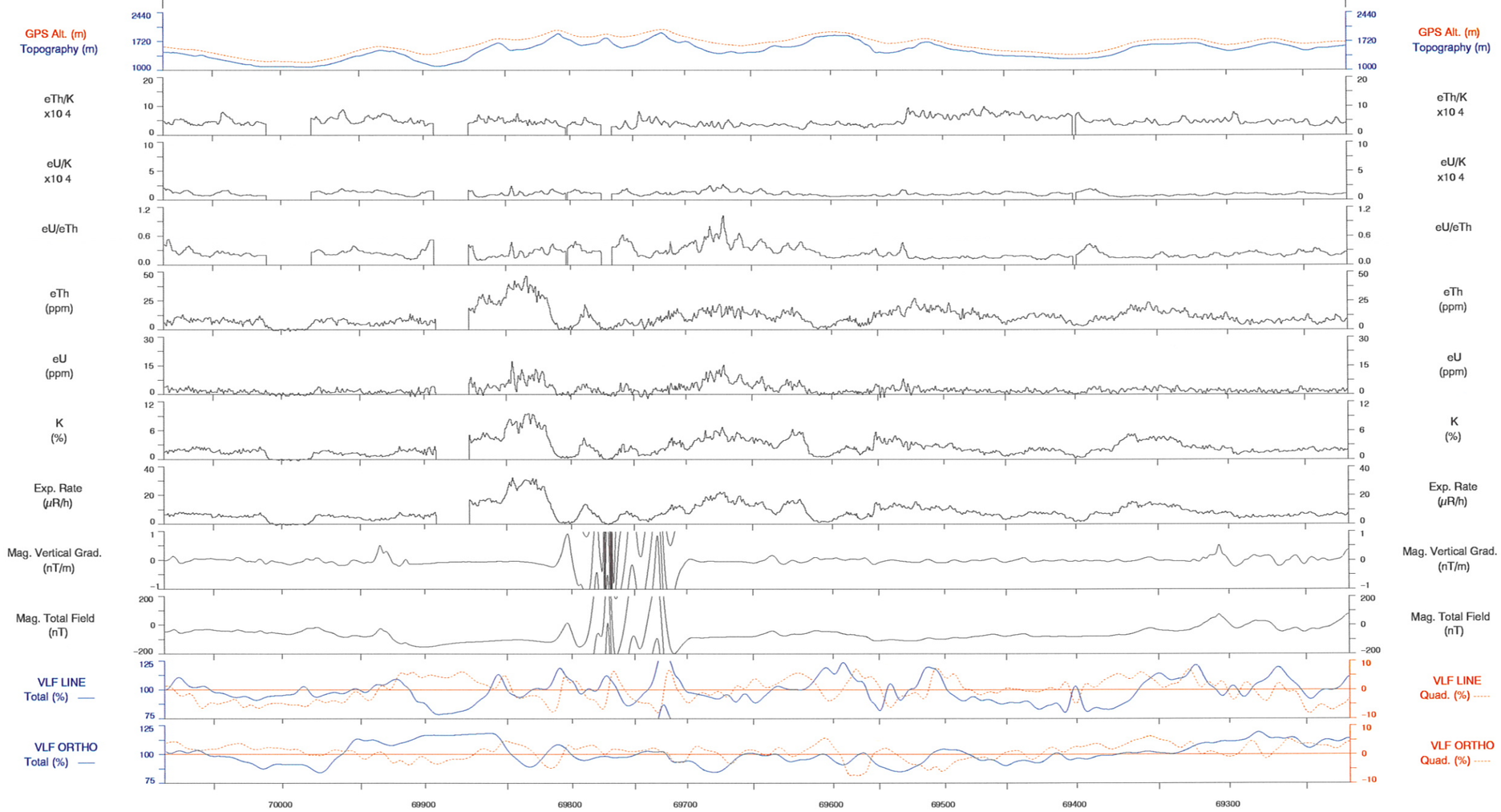
GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/2, 7



LINE 1050 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/2, 7

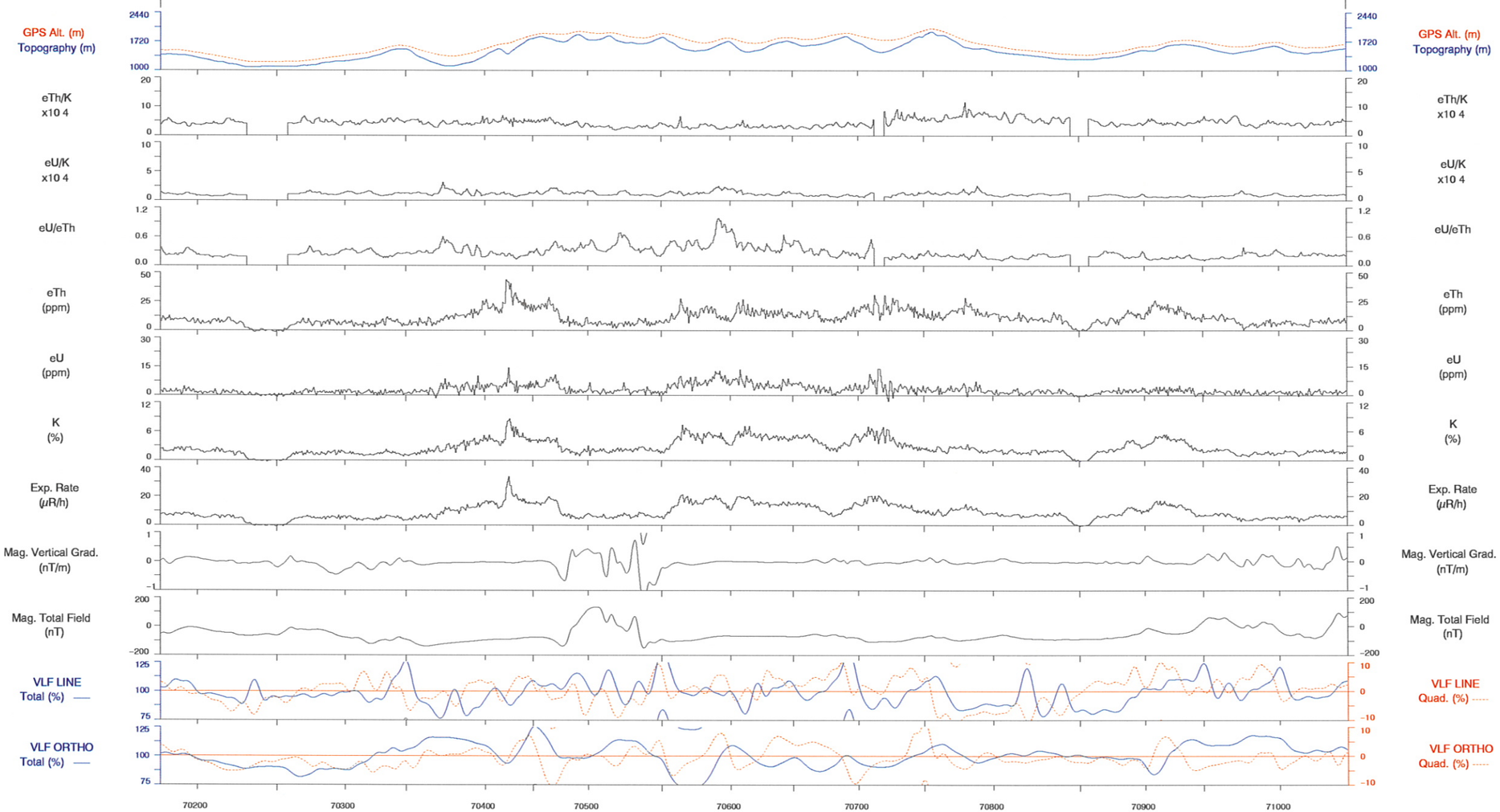
S N



LINE 1051 Scale 1:150000 3 KM azimuth 0°

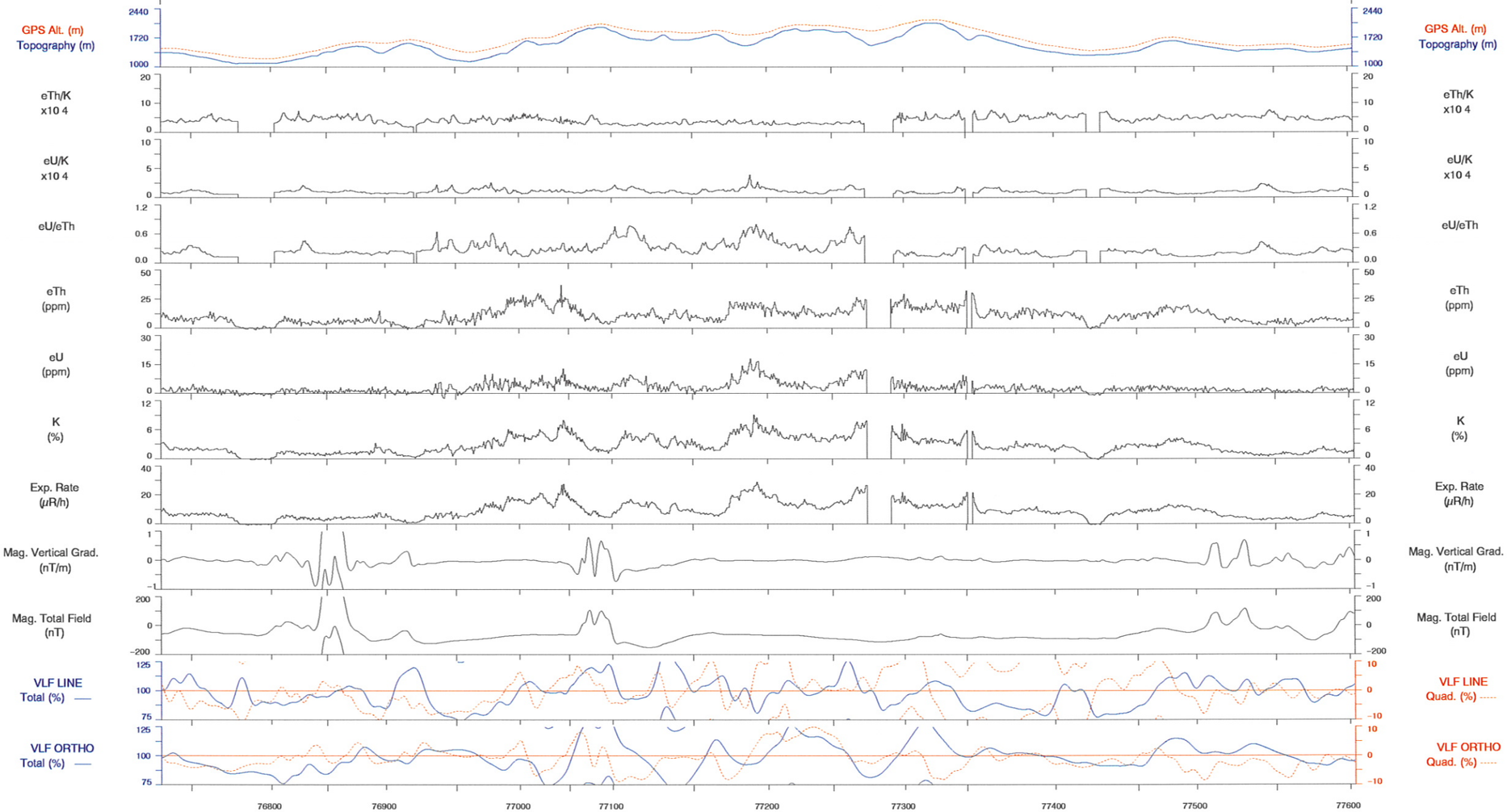
GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/2, 7

S N



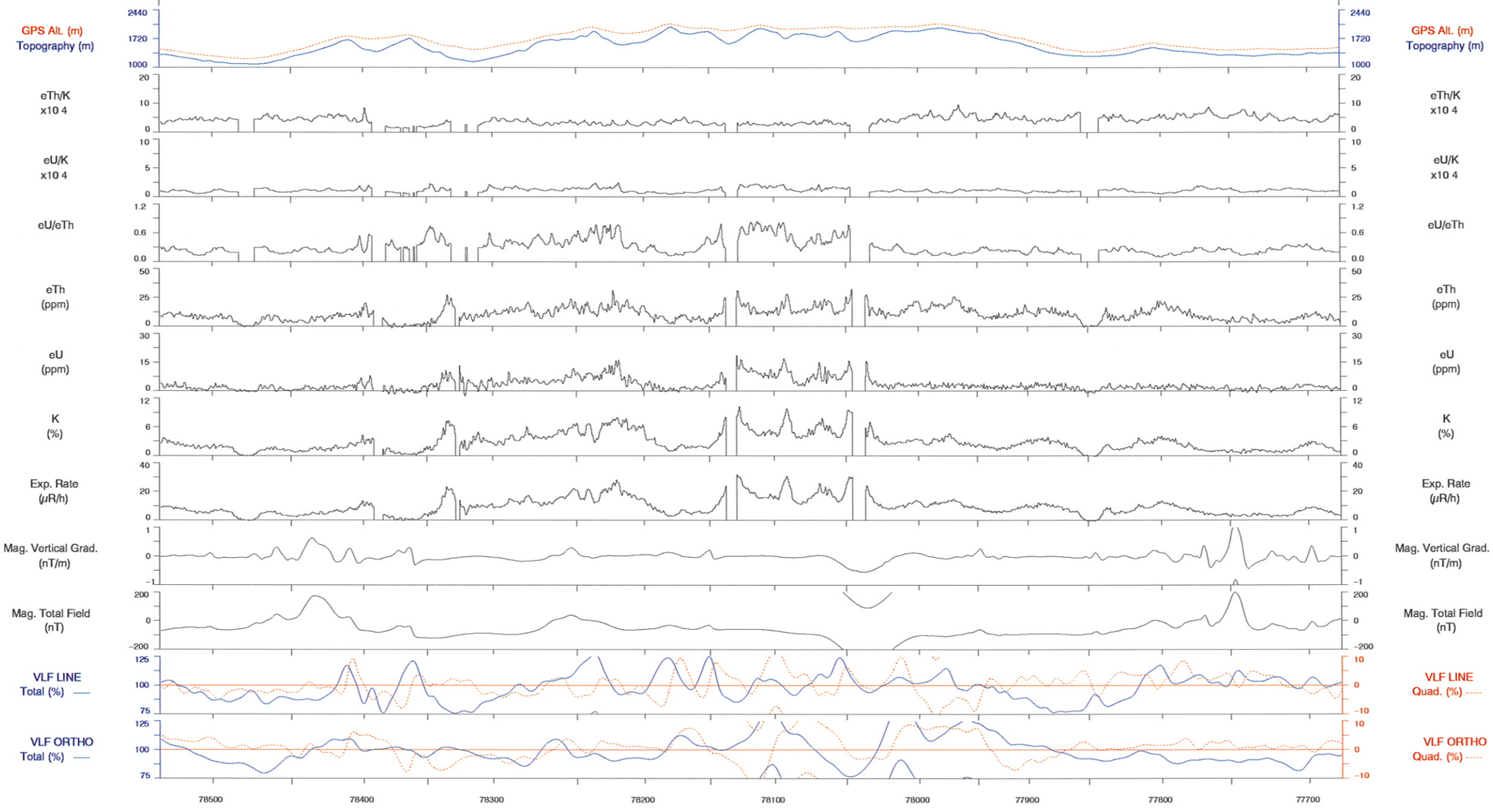
LINE 1052 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/2, 7



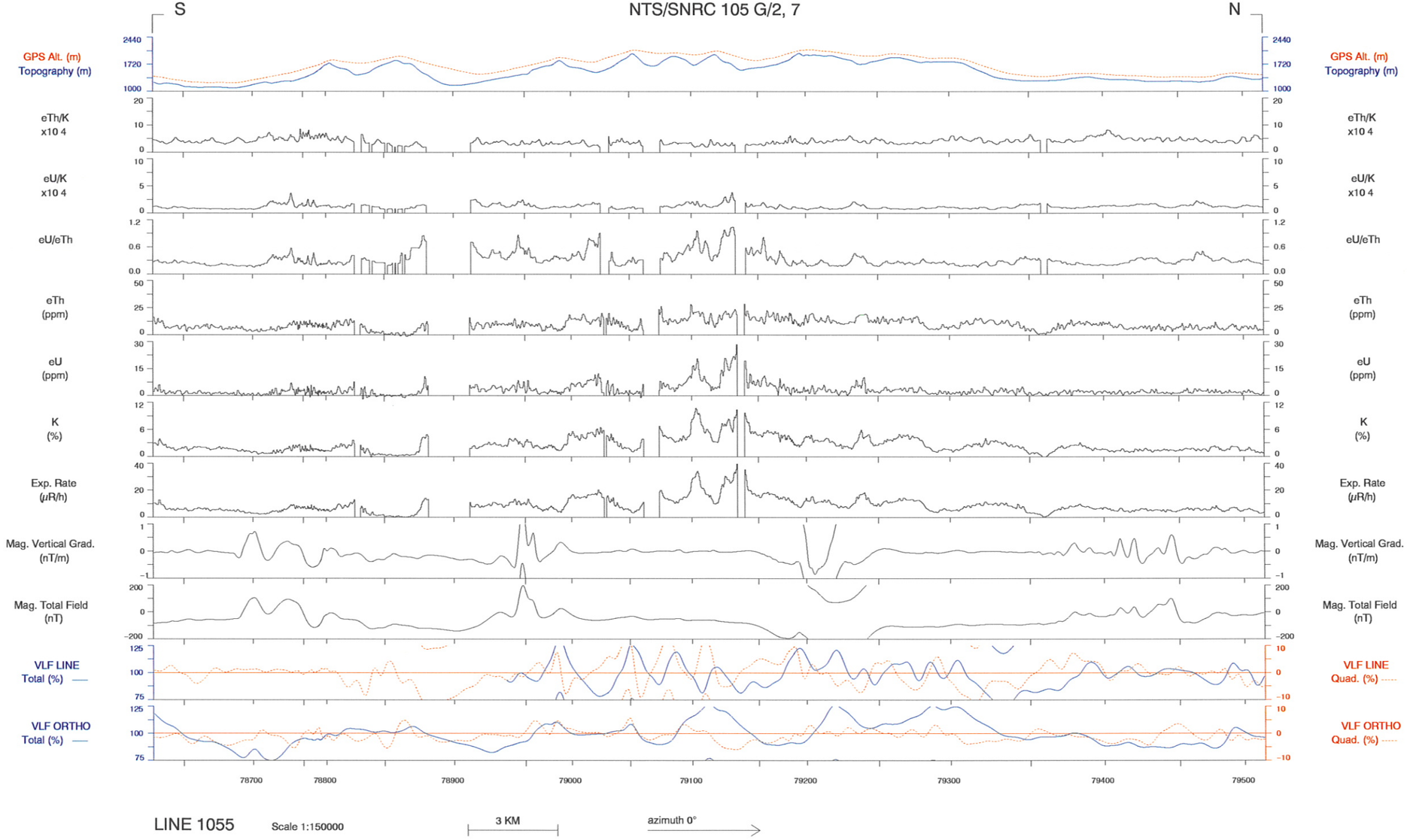
LINE 1053 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/2, 7



LINE 1054 Scale 1:150000 3 KM azimuth 0°

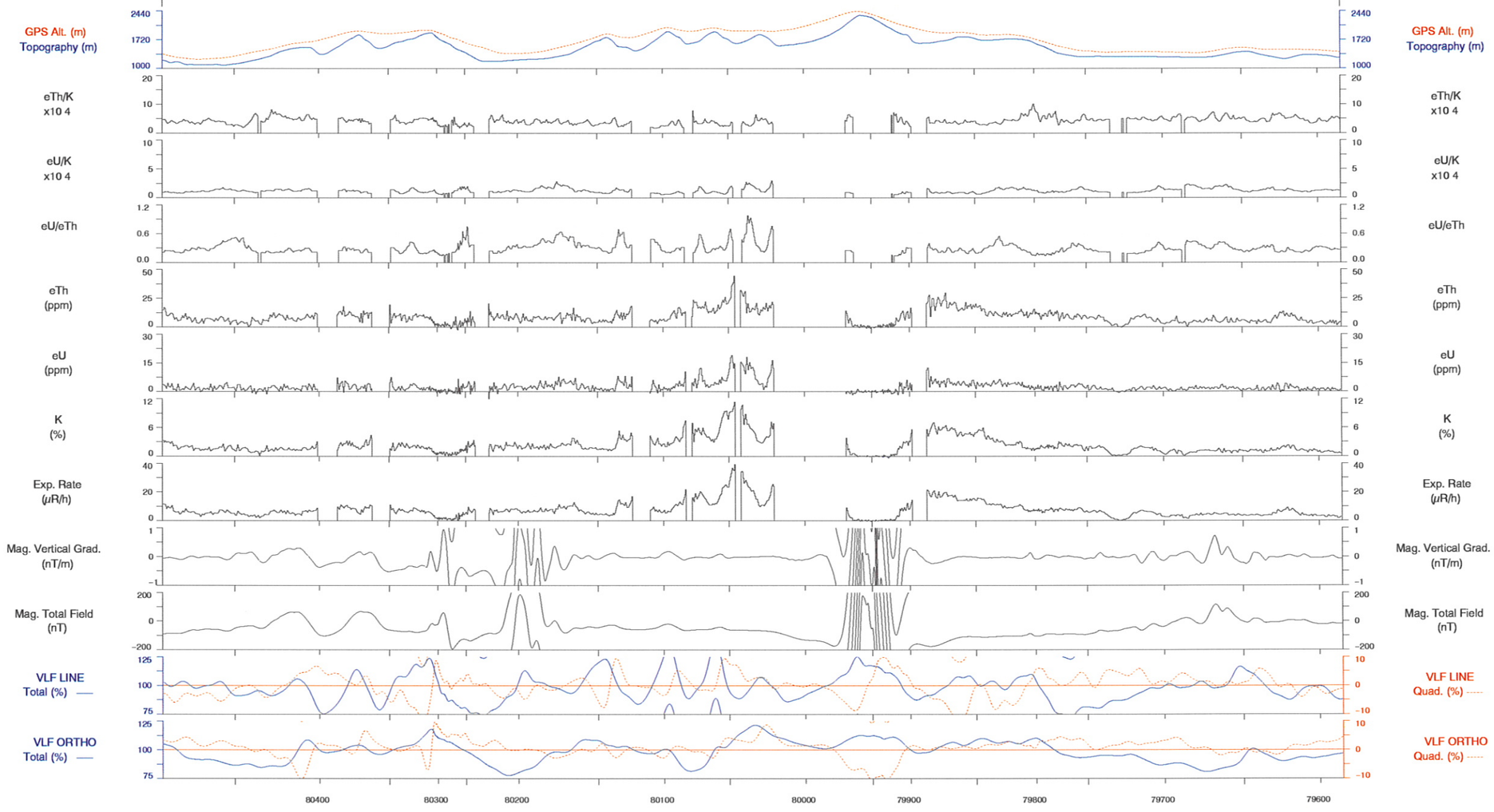
GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/2, 7



LINE 1055 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/2, 7

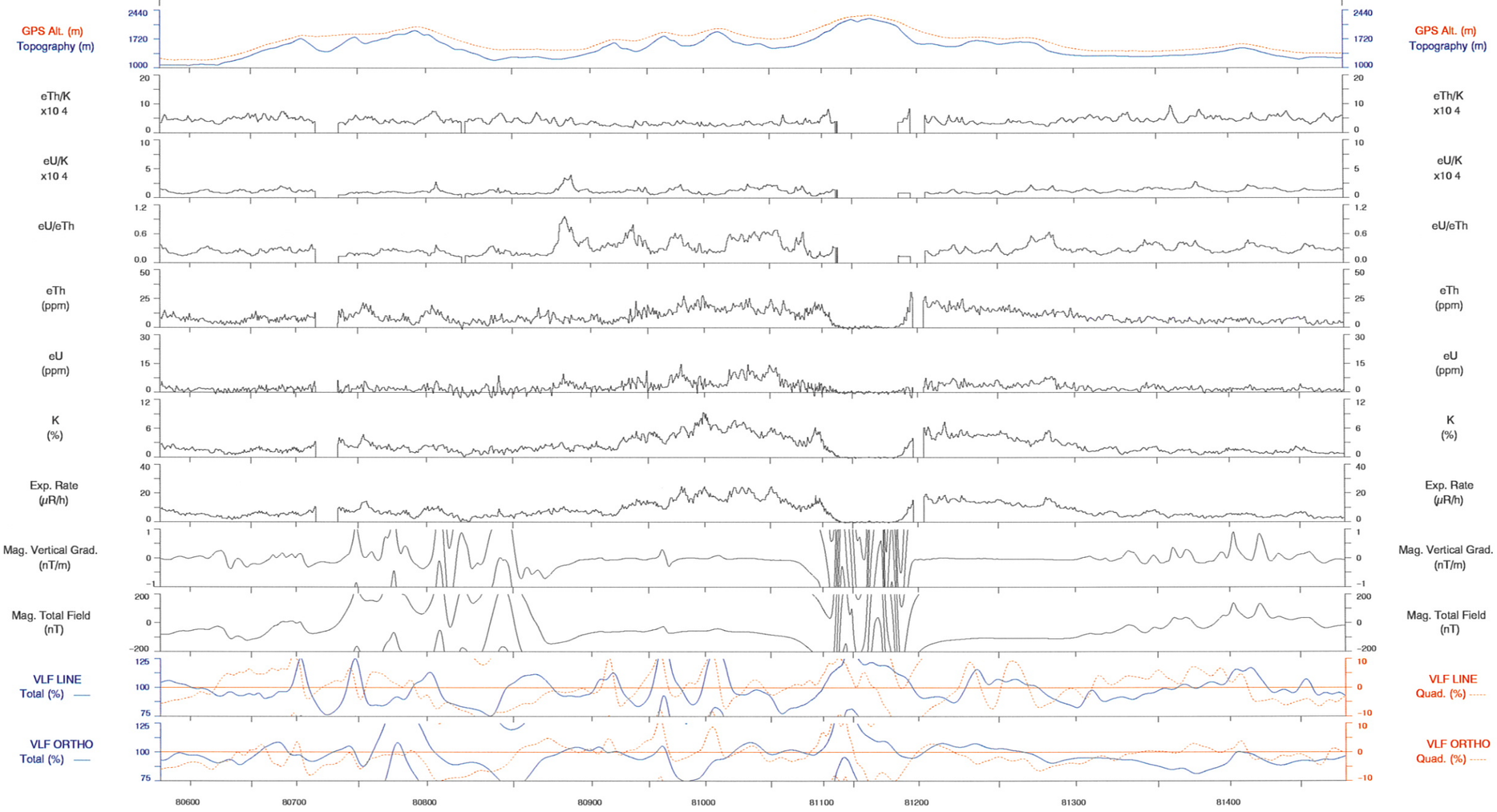
S N



LINE 1056 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/2, 8

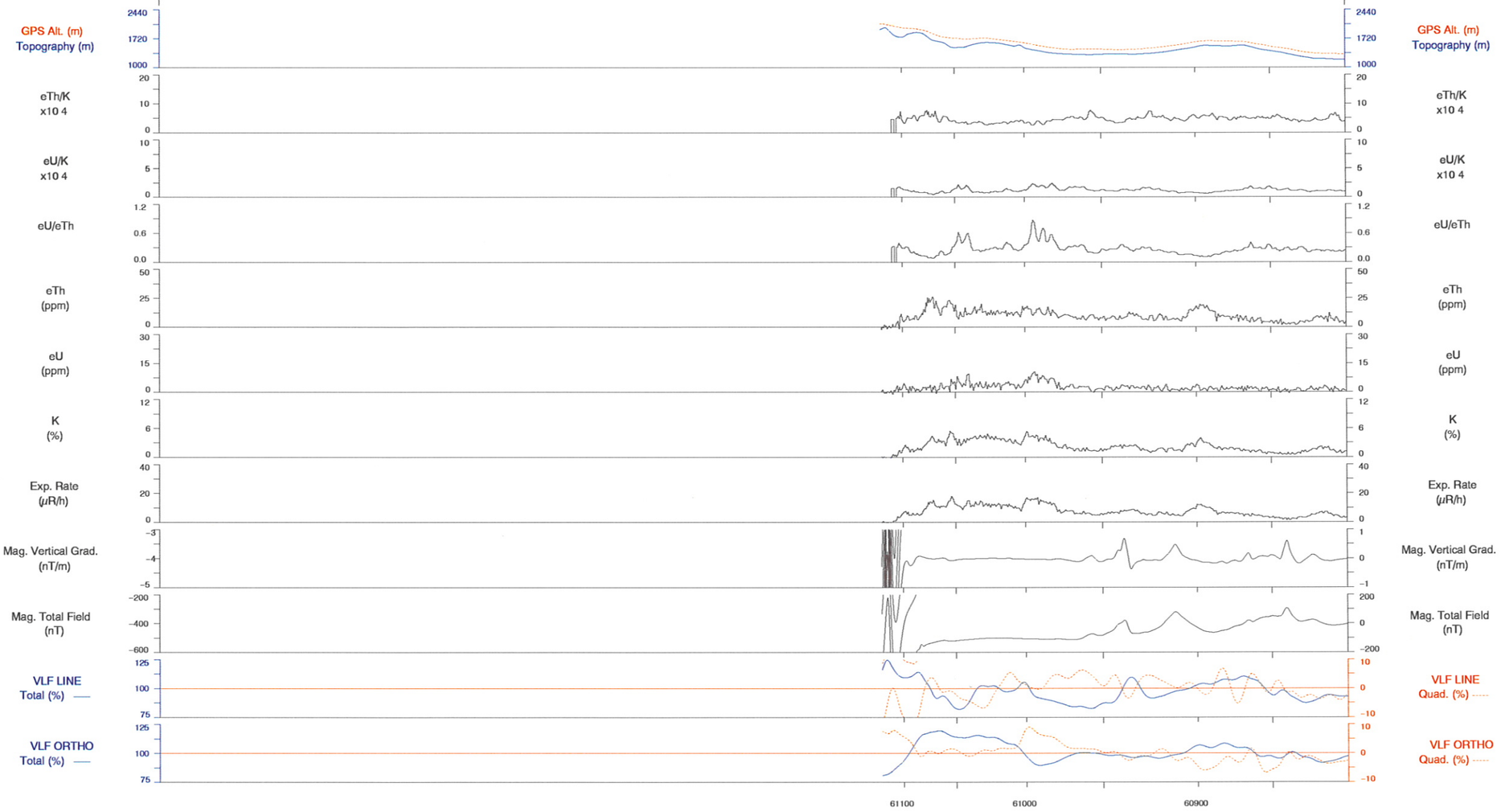
S N



LINE 1057 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

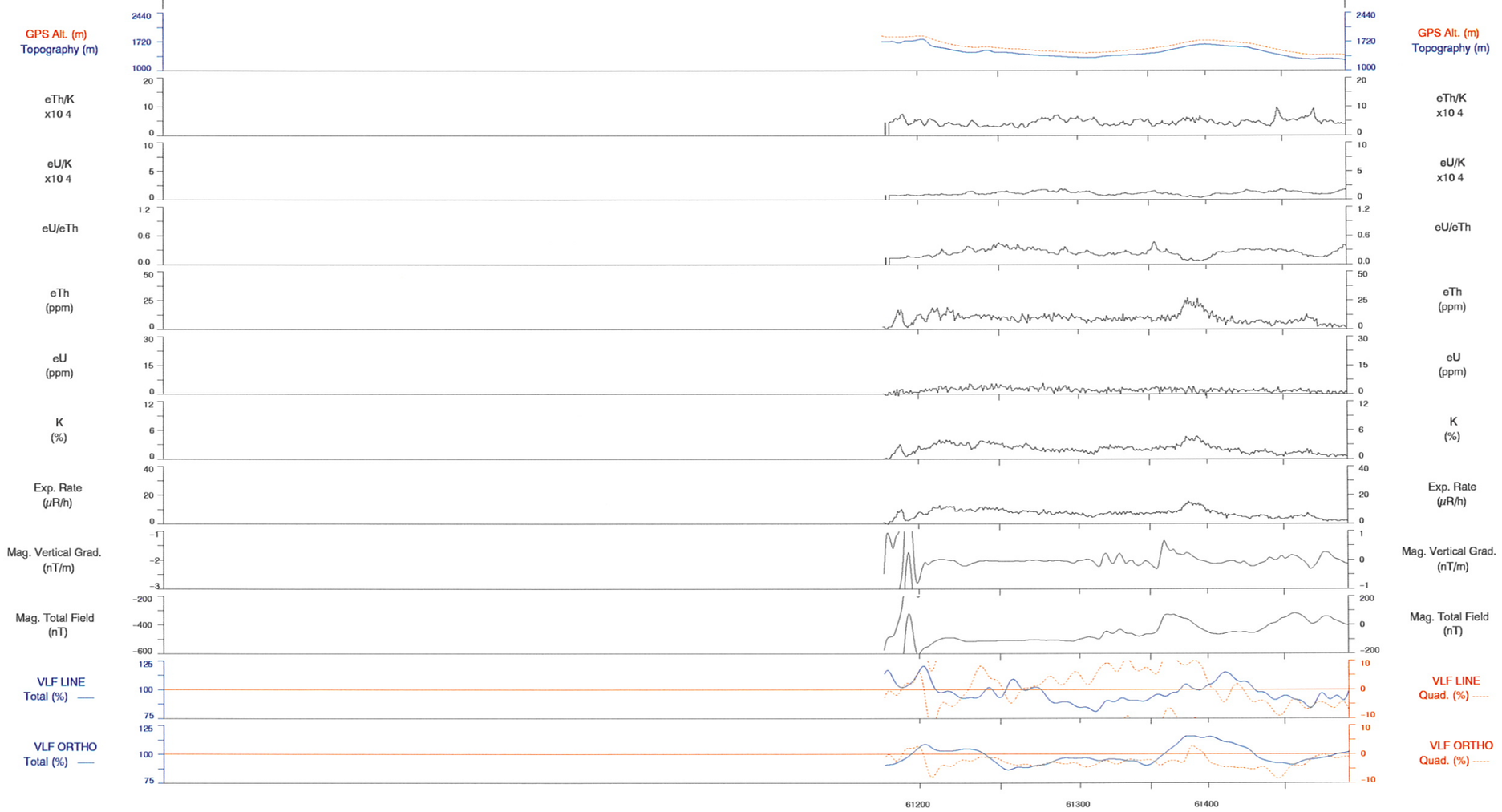
S N



LINE 1058 Scale 1:150000 3 KM azimuth 0°

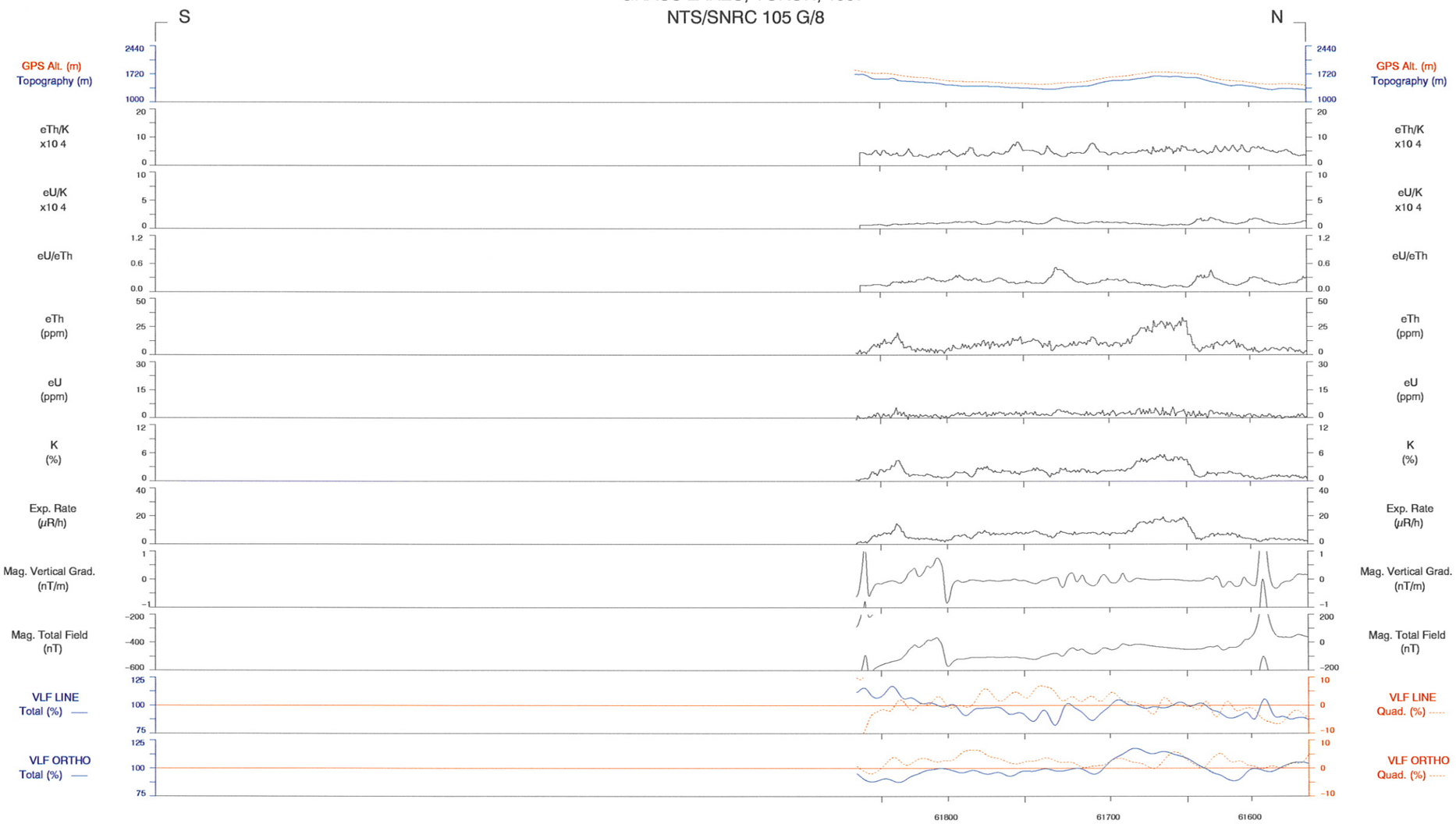
GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

S N



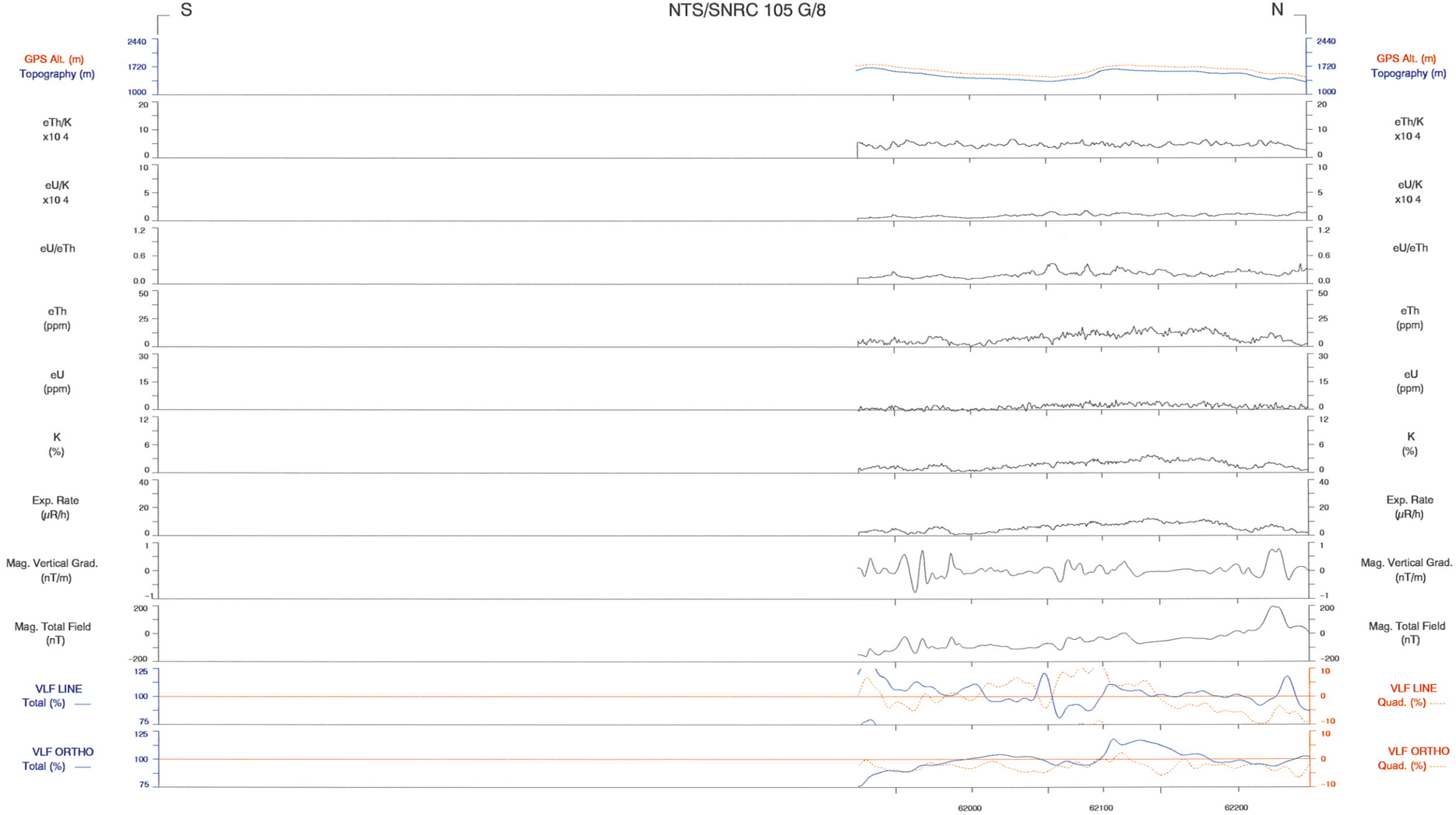
LINE 1059 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8



LINE 1060 Scale 1:150000 3 KM azimuth 0°

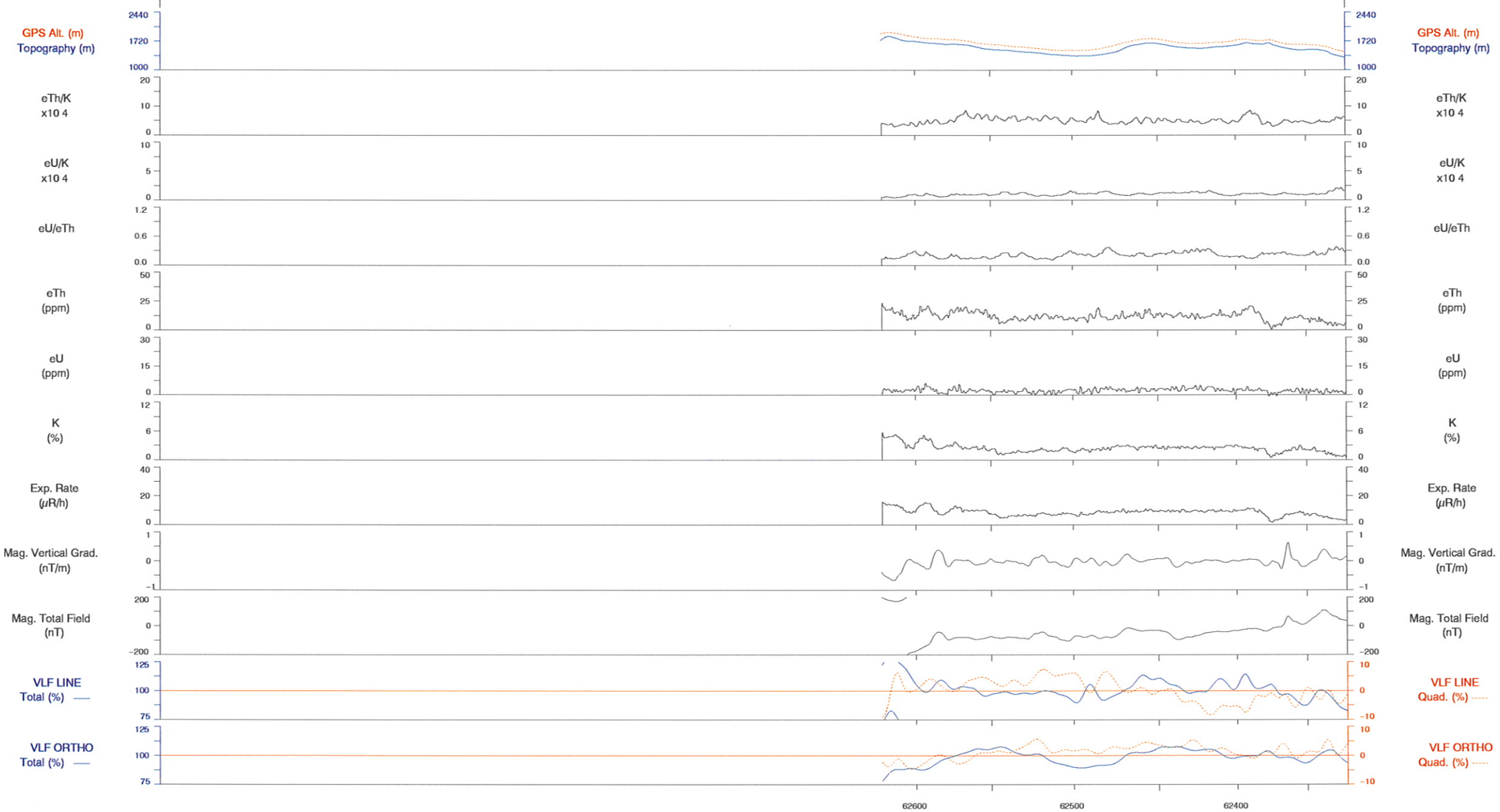
GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8



LINE 1061 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

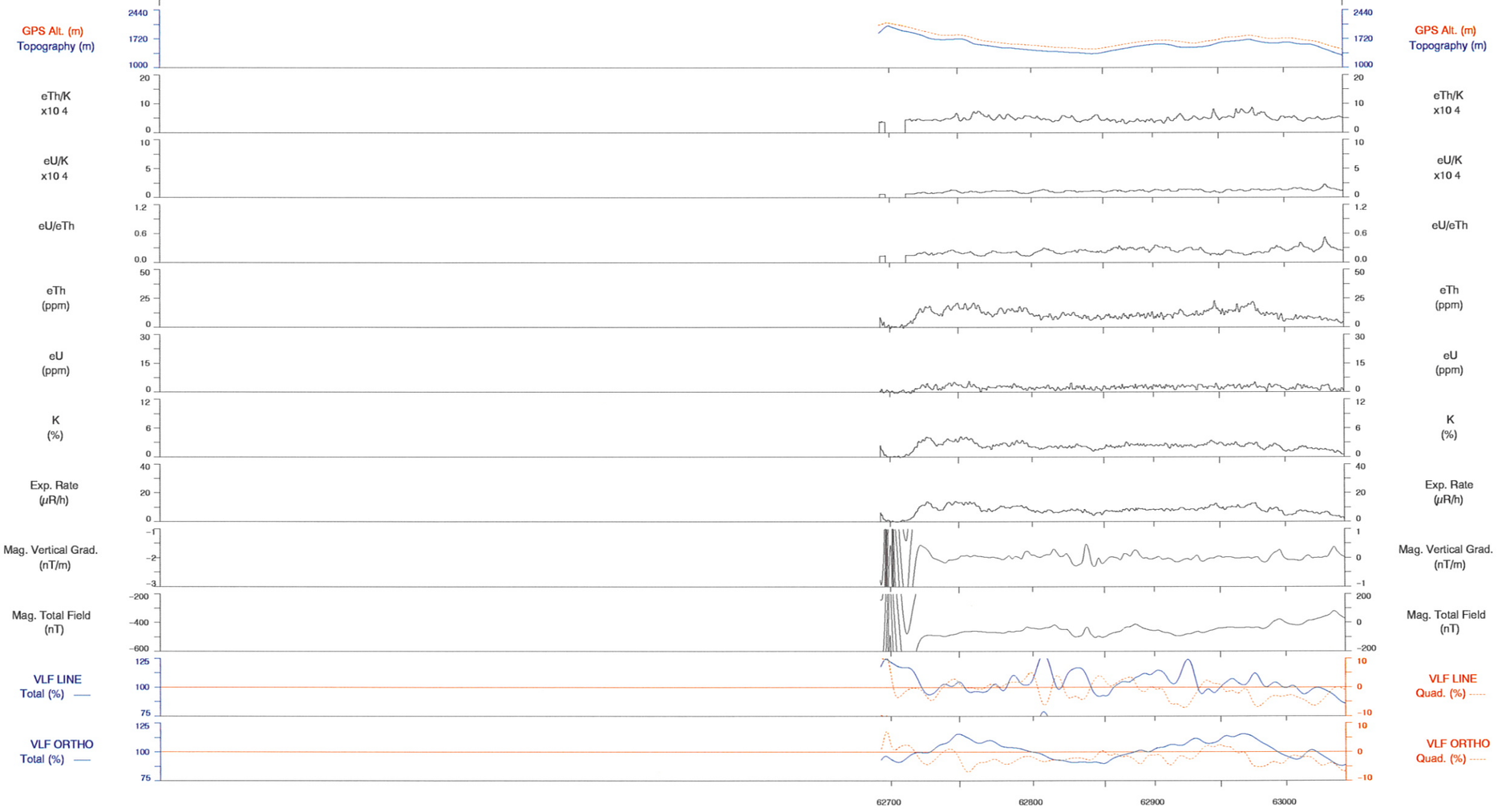
S N



LINE 1062 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

S N

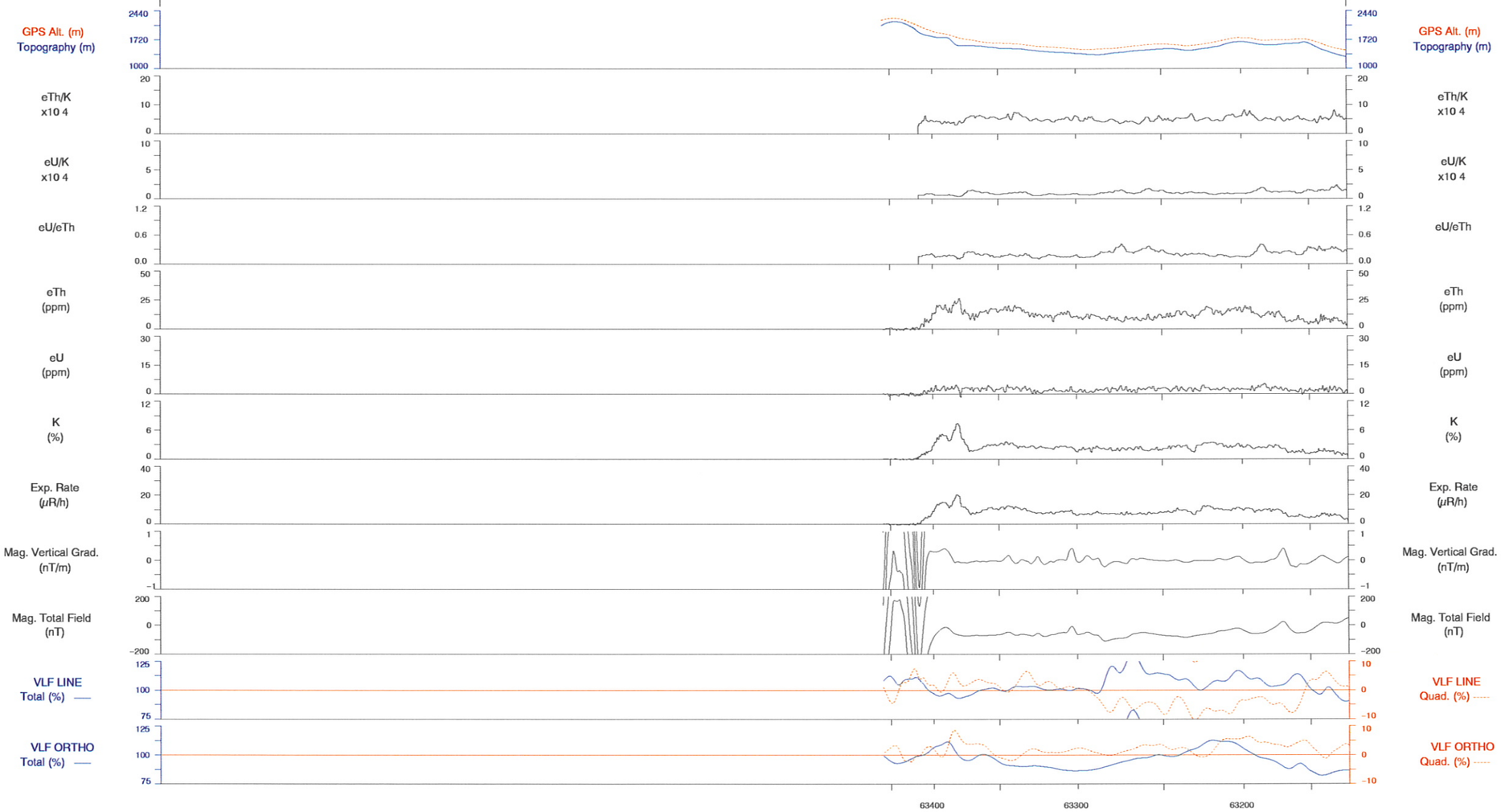


LINE 1063 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

S

N

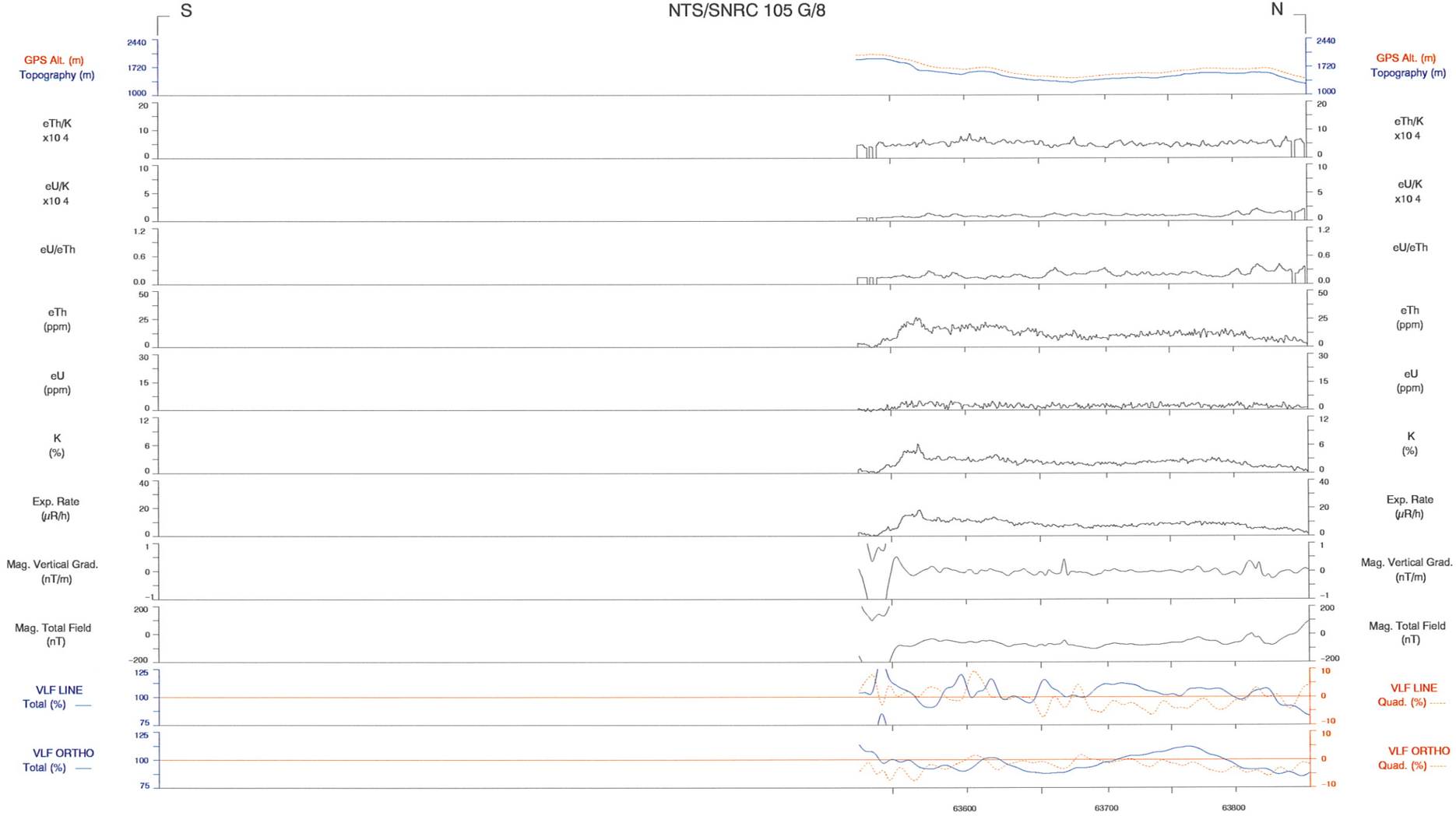


LINE 1064 Scale 1:150000

3 KM

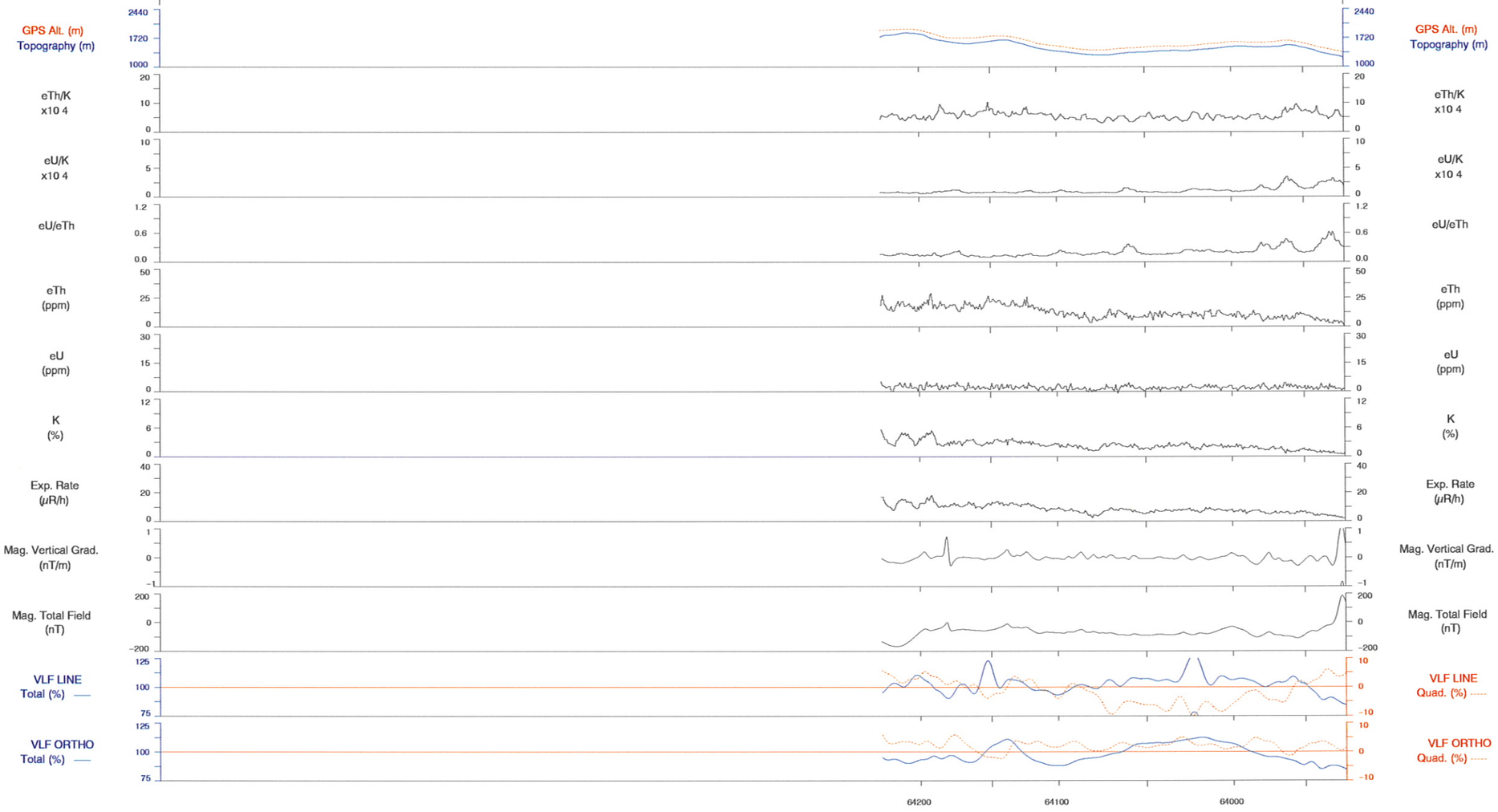
azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8



LINE 1065 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

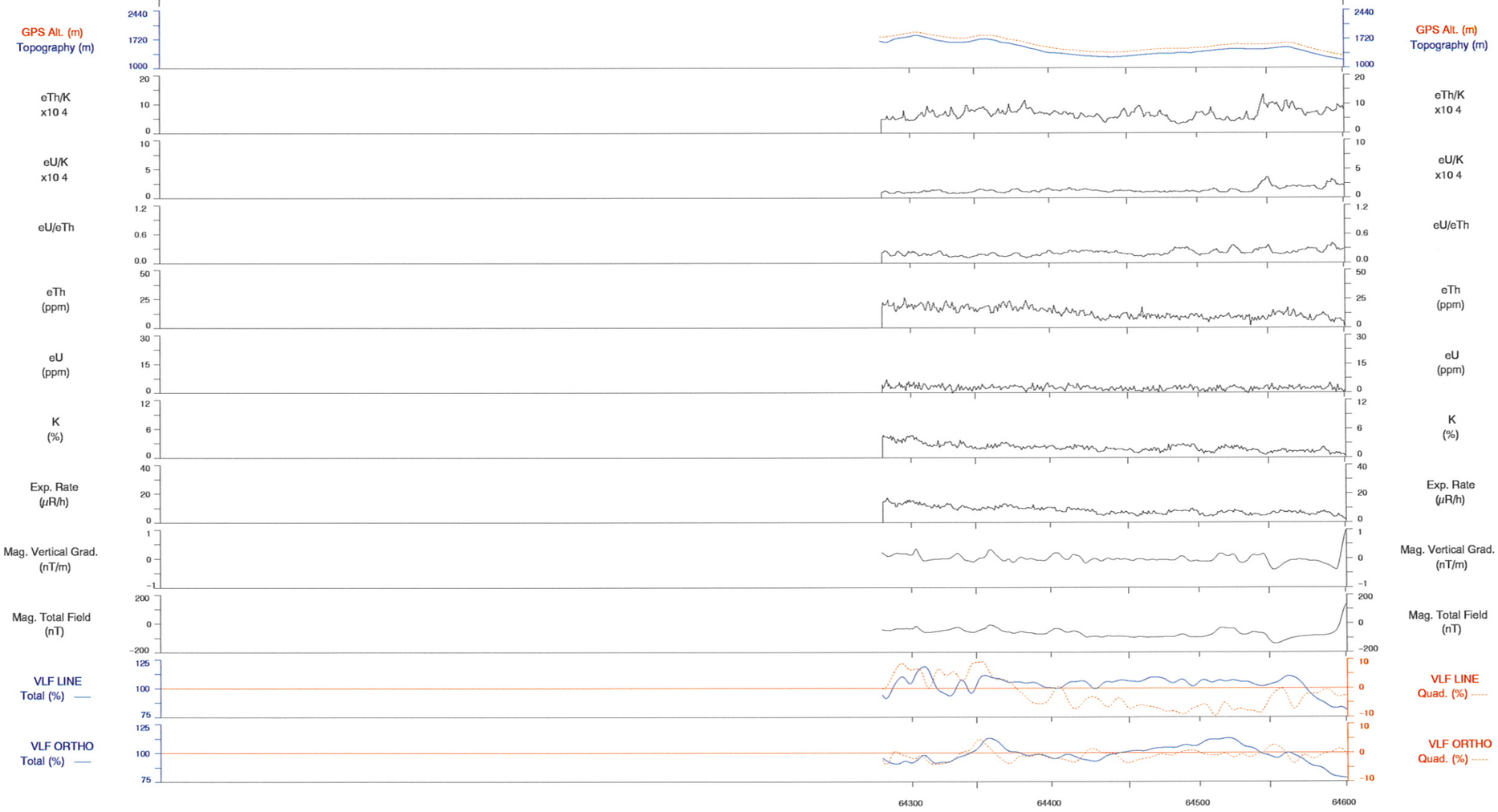


LINE 1066 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

S

N



LINE 1067 Scale 1:150000

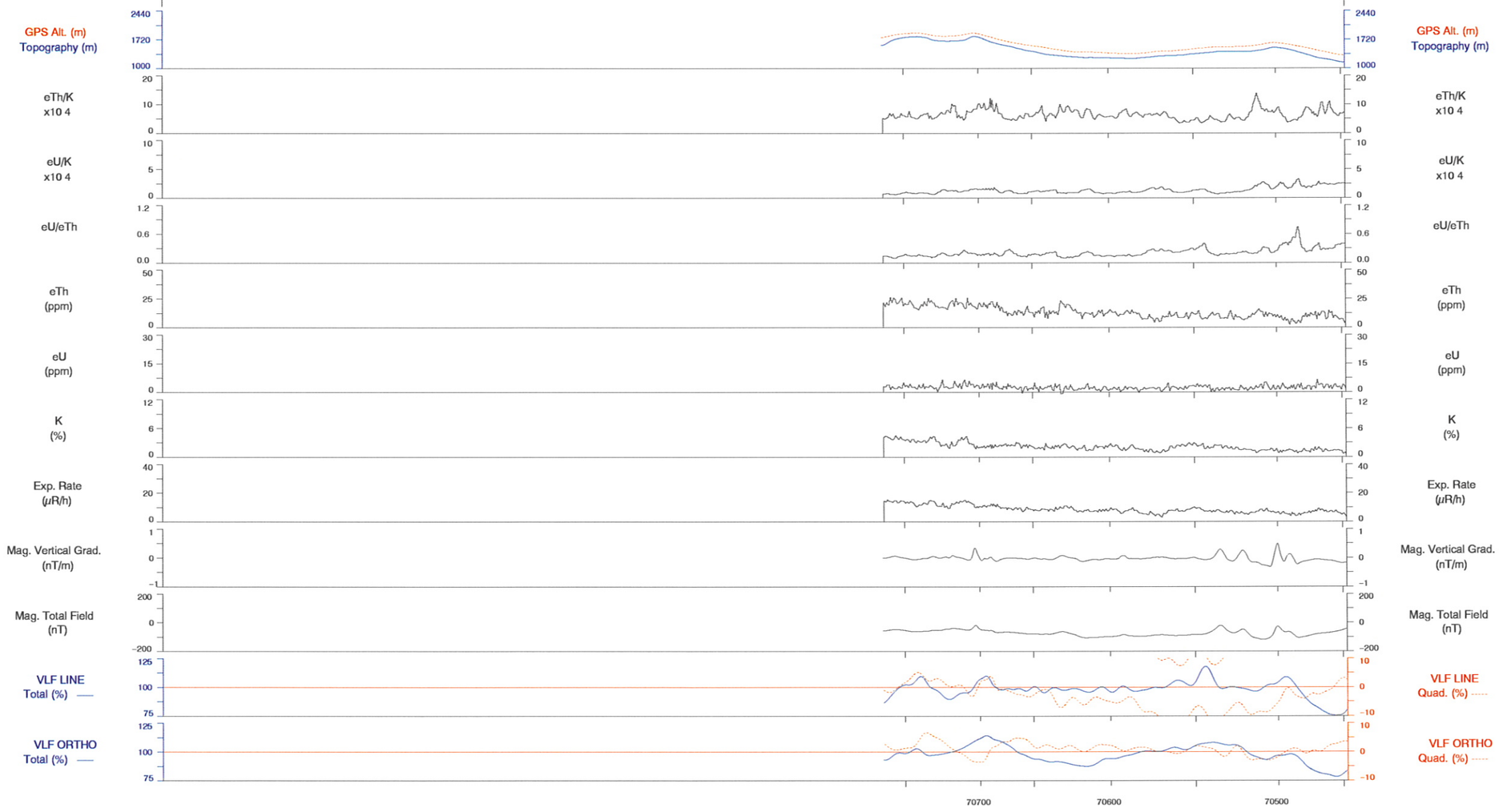
3 KM

azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

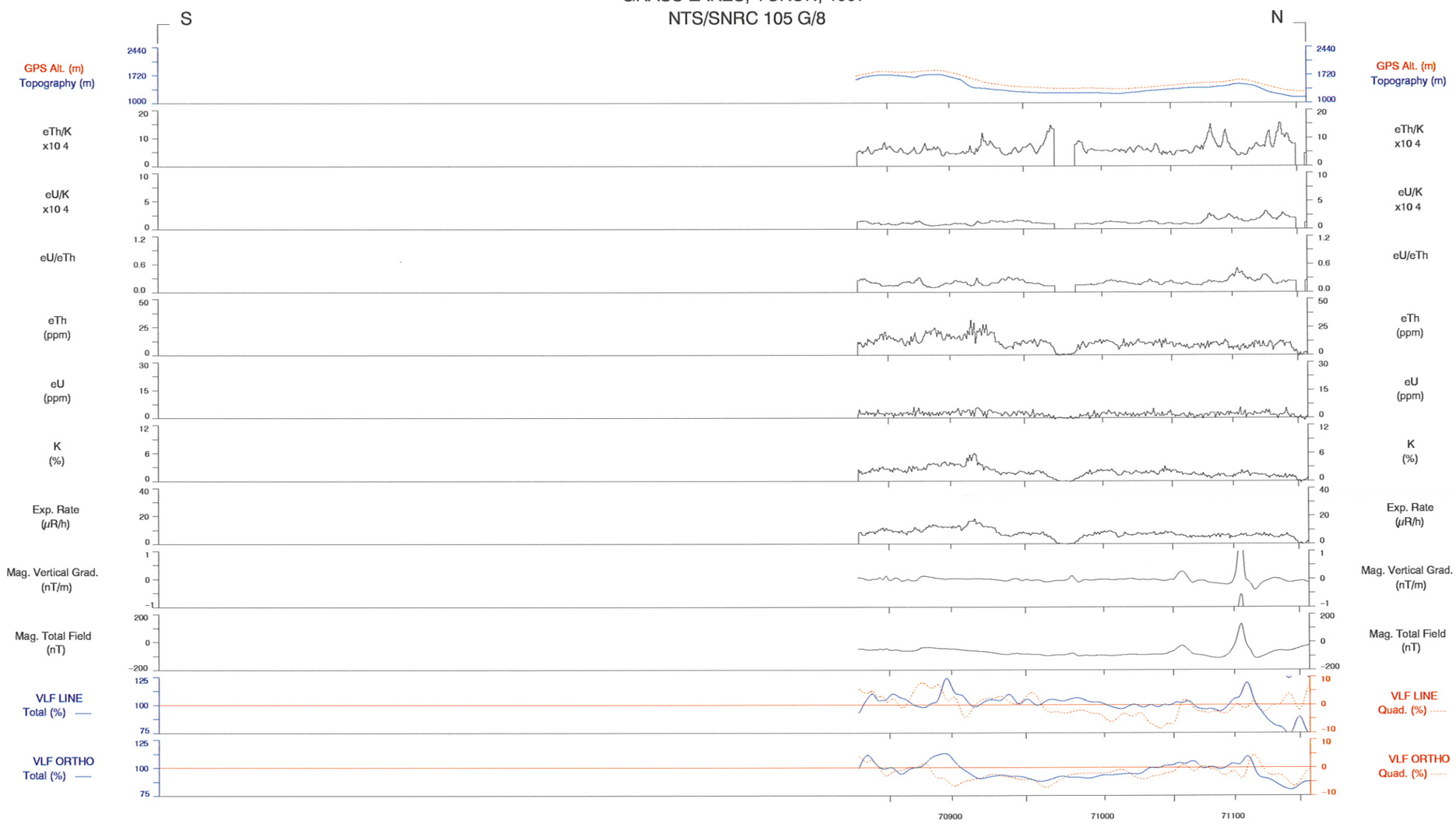
S

N



LINE 1068 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

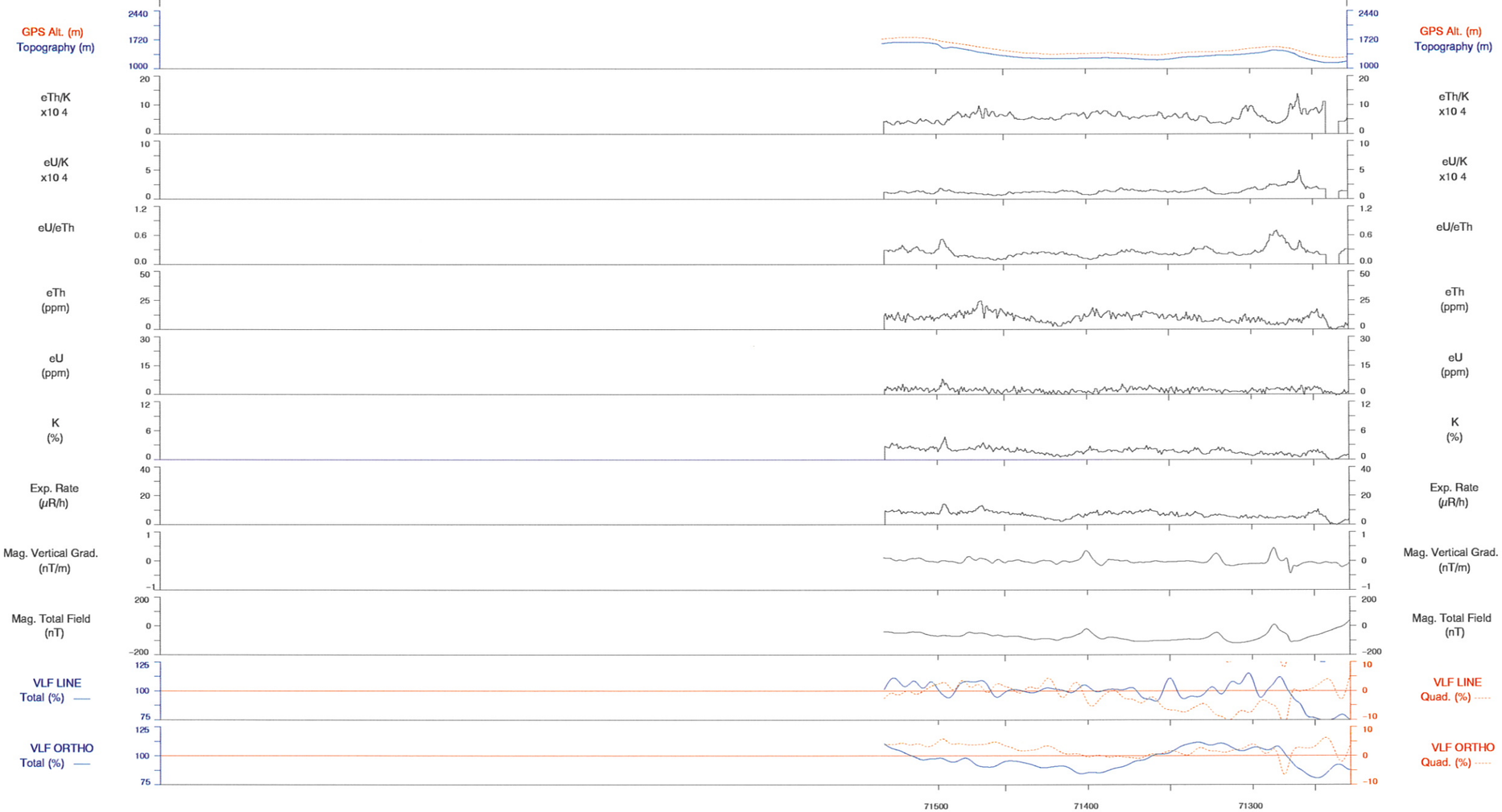


LINE 1069 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

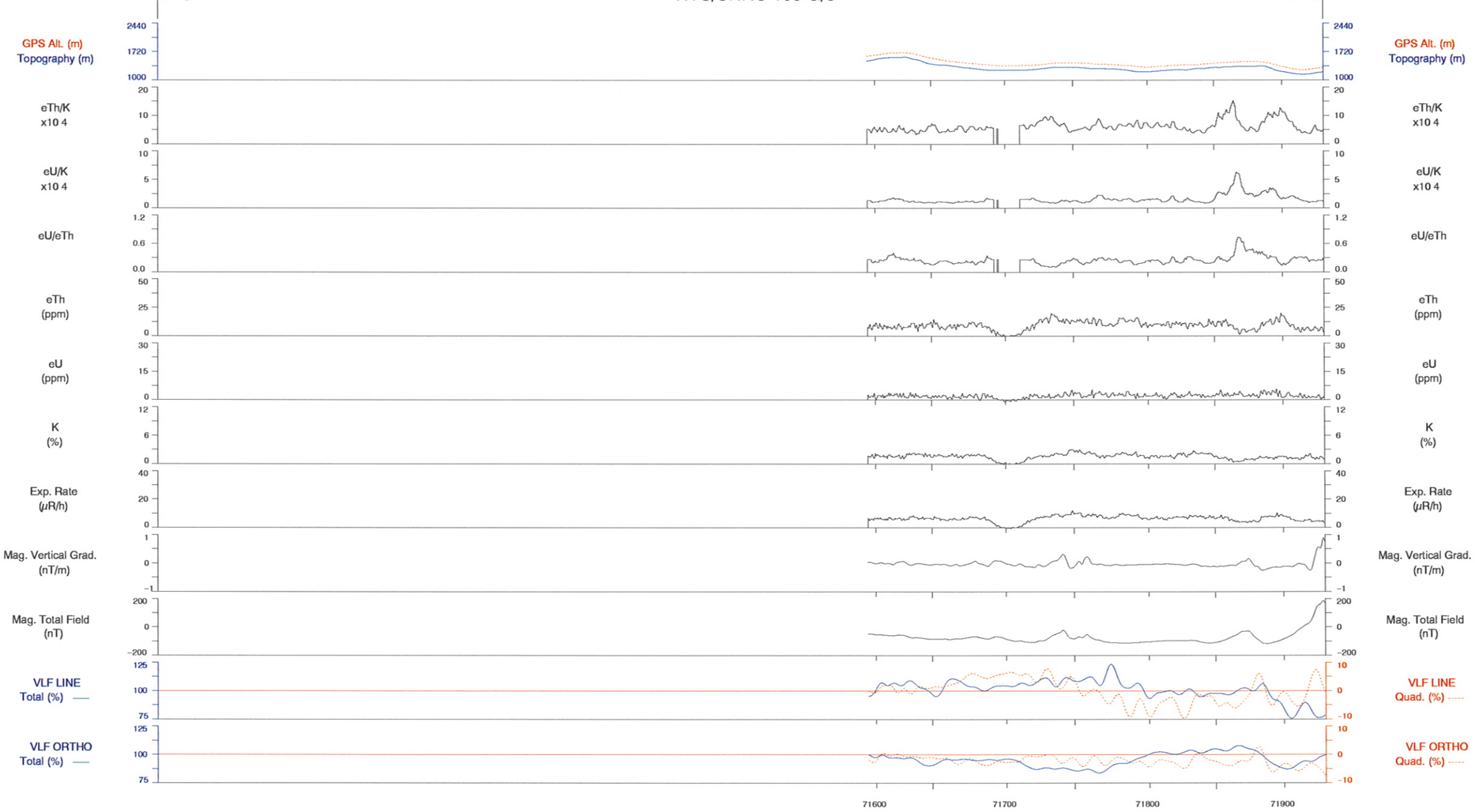
S

N



LINE 1070 Scale 1:150000 3 KM azimuth 0°

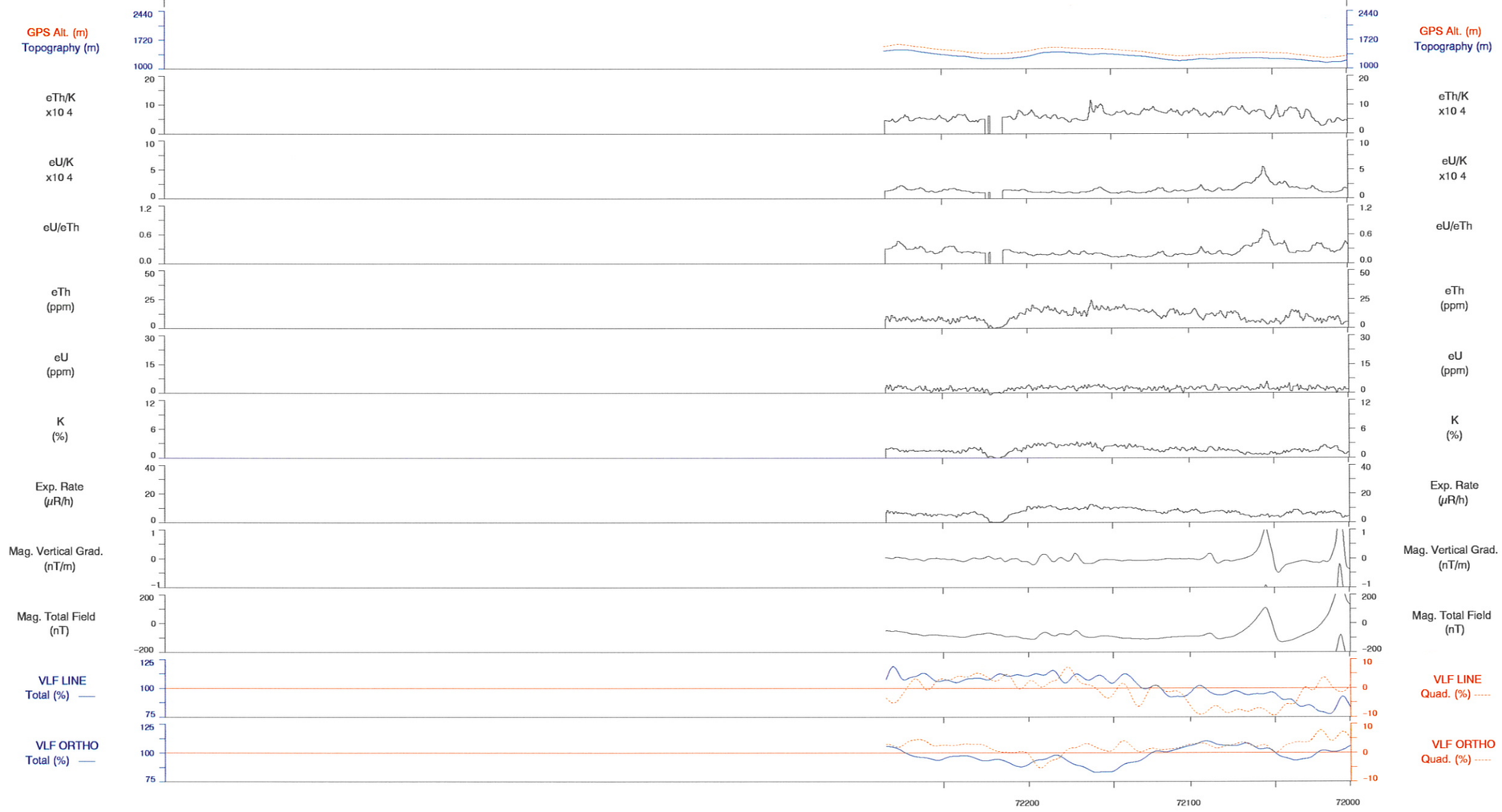
GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8



LINE 1071 Scale 1:150000 3 KM azimuth 0°

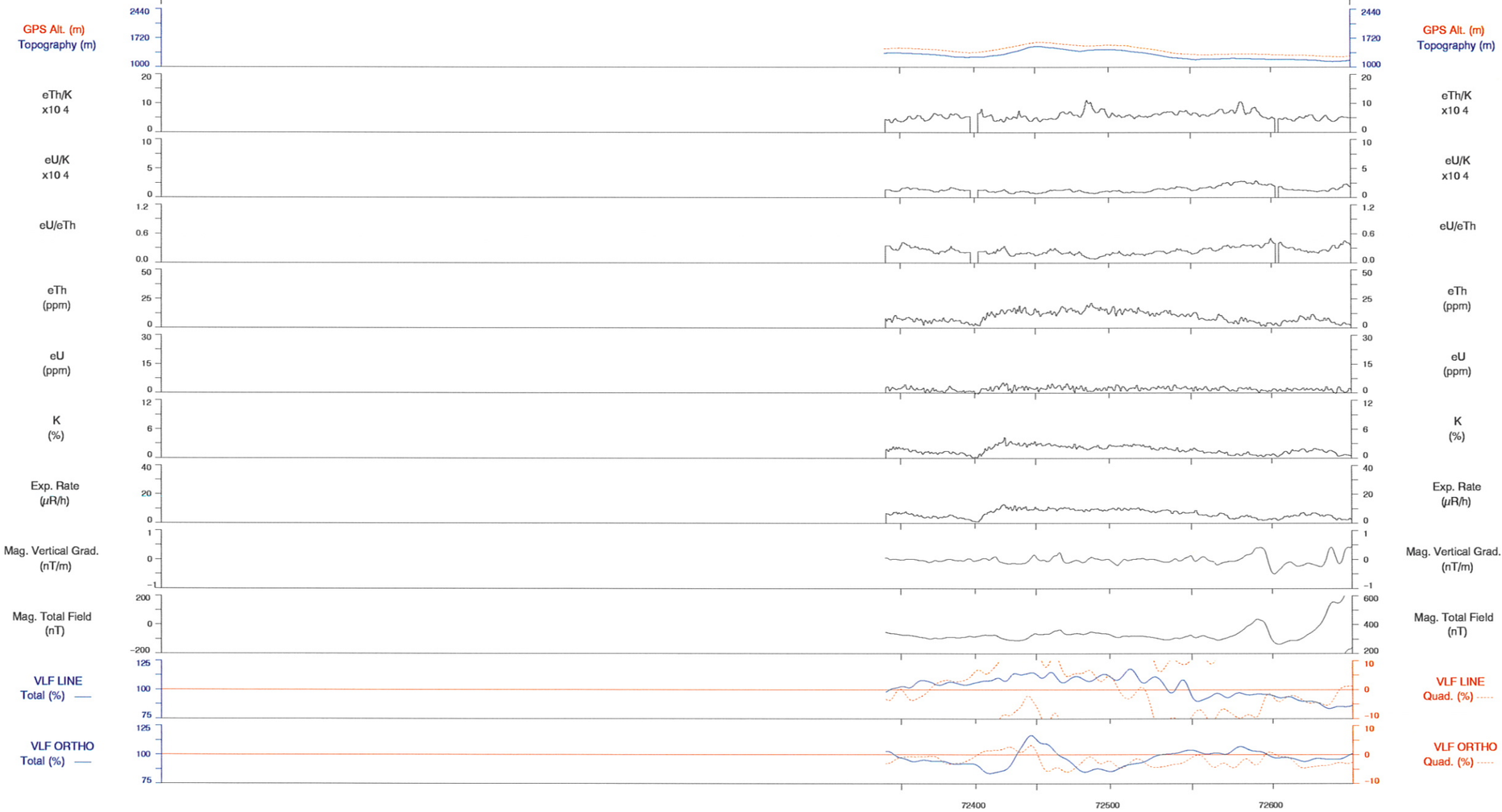
GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

S N



LINE 1072 Scale 1:150000 3 KM azimuth 0°

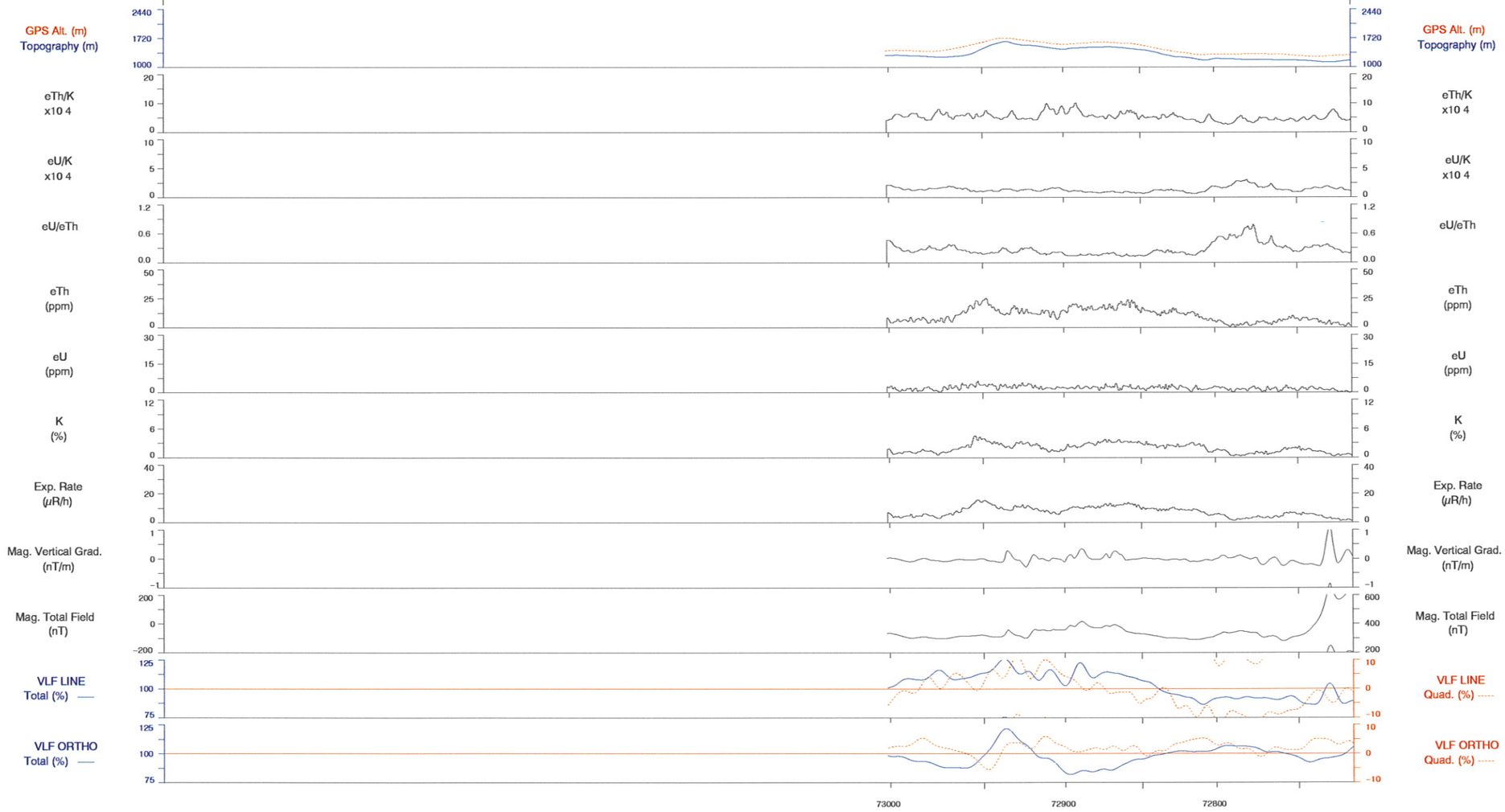
GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8



LINE 1073 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

S N

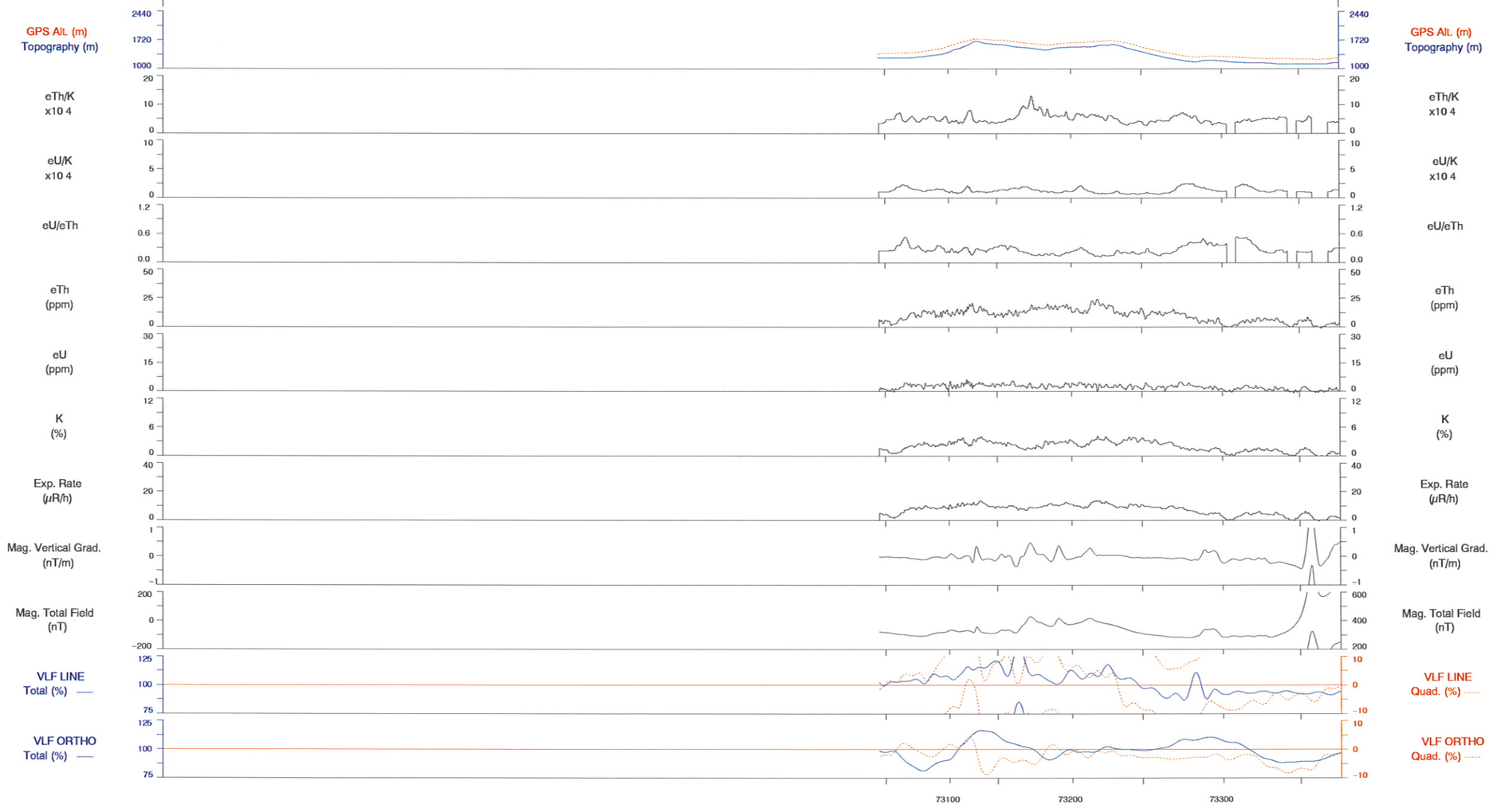


LINE 1074 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

S

N

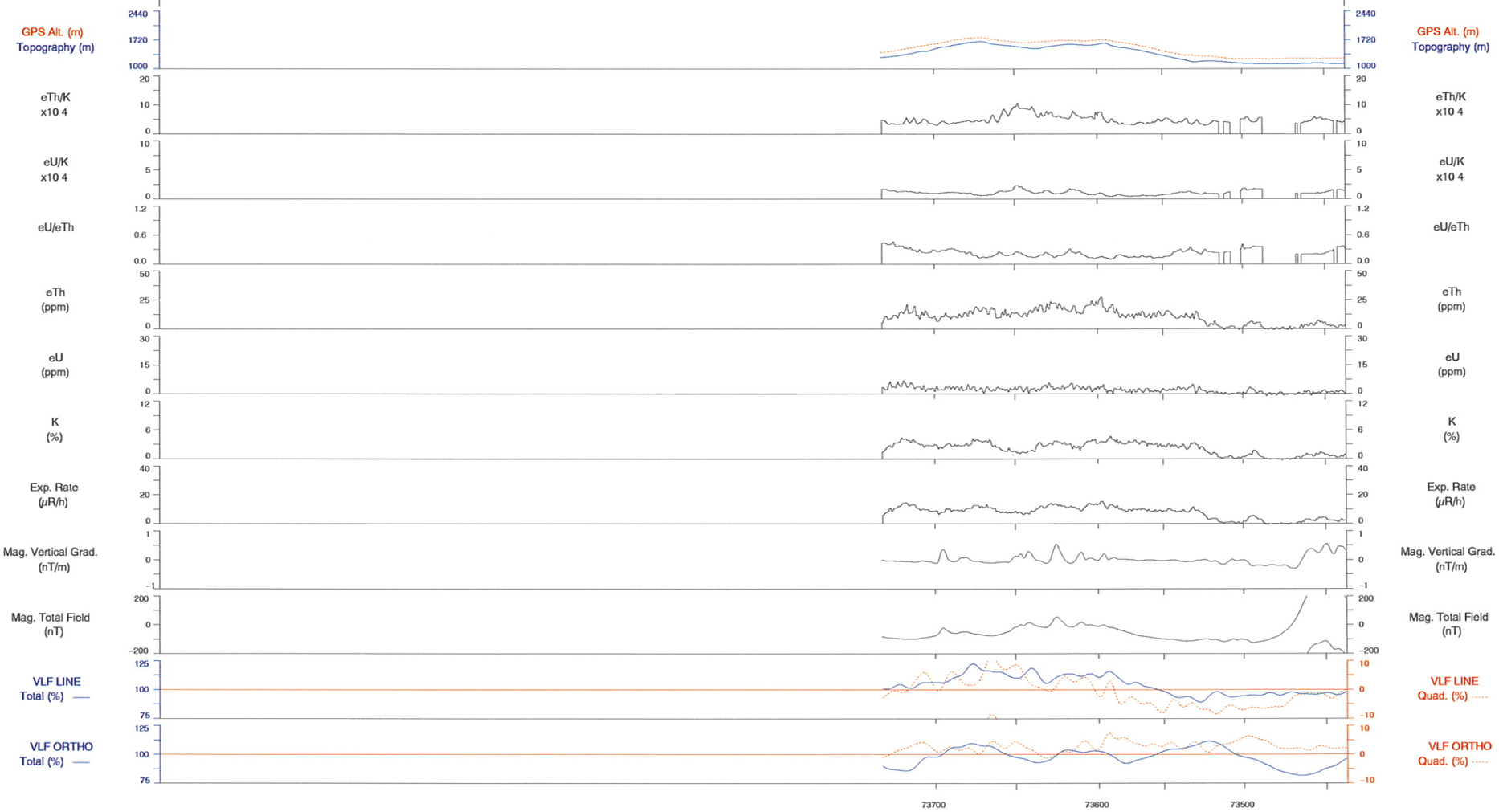


LINE 1075 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

S

N



LINE 1076 Scale 1:150000

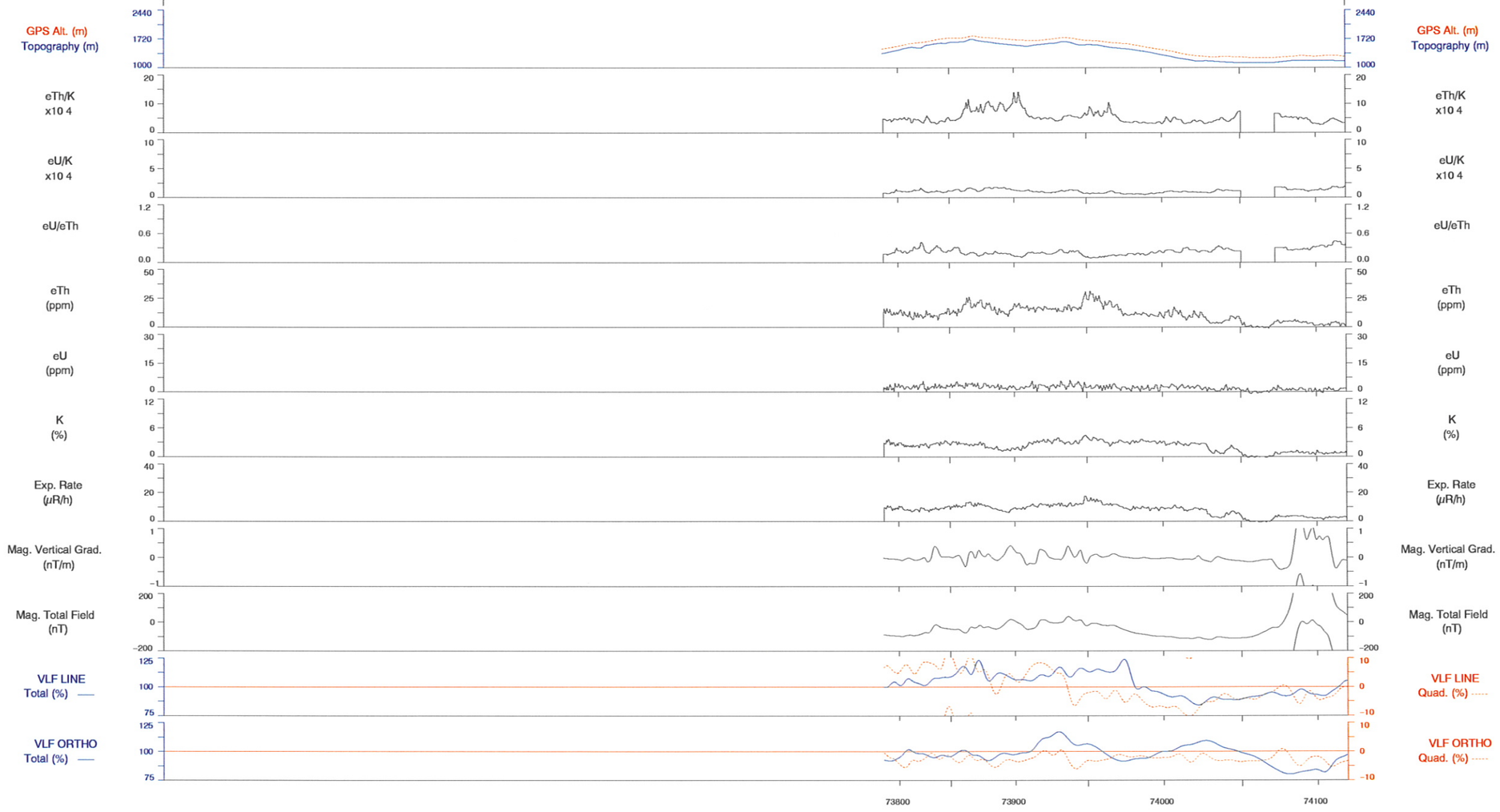
3 KM

azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

S

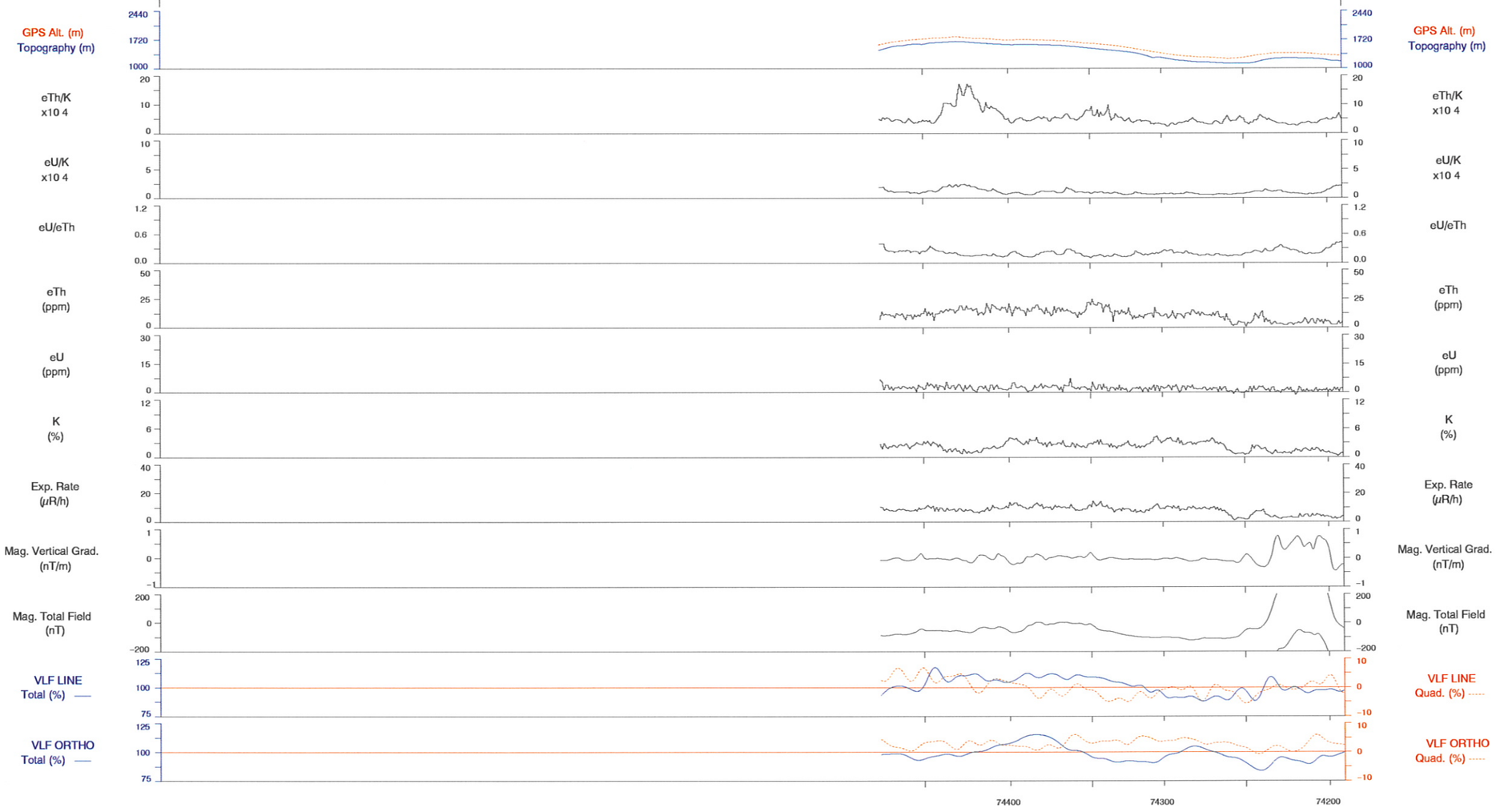
N



LINE 1077 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

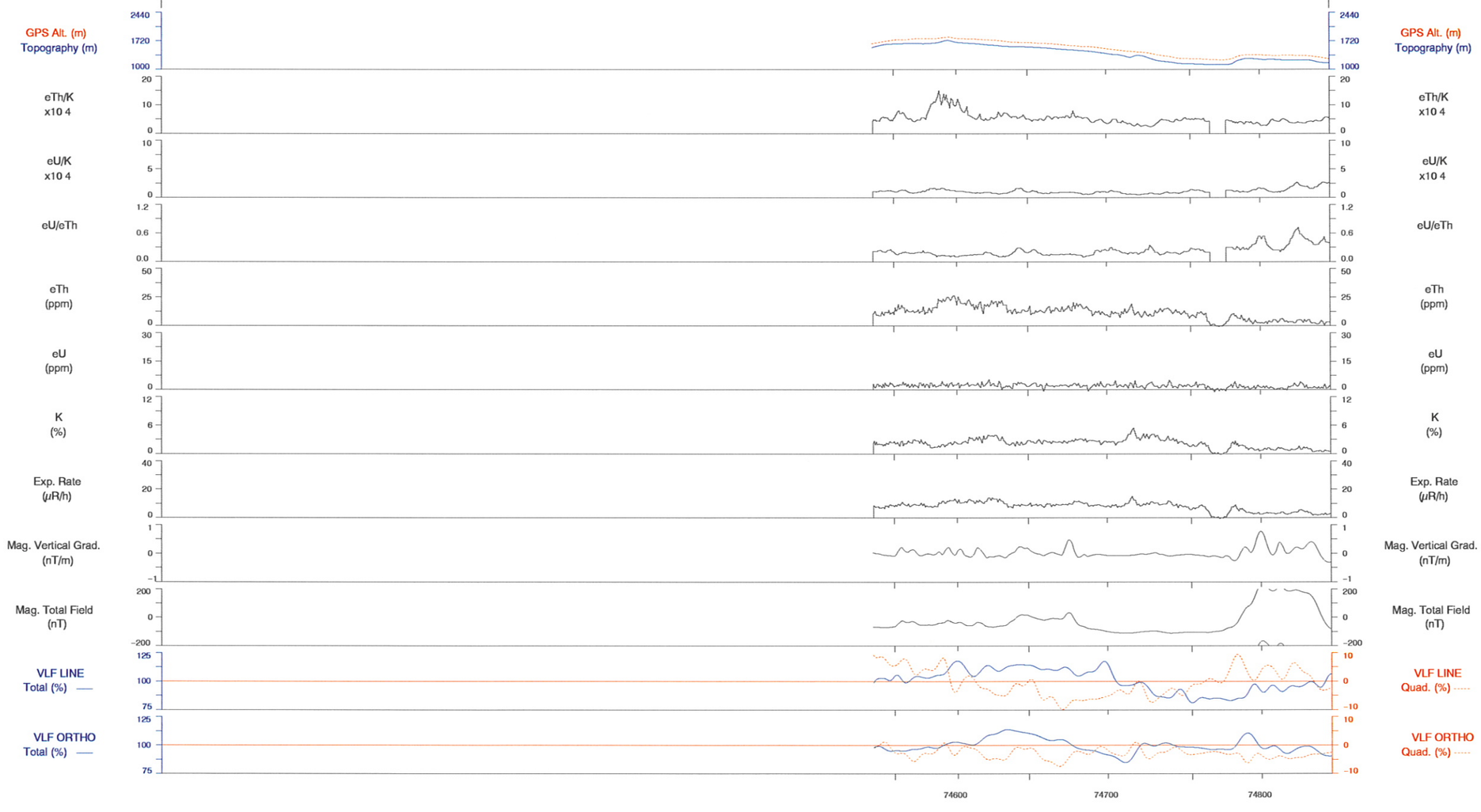
S N



LINE 1078 Scale 1:150000 3 KM azimuth 0°

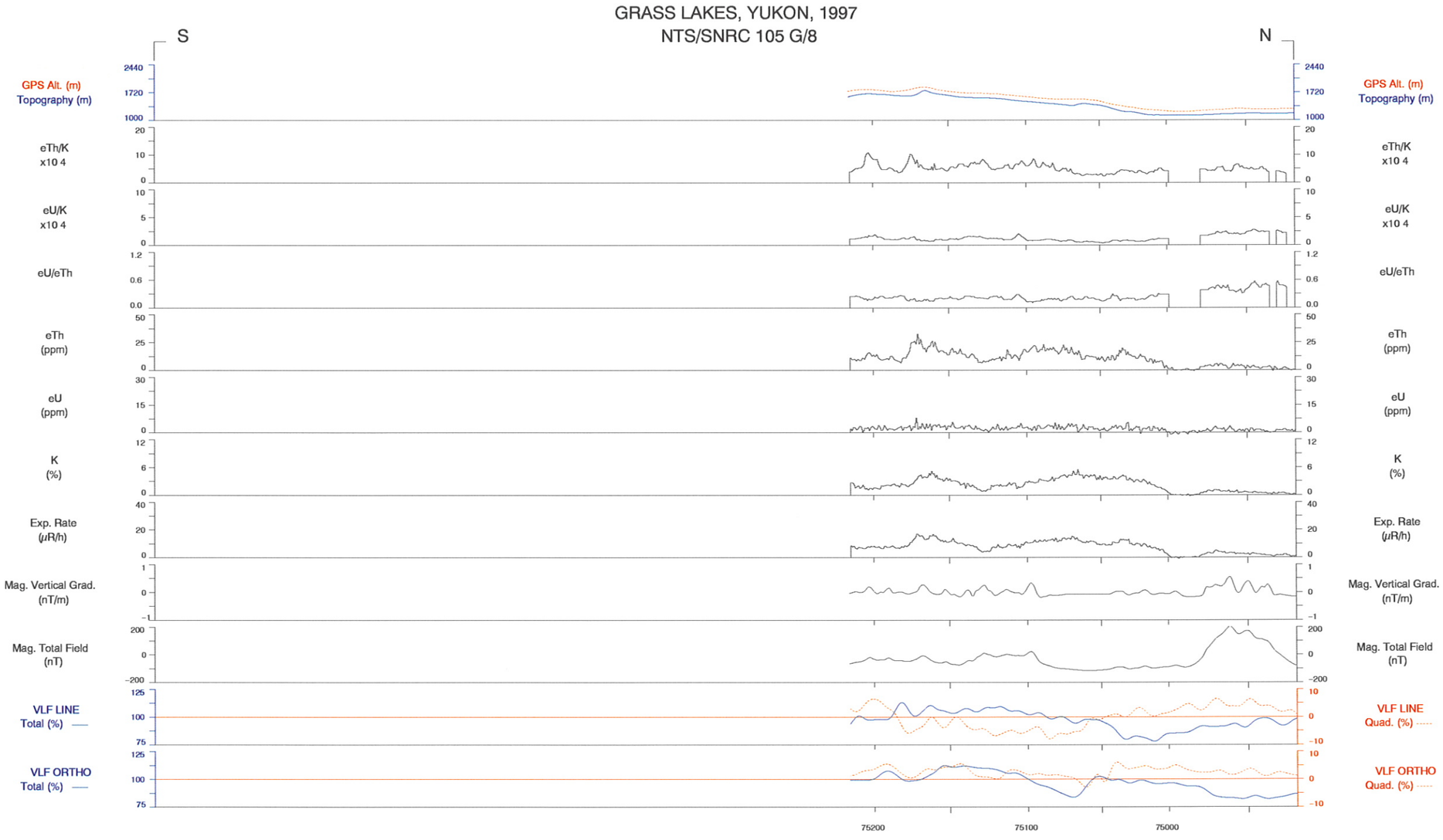
GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

S — N



LINE 1079 Scale 1:150000 3 KM azimuth 0°

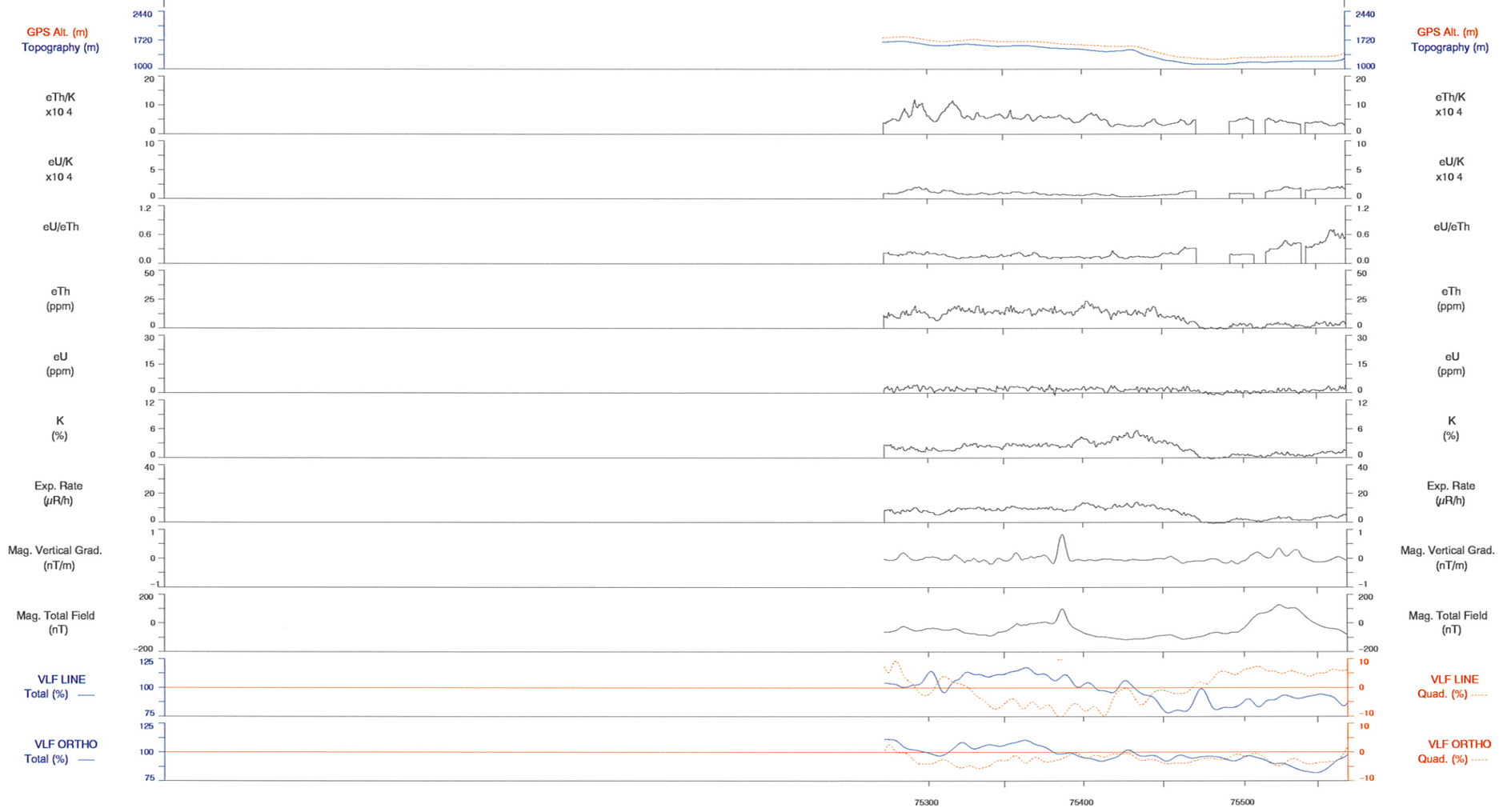
GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8



LINE 1080 Scale 1:150000 3 KM azimuth 0°

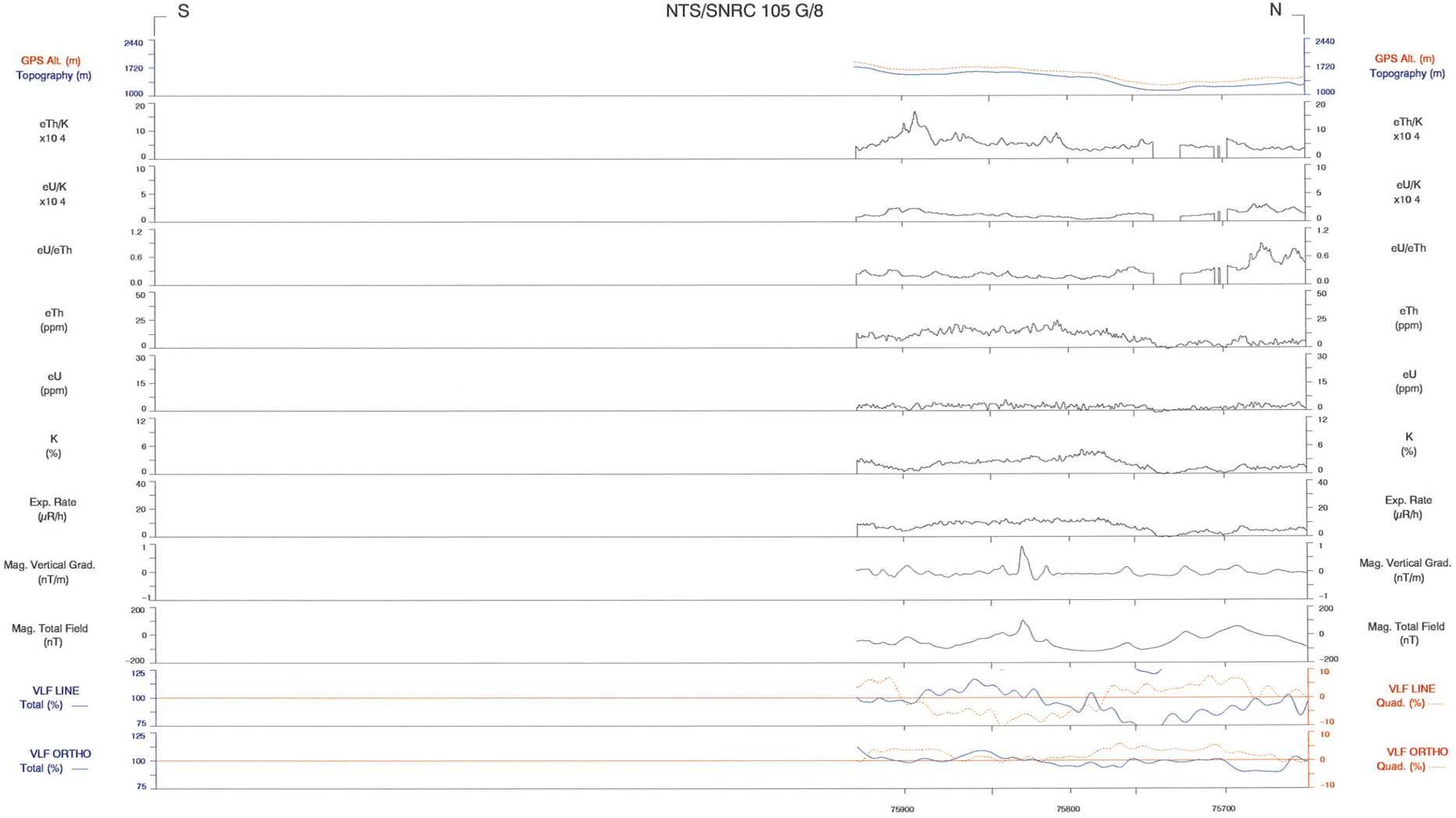
GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

S N



LINE 1081 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

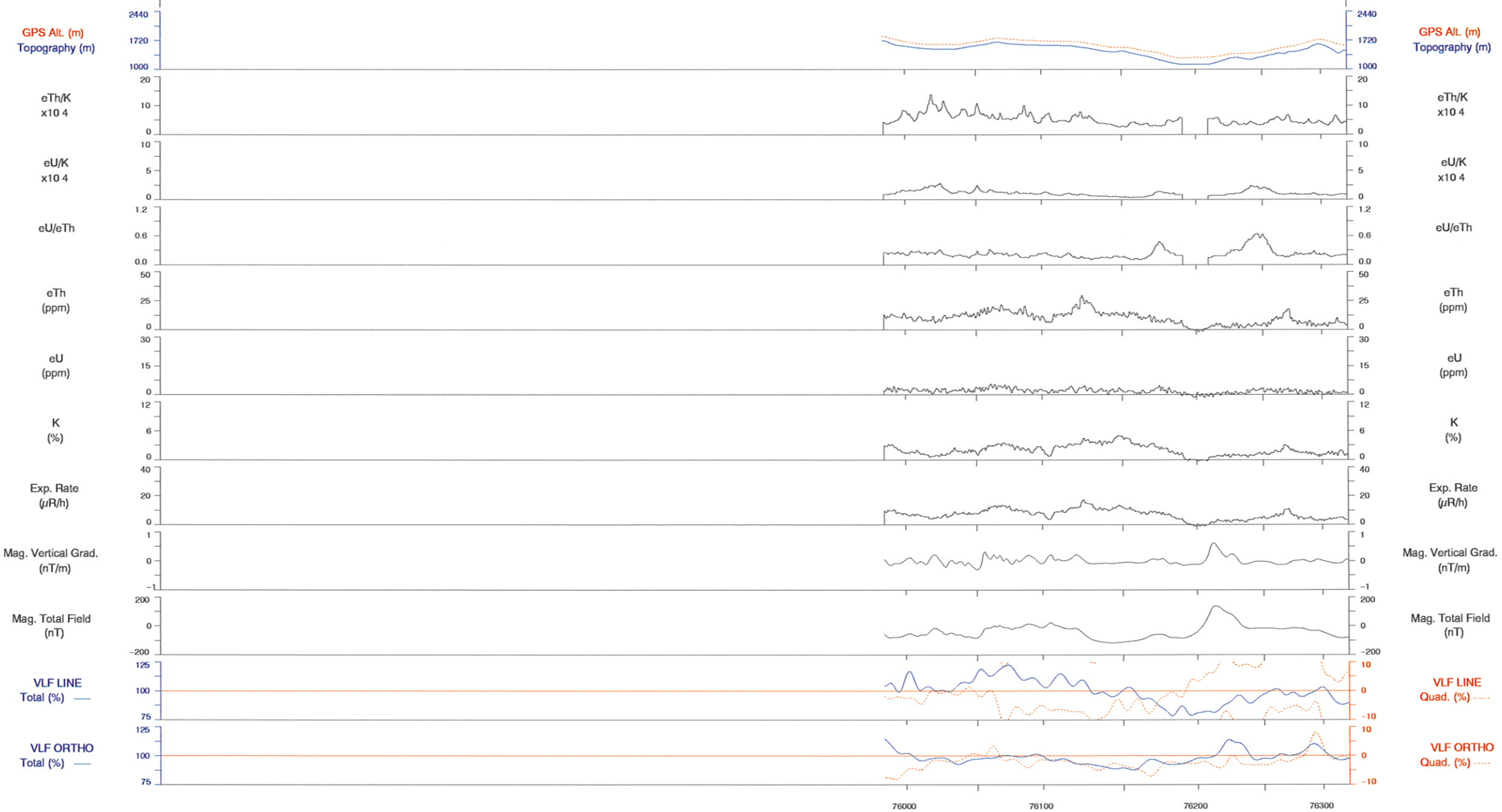


LINE 1082 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

S

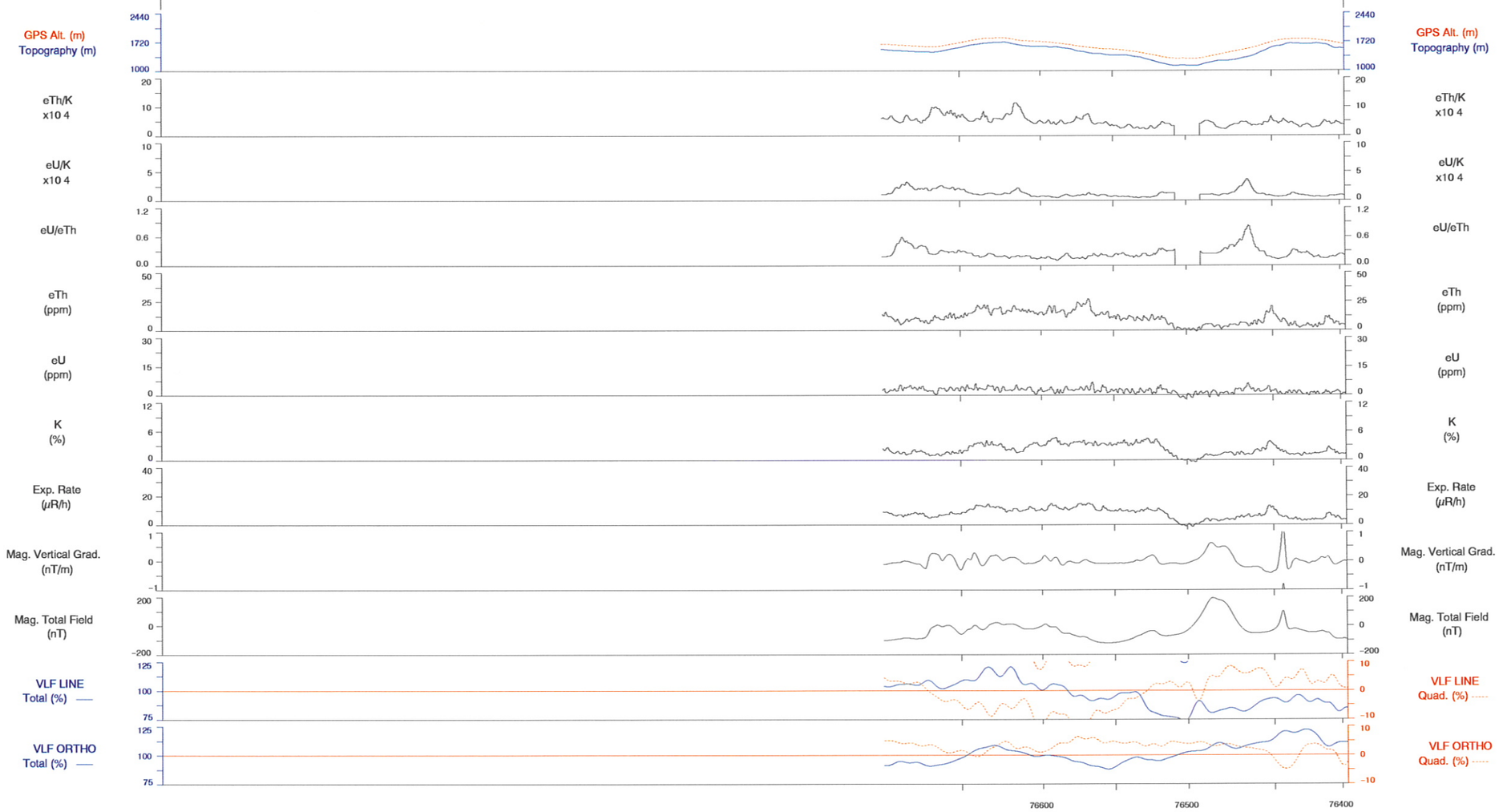
N



LINE 1083 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

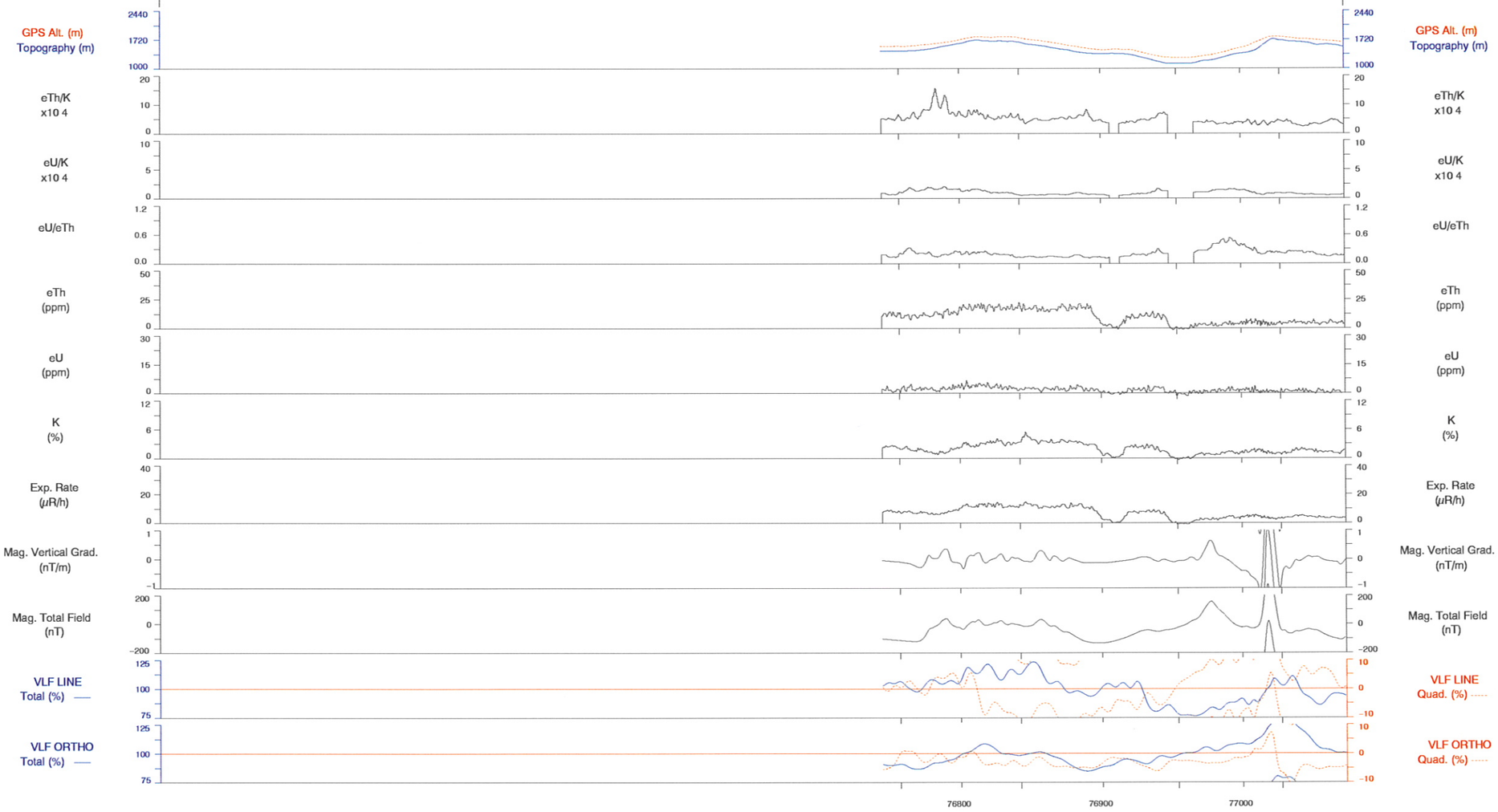
S N



LINE 1084 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

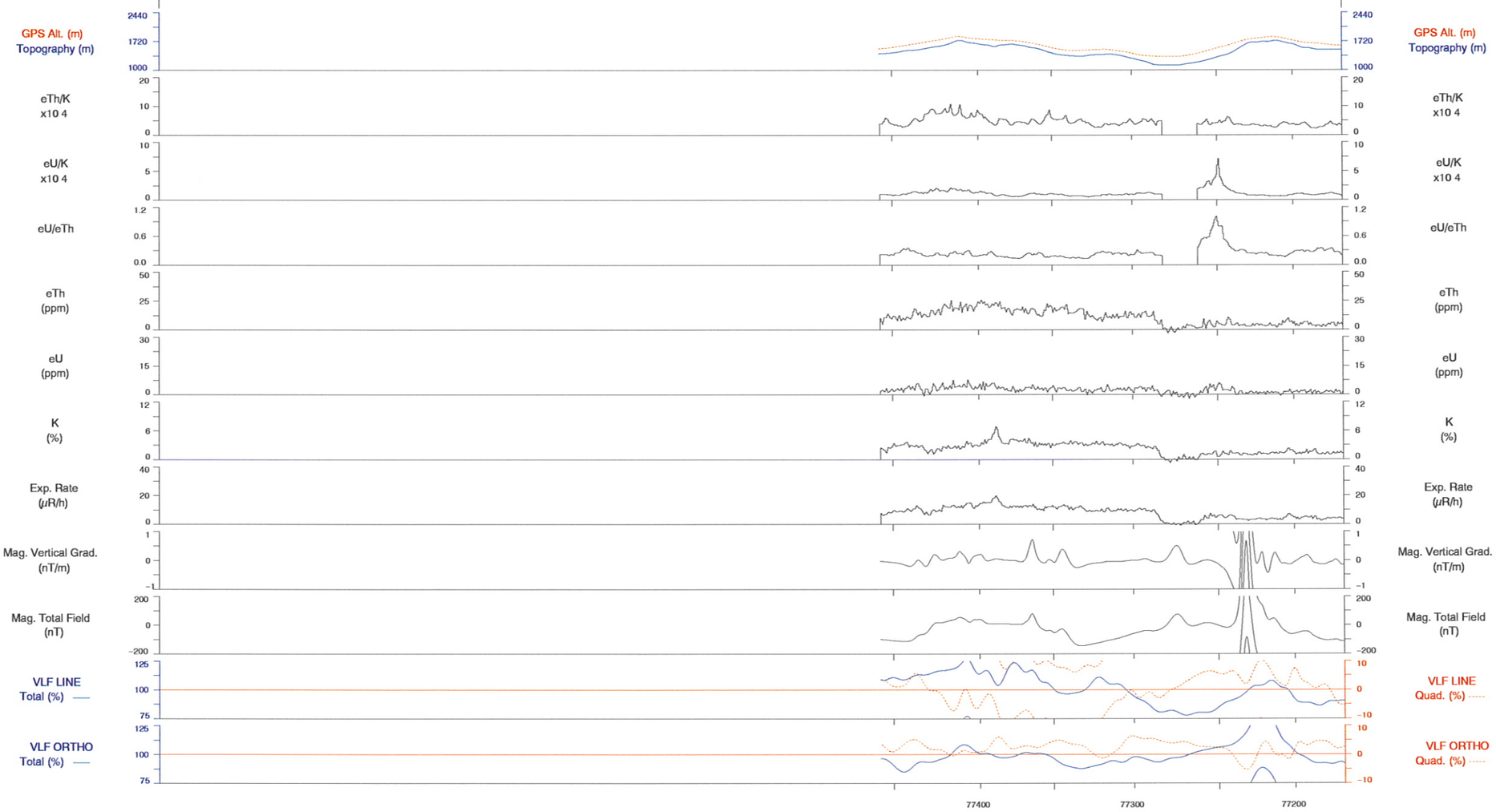
S N



LINE 1085 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

S N

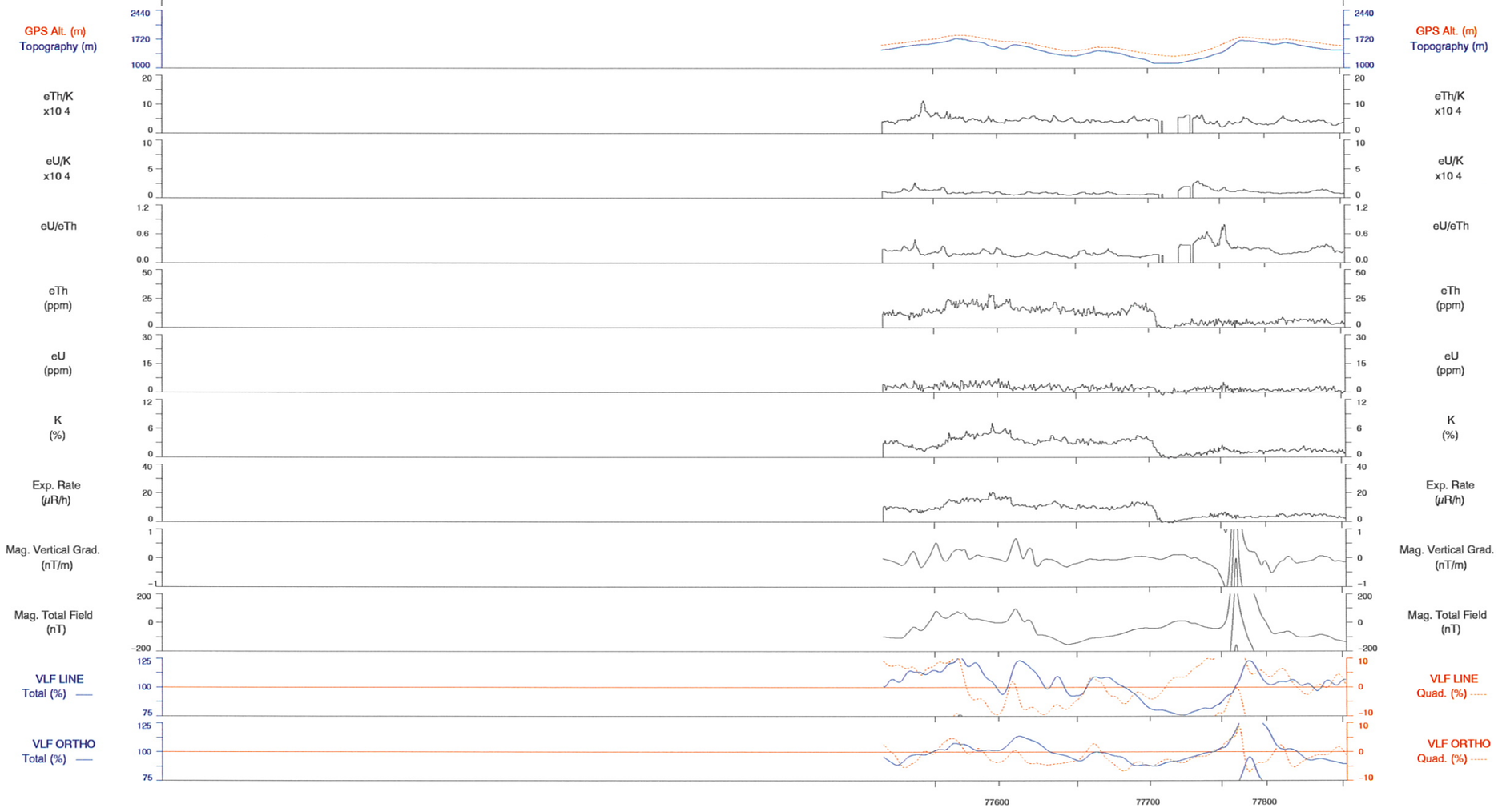


LINE 1086 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

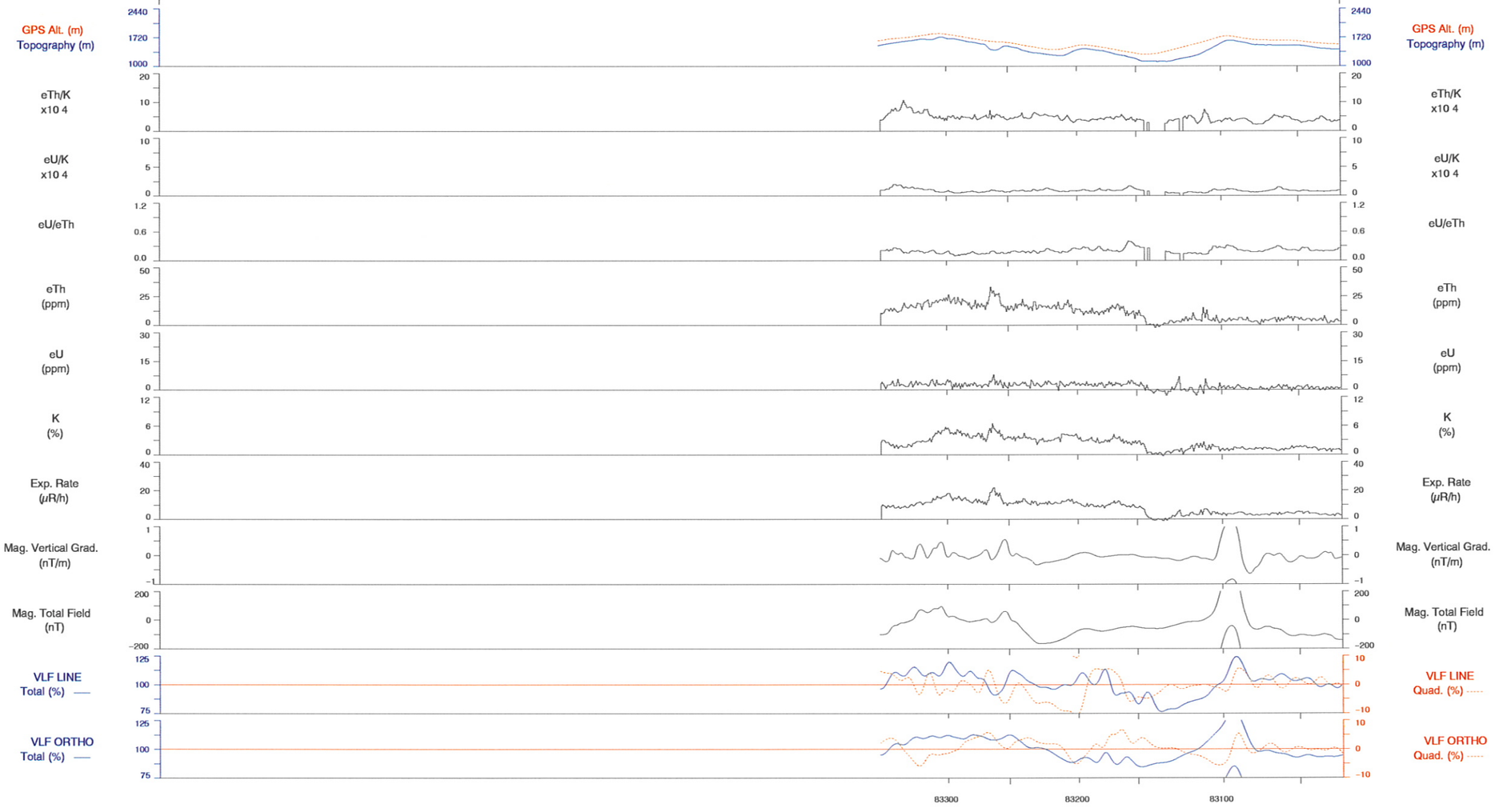
S

N



LINE 1087 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

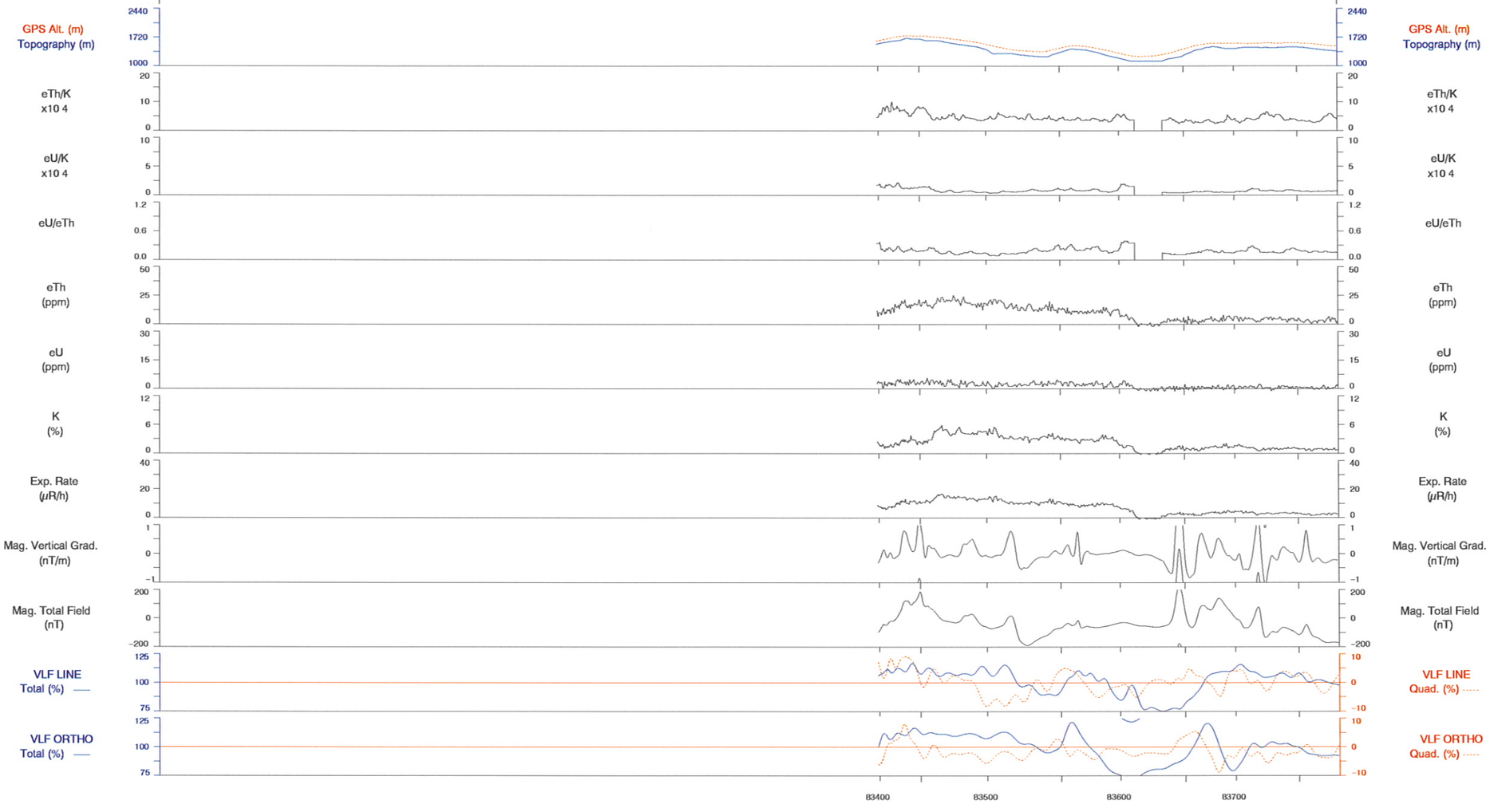


LINE 1088 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

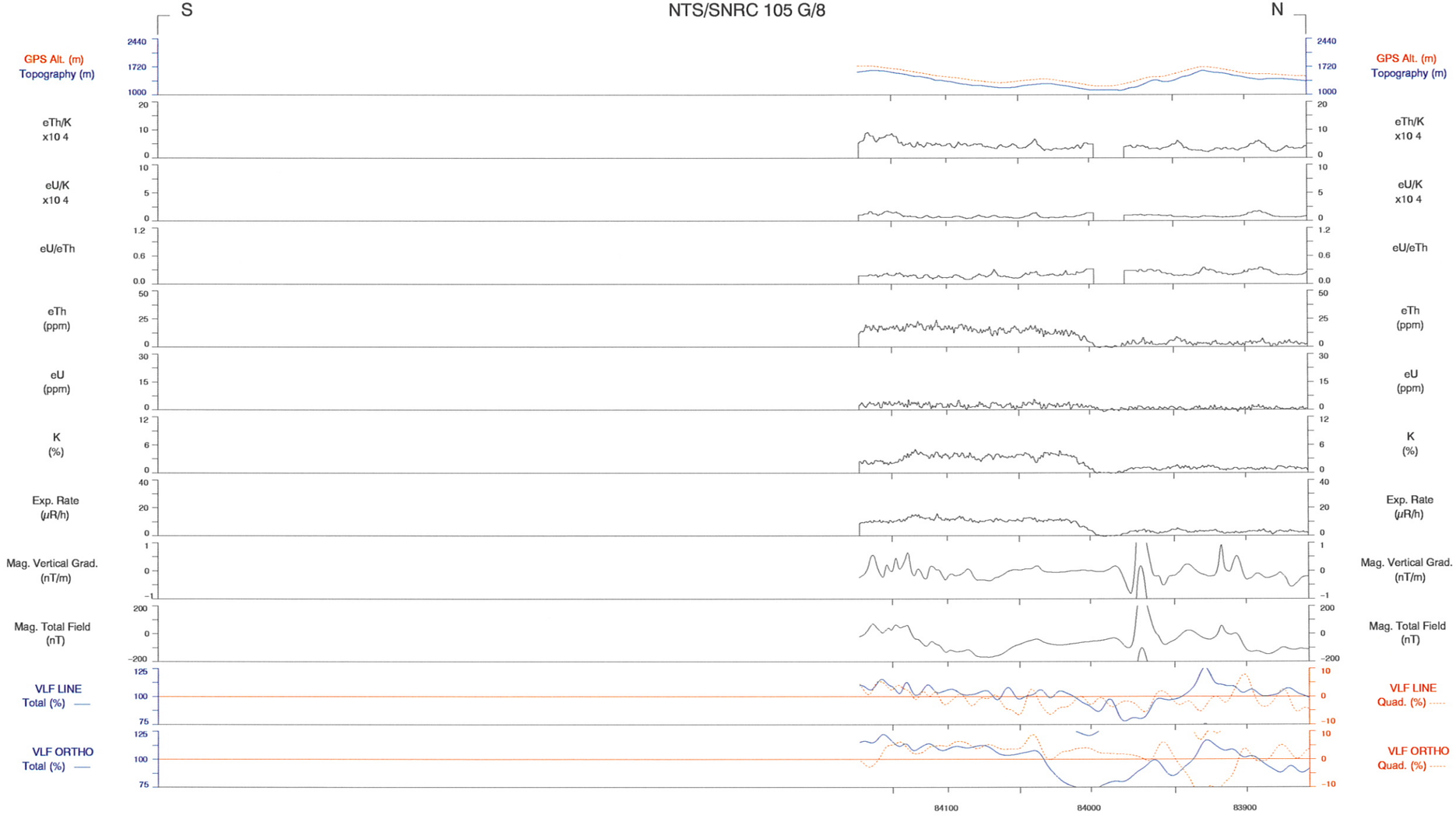
S

N



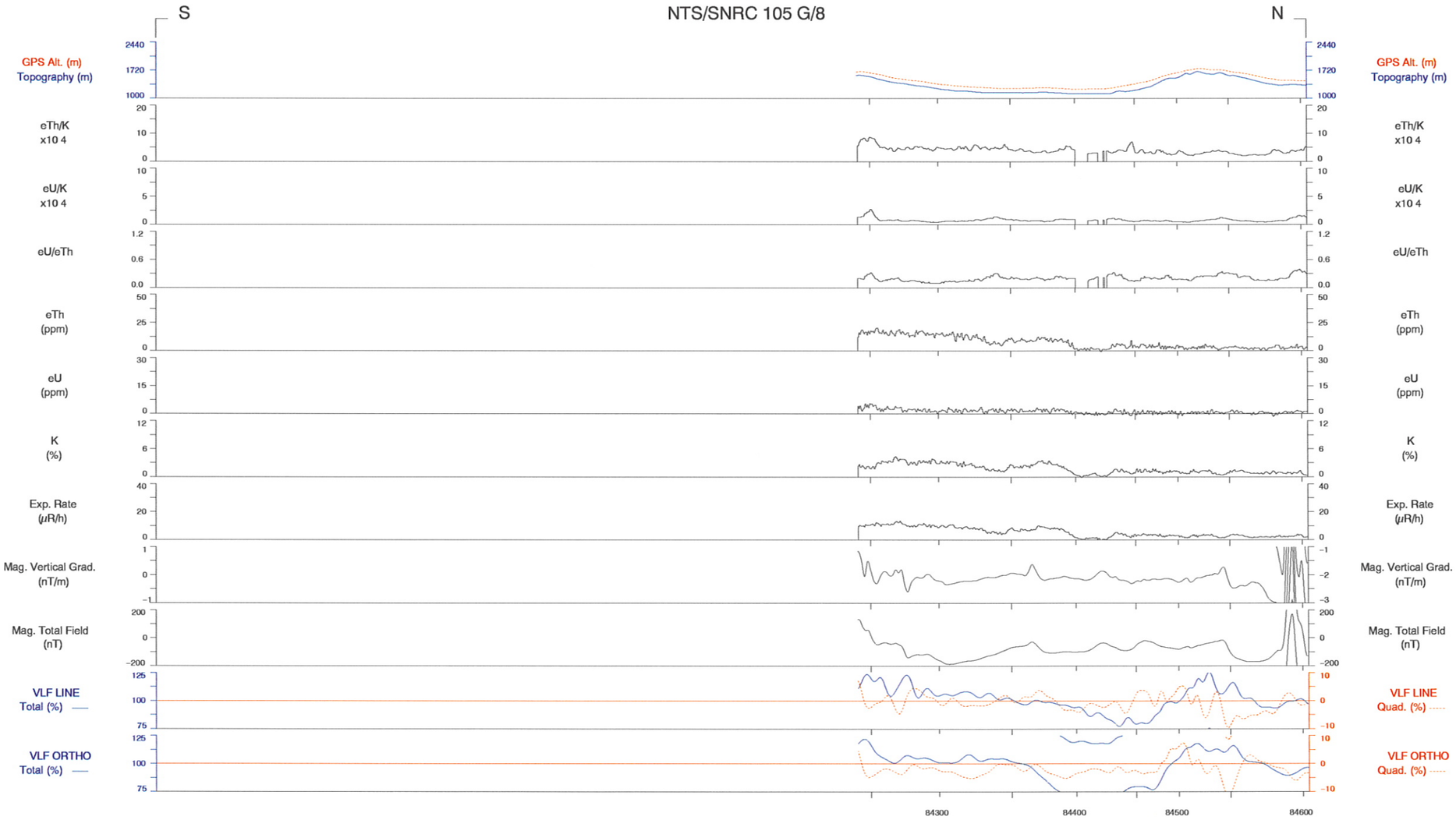
LINE 1089 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8



LINE 1090 Scale 1:150000 3 KM azimuth 0°

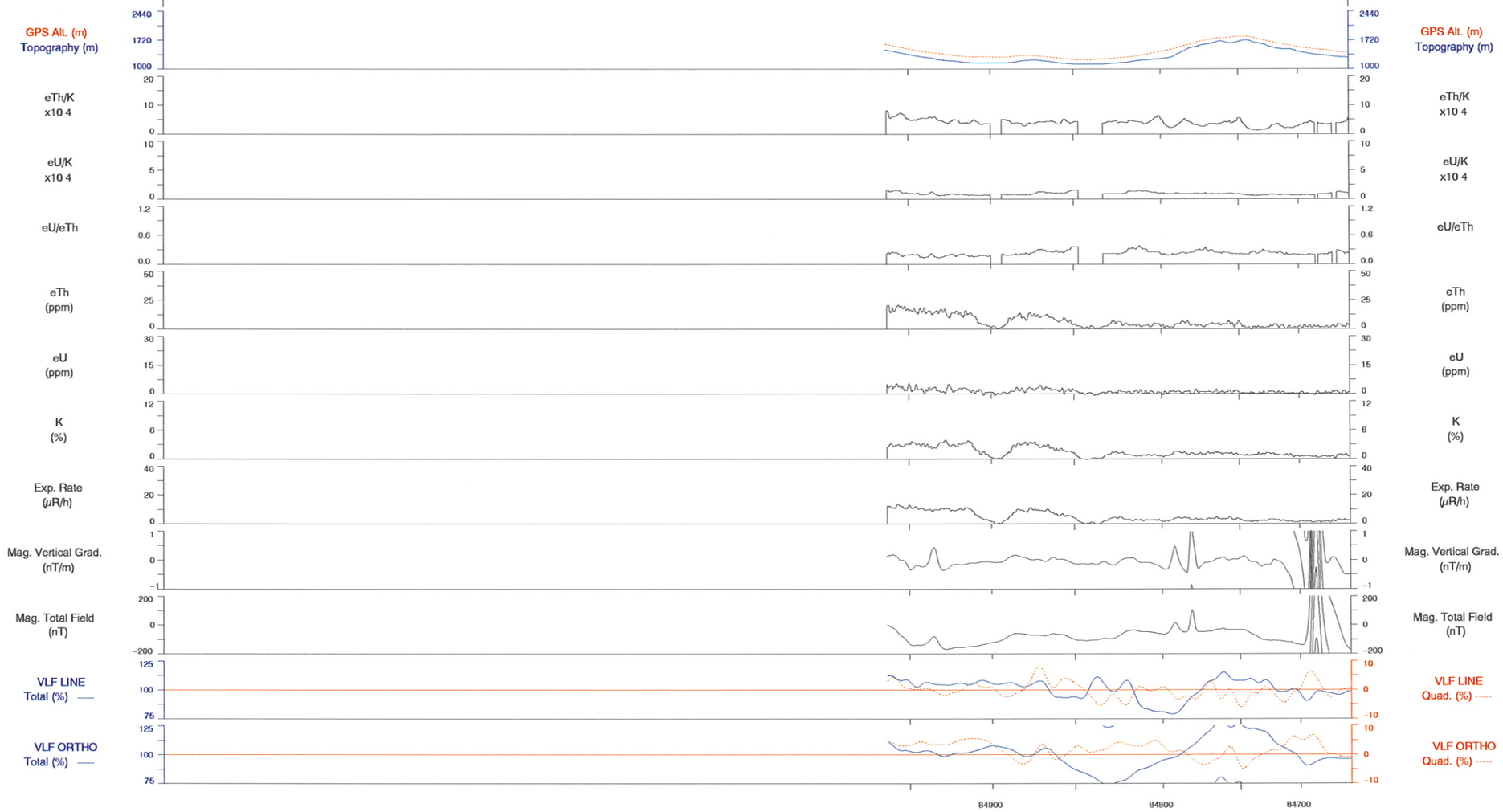
GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8



LINE 1091 Scale 1:150000 3 KM azimuth 0°

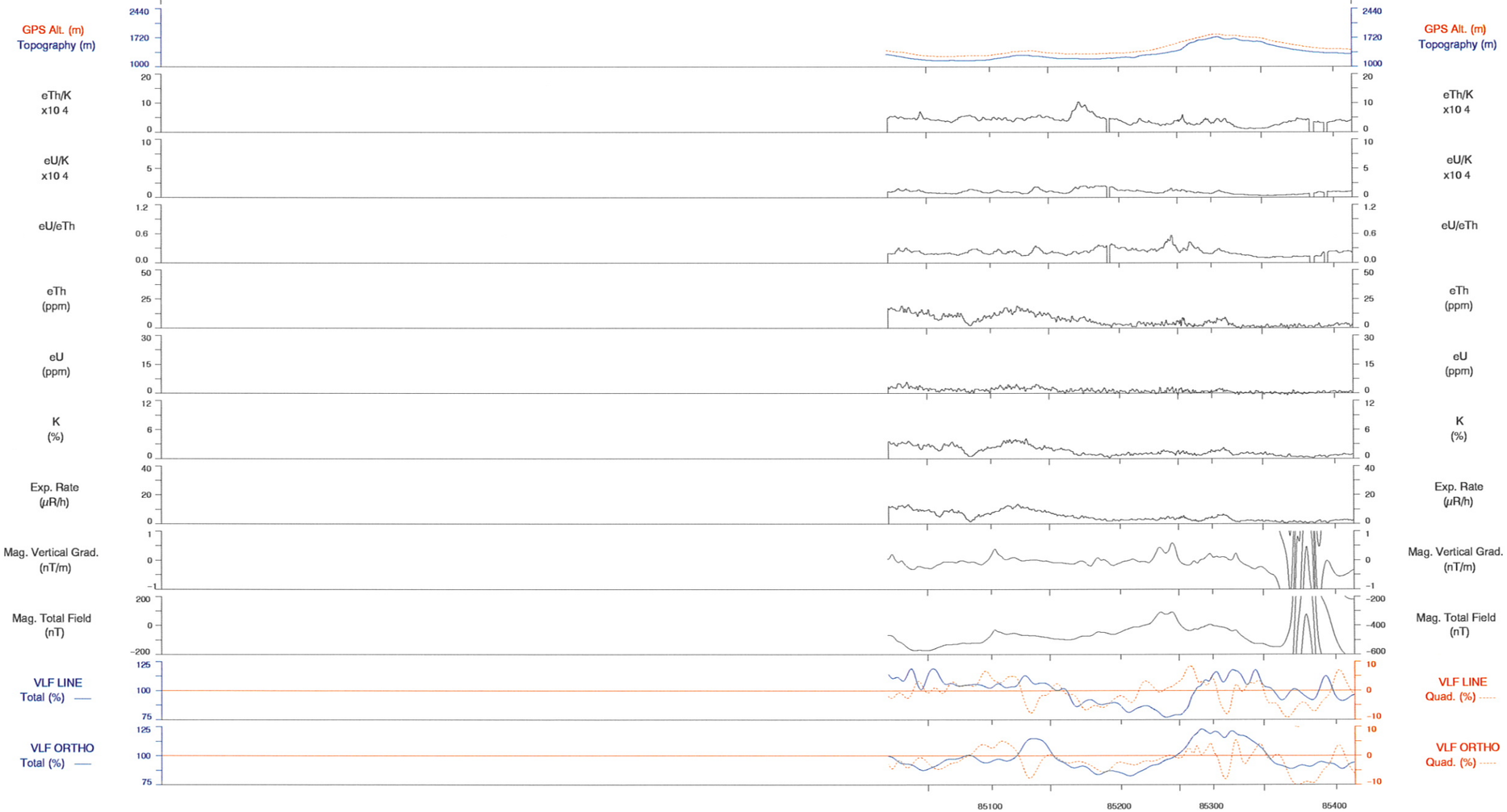
GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

S — N



LINE 1092 Scale 1:150000 3 KM azimuth 0°

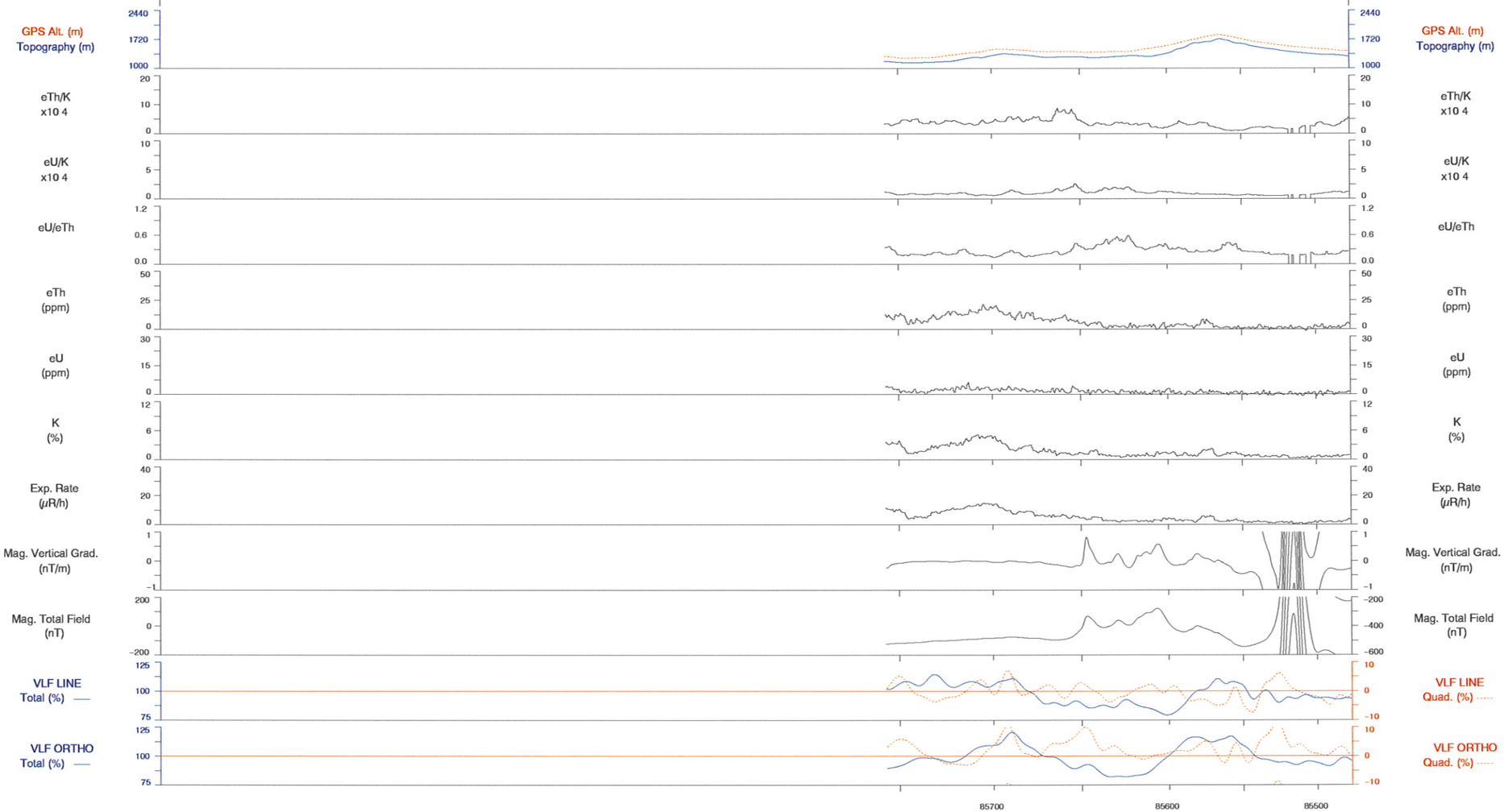
GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8



LINE 1093 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

S N

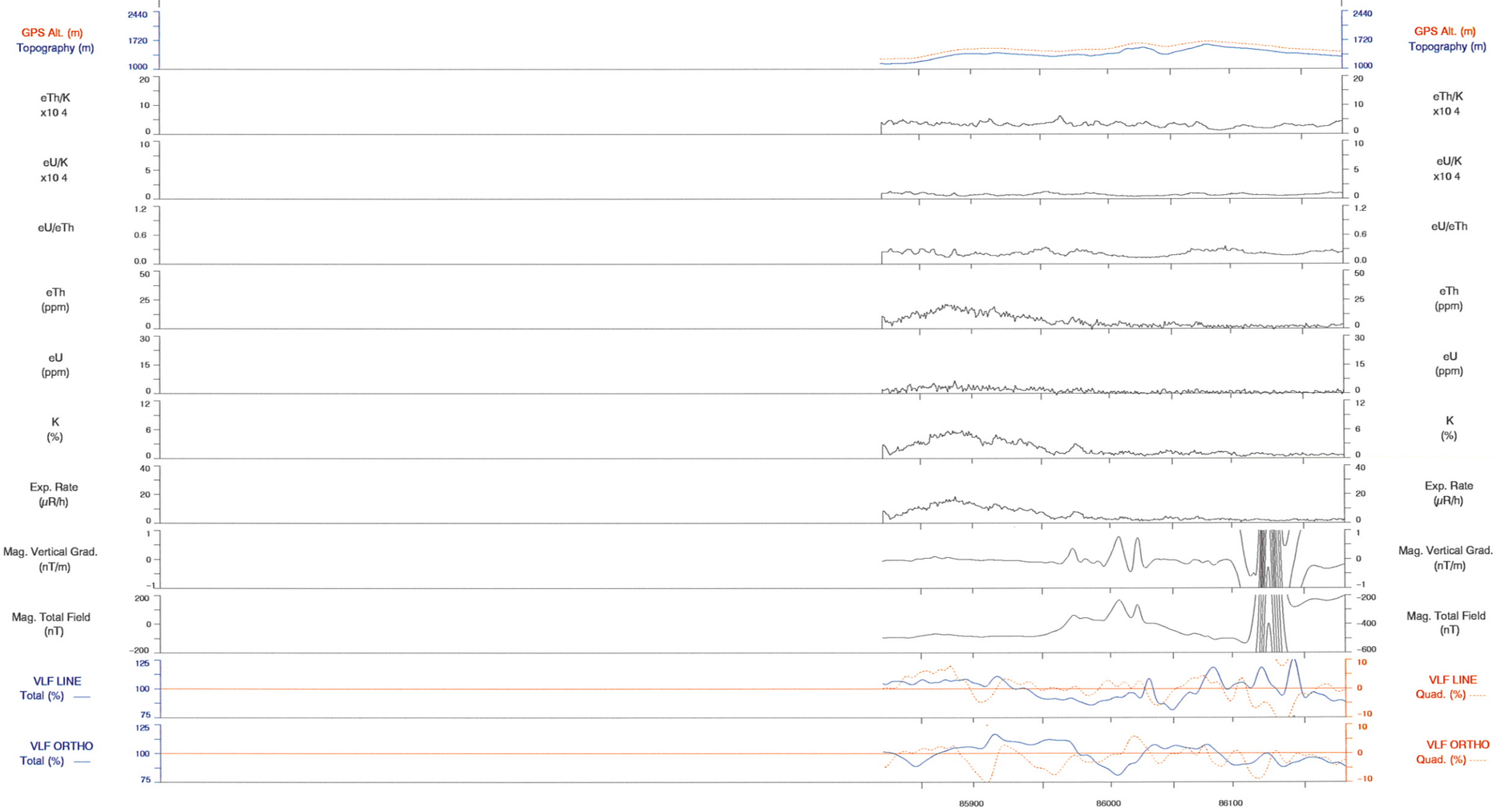


LINE 1094 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

S

N

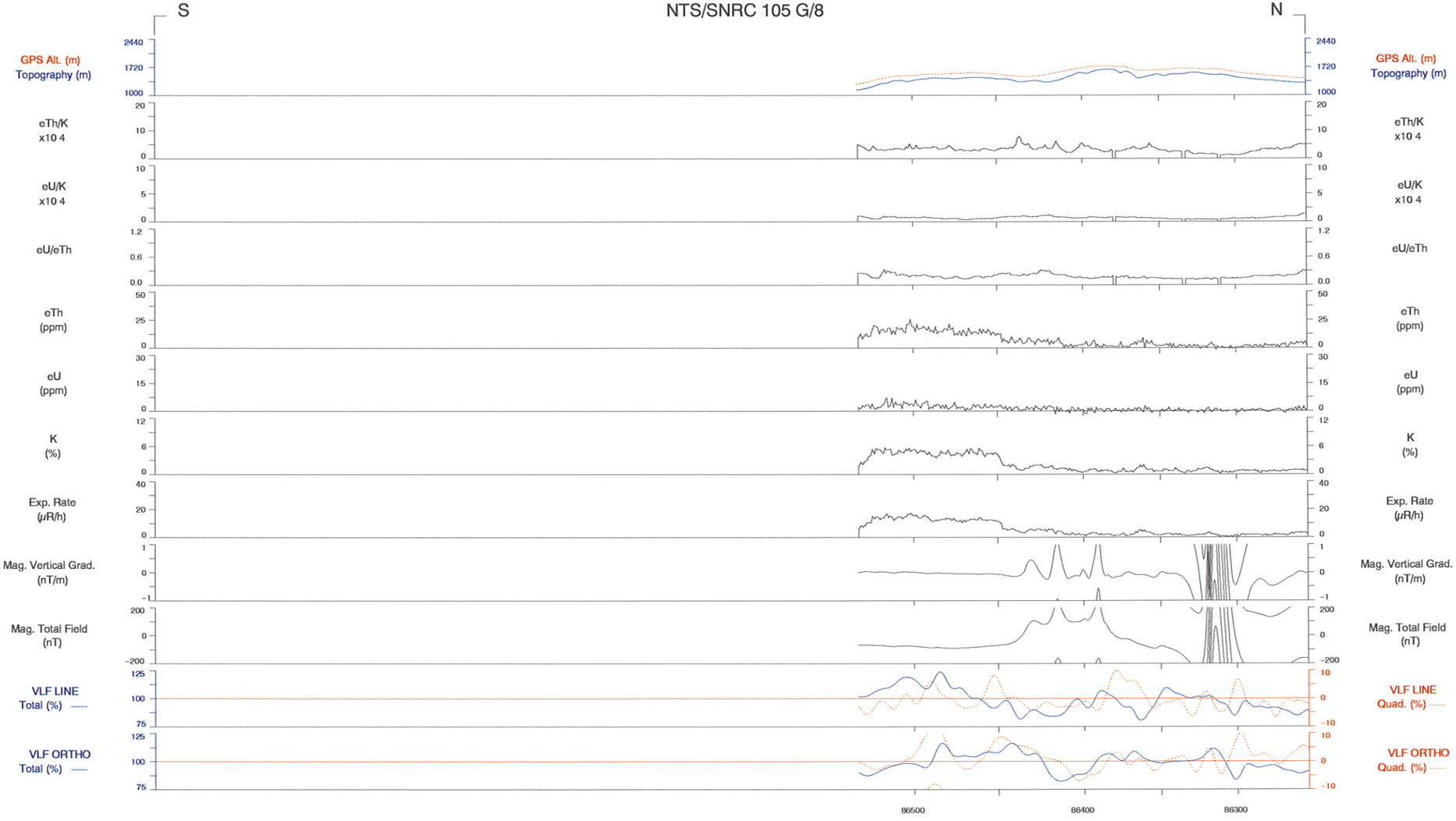


LINE 1095 Scale 1:150000

3 KM

azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

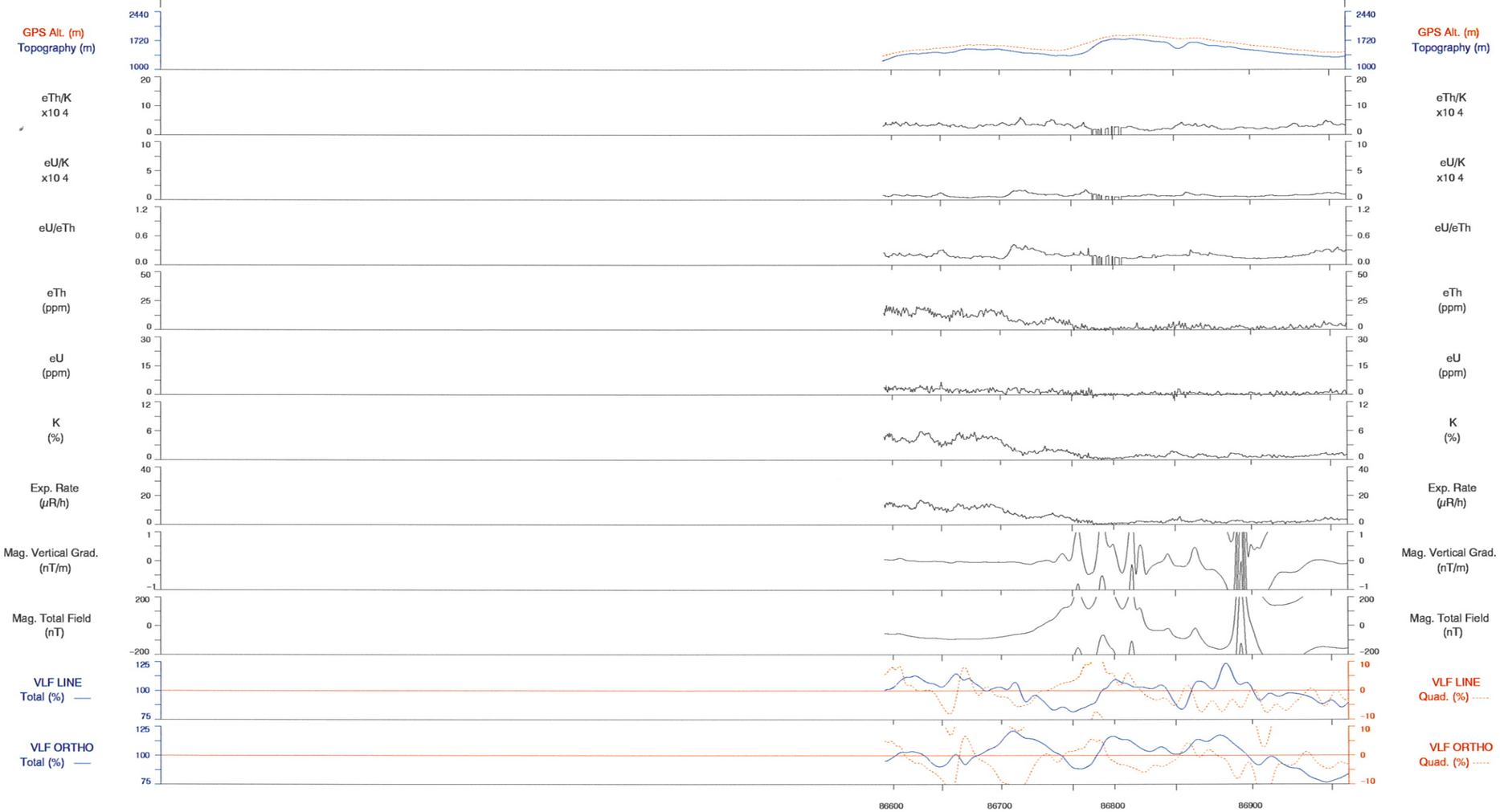


LINE 1096 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

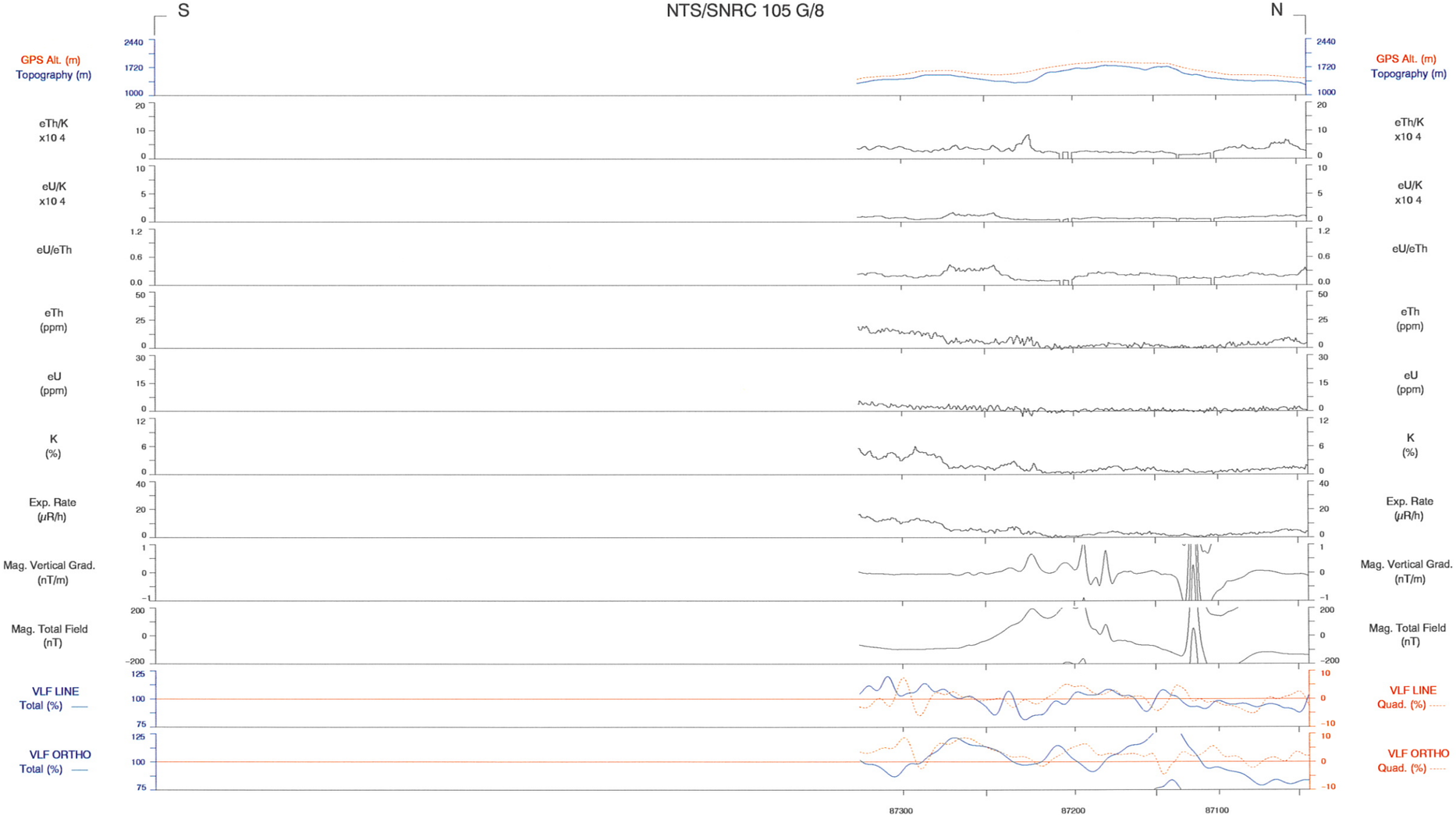
S

N



LINE 1097 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

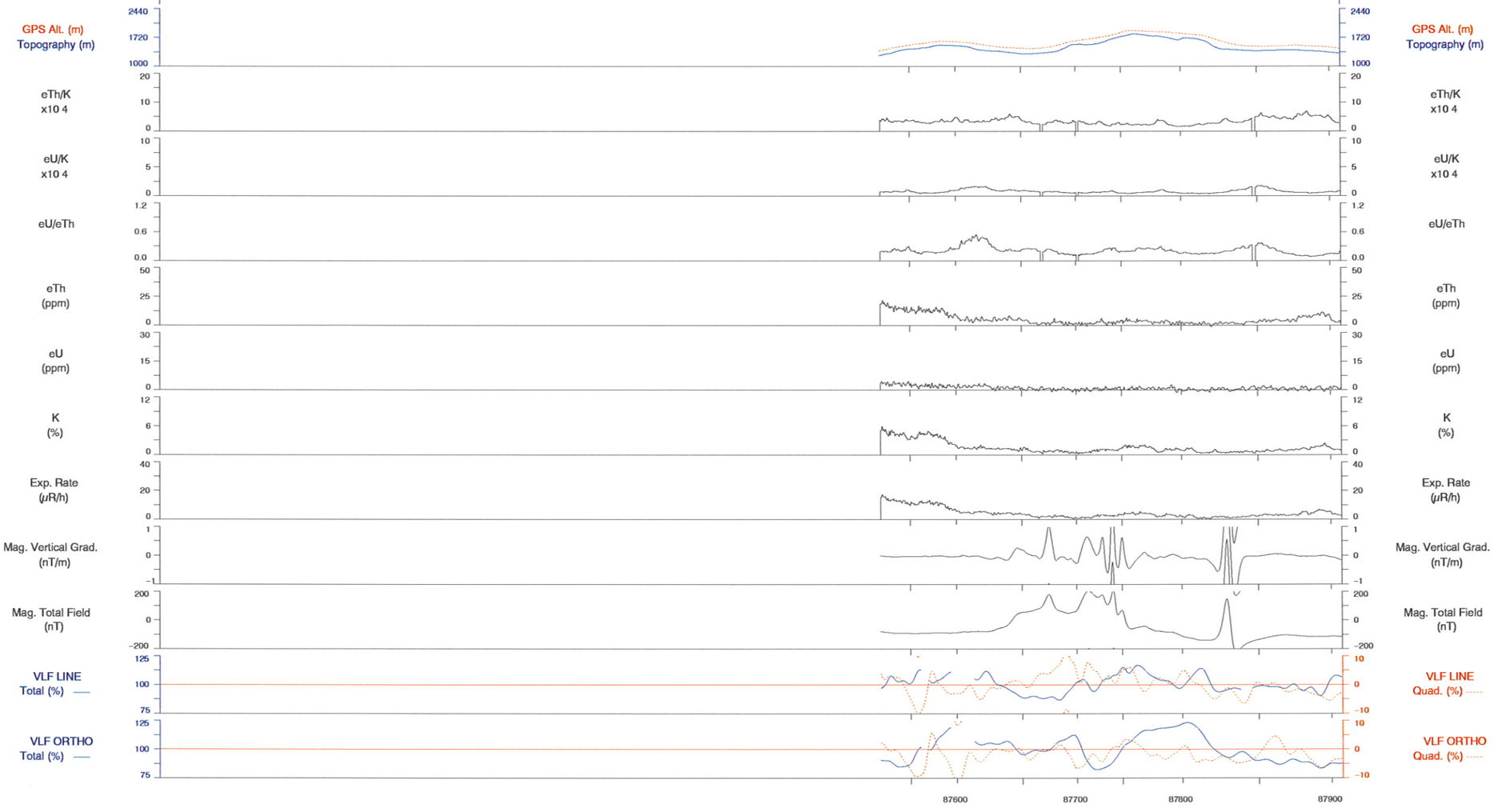


LINE 1098 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

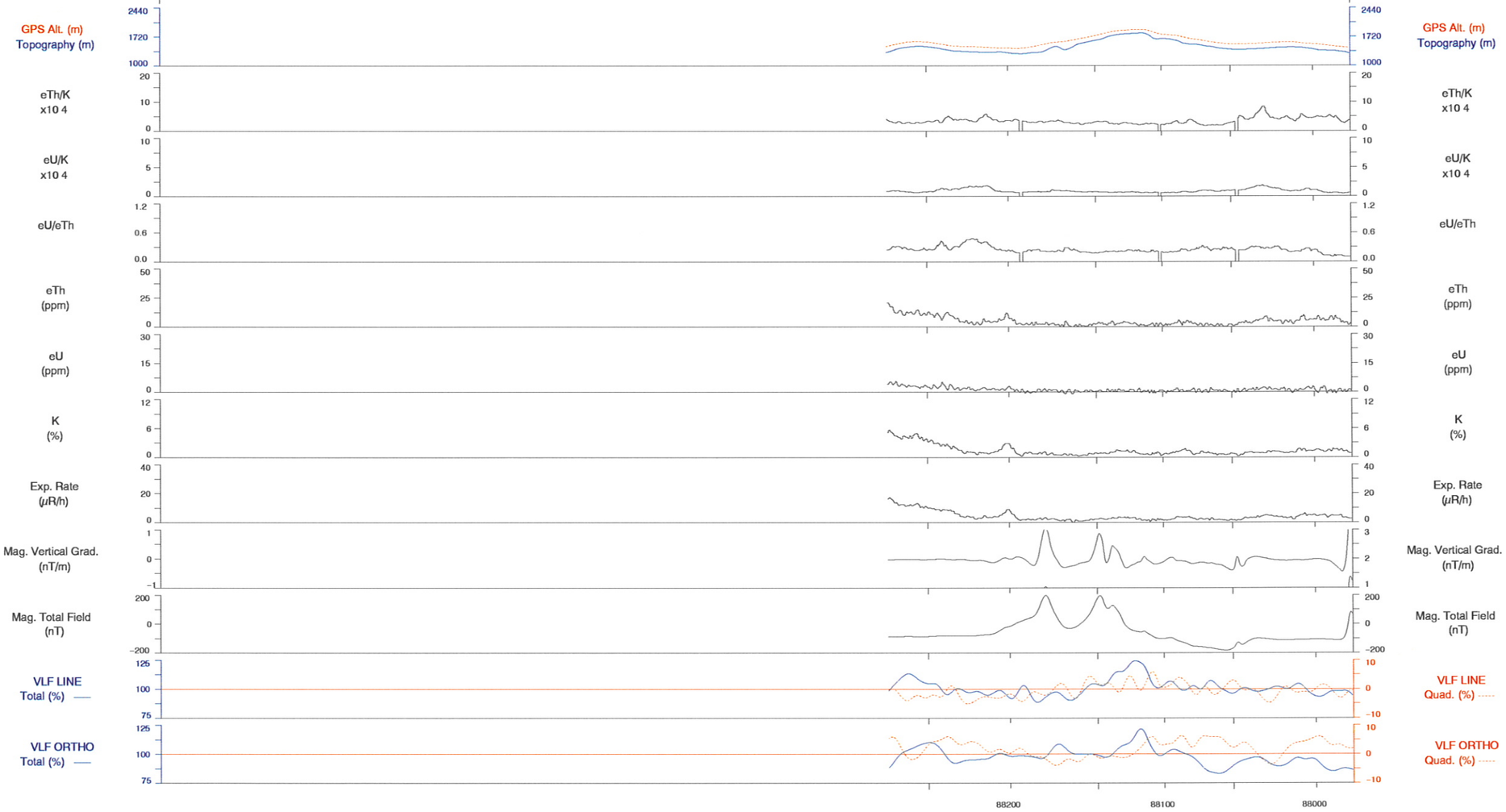
S

N



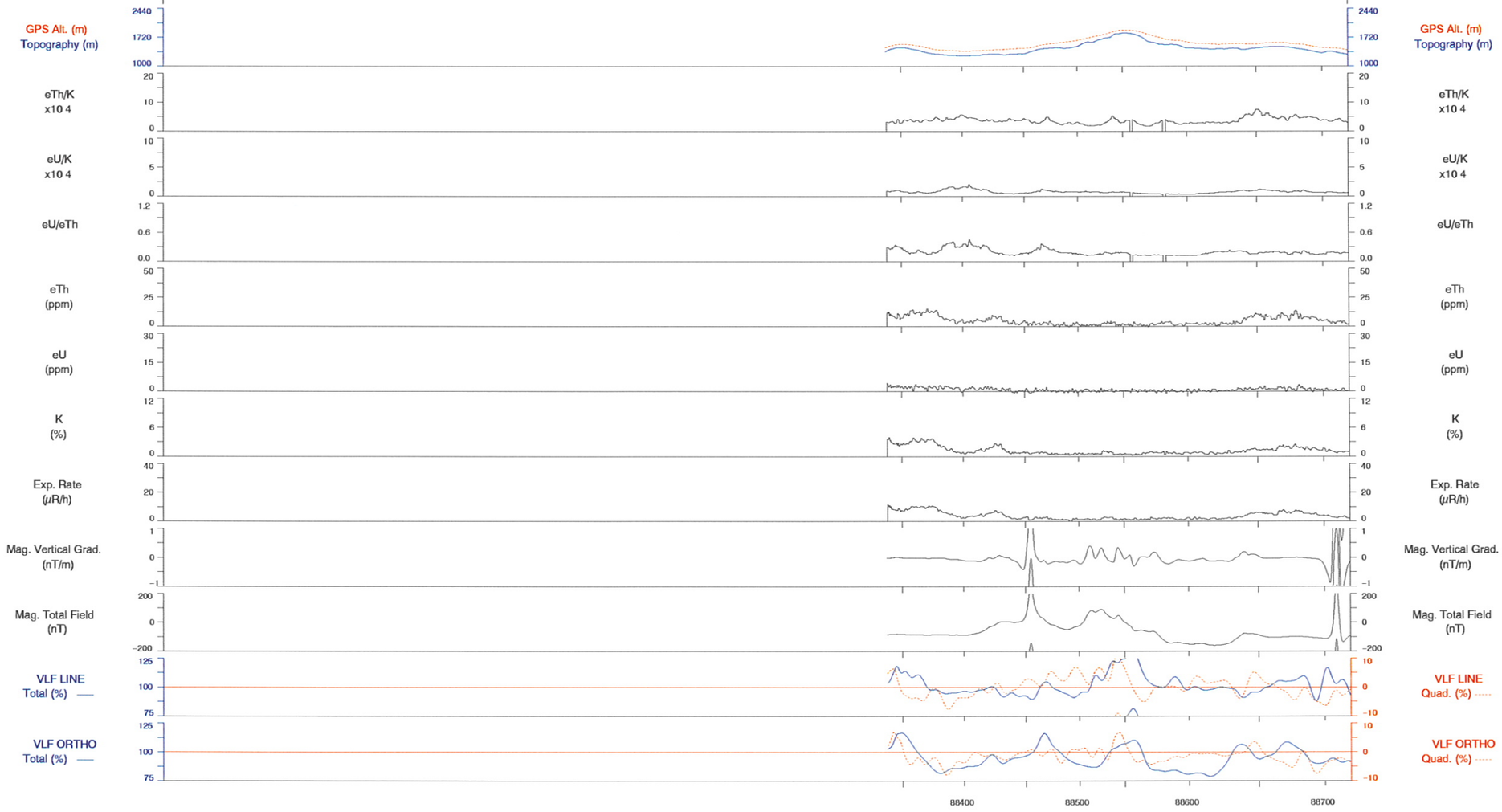
LINE 1099 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8



LINE 1100 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

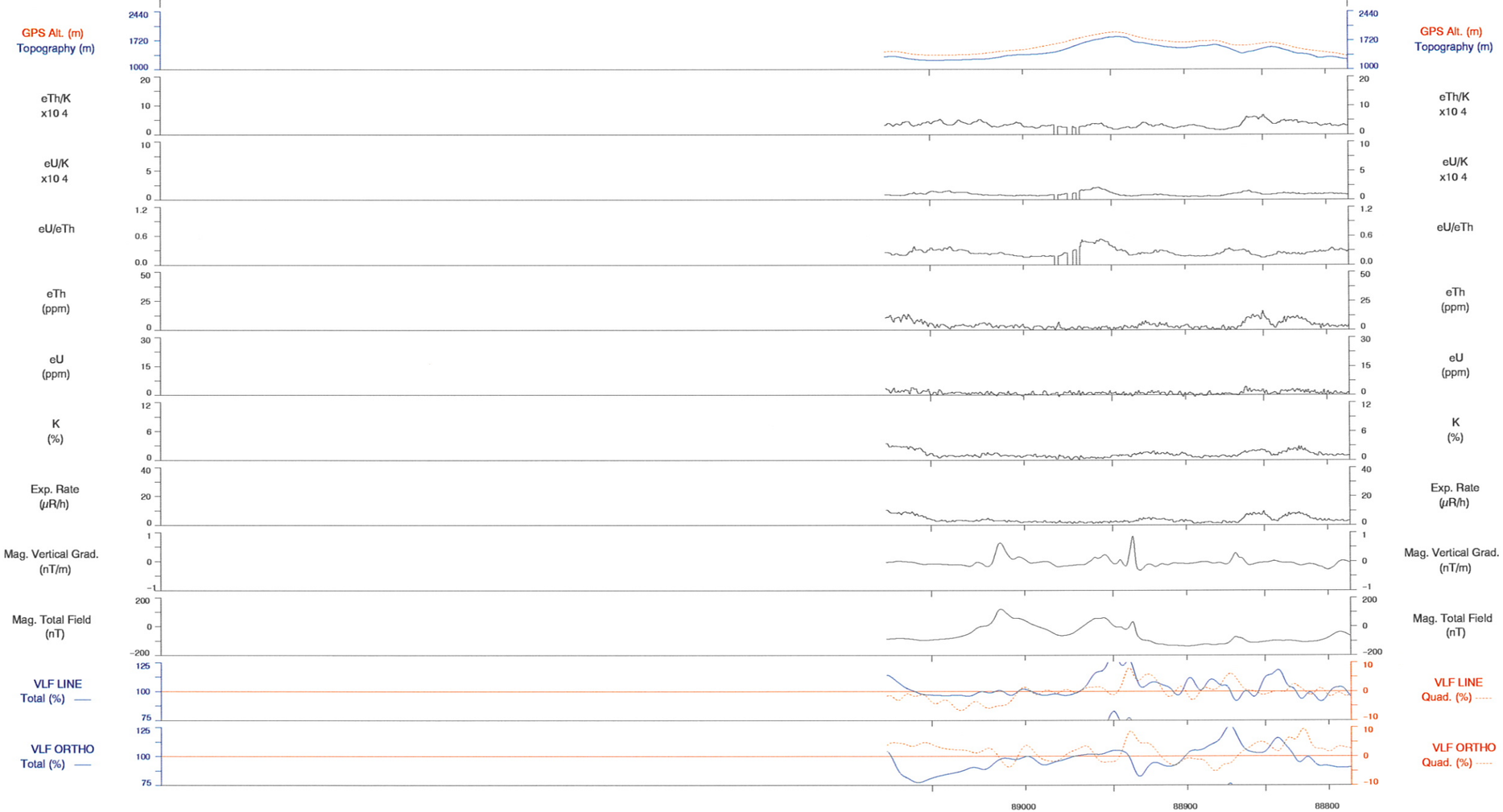


LINE 1101 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

S

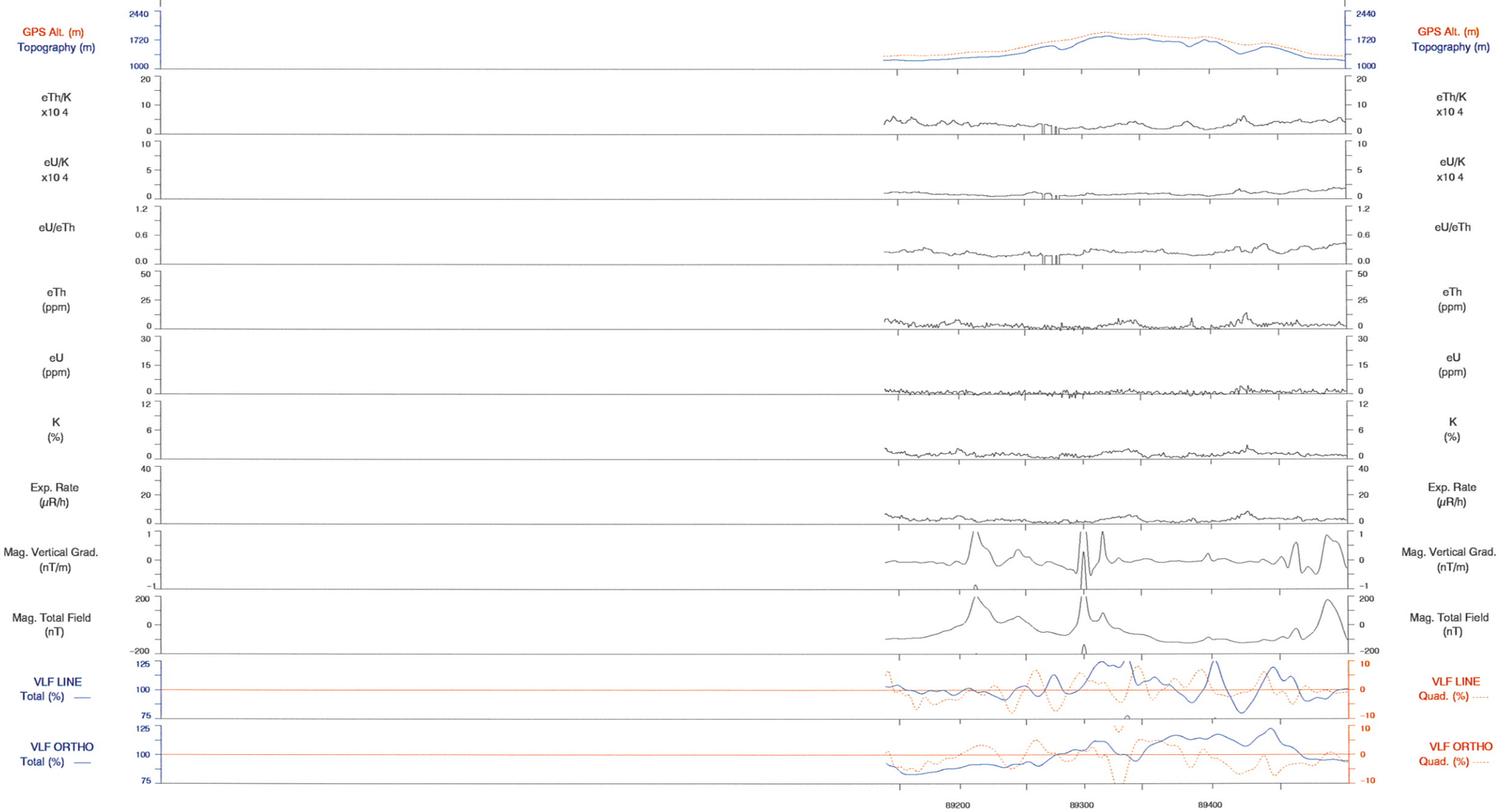
N



LINE 1102 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

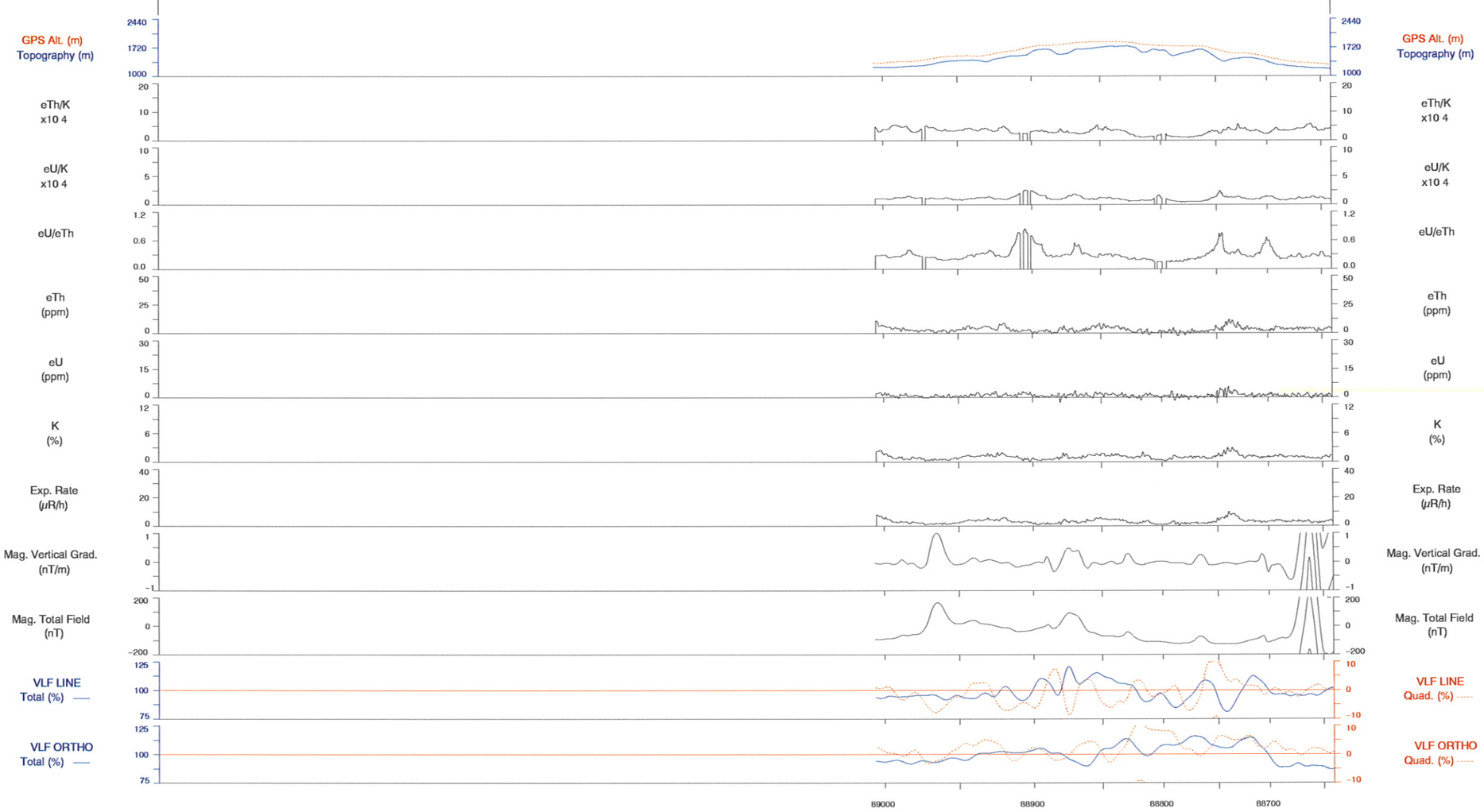
S N



LINE 1103 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

S — N

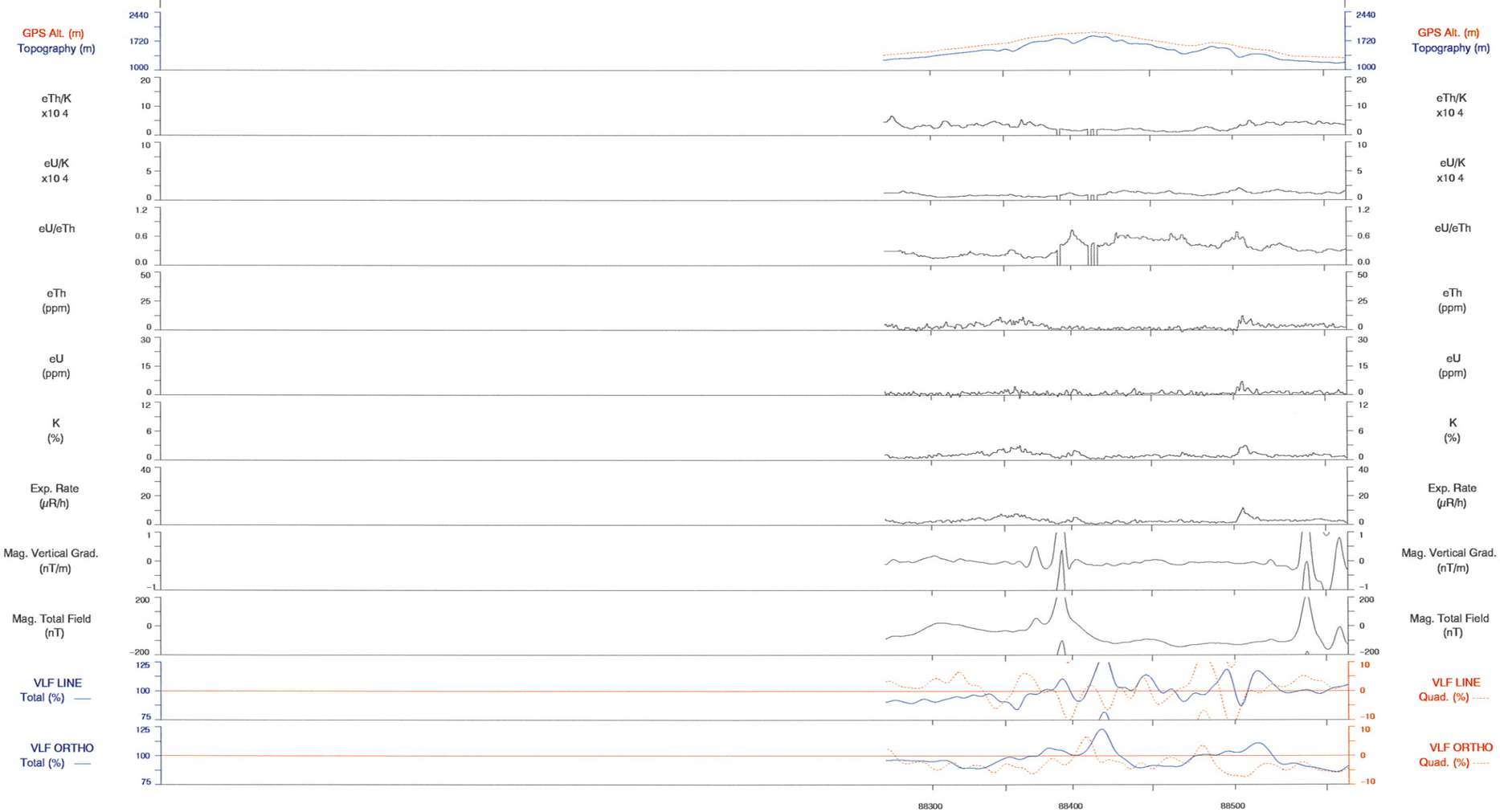


LINE 1104 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

S

N

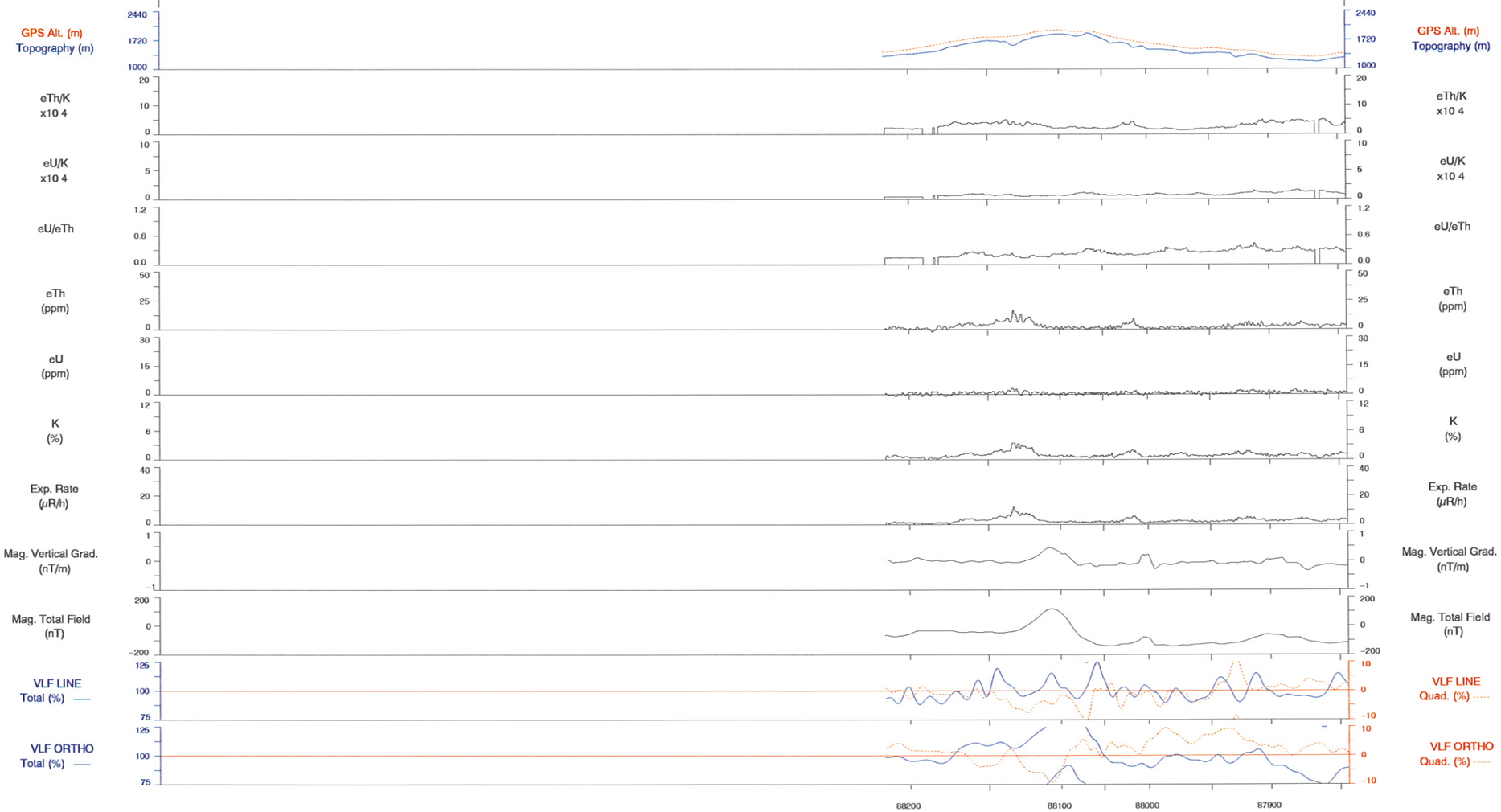


LINE 1105 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

S

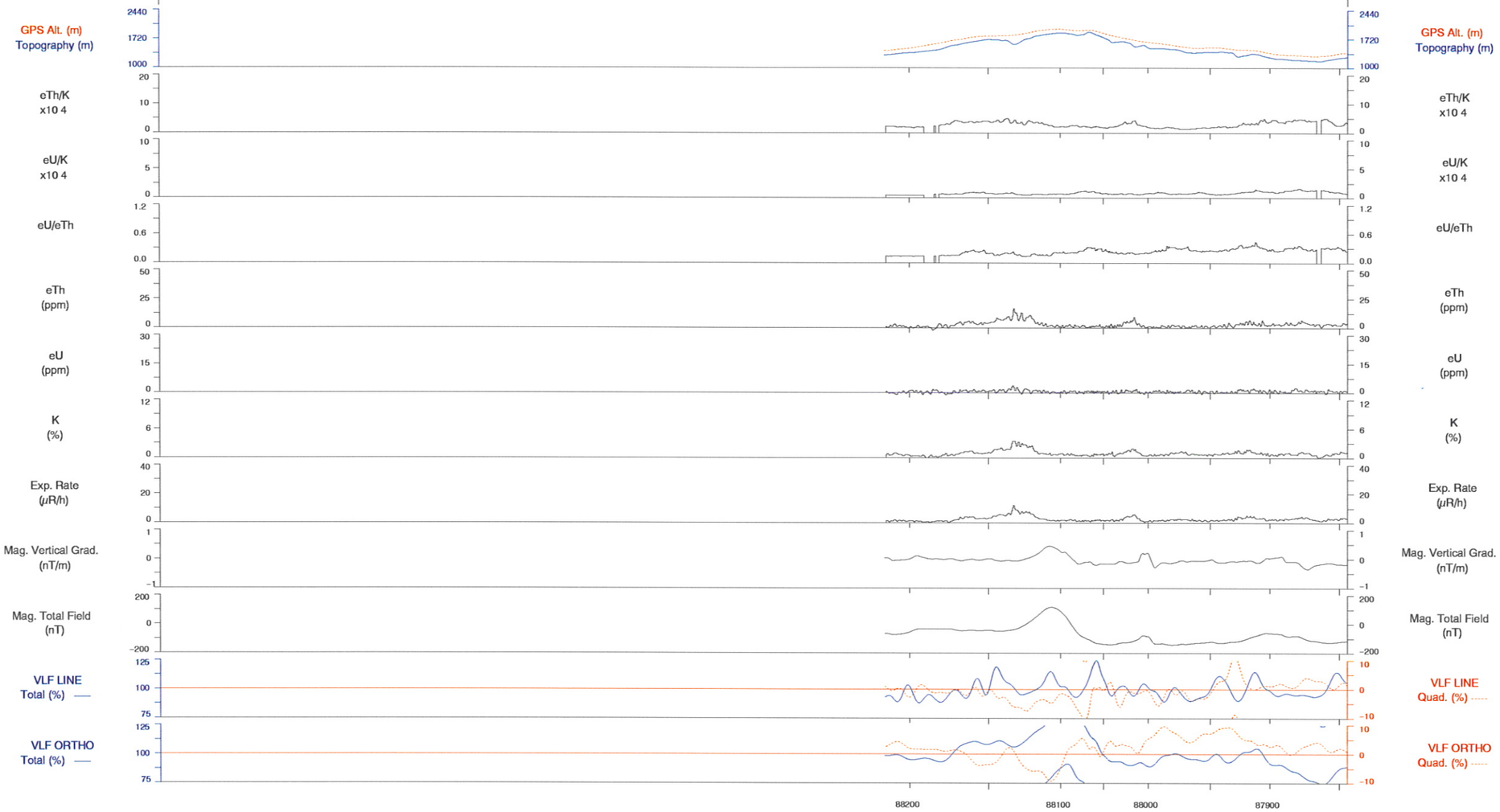
N



LINE 1106 Scale 1:150000 3 KM azimuth 0°

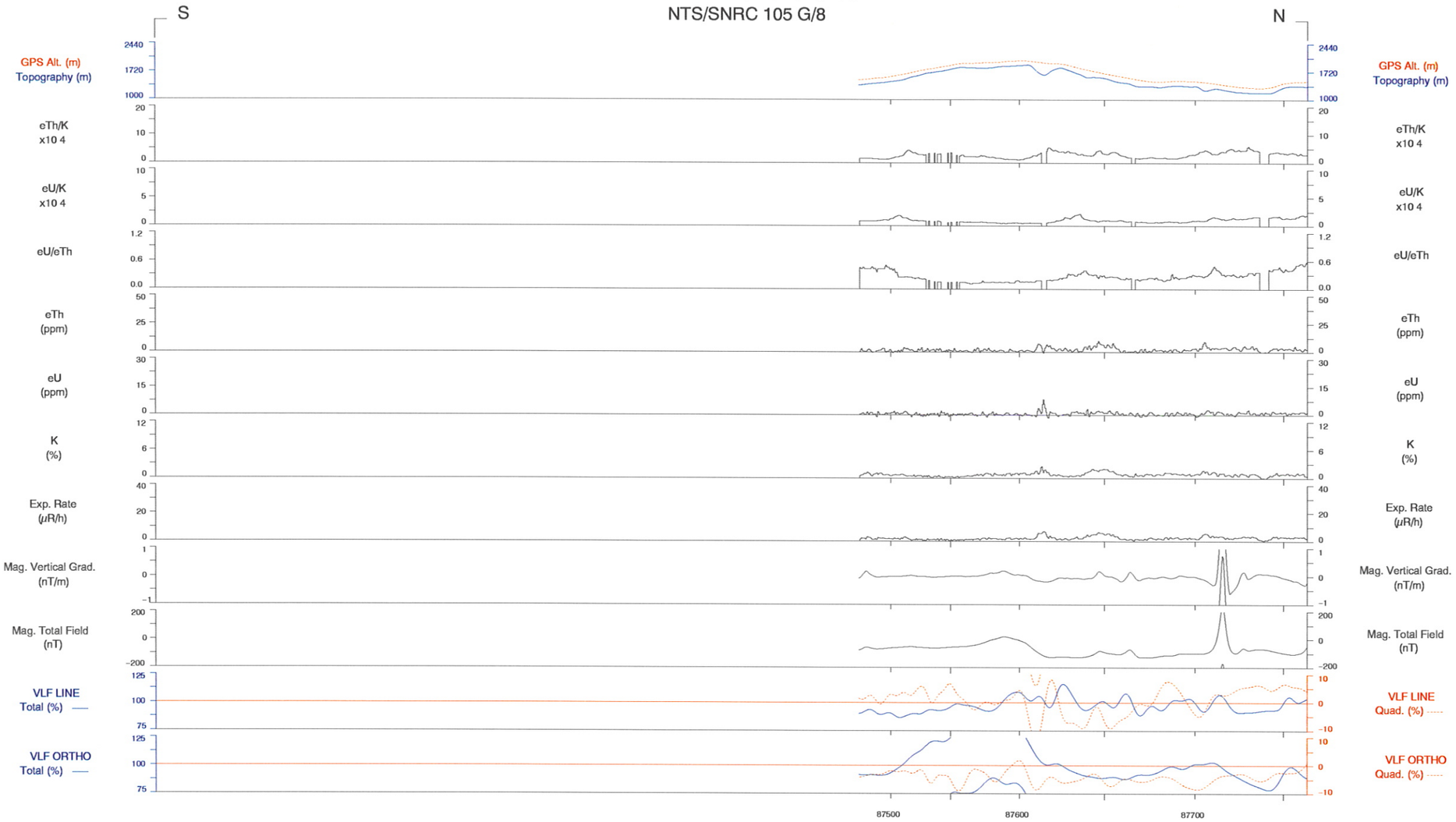
GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

S N



LINE 1106 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

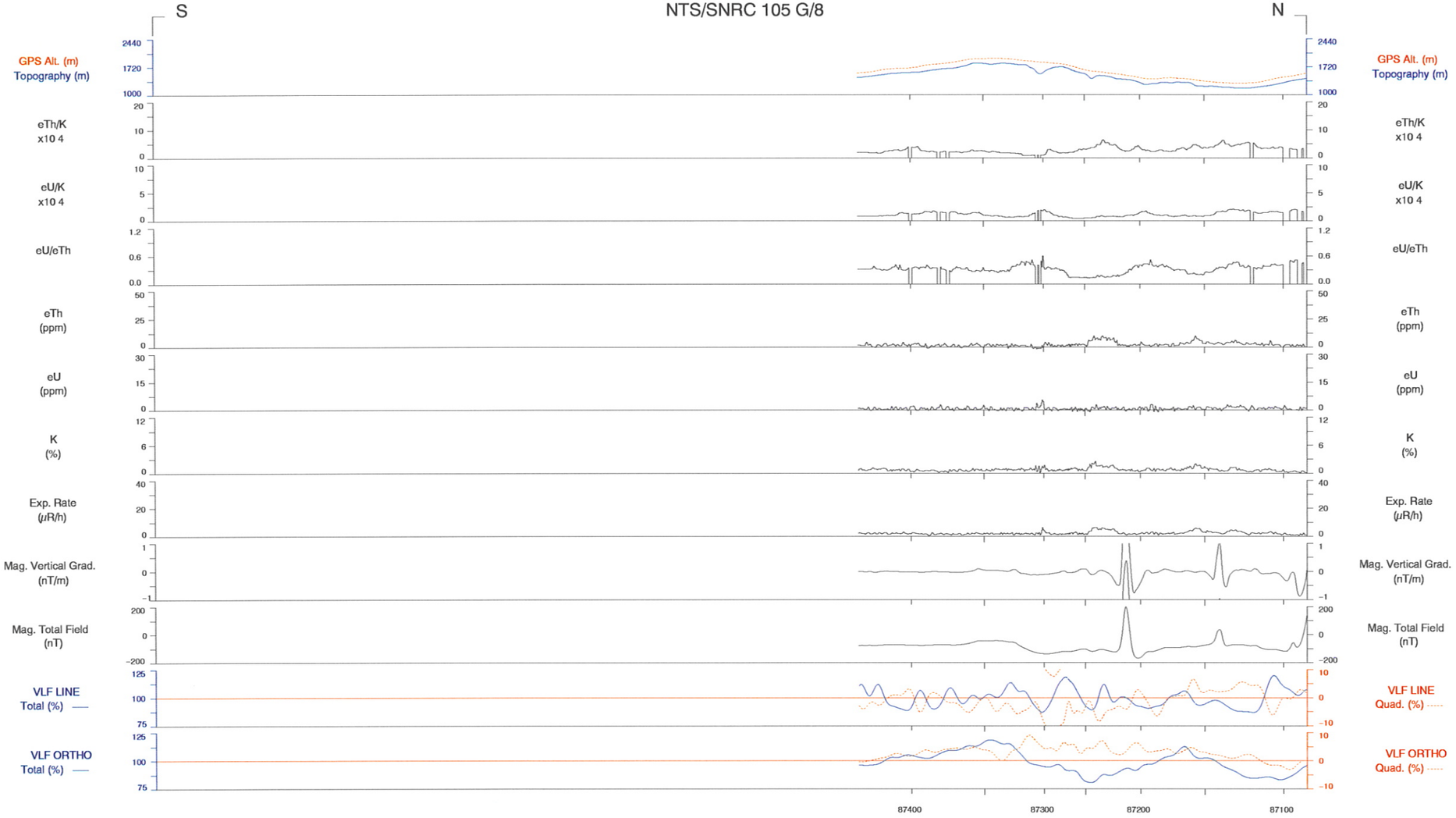


LINE 1107 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

S

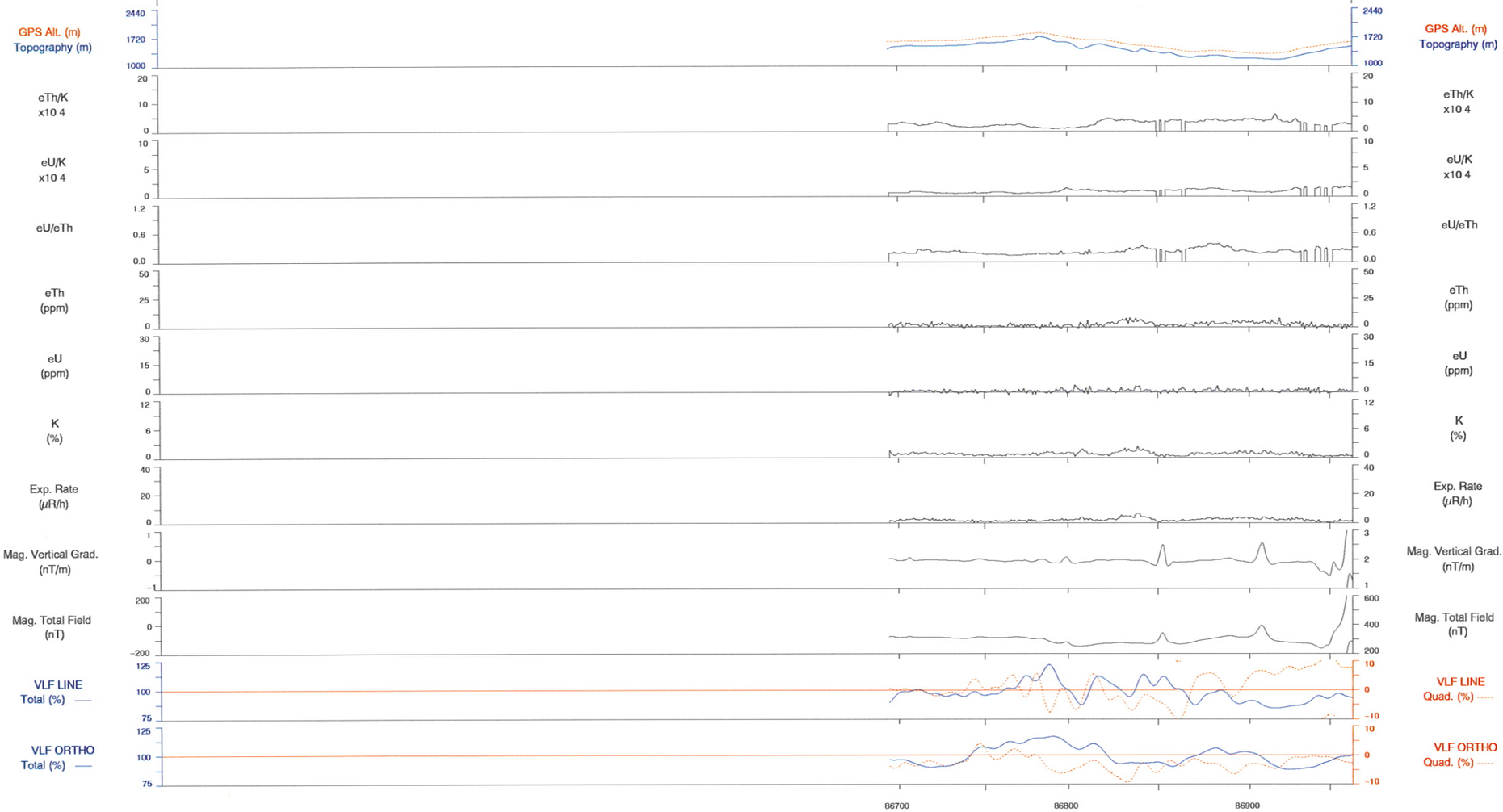
N



LINE 1108 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

S N

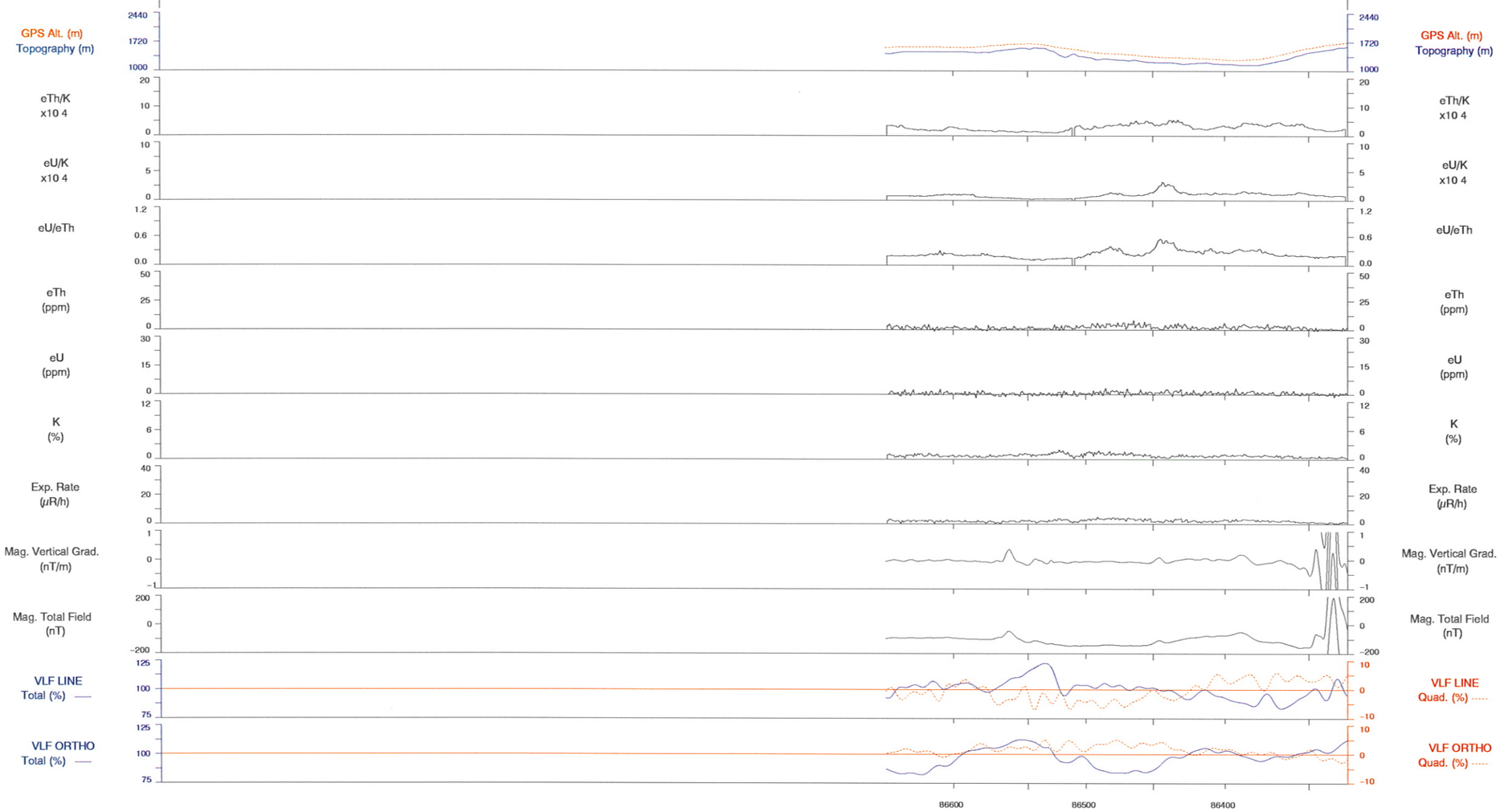


LINE 1109 Scale 1:150000 3 KM azimuth 0°

GRASS LAKES, YUKON, 1997
NTS/SNRC 105 G/8

S

N



LINE 1110 Scale 1:150000 3 KM azimuth 0°