ELECTROMAGNETIC MAPPING IN DRIFT COVERED REGIONS OF THE NECHAKO PLATEAU, BRITISH COLUMBIA

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INTRODUCTION

The southern Nechako Plateau of British Columbia (Figure 1) is a region of low relief, covered with glacial drift of variable thickness and composition. The drift limits bedrock mapping to regions of outcrop or to specific areas where bedrock can be inferred indirectly from topographic features. Geological mapping must therefore be supplemented by geochemical and geophysical surveys.

With this in mind, a Geonics EM-47 time-domain electromagnetic (TDEM) survey was carried out to investigate whether EM can map bedrock lithology and structure, as well as thickness and lithology of the drift (Best, 1995; Best *et al.*, 1995). As the contact between the Capoose batholith and the surrounding volcanic rocks is associated with known mineralization (Lane and Schroeter, 1995) a major objective of the surveys was to locate this contact beneath the drift cover.

Bedrock consists of resistive intrusives and volcanics. The eddy current generated within these bodies decays quickly, thus generating a low S/N ratio at long times (greater than 0.5 ms). Resistive drift overlies the resistive bedrock. Such environments are a challenge for EM methods.

Two sites were selected close to the expected location of the contact (Figure 2) and EM surveys were conducted across the proposed contact. Soundings in a third site investigated the ability of TDEM to map variations in drift thickness and lithology.

DESCRIPTION OF STUDY AREA

BEDROCK GEOLOGY AND MINERAL POTENTIAL

The bedrock geology of the Fawnie Creek map area was first mapped by Tipper (1954, 1963) and recently by Diakow *et al.* (1994). The area is part of a broad, structurally uplifted zone that includes the Fawnie Range and the Nechako Range to the east. The oldest strata, of probable Early Jurassic age, consist mainly of felsic volcaniclastic rocks. These in turn are conformable with stratigraphically overlying basaltic flows with interlayered fossil-bearing sediments of Middle Jurassic age. The Late Jurassic Capoose batholith, composed of quartz monzonite and granodiorite, projects southwest beneath the Entiako Spur and a relatively thin cap of Jurassic rocks that are variably altered to a propylitic assemblage. Eocene volcanic rocks of the Ootsa Lake Group form scattered, relatively thin outliers that rest unconformably on the Jurassic rocks. Miocene and younger basalts of the Chilcotin Group underlie mainly topographically subdued areas south and northwest of the Naglico Hills.

Anticipated mineral potential of the Fawnie Creek map area is high, based on the recent discovery of new precious metal prospects (Diakow and Webster, 1994), encouraging till and lake sediment geochemical results (Levson *et al.*, 1994; Cook and Jackaman, 1994) and geological mapping that shows a close spatial and possible genetic association between the Capoose batholith and a variety of known mineralized prospects (Lane and Schroeter, 1995). Mineralization in the Fawnie Creek and adjoining areas consists mainly of deposits found within or along the margin of subvolcanic and larger epizonal calcalkaline plutons. Three magmatic mineralizing events are inferred from recent 1:50 000 scale geological mapping and new radiometric dates. The oldest event, represented by the Late Jurassic Capoose batholith, is spatially associated with skarn, base metal veins and precious metal epithermal prospects. Latest Cretaceous felsic hypabyssal plutons at the Capoose prospect, contain either porphyry copper or disseminated silver mineralization, and Eocene rhyolitic volcanic rocks host epithermal precious metal stockwork veins at the Wolf prospect (Andrew, 1988).

QUATERNARY GEOLOGY

During the late Wisconsnian Fraser glaciation, ice moved into this part of the Nechako Plateau from the Coast Mountains (Tipper, 1971). Ice-flow studies indicate there was one dominant flow-direction towards the east-northeast, modified by topographic control during both early and late stages of glaciation (Giles and Levson, 1994; Levson and Giles, 1994). At the last glacial maximum, ice covered the highest peaks in the region suggesting an ice thickness in excess of 1000 metres. Glacial deposits are of variable thickness and include: compact, matrix-supported, silty diamictons interpreted as basal melt-out and lodgement tills (Photo 1), and loose, massive to stratified, sandy diamictons of inferred debris-flow origin. Typically, basal tills unconformably overlie bedrock and are overlain by glacigenic debris-flow deposits, glaciofluvial sediments or colluvium. Thick (10 m or more) sequences of till occur both in main valleys and smaller valleys oriented oblique to the regional ice-flow direction, such as the van Tine Creek valley.

Figure 1. Location map of the Interior Plateau electromagnetic survey.

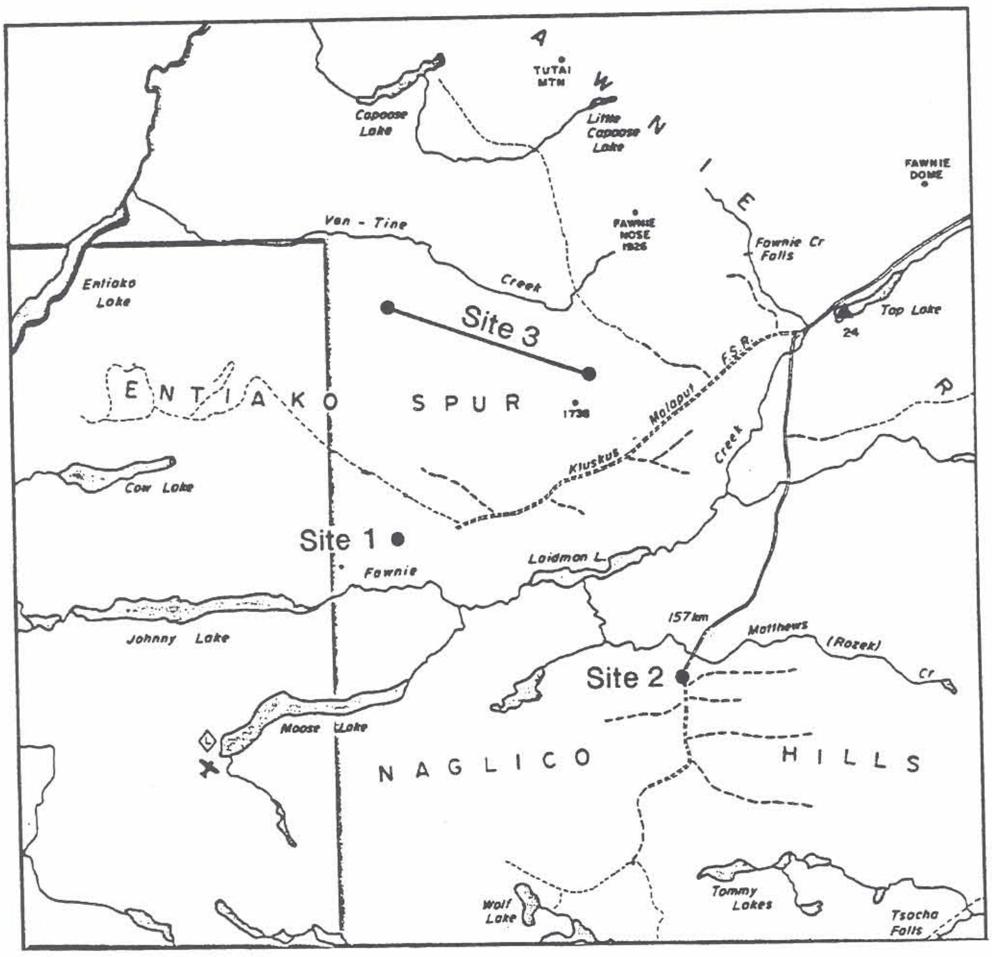

Figure 2. Vanderhoof Forest District recreational map showing the three EM-47 survey sites.

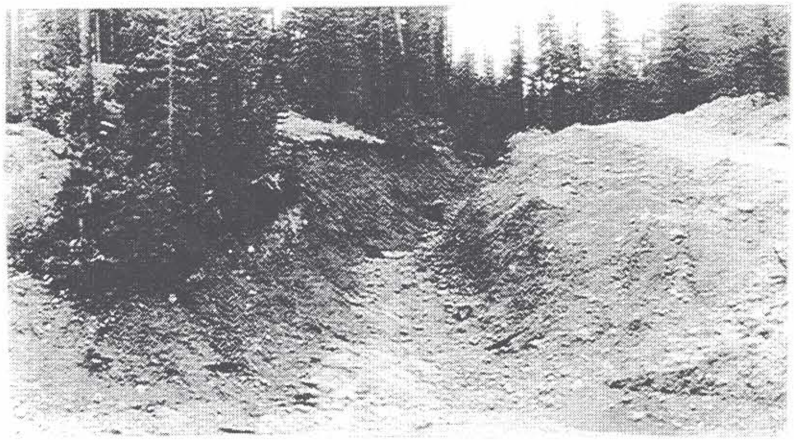

Photo 1. Till and glacigenic debris-flow deposits overlying bedrock exposed in a trench at the Wolf epithermal gold prospect.

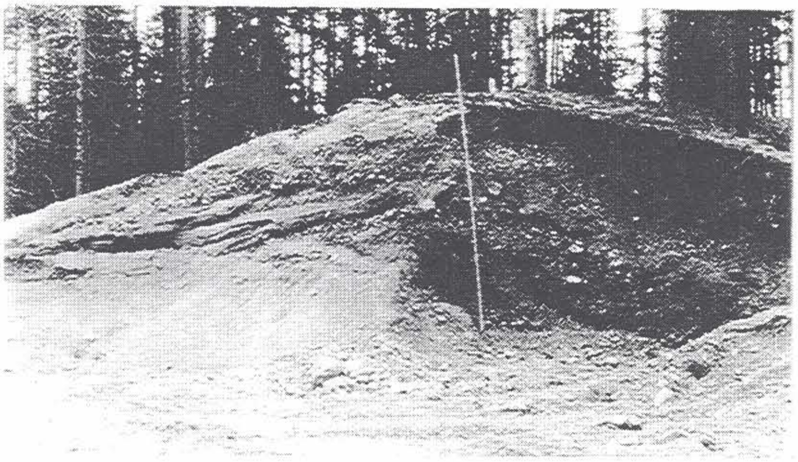

Photo.2. Exposure of glaciofluvial gravels and sands in a small esker in the van Tine Creek valley near site 3. Measuring rod is 4 metres long.

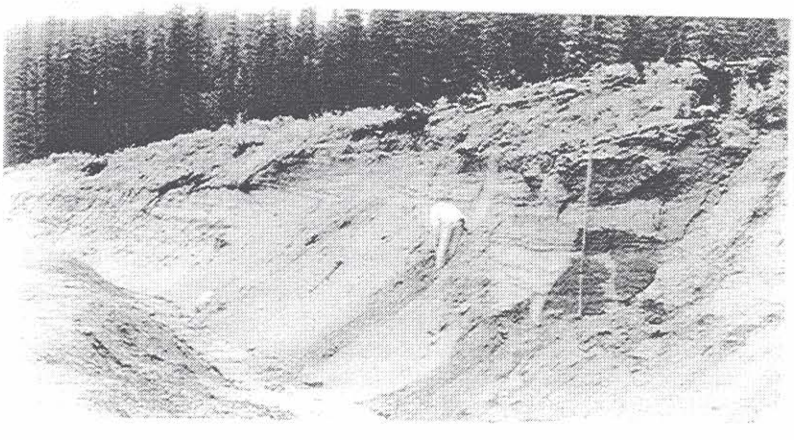

Photo 3. Exposure at site 1, of well-sorted, ripple-bedded, fine to coarse sand in a coarsening upward sequence interpreted as a glaciofluvial fan-delta deposit. Measuring rod is 3 metres long.

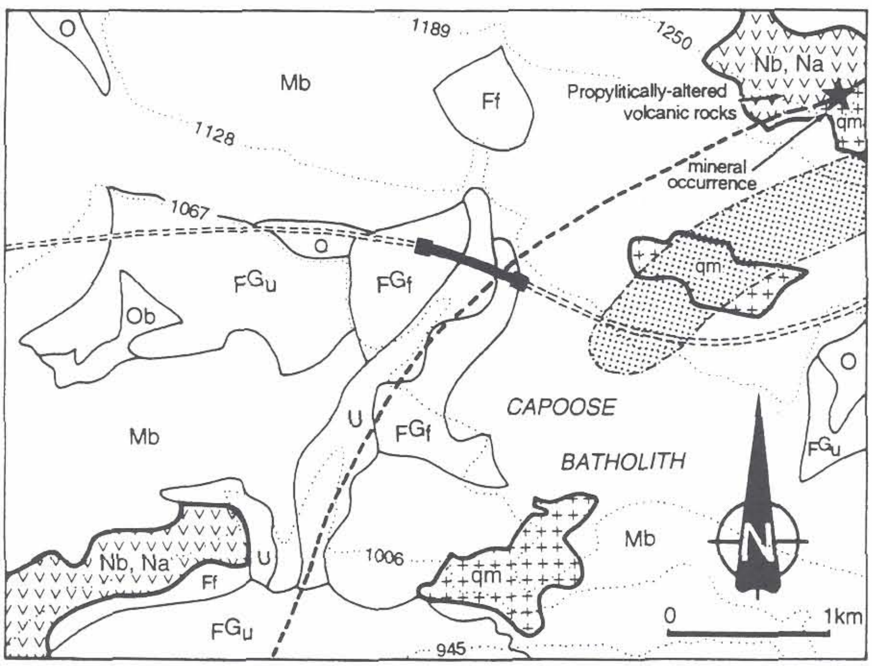

Figure 3. Bedrock and surficial geology of the region around EM survey site 1. The location of the EM survey (thick bar) along the Kluskus-Malaput forestry road (double dashed line), the inferred contact of the Capoose batholith with volcanic country rocks (thick dashed line) and an area of anomalous (10-80 ppb) gold in tills (shaded) are shown. Abbreviations: qm - quartz monzonite; Nb, Na - basalt and andesite; $F^{G}f$ - glaciofluvial fan-delta, $F^{G}u$ - glaciofluvial outwash; Ff - alluvial fan Mb - morained blanket; O, Ob - organics; U - undifferentiated (steep gullies).

During deglaciation, glaciofluvial and glaciolacustrine sediments were deposited in many parts of the region on or near the ablating glaciers. Glaciofluvial sediments consist mainly of poor to well sorted, stratified gravels and sands and commonly occur as eskers, kames, terraces, fans and outwash plains in valley bottoms and along valley flanks. Several small eskers formed under down-wasting ice in van Tine Creek (Photo 2) and Fawnie Creek valleys. Gravelly outwash plains covered the main valley bottoms as large volumes of sediment and water were removed from the ice margin. Glacial lakes formed locally along the margins of the retreating ice. One such lake, on the south side of the Entiako Spur (near site 1), probably was dammed by stagnant ice in Fawnie valley, A coarsening-upward sequence of well sorted, ripple-bedded, sands (Photo 3; see also section 9.5 in Levson and Giles, 1994) at this site is interpreted as a prograding fan-delta (Figure 3) that formed along the margin of the lake. Glacial lake sediments have also been mapped in the northern part of the region and may extend into the van Tine Creek valley near EM survey site 3.

During postglacial times, the surficial geology of the area was modified mainly by fluvial activity and the local development of alluvial fans in valley bottoms (Figure 3), as well as by colluvial reworking of glacial deposits along the valley sides. Holocene fluvial sediments in the map area are dominated by floodplain silts, fine sands and organics. Low areas in valleys are characterized by marshes and shallow lakes filled with organic sediments (Figure 3).

SITE DESCRIPTIONS

Figure 2 shows the location of the EM sites. Sites 1 and 3 are situated well down on the south and north sides of the Entiako Spur respectively, in areas where bedrock is generally poorly exposed. Site 2 is situated at a low elevation on the gentle north slope of the Naglico Hills, in an area where glacial deposits, presumed to be thick, mantle bedrock. The sites are located approximately 150 to 160 kilometres southwest of Vanderhoof in the Fawnie Creek map sheet (NTS 93F/3).

SITE 1 (CAP)

Regionally anomalous concentrations of gold, silver, arsenic and antimony in tills (Levson *et al.*, 1994) and gold and arsenic in sediments (Cook and Jackaman, 1994) occur at site 1 and, although the surficial sediment cover is extensive, silicified and mineralized country rock crops out nearby along the margin of the Capoose batholith (Diakow *et al.*, 1994). These data point to an area of potentially significant mineralization, along the west-central margin of the Capoose batholith. Due to the thick overburden in this area, Levson *et al.* (1994) suggested that geophysical prospecting was required to locate the sources of the gold anomalies. The EM survey reported here was initiated in part to investigate the thickness of the overburden and to help identify the western margin of the Capoose batholith in this area of high mineral potential.

Site 1 (Figure 2) consists of nine, 80 x 80 metre loop soundings along the Kluskus-Malaput forestry road in the Vanderhoof Forestry District, approximately 160 kilometres southwest of Vanderhoof. Sounding 0W was located on the north side of the road with the centre of the loop about 25 metres east of Kilometre 19 (Best, 1995).

SITE 2 (CAP2)

The main purposes of the EM survey at site 2 were to better locate the buried southern contact of the Capoose batholith and to determine the drift thickness in the area. Results of lithologic analysis of pebbles from tills in this area show a consistent northward increase in the percentage of quartz monzonite clasts derived from the batholith. Percentages of quartz monzonites range from 0% a few kilometres south of the inferred contact of the batholith, to 5% near the contact, and 10-23% over the batholith. Conversely, Jurassic andesite percentages decrease from a high of 45%, a few kilometres south of the inferred contact, to 17-24% north of the contact.

Site 2 consists of seven, 40 x 40 metre loop soundings and one 80 x 80 metre loop sounding (OS) along the Kluskus-Ootsa forestry road in the Vanderhoof Forestry District, approximately 150 kilometres southwest of Vanderhoof (Figure 2). Sounding 0S was located on the west side of the road about 1.4 kilometres south of the bridge crossing Matthews (Rozek) Creek (Best, 1995).

SITE 3 (CLVAN)

Anomalous gold concentrations in tills throughout this area (soundings CLVAN-1 to CLVAN-5 inclusive) were documented by Levson *et al.*, 1994 and are associated with a belt of thermally altered Hazelton rocks (Diakow *et al.*, 1994). This area is believed to be near the edge of the northern part of the Capoose batholith. Anomalously high copper values also occur in till near soundings CLVAN-2 (64 ppm) and CLVAN-5 (43 ppm) (Levson *et al.*, 1994). Mineral occurrences known in the area southeast of sounding CLVAN-5 include a magnetite skarn and epithermal-style mineralization (Lane and Schroeter, 1995). The main purposes of the EM survey at this site were to determine the depth to the top of the Capoose batholith, in other words drift thickness, and drift lithology in the area.

Site 3 consists of five 80 x 80 metre loop soundings along the van Tine road, approximately 150 kilometres southwest of Vanderhoof (Figure 2). The five soundings were spaced about 1.5 kilometres apart (Best, 1995).

ELECTROMAGNETIC METHODS

The time-domain electromagnetic survey used a Geonics EM-47 (Geonics, 1991) leased from the Ontario Geological Survey. Best (1995), Best *et al.* (1995), and the references therein contain a description of this system and a summary of electromagnetic methods.

The central sounding mode was used for all soundings. The period T of the transmitter current consists of a positive square wave of duration T/4, followed by an off-time of duration T/4 (receiver measurement time). These are then reversed to give a total period equal to T. The frequency of the transmitted square wave is the reciprocal of the period T. Three frequencies are available with the EM-47 system (UH = ultra high frequency = 285 Hz, VH = very high frequency = 75 Hz and H = high frequency = 30 Hz).

The receiver voltage in the EM-47 unit is measured in millivolts and then converted to the time derivative of the vertical magnetic field. This derivative, also called the normalized voltage, is measured in nV/m^2. The TEMIXGL software (Interpex Limited, 1994) can plot this voltage as a function of time.

The voltages can also be converted to apparent resistivity values (r_a) using the late time normalized voltage (Kaufmann and Keller, 1983; Fitterman and Stewart, 1986; Spies and Eggers, 1986). The apparent resistivity is defined as the ratio of the measured voltage to the voltage that would be measured over a half-space of constant resistivity.

Once the apparent resistivity versus time curves are computed, the data can be interpreted in terms of multi-layered earth models using standard forward and inverse mathematical modelling programs. A number of assumptions are required to ensure the data can be meaningfully represented by a layered earth model. We used the TEMIXGL software package for modelling the data from the Fawnie Creek map area.

FIELD PROCEDURES

Three data sets were collected at the high and very high frequency ranges at each sounding. A single data set was collected for the ultra-high range at most soundings.

Two transmitter loop sizes were used; 80 by 80 metres (area = 6400 m^2) and 40 by 40 metres (1600 m^2). The current in the wire was approximately 2.3 amps.

There were no cultural noise problems in the area, such as those caused by grounded pipes, electric transmission lines and electric fences. Several electrical storms occurred during the survey but did not interfere with the EM measurements.

The EM 47 system proved to be very reliable and robust in the field. There was no down time due to instrument problems.

The data for each site and/or sounding were transferred to a personal computer using software provided by Geonics. The files created by this software were subsequently translated into a form compatible with the Interpex software package TEMIXGL.

EDITING THE DATA

The data were first edited to remove noisy or bad data from the files. Examples of the noise encountered are given in Best (1995). The TEMIXGL software permitted the rapid removal of this noise using an interactive mouse. The results can quickly be displayed to ensure that all the noise is removed.

INTERPRETATION OF THE DATA

The edited apparent resistivity data formed the basis of the interpretation. Details on interpretation procedures can be found in Best (1995) and Best *et al.* (1995).

When an apparent resistivity curve does not fit a layered-earth model the voltage data can only be interpreted by forward modelling. In this case type curves and other available models are compared with the data (McNeill *et al.*, 1984; Spies and Parker, 1984; West *et al.*, 1984). Fortunately all the data from this survey, with the exception of five soundings from site 2 and sounding 330 at site 1, fit a one-dimensional earth model.

SITE 1

Examples of apparent resistivity versus time plots for site 1 are illustrated in Figure 4a. The data fit a model consisting of a layer of drift overlying resistive bedrock (Figure 5a). The overburden resistivity is relatively constant (68 to 157 ohm-metres "Ω-m"), but its thickness varies from 30 to 120 metres. The bedrock resistivity changes from about 8400, Ω-m on the east end of the traverse to about 10 000 Ω-m on the west end. The overburden was thickest, about 80 metres, to the east of the gully. Sounding 330 in the gully is difficult to fit to a one-dimensional model because the three-dimensional gully completely distorts the layering.

The interpretation of the EM results for this site, that is a generally thick overburden section, is supported by results of geology mapping (Levson and Giles, 1994). A large Late Pleistocene glaciofluvial fan (Photo 3) delta (Figure 3) occurs at this site and it is an obvious feature on air photos and on the ground. Exposures of the fan-delta sediments reveal up to several metres of ripple-bedded and troughs crossbedded sands (Photo 3; see Section 93-5, Levson and Giles, 1994). The fan delta sediments overlie till which is exposed in a modern gully that has incised the fan delta. Several tens of metres of till are exposed in cuts along the gully below the fan delta, further supporting the interpretation for thick overburden in this area. The EM results, however, provide the best estimate of the variations in drift thickness.

The bedrock depression between soundings 80W and 330W, and the lower bedrock resistivities associated with the depression, occur at the inferred location of the contact between granite to the east and volcanics to the west. The contact is extrapolated through this area from rock exposures to the north and south (Figure 3; *see* Diakow *et al.*, 1994). The lower resistivities across the contact may be a result of increased porosity (increased water content) due to fracturing or alteration of minerals in the contact zone to clay. The bedrock resistivity at the two ends of the line 8400 Ω-m to the east and 10 000 Ω-m to the west) are consistent with unaltered granite and basalt respectively. Considering the high resistivity of overburden and bedrock (low signal-to-noise ratio at large times) the information gleaned from the TDEM data is quite impressive.

A linear gold anomaly extending eastward for over 5 kilometres from near Site 1 (Figure 3) is documented by Levson *et al.* (1994). It contains the highest gold concentration recovered from regional till samples in the map area (77 ppb). Anomalous gold values occur at sample sites throughout this zone which is about 1 kilometre wide and several kilometres long. The shape of the zone is suggestive of a well developed, glacial dispersal train, comparable with or even larger than other dispersal trains in the region, including, for example, that developed down-ice of the Wolf property (Levson and Giles, 1995). This interpretation is further supported by the orientation of the anomalous zone parallel to the glacial paleoflow direction in the area. The up-ice end of the gold anomaly (Figure 3) also coincides with an area of regionally anomalous arsenic (25 to 46 ppm), antimony (2.2 to 2.8 ppm) and silver (0.4 ppm) concentrations in till (Levson *et al.*, 1994) and with anomalous gold and arsenic concentrations in lake sediments (Cook and Jackaman, 1994). Pervasively silicified and veined country rock adjacent to the intrusion, chip sampled directly north of this area (asterisk on Figure 3), yield gold, arsenic and antimony concentrations of 101 ppb, 12 730 ppm and 79 ppm, respectively, as well as anomalous silver (6 ppm), copper (186 ppm), lead (321 ppm), zinc (675 ppm) and molybdenum concentrations (14 ppm; Diakow *et al.*, 1994). These data further suggest that the area west of the anomalous zone, along the western edge of the Capoose batholith, is a prime target for exploration.

SITE 2

Three of the seven apparent resistivity versus time plots for site 2 are illustrated in Figure 4b. The five northern soundings (CAP2-0 to CAP2-320) have approximately the same shape as the two southern soundings (CAP2-400 and CAP2-480) but have a finite conductor response superimposed on them (see CAP-801 and CAP2-240). Finite conductors have a cross-over time, the time when the voltage changes sign, that is related to the depth to the top of the conductor.

The character of the voltage versus time curves changes going from north (CAP2-0) to south (CAP2-480). For example, the cross-over time decreases going north to south, indicating the conductor axis (top of the conductor) is shallower at the southern end. Sounding CAP2-320 is unique (Figure 4c) as the voltage decays very slowly at times greater than 0.4 millisecond. Indeed, the conductor axis must be very shallow at this sounding because the cross-over time is between 42 and 69 microseconds. There is a possibility that the conductor may be a culvert, although none was obvious in the area. Further field investigation is warranted to define the nature of this conductor.

The conductor is not present on the two southern soundings. Indeed, a one-layer model fitted to the data indicates that the drift is around 10 to 12 metres thick and that the bedrock has a resistivity of 3500 Ω-m. An overburden thickness on the order of 10 metres is compatible with estimates from surficial and bedrock geology mapping. A similar drift thickness is obtained from the five northern soundings when the finite conductor response is ignored (Figure 7b). The depth to the finite conductor current axis is consistent with the drift thickness.

The bedrock resistivity beneath the northern soundings is about three times larger than beneath the southern values. This change may be related to the granite-volcanic contact. An inferred contact between granitic and volcanic rocks has been mapped in the vicinity of this EM survey site (Diakow *et al.*, 1994) but no bedrock exposures are present.

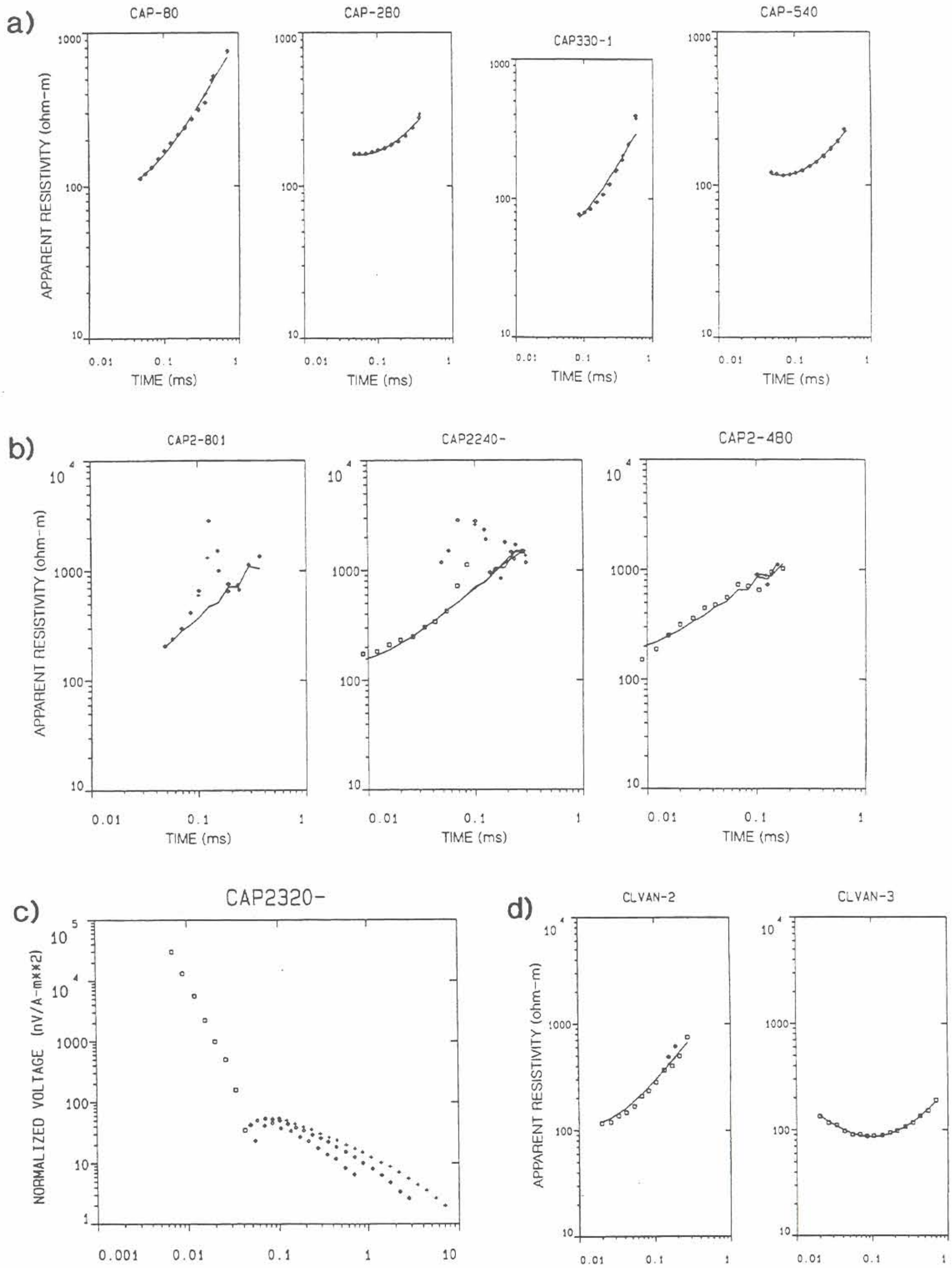

Figure 4. (a) Edited apparent resistivity versus time (log-log) plots for several soundings at site 1. (b) Edited apparent resistivity versus time (log-log) plots for several soundings at Site 2. (c) Example of cross-over time for one of the soundings at site 2 (the squares are positive voltages and the plusses are negative voltages). (d) Edited apparent resistivity versus time (log-log) plots for several soundings at site 3.

However, tills immediately south of this area contain abundant basaltic boulders whereas those to the north contain numerous granitic clasts. This supports the EM interpretation of a bedrock contact between the Capoose batholith and volcanic rocks at site 2. More fieldwork is needed to verify this and explain the nature of the conductor.

SITE 3

Two of the five apparent resistivity versus time plots for site 3 are illustrated in Figure 4d. The voltage (apparent resistivity) for CLVAN-1 is very noisy, but nevertheless fits a homogeneous half-space model that is very resistive. See Best (1995) for further details.

The other four soundings along the van Tine road are quite different and suggest the drift consists of two layers; one more resistive than the other (Figure 4d). The one-dimensional models for soundings CLVAN-3 to CLVAN-5, *at the east end of the site 3 traverse (Figure 2), have the* conductive layer overlying bedrock while CLVAN-2, near the west end of the traverse, has the resistive layer overlying bedrock (Best, 1995). The drift resistivities are greater than 60 Ω-m, and bedrock resistivities are several thousand ohm-metres. No drill holes or other information on the depth to bedrock are available, however, glaciolacustrine sediments have been mapped northwest of this region. These clay-rich sediments generally have a lower resistivity than sands and gravels. Regional stratigraphic studies indicate that ice damming prior to the last glaciation was common (Levson and Giles, 1995) and it is quite plausible that a glaciolacustrine unit may be present in the subsurface of this region. Tills in the area contain an unusually high proportion of clay, further suggesting that they may overlie a clay-rich unit. The till near site CLVAN-3 is especially clay rich, has an unusual yellow-brown colour (possibly indicating a high iron content) and is overlain by a spruce bog (see Site 93114, Levson *et al.*, 1994). The conductive layer at the surface at CLVAN-2 may therefore represent a small late-glacial clay unit.

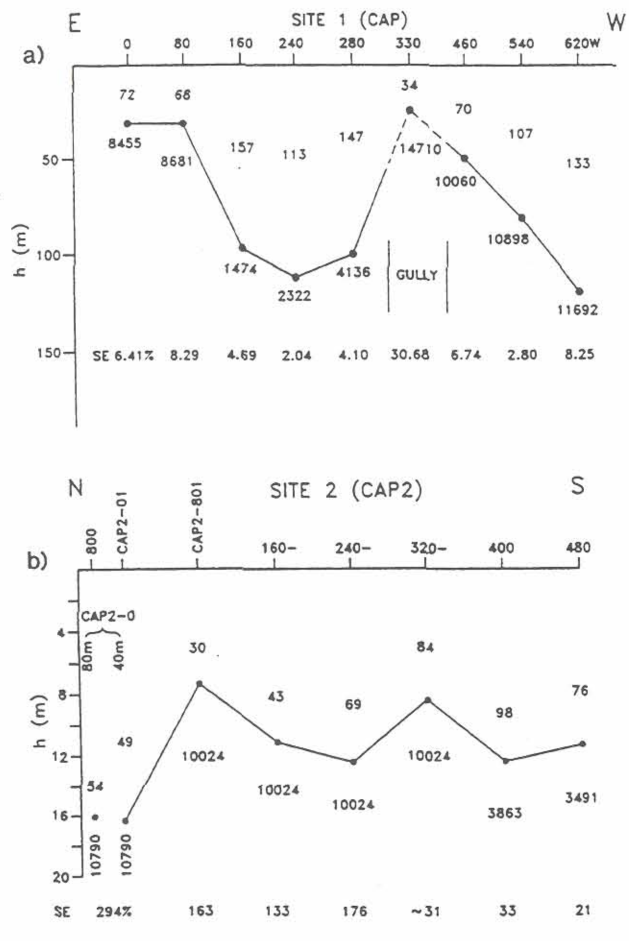

Figure 7. (a) Resistivity section based on the layered earth interpretation of the apparent resistivity plots for Site 1. (b) Resistivity section based on the layered earth interpretation of the apparent resistivity plots for Site 2. The values of standard error of fit from the inversion (labelled SE in the diagrams) are shown along the bottom of the 2 sections. The high SE values for CAP2-0 to CAP2-240 are caused by the finite conductor response superimposed on the layered earth responses.

SUMMARY AND OUTLOOK

The results of this survey indicate that useful electromagnetic data can be obtained in drift covered areas in the Nechako Plateau. The signal-to-noise (S/N) ratio is low at measurement times greater than 0.5 millisecond; thus little information is gleaned from the data at long times. Differences in bedrock resistivity of 2 or more can be resolved and, the drift thickness can easily be measured.

The contact between the granitic pluton and the volcanics at site 1 appears to be associated with thicker drift and more conductive bedrock, perhaps a result of (clay?) alteration or fracturing along the contact. One of the most pronounced multi-element till geochemical anomalies in the Fawnie Creek map area occurs directly east of EM survey site 1, adjacent to the western margin of the Capoose batholith. Here anomalous gold values occur in an east-trending zone that is about a kilometre wide and several kilometres long which parallels the local ice-flow direction. Till samples at several sites in this zone also contain anomalous arsenic, antimony and silver. The geochemical anomaly indicates an up-ice source in the vicinity of the EM survey, along the western margin of the batholith. Elsewhere, along the batholith margin, variably silicified country rock, sometimes associated with barite (see Malaput prospect *in* Diakow and Webster, 1994), suggests that near-surface hydrothermal activity locally accompanied the emplacement of the Capoose batholith. Further research, including drilling, is required to verify this concept.

A finite bedrock(?) conductor was located at site 2. The drift here is quite thin (less than 15 m) with resistivity values similar to those at site 1. The bedrock resistivity near the conductor differs from the resistivity further south, but it is not clear if it is associated with the granite-volcanic contact. Further field examination of the area is needed to verify that the conductor is real and not associated with a man-made object such as a culvert.

The resistivity character of the drift at Site 3, soundings CLVAN-2 to CLVAN-4, is different from the drift at the other two sites and is most likely due to the presence of glaciolacustrine sediments. Further investigations are needed to verify these results as there are no drill holes in this area.

Although the signal-to-noise ratio is low for times greater that 500 microseconds, that is 0.5 millisecond, the drift and bedrock material is resistive enough to permit eddy currents to diffuse into the ground rapidly. The depth of penetration at 500 microsecond can therefore be quite large. This is evident from depths to bedrock of more than 100 metres, obtained near the contact between the Capoose batholith and the volcanic country rock at site 1. This is quite different from conductive environments. For example, the signal-to-noise ratio at 7 milliseconds is very large for soundings near the dike by the Roberts Bank causeway in Delta (Best *et al.*, 1995). The shallow subsurface has saline water in the pores, producing a bulk resistivity of 1 to 1.5 ohm-metres. The underlying formation contains fresher water that produces a bulk resistivity of more than 100 ohm-metres. This contact can not be observed on the soundings if it is more than 70 metres deep. In other words, the eddy currents take more than 7 milliseconds to diffuse to this contact when it is deeper than 70 metres. The eddy current diffusion rate must be at least 12 times slower in the conductive sediments along the Fraser delta than in the glacial till in the Nechako region.

The central sounding configuration can generate a layered earth interpretation that is unique when the earth closely approximates horizontal layers of fixed resistivity. Significant topography, for example the gulley at site 1 can distort the one-dimensionality of the soundings because of the two or three dimensional topography. This is also true for bedrock topography. In such situations the depth and resistivity estimates for the layers will be incorrect. As a rule of thumb, the relief, either surface or bedrock, within one transmitter loop should be less than 25% of the length of one side of the loop. In other words if the loop sides have a length of 40 metres, the maximum relief should be less than 10 metres. Significant lateral variations in resistivity can also distort the soundings.

Where finite bedrock conductors are present, large-loop time-domain soundings are often difficult to interpret (*e.g.*, site 2). Consequently, a frequency-domain electromagnetic system such as the Apex MaxMin system is preferable over the large-loop systems. This is particularly true in this area as the drift does not appear to be that thick or conductive.

In conclusion, the results of the EM-47 survey in this region of the Interior Plateau are encouraging, in that the method successfully resolved till thickness, multiple Quaternary stratigraphic units, bedrock contacts, possible alteration zones as well as bedrock conductors. The potential contribution of electromagnetic techniques to regional geoscience programs is significant and we recommend and encourage its use.

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