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2.5D forward modelling of total field magnetic data from Väsman

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Abstract

This report presents results from 2.5D forward modelling of total field magnetic data from lake Väsman, close to the town of Ludvika in central Sweden. The modelling work was carried out by GeoVista AB, Håkan Mattsson. The magnetic data, east-west oriented lines of 100 m spacing and 10 m station spacing, were delivered to GeoVista AB by Nordic Iron Ore. The modelling was supported by petrophysical data from measurements of NRM intensity and magnetic susceptibility on 10 core samples of mineralized rock from an old drill core (Bh6 Finnäset), and also by geological mapping of this drill core.

The aims of this work are:

1. Produce magnetic 2.5D forward models along 20 profiles across the Väsman mineralization.

2. Use the magnetic susceptibility of the model bodies to estimate the volume content (vol%) magnetite, the weight% magnetite and combine these data with the volume of the bodies to estimated the total amount of magnetite ore and Fe of the model bodies.

The mineralized area trend in N-S, it is approximately 2 km long, and varies in width of roughly 300 – 400 m. The magnetic total field across the mineralized zone is in the range of 60,000 – 65,000 nT, with peak values of as much as 75,000 – 84,000 nT. All in all 47 bodies represent the mineralization according to the final model. The bodies have susceptibility in the range 0.5 – 2.2 SI, Q = 0.3 – 0.7 and volume in the range 55,000 m^3 to 18 500 000 m^3.

An estimation of the vol% magnetite based on the magnetic susceptibility of the models was carried out, and with reference to these data the weight% magnetite and hence weight% Fe was estimated.

The total mass of iron ore, according to this magnetic model, is c. 644 Mtonnes, with a weighted average grade Fe of 29%, which corresponds to c. 185 Mtonnes of Fe.

Contents

1 Introduction

This report presents results from 2.5D forward modelling of total field magnetic data collected on the lake Väsman, located close to the town of Ludvika in south central Sweden (Figure 1). The modelling work was carried out by GeoVista AB, Håkan Mattsson. The magnetic data, east-west oriented lines of 100 m spacing and 10 m stations, were delivered to GeoVista AB by Nordic Iron Ore. GeoVista AB did not take part in the collection of the data. The modelling was supported by petrophysical data from measurements of NRM intensity and magnetic susceptibility on 10 core samples of Fe-mineralized rock from an old drill core from Finnäset, located less than 1 km south of the Väsman mineralization. Part of the Finnäset drillcore was also logged with a hand-held susceptibility instrument and mapped by a geologist (Mats Larsson, Berg & Gruv AB).

Figure 1. *Map showing the location of the survey area indicated by a red ring.*

2 Objective and scope

The general aim of geophysical modelling is to estimate geometry and physical character of the cause to an investigated anomaly, for example a high magnetic feature caused by increased content of magnetite in the bedrock. In 2.5D forward modelling work the data along a profile are interpreted. A geological model of rock “bodies” is constructed and the bodies are given physical properties; in our case based on petrophysical data from an old borehole at Finnäset (bh6). The response of the model bodies is calculated and visualized together with the measured data, and the fit between the measured data and the “model data” can be compared. The properties and geometries of the model bodies are changed until a reasonably good fit is achieved. The model solution is not unique, but with knowledge of the geology and petrophysical properties it is possible to achieve geologically reasonable model solutions.

The specific aims of this work are:

1. Produce magnetic 2.5D forward models along 20 profiles across theVäsman mineralization.

2. Use the magnetic susceptibility of the model bodies to estimate the volume content (vol%) magnetite, the weight% magnetite and combine these data with the volume of the bodies to estimated the total amount of magnetite ore and Fe of the model bodies.

3 Data processing

3.1 Interpretation tools and processing

The processing, interpretation and reporting included the use of the following specialized software:

ModelVision v. 10.00 (Encom Technology)	(Forward magnetic modelling)
Profile Analyst Professional v. 9.0 (Encom)	(Model visualization)
Surfer 9 (Golden software)	(Data processing)
MapInfo Professional 10.0 (Pitney Bowes)	(Data processing and visualization)

The total magnetic field data were delivered in a MS Excel file together with east and north co-ordinates in the Swedish coordinate system, with projection RT90 2.5 gon väst. The survey had been performed on the ice during winter time. According to bathymetric data the average water depth is c. 10 m, and this was compensated for in the modelling work. The magnetic data and co-ordinates were imported into the software ModelVision. Minimum curvature interpolation was performed to create a grid for plotting and inspecting the data. Stacked profiles were created for the modelling. A regional magnetic field was estimated by use of linear regression of data from all survey lines. Modelling was performed on all 20 profiles. Since the profile distance is 100 m, each model body was set to be 100 m wide perpendicular to the profile orientation. Hence, by combining the models from all profiles we will actually get a pseudo 3D model of the bedrock and the mineralization. However, note that this pseudo 3D model is based on interpolation between the profiles, where we actually lack information.

3.2 Petrophysical measurements

In order to constrain the model and increase its geological reliability it is important to have knowledge of the magnetic properties of the rocks in the survey area. Most important are the magnetic susceptibility and the natural remanent magnetization (NRM). No rock samples have been collected from the Väsman lake mineralization, even though historic drillings have been performed in the area. However, during a visit at the drill core archive in Malå (Geological Survey of Sweden), we were able to geologically map, sample and susceptibility log part of an old drill core (bh6) from the Finnäset mineralization, which is located along strike, and less the 1 km south, of the Väsman mineralization. NRM intensity and magnetic susceptibility of ten core samples from the Fe-mineralized parts of the core were measured with an Oerstedt meter instrument at the petrophysical laboratory of Luleå University of Technology.

4 Results and evaluation

4.1 Petrophysical properties and core logging

The geological mapping of part of the drill core from Bh6 at Finnäset is presented in appendix 1. The susceptibility data of the same section are presented in appendix 2. In total 145.4 m of the Bh6 core was investigated. The geological mapping shows a dominance of quartz-biotite rich metasediment (48 m length) and arenitic metasediment (48 m length), with generally no, or very low, content of magnetic minerals. Some 15 m of the logged sections are governed by mafic metavolcanic rocks, and these rocks may have fair amounts of magnetic minerals, 2-15 weight% magnetite. There are seven Fe-mineralized sections with total length of c. 22 m. The main magnetic mineral is generally magnetite, but in some sections there are also large amounts of hematite present in the rock. The weight% magnetite in the mineralized sections is estimated at 15 – 60 weight%.

Ten samples were collected from the core for measurements of NRM intensity and magnetic susceptibility. The results are presented in Table 4-1. The median susceptibility of the Fe-mineralized samples is 2.2 SI and the median Q-value is 0.7

Table 4-1. *Magnetic susceptibility, NRM intensity and Q-value of ten Fe-mineralized samples of bh6, Finnäset.*

Sample	Suscept. (SI)	Remanence intensity (A/m)	Q-value (Mr/Mi)	Comment
1	3.7	36.1	0.2	BIF Fe-mineralization
2	3.3	79.5	0.6	BIF Fe-mineralization
3	1.91	256	3.4	BIF Fe-mineralization
4	2.17	701.6	8.1	BIF Fe-mineralization
5	3.06	13.2	0.1	BIF Fe-mineralization
6	1.99	189.5	2.4	BIF Fe-mineralization
7	0.34	9.9	0.7	BIF Fe-mineralization
8	1.17	262.7	5.6	Lava flow with magnetite
9	1.55	58.8	1.0	Lava flow with magnetite
10	1.3	43.4	0.8	Lava flow with magnetite

4.2 2.5D forward modelling

The 2.5D forward modeling was performed on all 20 surveyed lines (Figure 4-1). The Fe-mineralized rocks were modeled with a Q-value in the range 0.5 – 0.7, and since the orientation of the NRM vector is unknown it was set parallel with the present earth magnetic field (Decl. = 4°, Incl. = 73º, 51,221 nT). The susceptibility of the Fe-mineralized model bodies is in the range 0.5 – 2.2 SI, with median of 0.9 SI. Due the high susceptibility values demagnetization was accounted for in the modeling work. Background susceptibility was set to 0 SI. In the model plots the Fe-mineralized rocks are shown by red color.

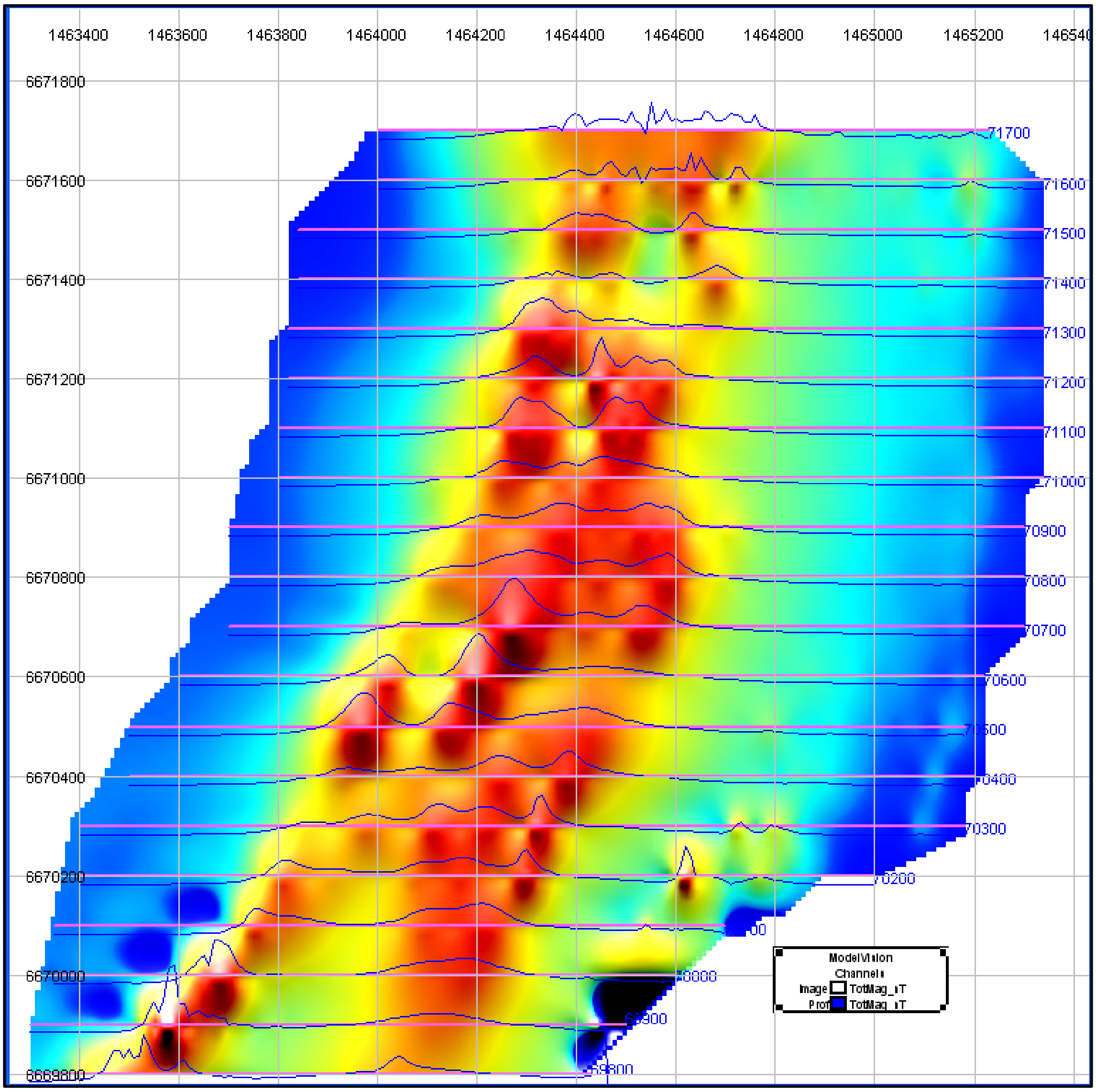

Figure 4-1. *Measured magnetic data as stacked profiles on top of magnetic pseudo color map interpolated with minimum curvature.*

The mineralized area trend in N-S, it is approximately 2 km long, and the width varies between roughly 300 – 400 m. The magnetic total field across the mineralized zone is in the range of 60,000 – 65,000 nT, with peak values of as much as 75,000 – 84,000 nT. The shapes of the majority of the anomalies indicate that the mineralized rocks dip steeply, generally sub vertically. In Figure 4.2, three examples (three profiles) of 2.5D models of the bedrock are presented. Red bodies show Fe-mineralized rock and green bodies show surrounding rocks. The location of the profiles is displayed in Figure 4-1.

All in all 47 bodies represent the mineralization according to the final model. The bodies have susceptibility in the range 0.5 – 2.2 SI, Q = 0.3 – 0.7 and volume in the range 55,000 m^3 to 18,500,000 m^3.

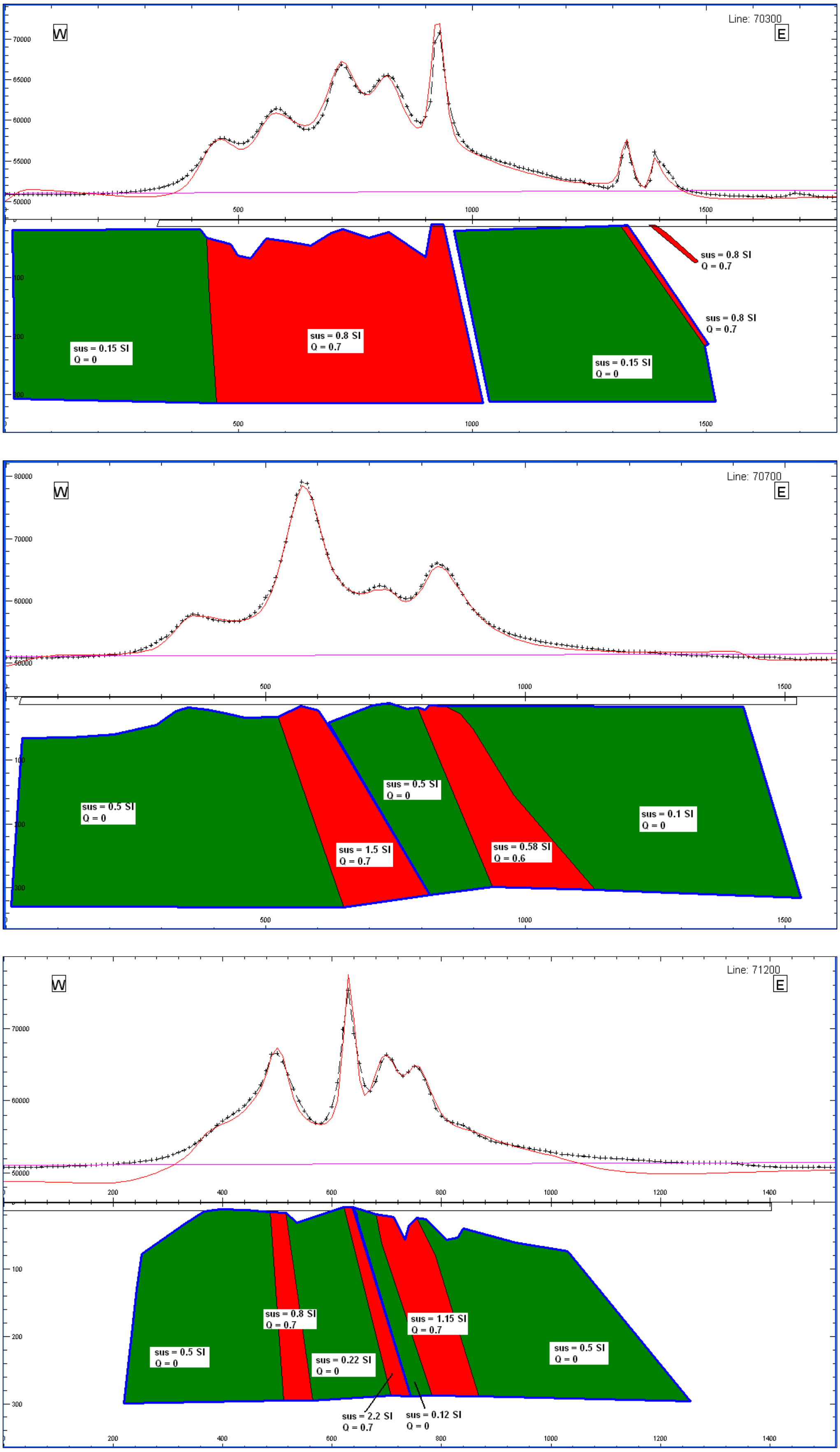

Figure 4-2. *2D models of three profiles. Red line = model response, plus symbol = measured data, purple line = regional field.*

Standard procedure to test how well the model represents the measured data is to interpolate a grid from synthetic data of the model response and compare with the grid of the actual measured data. In Figure 4-3 two pseudo color maps are presented, one showing the model data and the other showing the measured data. As seen from the figure the magnetic model explains the data very well and there are only minor differences between the model and measured plots. However, note that this magnetic model is not unique.

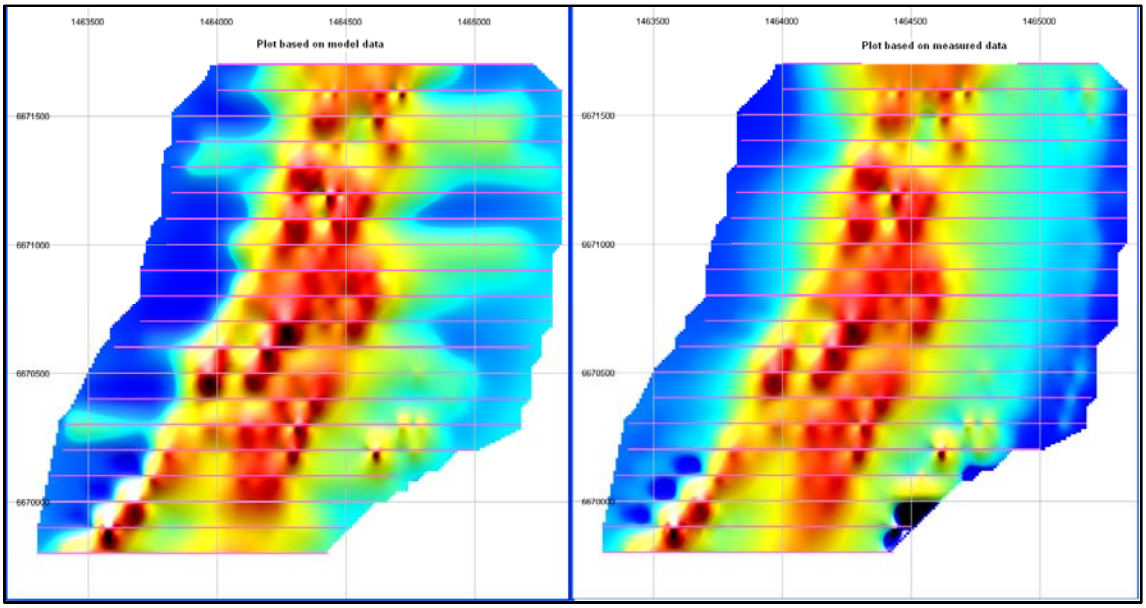

Figure 4-3. *Pseudo color plots of the magnetic total field based on model data (left) and measured data (right).*

4.3 Estimation of magnetite and Fe content

The magnetic susceptibility of rocks is mainly controlled by the amount of magnetite present in the rock. For groups of rocks it is possible to find a statistically reliable correlation between the magnetic susceptibility and the volume content (vol%) magnetite. Such correlations are presented in the literature, e.g. by D.S. Parasnis (Principles of applied geophysics, 1993, Chapman & Hall). However, any such correlation must be used with caution. GeoVista AB has a fairly large database of susceptibility data and geochemical analyses of magnetite mineralized rocks. With reference to this database we have established a mathematical relation between the magnetic susceptibility and the vol% of magnetite, which has proven to work very well. By use of this relation we have estimated the vol% magnetite of the Fe-mineralized bodies (the red bodies) of the 2.5D forward modelling presented in this report. Furthermore, since the density of magnetite is known, with reference to the vol% magnetite, we can then estimate the weight% of magnetite under the assumption that we know the density of the surrounding (none mineralized) rocks. We have used a "background" density of 2,800 kg/m^3. The background density is not a very critical parameter, for example changing it to 2,900 kg/m^3 only results in a minor change of the estimated weight% magnetite.

By estimating the weight% of magnetite it is a simple matter to calculated estimates of the weight% Fe and hence also the total mass of ore and Fe. The results of these calculations are presented in Table 4-2 below. The input from the model work to the estimation presented in Table 4-2 is the magnetic susceptibility and the volume of the model bodies. All other parameters are calculated.

The total mass of iron ore, according to this magnetic model, is c. 644 Mtonnes, with a weighted average grade Fe of 29%, which corresponds to c. 185 Mtonnes of Fe.

Table 4-2. *Estimation of mass of ore and mass of Fe based on 2.5D forward magnetic models.*

Body_No	Volume(m3)	Mag_sus(SI)	vol%_magn	weight%_magn	weight%_Fe	ore densisty (background density of 2,800 kg/m3)	Mass of ore (Mtonnes)	Mass of iron (Mtonnes)
0	4419432	2,00	47	62	45	3923	17,3	7,8
1	3255371	0,75	23	36	26	3347	10,9	2,8
3	9214184	0,75	23	36	26	3347	30,8	7,9
4	1647729	0,94	28	41	30	3458	5,7	1,7
5	7079421	1,10	31	46	33	3543	25,1	8,3
6	4321725	1,40	37	52	38	3688	15,9	6,0
10	18484752	0,80	24	37	27	3377	62,4	16,8
12	4260996	1,50	39	54	39	3731	15,9	6,3
14	3585297	0,58	18	30	21	3239	11,6	2,5
16	17982417	1,20	33	48	35	3594	64,6	22,5
17	15081970	0,80	24	37	27	3377	50,9	13,7
18	285757	0,80	24	37	27	3377	1,0	0,3
19	97302	0,80	24	37	27	3377	0,3	0,1
20	2020847	1,10	31	46	33	3543	7,2	2,4
21	5256461	0,80	24	37	27	3377	17,8	4,8
22	1713874	1,60	41	56	41	3773	6,5	2,6
23	464719	0,90	27	40	29	3435	1,6	0,5
25	1068432	0,80	24	37	27	3377	3,6	1,0
26	1888541	1,55	40	55	40	3753	7,1	2,8
28	8374211	0,80	24	37	27	3377	28,3	7,6
32	1135523	0,80	24	37	27	3377	3,8	1,0
33	739429	2,20	50	65	47	3988	2,9	1,4
34	2235808	1,15	32	47	34	3569	8,0	2,7
38	2156564	0,85	25	39	28	3406	7,3	2,1
39	10153574	0,57	18	29	21	3233	32,8	6,9
43	11823305	0,78	24	37	26	3365	39,8	10,5
44	6183041	0,60	19	30	22	3252	20,1	4,4
46	3177840	1,00	29	43	31	3490	11,1	3,5
47	2139001	1,50	39	54	39	3731	8,0	3,1
52	2806452	0,50	16	26	19	3186	8,9	1,7
53	2415923	0,75	23	36	26	3347	8,1	2,1
59	3037965	0,60	19	30	22	3252	9,9	2,2
60	5141541	0,63	20	31	23	3272	16,8	3,8
61	858534	1,50	39	54	39	3731	3,2	1,3
62	585728	1,50	39	54	39	3731	2,2	0,9
69	3193919	1,30	35	50	36	3642	11,6	4,2
72	2391739	1,10	31	46	33	3543	8,5	2,8
73	451596	0,80	24	37	27	3377	1,5	0,4
74	637849	1,05	30	44	32	3517	2,2	0,7
77	15261774	0,50	16	26	19	3186	48,6	9,3
78	326402	0,80	24	37	27	3377	1,1	0,3
79	164349	1,00	29	43	31	3490	0,6	0,2
80	159551	1,20	33	48	35	3594	0,6	0,2
81	133545	1,00	29	43	31	3490	0,5	0,1
82	189706	1,10	31	46	33	3543	0,7	0,2
83	201077	0,90	27	40	29	3435	0,7	0,2
84	55280	1,10	31	46	33	3543	0,2	0,1
						Total sum:	644	185
						Weighted average grade Fe:	29%	

5 Uncertainties

The modelling of geophysical data is always impaired by uncertainties. In the magnetic forward modelling presented in this report it is basically assumed that we know the magnetic susceptibility distribution of the rock types. By applying more or less fixed values of the magnetic susceptibility, this parameter is held fixed, and the modelling is mainly carried out by varying the geometry of the model bodies. This procedure will never result in a unique or true geological solution. It is important to note that a small body with high susceptibility can cause the same type of anomaly as a larger body with lower susceptibility. From sample measurements of the magnetic susceptibility we have a fair knowledge of the susceptibility distribution. Comparing the sample susceptibility data with the model susceptibility data shows that the models tend to have lower susceptibilities. Hence, the model presented in this report may exaggerate the volumes of the bodies, but underestimate the magnetite content.

The strength of the magnetic field decreases significantly with distance from the source, so the spatial resolution decreases with depth and the majority of the information supporting the models inherits from the uppermost 10-50 m of the bedrock. However, test during the modelling work clearly show significant effects on the magnetic anomalies when altering the body geometry of high magnetic bodies, down to c. 300 m depth below the surface. It is therefore reasonable to assume that the models indicate variations in the susceptibility distribution down to this depth.

The estimation of vol% magnetite based on magnetic susceptibility data depends on grain size, mode of distribution, susceptibility range, and it may also vary between different mineralizations. Hence, this estimation is a bit rough and should be taken with some caution.

Appendix 1 – Geological core log of Bh6, from Finnäset (Mats Larsson, G&B AB)

D-hole	From_m	To_m	Length	Description complete
Väsmanfältet (Finnäset) bh 6.	245,00	256,00	11,00	Quartz- biotite rich metasediment, foliated.
Väsmanfältet (Finnäset) bh 6.	256,00	256,50	0,50	Quartz- biotite rich metasediment, foliated, with jaspilite alteration.
Väsmanfältet (Finnäset) bh 6.	256,50	257,50	1,00	Quartz- biotite rich metasediment, foliated.
Väsmanfältet (Finnäset) bh 6.	257,50	259,40	1,90	Basic metavolcanite, foliated, as skarn, with weak magnetite imp 5-10%.
Väsmanfältet (Finnäset) bh 6.	259,40	261,40	2,00	Massive magnetite lava flow, with quartz layers, clear lava flow structures.
Väsmanfältet (Finnäset) bh 6.	261,40	264,10	2,70	Tuffitic basic metavolcanite, with magnetite pepper corn structures.
Väsmanfältet (Finnäset) bh 6.	264,10	266,10	2,00	Quartz- biotite rich metasediment, foliated with some minor intersections with ryodacitic porphyry, 10 cm.
Väsmanfältet (Finnäset) bh 6.	266,10	269,32	3,22	BIF, massive magnetite quartz amphibole banded.
Väsmanfältet (Finnäset) bh 6.	269,32	270,65	1,33	Basic metavolcanite foliated with some massive magnetite bands.
Väsmanfältet (Finnäset) bh 6.	270,65	273,90	3,25	Dirty quartzite with biotite and k-feldspar eyes, 1-2 mm.
Väsmanfältet (Finnäset) bh 6.	273,90	274,55	0,65	Jaspilite in arenitic metasediment (dirty quartzite).
Väsmanfältet (Finnäset) bh 6.	274,55	277,35	2,80	Quartz- biotite rich metasediment, k-feldspar and albite eyes, 2mm, foliated.
Väsmanfältet (Finnäset) bh 6.	277,35	280,30	2,95	Basic metavolcanite, strongly foliated, greenish black with intercalated biotite rich metasediment.
Väsmanfältet (Finnäset) bh 6.	280,30	281,15	0,85	Quartzite massive, with some biotite, suger corn structures, grey.
Väsmanfältet (Finnäset) bh 6.	281,15	288,60	7,45	Quartz- biotite rich metasediment with some intersections of strongly foliated basic metavolcanite. Towards end of section magnetite grains and granules.
Väsmanfältet (Finnäset) bh 6.	288,60	291,00	2,40	Basic metavolcanite strongly foliated.
Väsmanfältet (Finnäset) bh 6.	291,00	295,00	4,00	Quartz- biotite rich metasediment, foliated, with albite eyes, 1-2 mm. Some magnetite granules 2-3 mm.
Väsmanfältet (Finnäset) bh 6.	295,00	303,70	8,70	Quartz- biotite rich metasediment, foliated. Magnetite grains and granules.
Väsmanfältet (Finnäset) bh 6.	303,70	305,40	1,70	Biotite rich metasediment, altered basic metavolcanite, with magnetite grains and granules, 3mm.
Väsmanfältet (Finnäset) bh 6.	305,40	316,25	10,85	Arenitic greywacke partly as quartzite, banded towards massive, graded bedding, up 305,40. Intersections with pegmatite.
Väsmanfältet (Finnäset) bh 6.	316,25	318,70	2,45	Basic metavolcanite, massive- foliated, some magnetite grains.
Väsmanfältet (Finnäset) bh 6.	318,70	320,50	1,80	Pegmatite, red, coarse grained.
Väsmanfältet (Finnäset) bh 6.	320,50	323,20	2,70	Quartz- biotite richmeta sediment, massive, dark grey.
Väsmanfältet (Finnäset) bh 6.	323,20	326,30	3,10	Pegmatite, red, coarse grained.
Väsmanfältet (Finnäset) bh 6.	326,30	328,70	2,40	Arenitic to argillitic greywacke, massive to banded, partly as quartzite. Intercalated some thin strongly foliated basic metavolcanite layers with up to 105 magnetite.
Väsmanfältet (Finnäset) bh 6.	328,70	331,30	2,60	BIF, massive magnetite strongly quartz amphibole banded.
Väsmanfältet (Finnäset) bh 6.	331,30	332,00	0,70	Quartz vein with magnetite stringers.
Väsmanfältet (Finnäset) bh 6.	332,00	337,50	5,50	Quartz- biotite rich metasediment, massive to banded, with graded bedding and cross bedding, no foliation. At 337,30-337,60 jaspilite.
Väsmanfältet (Finnäset) bh 6.	337,50	339,60	2,10	Dirty quartzite with biotite and some epidote bands.
Väsmanfältet (Finnäset) bh 6.	339,60	340,25	0,65	Dirty quartzite with biotite and some epidote bands. Jaspilite bands and magnetite pepper corn structures.
Väsmanfältet (Finnäset) bh 6.	340,25	346,15	5,90	BIF Massive magnetite and hematite, aprox 30% magnetite and 20% hematite. Towards end of section skarn banded (garnet, diopside), increasing skarn content towards end of section.

Appendix 2 – Magnetic susceptibility on core, 1 m spacing, bh6 Finnäset.

bhlen	Measured sus_exp-5(SI)	corr_sus for core (exp-5 SI)	Log10 Sus (exp-5 SI)	sus(SI)	Vol%_magnetite	weight%_magn	weight%_Fe
246,0	300	690	2,8	0,00690	0,3	0,5	0,3
247,0	1	2,3	0,4	0,00002	0,0	0,0	0,0
248,0	5	11,5	1,1	0,00012	0,0	0,0	0,0
249,0	800	1840	3,3	0,01840	0,7	1,2	0,9
250,0	1500	3450	3,5	0,03450	1,2	2,3	1,6
251,0	300	690	2,8	0,00690	0,3	0,5	0,3
252,0	400	920	3,0	0,00920	0,3	0,6	0,4
253,0	400	920	3,0	0,00920	0,3	0,6	0,4
254,0	10	23	1,4	0,00023	0,0	0,0	0,0
255,0	250	575	2,8	0,00575	0,2	0,4	0,3
256,0	20	46	1,7	0,00046	0,0	0,0	0,0
257,0	1	2,3	0,4	0,00002	0,0	0,0	0,0
258,0	5000	11500	4,1	0,11500	4,1	7,3	5,3
259,0	2000	4600	3,7	0,04600	1,7	3,0	2,2
260,0	400	920	3,0	0,00920	0,3	0,6	0,4
261,0	40000	92000	5,0	0,92000	27,2	40,8	29,5
262,0	40	92	2,0	0,00092	0,0	0,1	0,0
263,0	3000	6900	3,8	0,06900	2,5	4,5	3,2
264,0	3000	6900	3,8	0,06900	2,5	4,5	3,2
265,0	50	115	2,1	0,00115	0,0	0,1	0,1
266,0	100	230	2,4	0,00230	0,1	0,2	0,1
267,0	80000	184000	5,3	1,84000	44,8	60,0	43,4
268,0	60000	138000	5,1	1,38000	36,9	52,0	37,6
269,0	90000	207000	5,3	2,07000	48,2	63,2	45,7
270,0	4000	9200	4,0	0,09200	3,3	5,9	4,3
271,0	100	230	2,4	0,00230	0,1	0,2	0,1
272,0	10	23	1,4	0,00023	0,0	0,0	0,0
273,0	20	46	1,7	0,00046	0,0	0,0	0,0
274,0	1	2,3	0,4	0,00002	0,0	0,0	0,0
275,0	10	23	1,4	0,00023	0,0	0,0	0,0
276,0	1500	3450	3,5	0,03450	1,2	2,3	1,6
277,0	2000	4600	3,7	0,04600	1,7	3,0	2,2
278,0	2000	4600	3,7	0,04600	1,7	3,0	2,2
279,0	30	69	1,8	0,00069	0,0	0,0	0,0
280,0	100	230	2,4	0,00230	0,1	0,2	0,1
281,0	1000	2300	3,4	0,02300	0,8	1,5	1,1
282,0	200	460	2,7	0,00460	0,2	0,3	0,2
283,0	550	1265	3,1	0,01265	0,5	0,8	0,6
284,0	750	1725	3,2	0,01725	0,6	1,1	0,8
285,0	2500	5750	3,8	0,05750	2,1	3,7	2,7
286,0	1500	3450	3,5	0,03450	1,2	2,3	1,6
287,0	1500	3450	3,5	0,03450	1,2	2,3	1,6
288,0	100	230	2,4	0,00230	0,1	0,2	0,1
289,0	30	69	1,8	0,00069	0,0	0,0	0,0
290,0	40	92	2,0	0,00092	0,0	0,1	0,0
291,0	1000	2300	3,4	0,02300	0,8	1,5	1,1
292,0	3500	8050	3,9	0,08050	2,9	5,2	3,8
293,0	1500	3450	3,5	0,03450	1,2	2,3	1,6
294,0	2000	4600	3,7	0,04600	1,7	3,0	2,2
295,0	1000	2300	3,4	0,02300	0,8	1,5	1,1
296,0	1500	3450	3,5	0,03450	1,2	2,3	1,6
297,0	700	1610	3,2	0,01610	0,6	1,1	0,8
298,0	3000	6900	3,8	0,06900	2,5	4,5	3,2
299,0	3000	6900	3,8	0,06900	2,5	4,5	3,2
300,0	2500	5750	3,8	0,05750	2,1	3,7	2,7
301,0	1500	3450	3,5	0,03450	1,2	2,3	1,6
302,0	3500	8050	3,9	0,08050	2,9	5,2	3,8
303,0	4000	9200	4,0	0,09200	3,3	5,9	4,3
304,0	3500	8050	3,9	0,08050	2,9	5,2	3,8

305,0	6000	13800	4,1	0,13800	4,9	8,6	6,2
306,0	10000	23000	4,4	0,23000	7,9	13,7	9,9
307,0	100	230	2,4	0,00230	0,1	0,2	0,1
308,0	50	115	2,1	0,00115	0,0	0,1	0,1
309,0	200	460	2,7	0,00460	0,2	0,3	0,2
310,0	1500	3450	3,5	0,03450	1,2	2,3	1,6
311,0	1000	2300	3,4	0,02300	0,8	1,5	1,1
312,0	3500	8050	3,9	0,08050	2,9	5,2	3,8
313,0	1000	2300	3,4	0,02300	0,8	1,5	1,1
314,0	1000	2300	3,4	0,02300	0,8	1,5	1,1
315,0	400	920	3,0	0,00920	0,3	0,6	0,4
316,0	120000	276000	5,4	2,76000	56,4	70,5	51,0
317,0	10000	23000	4,4	0,23000	7,9	13,7	9,9
318,0	8000	18400	4,3	0,18400	6,4	11,2	8,1
319,0	10	23	1,4	0,00023	0,0	0,0	0,0
320,0	25	57,5	1,8	0,00058	0,0	0,0	0,0
321,0	20	46	1,7	0,00046	0,0	0,0	0,0
322,0	40	92	2,0	0,00092	0,0	0,1	0,0
323,0	25	57,5	1,8	0,00058	0,0	0,0	0,0
324,0	20	46	1,7	0,00046	0,0	0,0	0,0
325,0	100	230	2,4	0,00230	0,1	0,2	0,1
326,0	2500	5750	3,8	0,05750	2,1	3,7	2,7
327,0	150	345	2,5	0,00345	0,1	0,2	0,2
328,0	4000	9200	4,0	0,09200	3,3	5,9	4,3
329,0	30000	69000	4,8	0,69000	21,4	33,5	24,3
330,0	70000	161000	5,2	1,61000	41,1	56,3	40,7
331,0	120000	276000	5,4	2,76000	56,4	70,5	51,0
332,0	2500	5750	3,8	0,05750	2,1	3,7	2,7
333,0	1500	3450	3,5	0,03450	1,2	2,3	1,6
334,0	4000	9200	4,0	0,09200	3,3	5,9	4,3
335,0	1500	3450	3,5	0,03450	1,2	2,3	1,6
336,0	150	345	2,5	0,00345	0,1	0,2	0,2
337,0	10000	23000	4,4	0,23000	7,9	13,7	9,9
338,0	25000	57500	4,8	0,57500	18,3	29,3	21,2
339,0	10000	23000	4,4	0,23000	7,9	13,7	9,9
340,0	17000	39100	4,6	0,39100	13,0	21,6	15,7
341,0	70000	161000	5,2	1,61000	41,1	56,3	40,7
342,0	80000	184000	5,3	1,84000	44,8	60,0	43,4
343,0	120000	276000	5,4	2,76000	56,4	70,5	51,0
344,0	55000	126500	5,1	1,26500	34,7	49,5	35,8
345,0	20000	46000	4,7	0,46000	15,0	24,7	17,9
346,0	20000	46000	4,7	0,46000	15,0	24,7	17,9
347,0	50000	115000	5,1	1,15000	32,3	46,9	33,9
348,0	4500	10350	4,0	0,10350	3,7	6,6	4,8
349,0	5500	12650	4,1	0,12650	4,5	8,0	5,8
350,0	3000	6900	3,8	0,06900	2,5	4,5	3,2
351,0	1500	3450	3,5	0,03450	1,2	2,3	1,6
352,0	500	1150	3,1	0,01150	0,4	0,8	0,6
353,0	35000	80500	4,9	0,80500	24,4	37,3	27,0
354,0	5000	11500	4,1	0,11500	4,1	7,3	5,3
355,0	2000	4600	3,7	0,04600	1,7	3,0	2,2
356,0	40000	92000	5,0	0,92000	27,2	40,8	29,5
357,0	15000	34500	4,5	0,34500	11,6	19,5	14,1
358,0	60000	138000	5,1	1,38000	36,9	52,0	37,6
359,0	80000	184000	5,3	1,84000	44,8	60,0	43,4
360,0	40000	92000	5,0	0,92000	27,2	40,8	29,5
361,0	60000	138000	5,1	1,38000	36,9	52,0	37,6
362,0	110000	253000	5,4	2,53000	53,9	68,4	49,5
363,0	100000	230000	5,4	2,30000	51,2	66,0	47,7
364,0	90000	207000	5,3	2,07000	48,2	63,2	45,7
365,0	2200	5060	3,7	0,05060	1,8	3,3	2,4

366,0	130	299	2,5	0,00299	0,1	0,2	0,1
367,0	2000	4600	3,7	0,04600	1,7	3,0	2,2
368,0	6500	14950	4,2	0,14950	5,2	9,3	6,7
369,0	40	92	2,0	0,00092	0,0	0,1	0,0
370,0	75	172,5	2,2	0,00173	0,1	0,1	0,1
371,0	45	103,5	2,0	0,00104	0,0	0,1	0,1
372,0	45	103,5	2,0	0,00104	0,0	0,1	0,1
373,0	25	57,5	1,8	0,00058	0,0	0,0	0,0
374,0	30	69	1,8	0,00069	0,0	0,0	0,0
375,0	80	184	2,3	0,00184	0,1	0,1	0,1
376,0	40	92	2,0	0,00092	0,0	0,1	0,0
377,0	600	1380	3,1	0,01380	0,5	0,9	0,7
378,0	12000	27600	4,4	0,27600	9,4	16,1	11,7
379,0	4500	10350	4,0	0,10350	3,7	6,6	4,8
380,0	3000	6900	3,8	0,06900	2,5	4,5	3,2
381,0	5000	11500	4,1	0,11500	4,1	7,3	5,3
382,0	2500	5750	3,8	0,05750	2,1	3,7	2,7
383,0	1000	2300	3,4	0,02300	0,8	1,5	1,1
384,0	5000	11500	4,1	0,11500	4,1	7,3	5,3