Izok Lake volcanogenic massive-sulphide deposit in the Slave craton, western Nunavut: a field summary of deposit mineralization and alteration

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Abstract

The Izok Lake deposit, located in the Slave craton within the Kitikmeot region of Nunavut, near the Northwest Territories border, is a bimodal-felsic, Zn-Cu-Pb-Ag, volcanogenic massive-sulphide (VMS) deposit. It is considered to be one of the most potentially economical, undeveloped deposits in North America. Its polymetallic mineralization occurs mainly in felsic volcanic and volcaniclastic units. The units underlying the mineralized zones are characterized by a higher abundance of sericite and chlorite than the overlying units. Durchbewegung textures, characteristic of sulphide mobilization during deformation, occur at the top of the massive-sulphide lenses. The durchbewegung texture, in association with foliation intensity, is indicative of deformation that was concentrated in the sulphide units, which are less competent than the surrounding volcanic units. This has important implications on the understanding of the Izok Lake deposit, insofar as establishing potential genetic links between alteration and mineralization and determining the influence of deformation on the mineralization.

Introduction

The Izok Lake deposit in northwestern Nunavut has an indicated resource of 13 million tonnes (Mt) with 13.3% Zn, 2.4% Cu, 1.4% Pb and 73 g/t Ag and an inferred resource of 1.2 Mt with 10.5% Zn, 1.5% Cu, 1.3% Pb and 73 g/t Ag (MMG Limited, 2022). Based on the early detailed description of Money and Heslop (1976), the deposit can be classified as a bimodal-felsic, volcanogenic massive sulphide (VMS; e.g., Franklin et al., 2005; Galley et al., 2007) and is one of the largest undeveloped deposits in North America for its Zn-Cu resources as well as for its potential byproducts. The Izok Lake deposit (lat. 69°39’N, long. 112°49’W) is located in the Kitikmeot region of Nunavut, approximately 250 km southeast from the community of Kugluktuk, 30 km east of the Northwest Territories (NT) border and 350 km north of Yellowknife. The Izok Lake deposit is among a linear continuum of VMS deposits in the northern Slave craton, which also includes the High Lake, High Lake East, Hood and Gondor VMS deposits (Figure 1).

Discovered in 1974 by Texasgulf Inc., the exploration rights to the Izok Lake site have been owned by MMG Resources Inc. (MMG) since 2009, although exploration work ceased in 2015. During the summer of 2022, the Canada-Nunavut Geoscience Office (CNGO) in collaboration with the Northwest Territories Geological Survey (NTGS) and Université du Québec à Montréal (UQAM) completed additional work to better understand the geological setting of the area. Such work will also increase the knowledge of the metallogeny of the area and serve as a guide for future exploration within the Slave craton.

Given the increasing importance of critical and strategic minerals (Natural Resources Canada, 2023), remote deposits, once not amenable to profitable mining because of a lack of infrastructure, may represent attractive targets in the

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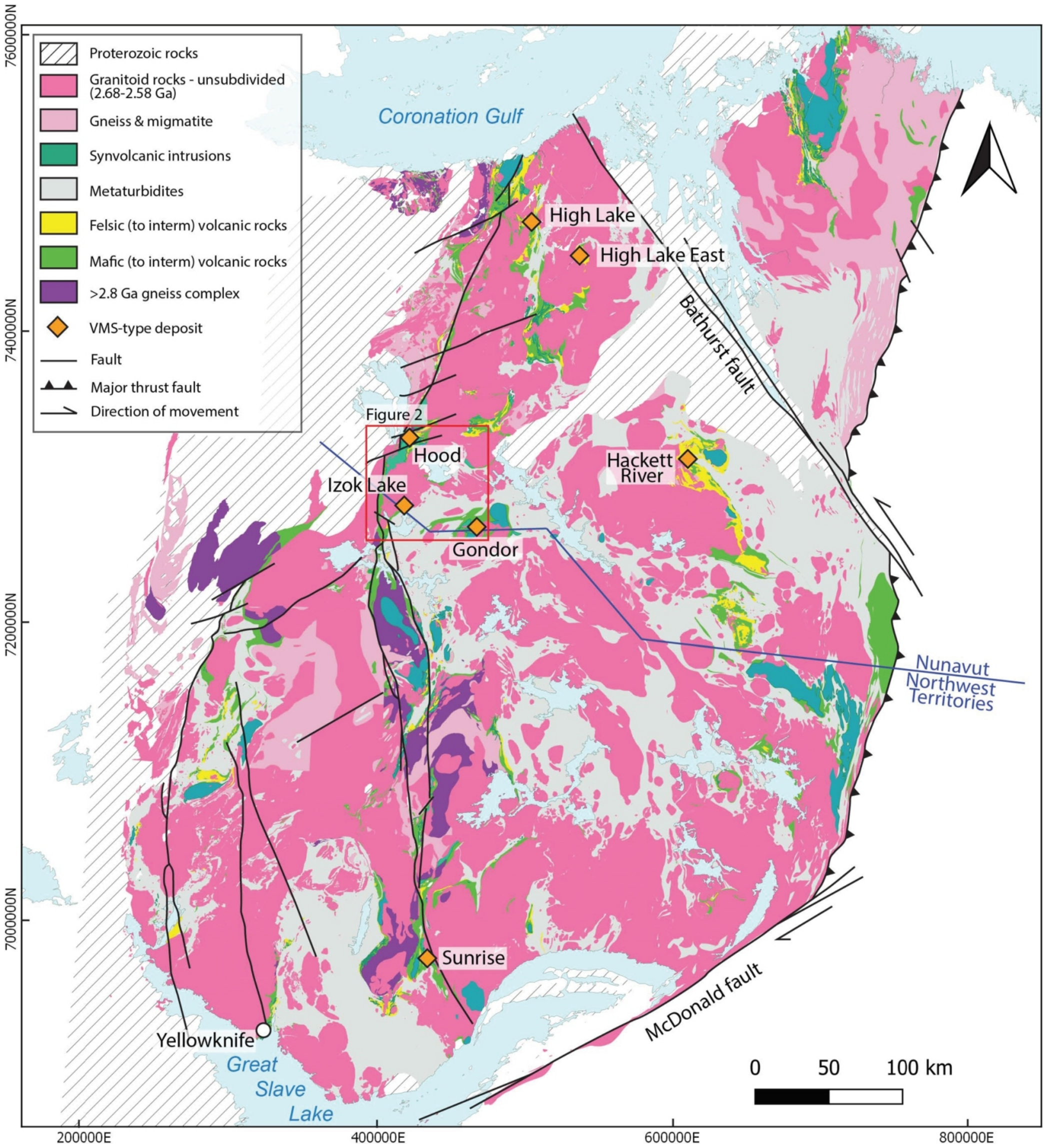

Figure 1: Simplified geology of the Slave craton, showing Izok Lake deposit location, northwestern Nunavut and northeastern Northwest Territories (modified after Stubley and Irwin, 2019). Red outlined area shows the area of Figure 2. All co-ordinates are in UTM Zone 12, NAD 83. Abbreviations: interm, intermediate; VMS, volcanogenic massive sulphide.

near future. Additionally, the current interest in the Izok lake (unofficial geographic name[5]) area stems from previously established resource estimates from numerous proximal mineral occurrences. A better definition of the geological and metallogenic contexts for the Izok Lake VMS deposit is therefore warranted. This project involves detailed logging of core from drillholes that intersect the Izok Lake mineralized zones and releasing information that, prior to this study, had not been available publicly. The purpose of this paper is to describe the massive-sulphide lenses at the Izok Lake deposit and to contextualize the deposit with the nature and alteration of its hostrocks. In a complementary study, Lebeau et al. (2025) document regional characteristics of the area, including regional drillcore and transect mapping descriptions.

Geological context

The study site is located within the Point Lake greenstone belt, also known as the Izok Lake belt. The Point Lake greenstone belt is a subdivision of the Yellowknife Supergroup of the Slave craton (Figures 1, 2; Bostock, 1980; Padgham and Fyson, 1992; Morrison, 2004; Bleeker and Hall, 2007; Paulen et al., 2013). The Izok Lake deposit is hosted within the Point Lake Formation, which is

[5]*Latitude 65°38' N and longitude 112°48' W*

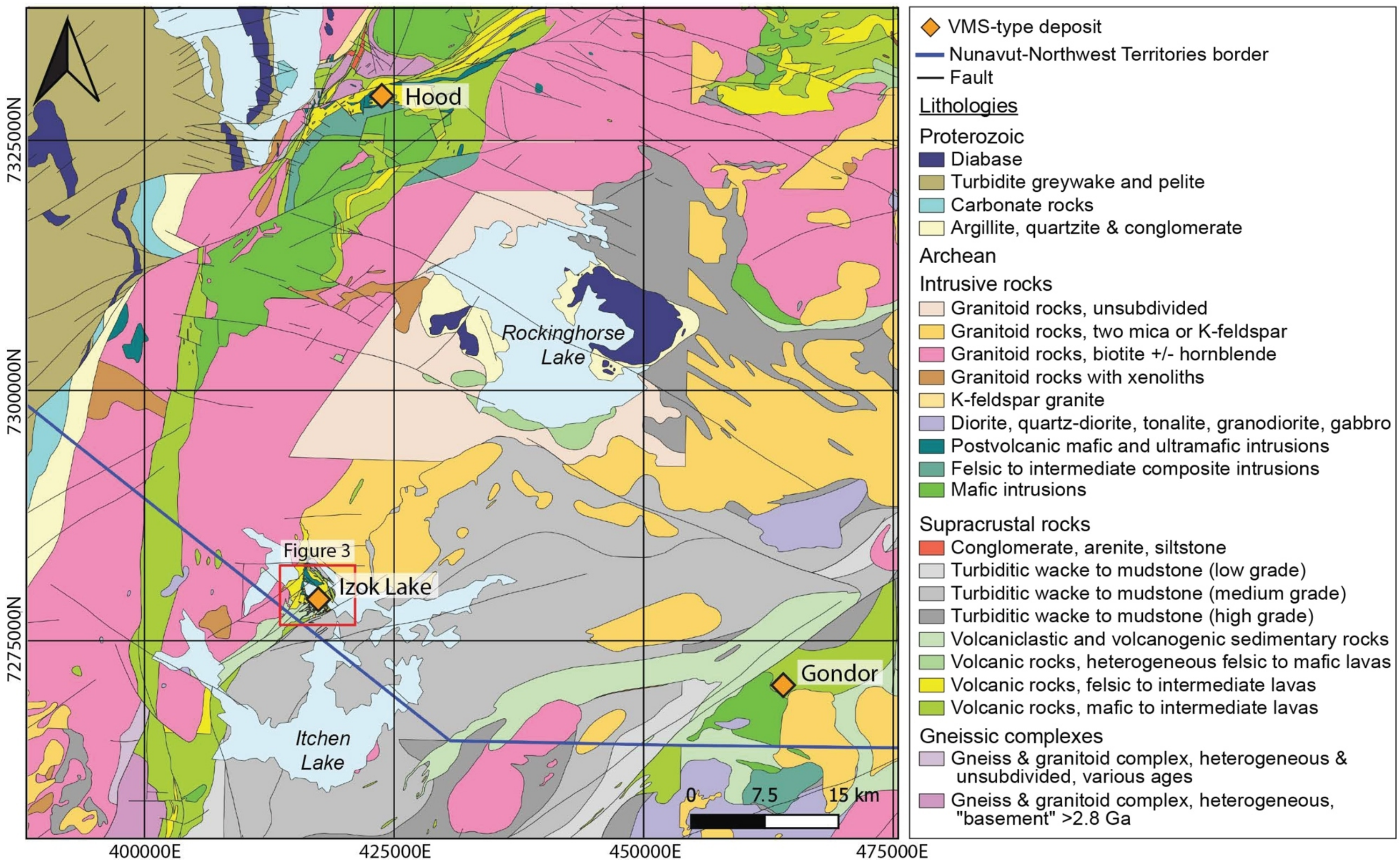

Figure 2: Geology of Izok lake area (modified after Stubley and Irwin, 2019). The area of Figure 3 is outlined in red. All co-ordinates are in UTM Zone 12, NAD 83. Abbreviation: VMS, volcanogenic massive sulphide.

dominated by aphanitic or porphyritic rhyolitic flows, with plagioclase and minor quartz.

The Izok Lake deposit consists of five main sulphide lenses (West Central, East Central, North, Northwest and Inukshuk zones) and is hosted near the top of a thick sequence of felsic volcaniclastic rocks (Figure 3). The overlying units include felsic volcanic and volcaniclastic rocks but also, in lesser abundance, andesitic and basaltic volcanic rocks and turbidites (Morrison, 2004). Mortensen et al. (1988) and Gebert (1995) dated rhyolite from the area and obtained Neoarchean ages of 2623 ±20 Ma and 2680 +7/-3 Ma, respectively. Lebeau et al. (2025) also collected samples of rhyolite for geochronological analyses to establish regional correlations along the Point Lake greenstone belt.

The felsic units are crosscut by intermediate and gabbroic dykes, interpreted as feeder dykes. The Point Lake greenstone belt is also crosscut by late, syn- to postvolcanic, granitoid rocks (2.68 and 2.58 Ga; Davis et al., 1994) and the north-northwest-trending Proterozoic Mackenzie gabbroic (diabase) dykes (Bostock, 1980; Bleeker et al., 1999; Morrison, 2004).

The study area has a complex structural, metamorphic and hydrothermal history. The volcanic rocks and granitoid basement complex are thought to have undergone three phases of deformation (Glover, unpublished report, 1992, as cited in Morrison, 2004). The first phase is expressed as a stratigraphically parallel penetrative planar fabric, the second phase is a weak crenulation and mineral lineation, observed in the northern portion of the Izok lake area, and the third phase consists of a net change in the orientation of the foliation, thereby creating the Izok lake antiform. In terms of metamorphism, the northern and central sectors of the Izok lake area exhibit an upper amphibolite metamorphic facies (with the occurrence of sillimanite in fresh rocks) and the southern sector has a weaker greenschist gradient (Thomas, 1978; Bostock, 1980; J. Getsinger, unpublished data, 1993, as cited in Morrison, 2004; Morrison and Balint, 1993). This high degree of metamorphism resulted in porphyroblastic textures within the units, with minerals such as sillimanite in the volcanic units, gahnite near the sulphide zones and garnet in the intermediate zones (Morrison, 2004). A regional metamorphism with a temperature of ~700 °C and pressure of 0.25 gigapascals is interpreted from geothermobarometric studies on the anthophyllite-cordierite-spinel-corundum assemblage in unaltered rocks and the textural analysis of key metamorphosed samples (J. Getsinger, unpublished data, 1993, as cited in Morrison, 2004). This is also consistent with hornfels pyroxene metamorphic facies documented by previous workers (Relf, 1992; J. Getsinger, unpublished data, 1993, as cited in Morrison, 2004). At the study site, widespread hydrothermal alteration consists of minerals such as white mica, biotite, chlorite and quartz (i.e., silicification), that are all overprinted by subsequent metamorphism on units proximal to mineralized zones (Money and Heslop, 1976; Thomas, 1978; Morrison, 2004).

Methodology

The selection of drillholes for analysis in this study was based on previous drillcore descriptions by MMG (unpublished data, 2009–2015) and S.J. Piercey (unpublished reports, 2011, 2013). The first step was to choose drillholes that intersected the mineralized zones. Of those drillholes, those that intersected with favourable geochemically distinct rhyolite types were chosen. Bailey and Stubley (2013) had classified core samples from the Izok Lake deposit drillholes into rhyolite types (e.g., R1, R2, R3, etc.), representing groups of rhyolites that are geochemically distinguishable by their Al_2O_3/TiO_2 and Zr/Nb ratios. Based on these criteria, three drillholes were selected: HEN-093 (Northwest zone, 3 cm diameter core), HEN-228 (Central East zone, 5 cm diameter core) and HEN-317 (Northwest zone, 5 cm diameter core).

At the Izok Lake core shack, boxes of drillcore were removed from storage and laid out sequentially to analyze the geological successions intersected by drilling. An indication at each metre was marked to facilitate the logging process. In addition to rock unit and contact descriptions, the intensity and style of deformation and chlorite and sericite alteration were documented with respect to drillhole depth. Finally, photographs were taken to document the nature of all rock units. Samples of core were selected for geochemical and/or petrographic analyses.

Results

Drillhole observations

Drillhole HEN-093

Located in the Northwest zone, drillhole HEN-093 has a total depth of 113.69 m from surface and a vertical plunge (Figures 3, 4). At the top of the hole is an intermediate, relatively homogeneous dacitic unit rich in biotite (30%; Figure 5a). This unit is locally rhyolitic and grades into a sillimanite-bearing rhyolite at 39 m downhole (Figure 5b). This rhyolite gradually grades into a pseudoclastic/patchy chlorite rhyolite with sulphide stringers comprising up to 7% of the rock, which then grades into a semimassive-sulphide lens (at 50 m downhole) to a massive-sulphide lens at 59 m, with sphalerite as the dominant sulphide mineral. The rhyolite hosting the mineralization is variably chloritized and silicified. Farther downhole (~76 m), stratigraphically below the massive-sulphide zone, is a foliated and sericitized rhyolite (Figure 5c) that locally has a pseudoclastic/patchy chlorite texture (Figure 5d).

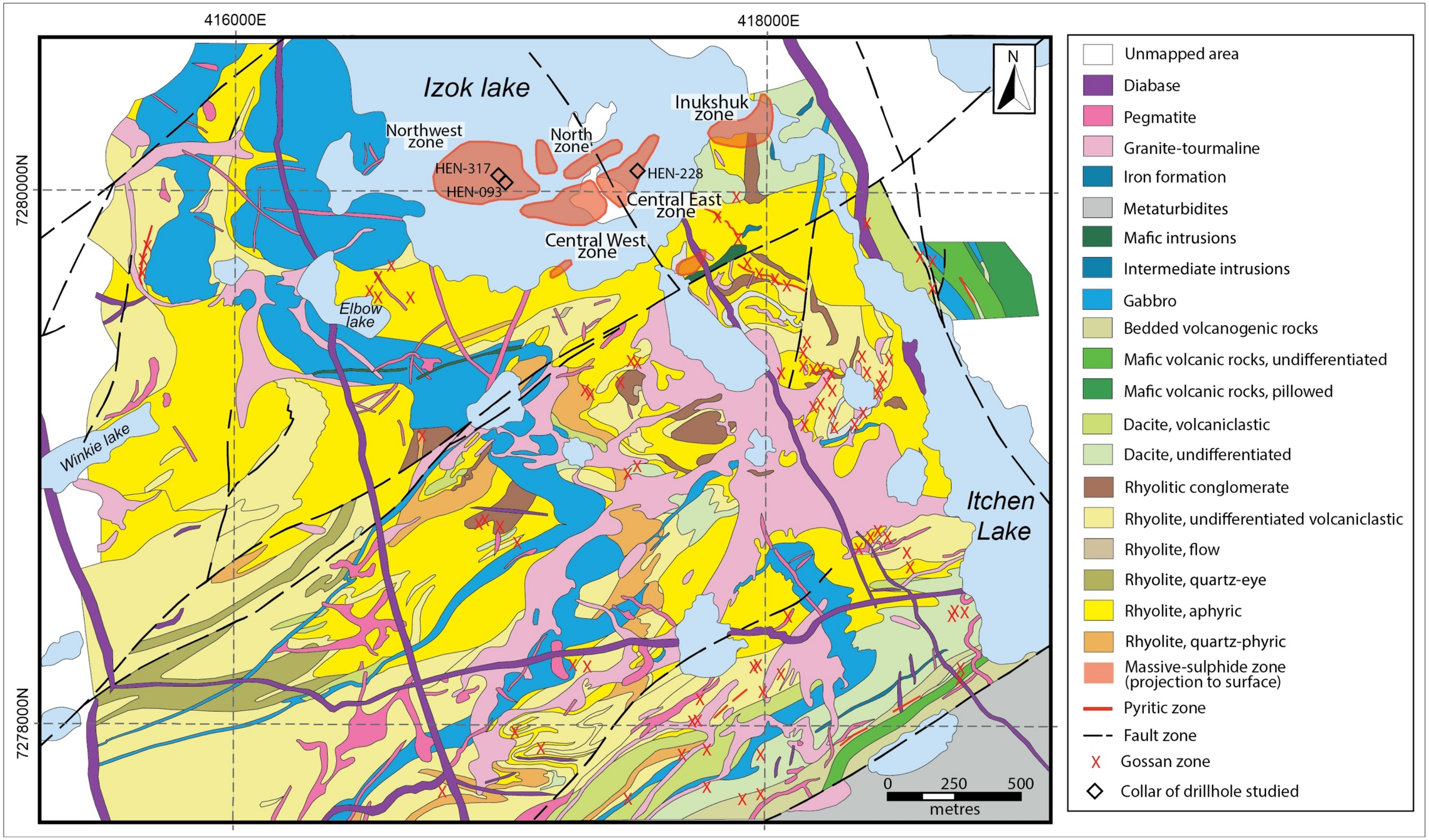

Figure 3: Detailed geology of the Izok lake area showcasing the diversity of the felsic volcanic units (modified after Bailey and Stubley, 2013). The small black boxes represent the location of the collars of the drillholes studied. The drillholes are all vertically dipping. Place names with the generic in lower case are unofficial. All co-ordinates are in UTM Zone 12, NAD 83.

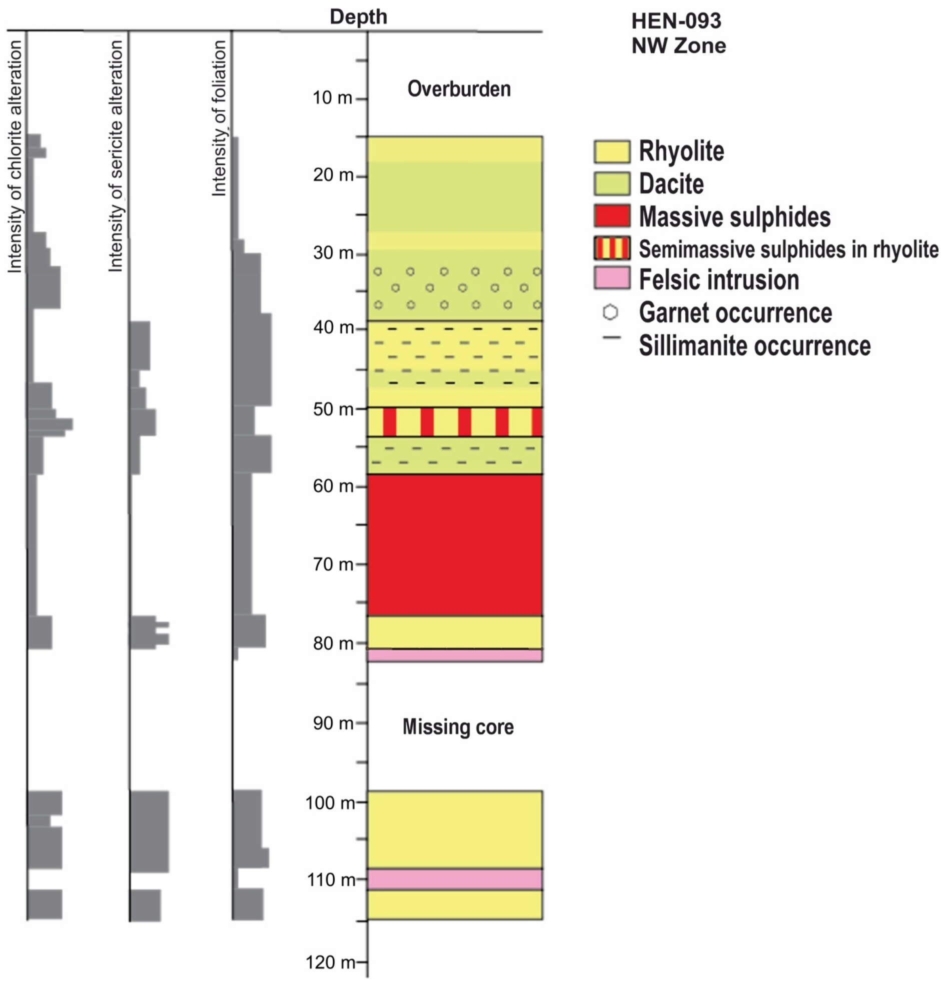

Figure 4: Simplified geological log of drillhole HEN-093, located in the Northwest (NW) zone of the Izok Lake deposit (see Figure 3 for location). Intensity of foliation and chlorite and sericite alteration are indicated on a relative scale. Depth in metres from surface.

Drillhole HEN-228

Drillhole HEN-228, in the Central East zone, has a total depth of 123 m from surface and a vertical plunge (Figures 3, 6). The top of the hole is defined by alternating chlorite-altered rhyolitic and dacitic heterogeneous volcanic and volcaniclastic units, which were intruded by a leucogranite (Figure 7a). Concentric centimetre-scale porphyroblasts, which consist of a white mica or andalusite core with white plagioclase and chlorite rims, locally occupy 10% of the rhyolite (Figure 7b). The pseudoclastic/patchy chlorite texture is present around 30 m downhole in a felsic volcanic unit (Figure 7c). At 68 m downhole, the sequence continues with massive- and semimassive-sulphide mineralized zones in a felsic host. These sulphide lenses are located stratigraphically above a homogeneous, strongly sericite-altered and leached rhyolitic flow (Figure 7d).

Drillhole HEN-317

Located in the Northwest zone, drillhole HEN-317 is vertical and has a total depth of 101 m from surface (Figures 3, 8). The top of the hole contains an intermediate tuff that alternates on a metre scale with a rhyolite exhibiting a range breccia, fine-bedding and tuffaceous textures (Figure 9a, b). Downhole, at 36 m, the rocks transition to a thick ~40 m massive-sulphide zone interrupted by less silicified and sericite-altered rhyolite zones up to 5 m thick at 40 and 50 m. This rhyolite is strongly foliated and locally has the pseudoclastic/patchy chlorite texture. Stratigraphically below the massive-sulphide mineralization, at 76 m downhole, there is a heterogeneous white rhyolite with a strong foliation that is locally mylonitic (Figure 9c) and gradually grades into a homogeneous rhyolite with the typical pseudoclastic/patchy chlorite texture (Figure 9d).

Mineralization

Mineralization at the Izok Lake deposit consists mainly of pyrite, sphalerite, chalcopyrite, pyrrhotite and galena in variable quantities within the massive- to semimassive-sulphide lenses or as disseminated stringers, veinlets and clots. A detailed description of the mineralized zones ob-

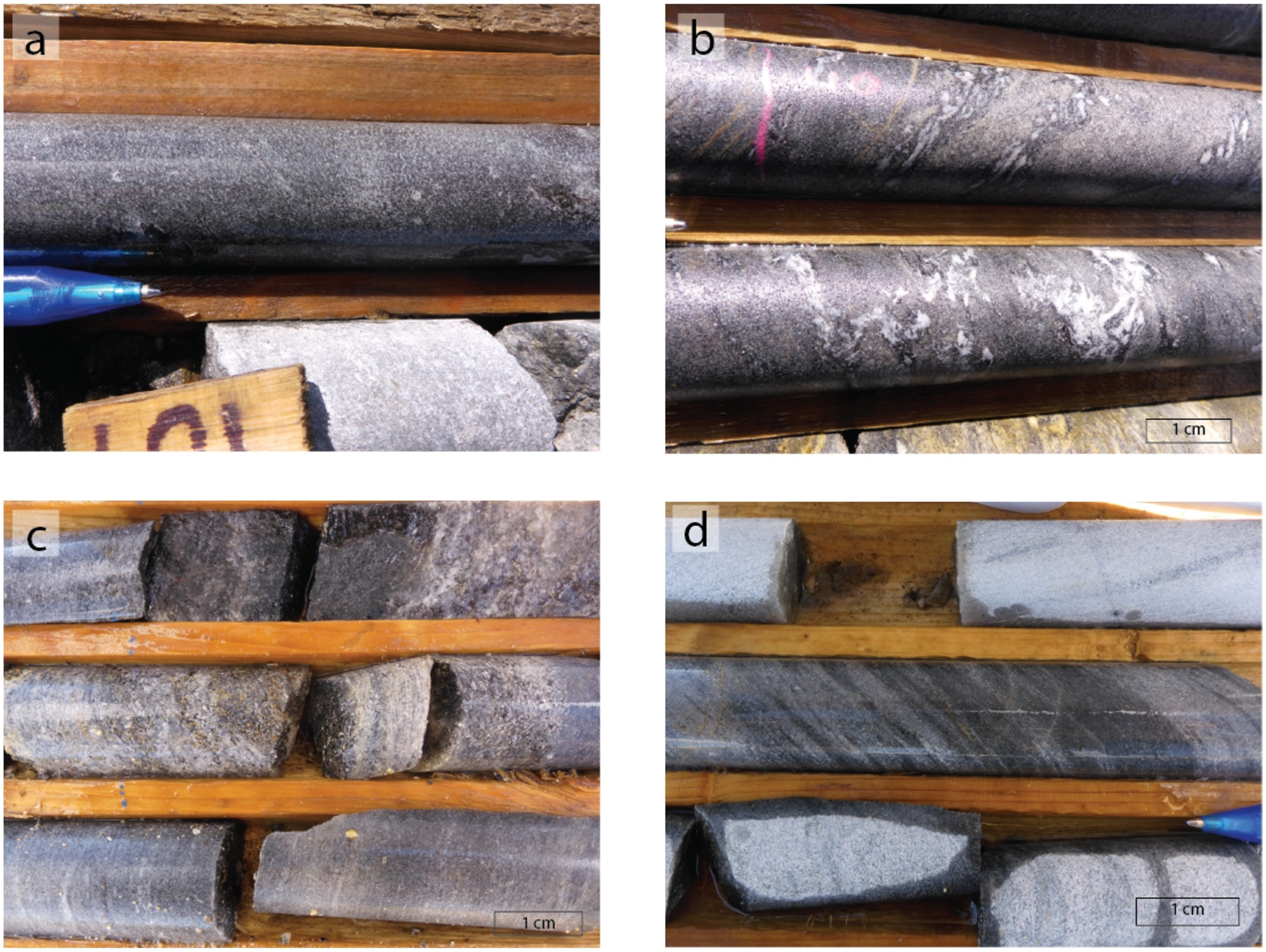

Figure 5: Core from drillhole HEN-093, Izok Lake deposit: **a)** dark grey homogeneous dacite; **b)** rhyolite with intestinal-textured white fibrous sillimanite; **c)** silicified rhyolite with coarse-grained sericite zones; **d)** rhyolite with a pseudoclastic/patchy chlorite texture, pseudoclasts being elongated patches of chlorite that have the appearance of a clast.

served in core from drillholes HEN-093, -228 and -317 is given below.

Drillhole HEN-093

In drillhole HEN-093 core, mineralization occurs primarily in semimassive form at 50 m downhole with gradual contacts in a silicified and sericite-altered hanging wall rhyolite. The mineralization occurs as 0.2 to 1 cm wide veinlets/stringers of sphalerite, pyrite and chalcopyrite. Within this unit, a massive-sulphide lens, ~30 cm thick, consists mainly of centimetre-sized crystals of reddish sphalerite (60%), interstitial black galena (20%) and disseminated chalcopyrite (10%).

At 58 m downhole, chalcopyrite veinlets appear in the rhyolite, which grade downhole into massive-sulphide lenses. These veinlets and lenses contain reddish to purple, millimetre- to centimetre-sized, sphalerite crystals with millimetre-sized subhedral pyrite (Figure 10a). Chalcopyrite is present in 0.3 cm wide stringer veinlets. In an ~10 cm thick massive-sulphide lens, sphalerite makes up 70% and chalcopyrite comprises 10% of the rock. The rhyolite hostrock is chlorite altered and silicified. Sulphides are moderately deformed in this drillhole and show some foliation parallel to the sulphide banding.

Drillhole HEN-228

The mineralized zones in core from drillhole HEN-228 are ~15 m thick and consist of alternating semimassive- and massive-sulphide lenses in a rhyolite or chloritic schist. Mineralized zones at the top of this core have semimassive-sulphide lenses mainly composed of subhedral pyrite (>75%), up to 1 cm in size, and ~1% chalcopyrite. The semimassive zones grade into massive-sulphide zones. The uppermost massive-sulphide zone is marked by durchbewegung texture, represented by rounded clasts of quartz and sphalerite in a matrix of sphalerite (60%) and pyrite (40%). At a depth of 70.5 m downhole, the mineralized lens is sphalerite rich and grades into 15% galena, which is interstitial between the coarse sphalerite (82%) and anhedral pyrite grains (3%; Figure 10b). Along the base of the massive-

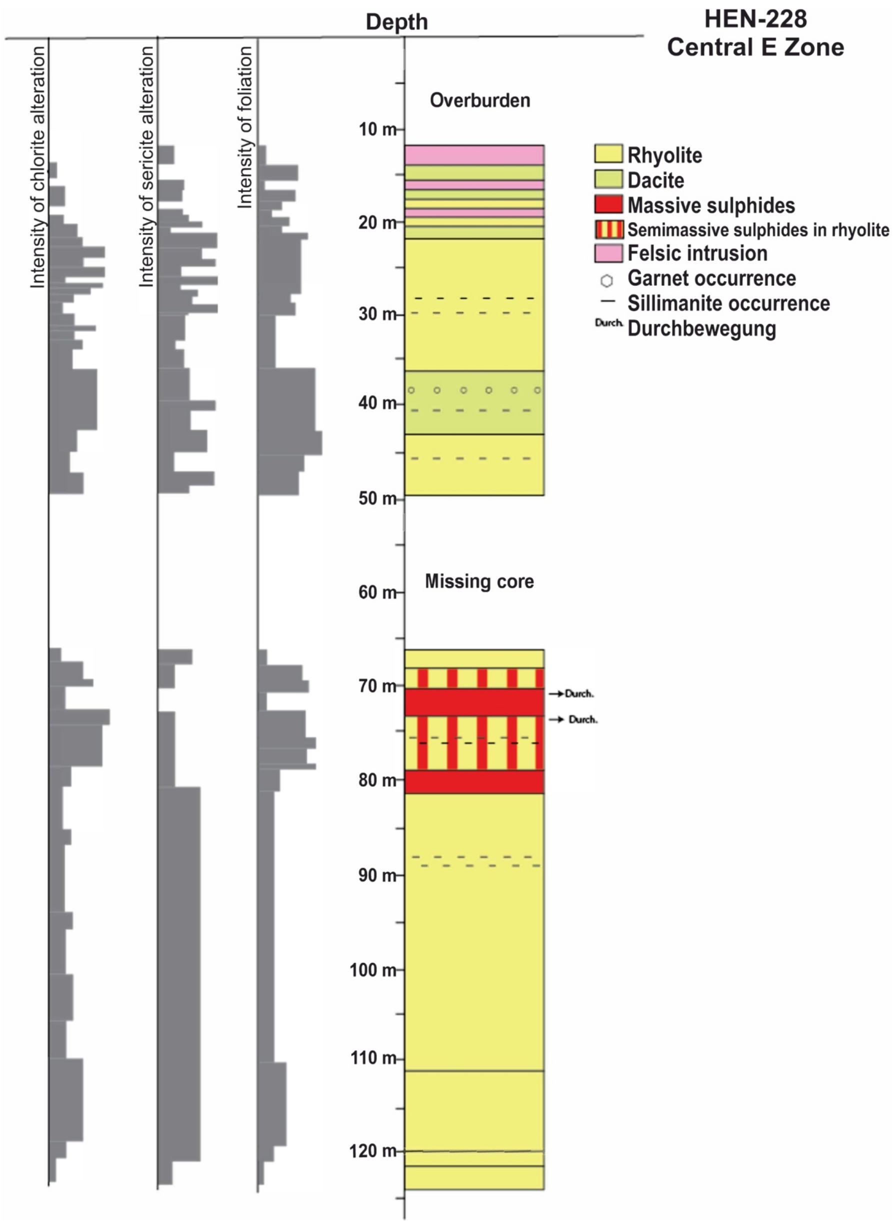

Figure 6: Simplified geological log of drillhole HEN-228, located in the Central East (E) zone of the Izok Lake deposit (see Figure 3 for location). Intensity of foliation and chlorite and sericite alteration are indicated on a relative scale. Depth in metres from surface.

sulphide lens, the mineralized zone is overprinted by a later event of mineralization of millimetre-scale euhedral pyrite along fractures.

Between 72.2 and 79.4 m downhole, a rhyolite-hosted semi-massive-sulphide unit is characterized by dominant anhedral pyrite (40%). The upper contact has a durchbewegung texture with rounded rhyolite clasts in a sulphide matrix. Chalcopyrite comprises 1–2% of this interval. The host-rock is a chlorite-sillimanite schist (protolith is likely rhyolite) exhibiting local parasitic millimetre- to centimetre-scale folds. These layers grade into rusty massive-sulphide mineralization with up to 55% pyrite, 30% pyrrhotite and 10 to 15% chalcopyrite.

Drillhole HEN-317

Drillhole HEN-317 core contains four main mineralized zones with a total thickness of approximately 40 m. Massive-sulphide mineralization zones alternate between sphalerite-rich and pyrite-rich units, with chalcopyrite occurring mostly as stringers located structurally below the massive-sulphide lenses. Durchbewegung texture is common at the top of the mineralized zones, and a moderate foliation overprints all units.

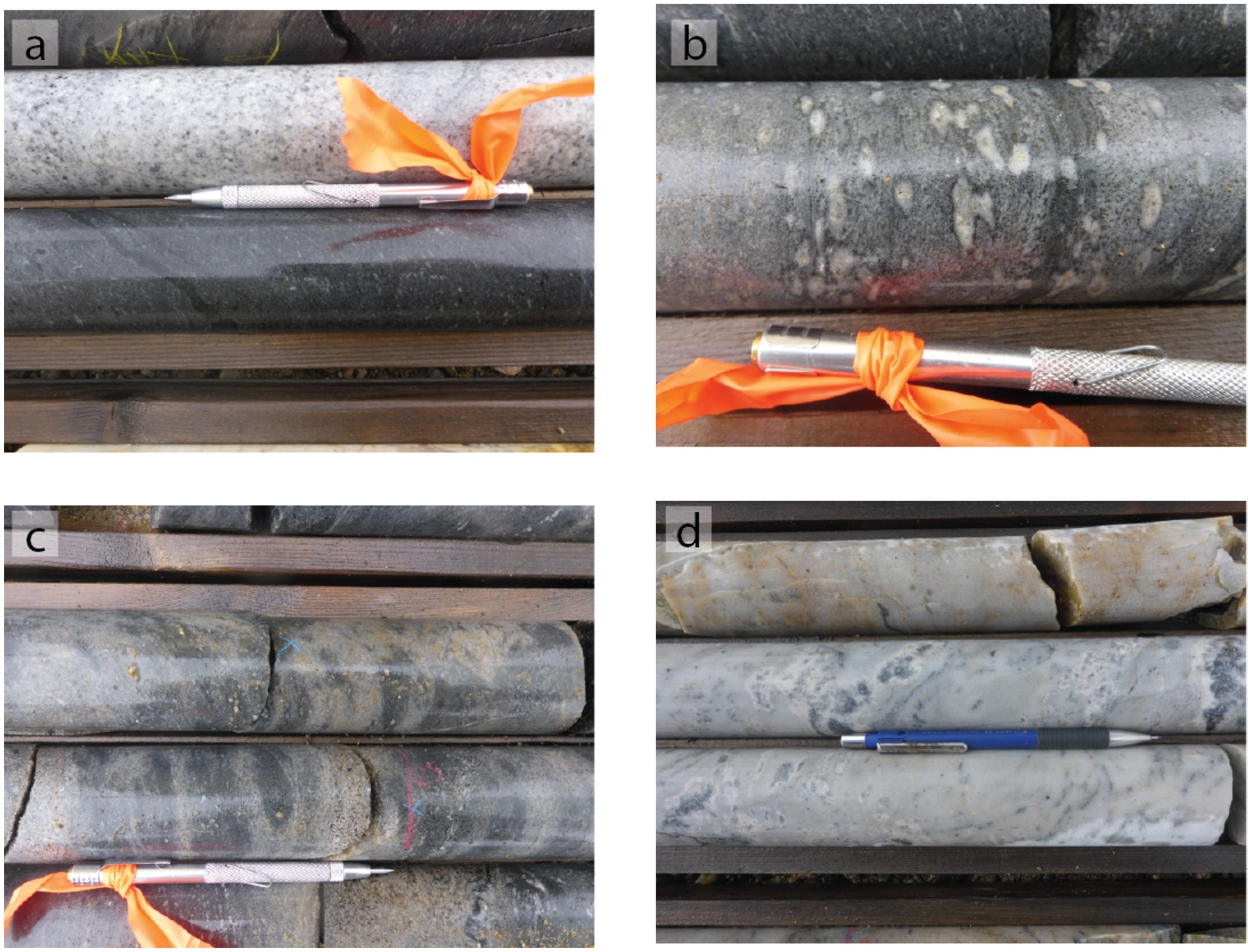

Figure 7: Core from drillhole HEN-228, Izok Lake deposit: **a)** white leucogranite and dacitic tuff; **b)** porphyroblasts with a white mica core and white feldspar and chlorite rims; **c)** pseudoclastic/patchy chlorite texture in a sericite-altered rhyolite; **d)** sericite-altered, leached rhyolite.

At a depth of 33 m downhole, a ~1 m thick massive-sulphide lens is hosted in a rhyolitic unit. The massive-sulphide mineralization is composed of pyrite (60%), sphalerite (38%) and magnetite (2%) with stringers adjacent to the lens. At the top of the lens, a durchbewegung texture is present, consisting of rounded to subrounded clasts of the host rhyolite in a sphalerite and pyrite sulphide matrix (Figure 10c).

At a depth of 35.5 to 39.1 m downhole, a ~4 m thick massive-sulphide lens consists of pyrite (60%), sphalerite (32%), chalcopyrite (5%) and magnetite (2%). A durchbewegung texture is again present and there is a matrix of sphalerite, chalcopyrite and minor subhedral pyrite. Below the lens, at 39.1 m downhole, sulphide stringers (pyrite > sphalerite > chalcopyrite) are present in the host rhyolite.

At 46 to 50 m downhole, a third sulphide lens has an upper contact characterized by a durchbewegung texture. Here this texture is composed of rounded centimetre-scale clasts of the rhyolitic hostrock in a matrix of sphalerite, chalcopyrite and pyrrhotite, in decreasing order of abundance. Subhedral pyrite is present but is clearly not part of the matrix. Under the band of durchbewegung texture, at 46.5 m downhole, the lens consists of a sphalerite-rich matrix with minor chalcopyrite, galena and pyrrhotite. Within the massive-sulphide lens, sections of 10-15 cm have a strong foliation and locally show evidence of shearing (e.g., C-S fabrics; Figure 10e).

At a depth of 53.6 to 72.8 m downhole, a 19 m thick massive-sulphide lens is characterized by alternating pyrite-rich and sphalerite-rich zones. Galena and chalcopyrite are also present in these intervals, ranging from <1 to 10% of the rock. In the sphalerite-rich zones, sphalerite occurs as a fine-grained matrix where it is associated with pyrite, and also occurs as millimetre-scale crystals where it is associated with galena. In the alternating pyrite-rich zones, the rock is composed of 90 to 95% of centimetre-scale, anhedral, massive pyrite, and 5 to 10% chloritic rhyolite. In

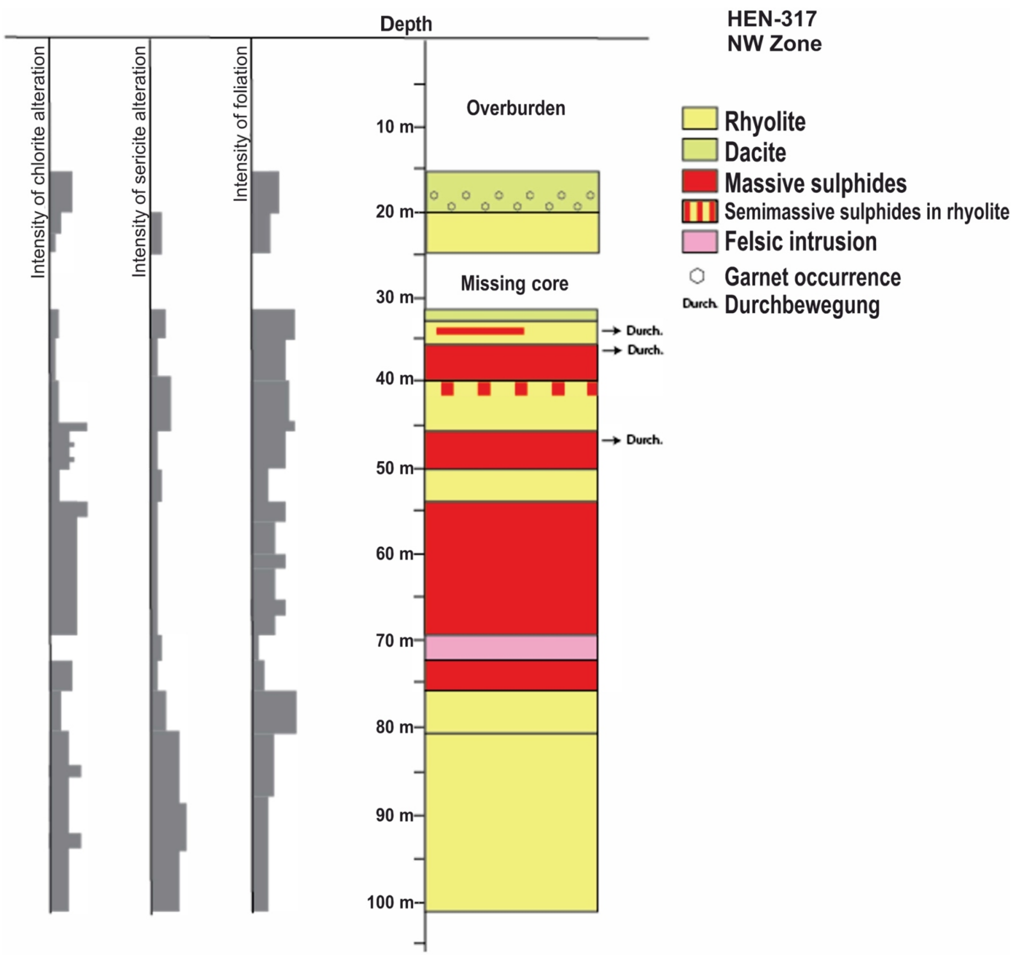

Figure 8: Simplified geological log of drillhole HEN-317, located in the Northwest (NW) zone of the Izok Lake deposit (see Figure 3 for location). Intensity of foliation and chlorite and sericite alteration are indicated on a relative scale. Depth in metres from surface.

the uppermost massive-sulphide lens, small parasitic isoclinal folds are evident in the pyrite-rich zones (Figure 10d). The base of the lens is more massively textured with a strongly chlorite-altered matrix.

Lithology and alteration of the hostrocks

One common characteristic among drillholes HEN-093, -228 and -317 is that the mineralized zones are found exclusively in rhyolitic units, and there are no intermediate or mafic units directly below the sulphide zones. In addition, deformation fabrics are generally of a higher intensity within the mineralized zones and along their contacts with unmineralized zones. Some local deformation caused strong foliation or parasitic folding in the sulphide mineralization (Figure 10d) and durchbewegung textures. However, this phenomenon is less evident in drillhole HEN-093, where there is no durchbewegung texture developed.

Sericite alteration is typically well developed below the mineralized zones and is weak to almost nonexistent above the mineralized zones. The same relationship is noted with chlorite alteration.

Discussion

An interesting aspect of the Izok Lake VMS deposit is the relative timing of mineralization with respect to volcanism. The alteration assemblages typically associated with hydrothermal activity in VMS systems (i.e., chlorite alteration, sericite alteration and silicification) are overlying and underlying the mineralized zones, although chlorite and sericite are found in greater abundance beneath the mineralized zones. This could suggest that the massive-sulphide zones were emplaced syn- to postvolcanism, possibly replacing felsic volcaniclastic units. This may also indicate that the hydrothermal system was still active as the hanging wall units were emplaced, and that the mineralization could result from an exhalative synvolcanic process. As a result, hydrothermal alteration affected the units above and below the mineralized zones, but to a greater extent this alteration is evidenced in the units that also host the

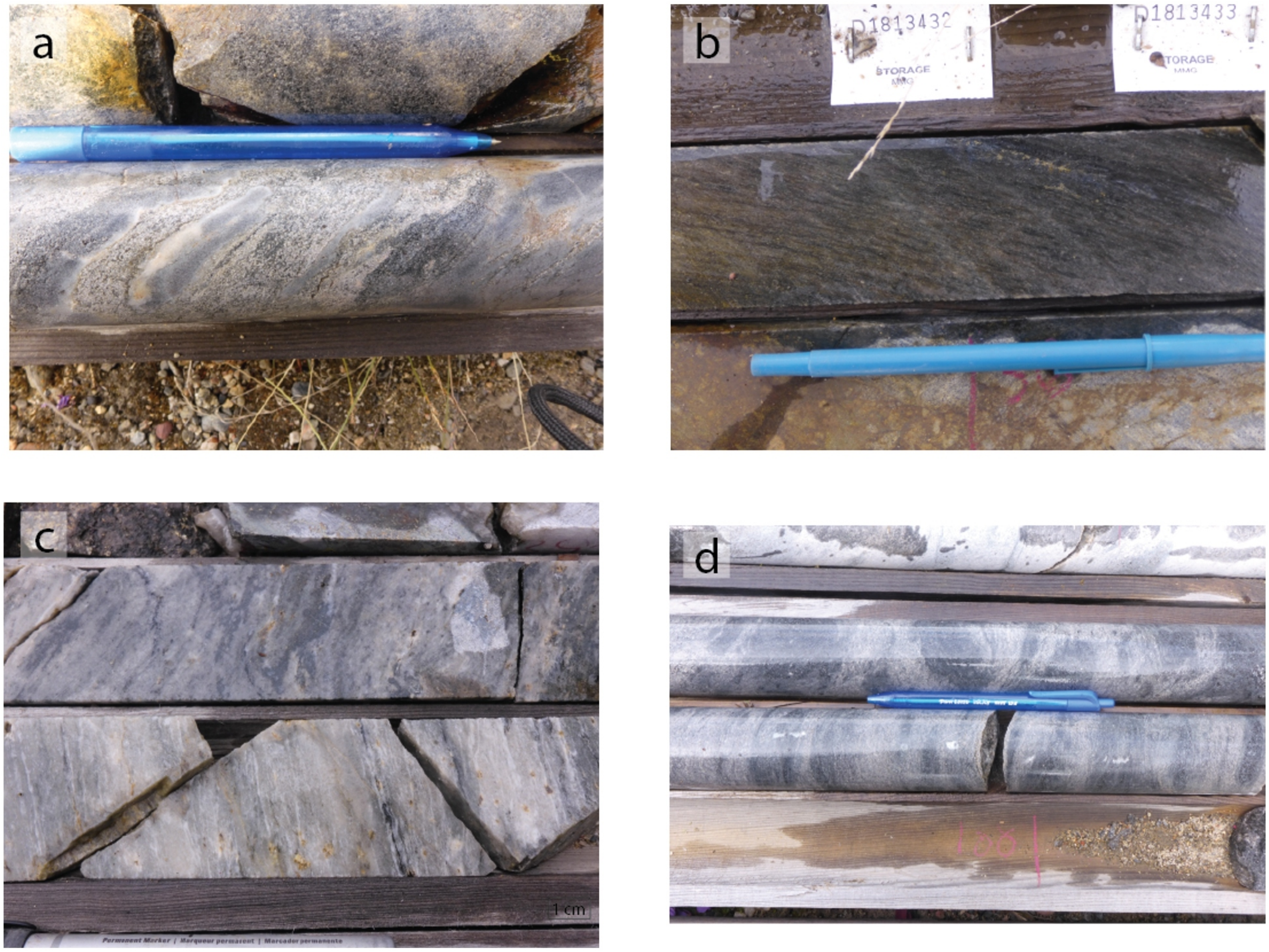

Figure 9: Core from drillhole HEN-317, Izok Lake deposit: **a)** brecciated rhyolite; **b)** volcaniclastic rhyolite lapilli tuff, finely bedded and strongly foliated; **c)** silicified rhyolite with a mylonitic texture; **d)** pseudoclastic/patchy chlorite texture in a rhyolite.

hydrothermal vents (i.e., below the sulphide lenses). The sulphide stringers are mainly found in the rhyolitic units below the mineralized zones; similarly, the intensity of the alteration indicates a younging direction in the volcanic stratigraphy toward the top of the drillholes.

The deformation intensity is another aspect of particular interest, especially in the massive-sulphide lenses. The foliation is generally stronger on both sides of the massive-sulphide lens and deformation gradients locally increase within the lenses themselves, which is a result of major rheological contrasts. The strongest deformation within the mineralized lenses is characterized by centimetre-scale parasitic folds and, most importantly, by durchbewegung textures, which consist of a matrix of massive-sulphide minerals with rounded to subrounded clasts of the hostrock. This texture is normally associated with simple shearing and/or remobilization of sulphide minerals (e.g., Marshall and Gilligan, 1989).

Two models, primary and tectonic, can explain the occurrence of durchbewegung textures. In a primary model, synvolcanic deformation and faulting on the seafloor can cause sulphide remobilization during the emplacement of the lenses, but this is difficult to demonstrate in strongly deformed Archean deposits such as those at Izok lake. In a tectonic model, durchbewegung texture can form by differential strain partitioning and, therefore, is unrelated to the primary volcanic environment. Because sulphide minerals and sericite- and chlorite-rich rocks are less competent than the host volcanic rocks of the Izok Lake deposit, deformation is therefore concentrated in these less competent portions, which then behave as shear zones (Marshall and Gilligan, 1989; Lafrance et al., 2020). The spatial relationship between foliation and durchbewegung texture suggests that they have a common origin and that the latter is the result of tectonic deformation.

The hydrothermal alteration halo generated by this deposit is relatively large (between 1 and 2 km; Laakso et al., 2015), probably due to the high permeability of the felsic

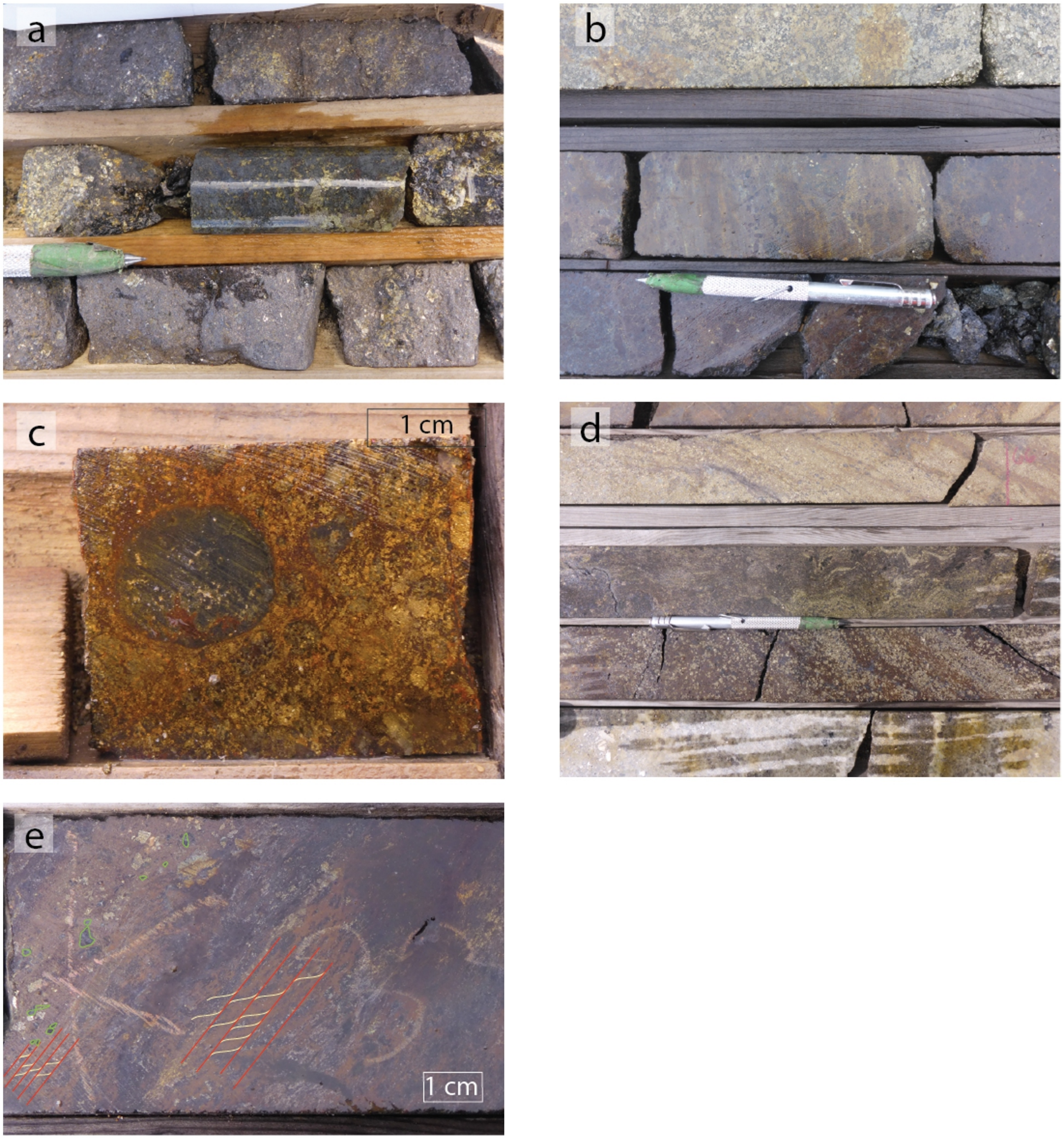

Figure 10: Mineralized zones in core from the Izok Lake deposit: **a)** pyrite- and sphalerite-rich semimassive- to massive-sulphide lenses (drillhole HEN-093); **b)** pyrite-rich massive-sulphides with a pseudo-durchbewegung texture and sphalerite-rich massive sulphides (drillhole HEN-228); **c)** durchbewegung texture in massive sulphides (drillhole HEN-317); **d)** parasitic folds in massive sulphides (drillhole HEN-317); **e)** C-S fabric and subtle durchbewegung texture in massive sulphides (drillhole HEN-317); green highlights the host clast, red and yellow highlight the C-S fabric.

volcaniclastic rocks, which allowed for pervasive fluid circulation. However, this pervasive hydrothermal alteration masks the protoliths and primary features, making protolith identification difficult in the field. Lithogeochemical and portable X-ray fluorescence (XRF) analyses would, therefore, prove to be an asset to help differentiate units (Bailey and Stubley, 2013; Lebeau et al., 2025) and are strongly recommended for future prospecting and mapping in the area.

Previously described as pseudoclastic rhyolite (S.J. Piercey, unpublished report, 2013), the patchy chlorite tex-

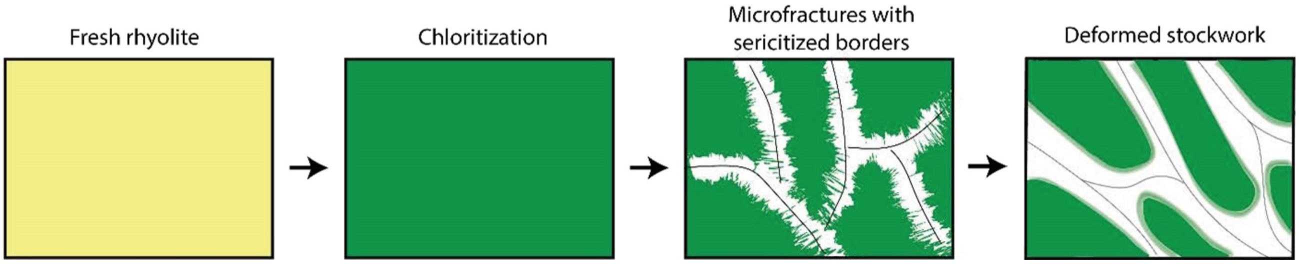

Figure 11: Model for the formation of pseudoclastic/patchy chlorite texture.

ture in rhyolite has an ambiguous origin. As described above (Figures 4d, 6c, 8d), this texture consists of patchy-looking chlorite in a matrix of a white mineral (sericite and/or albite). One hypothesis is that this texture is volcaniclastic, that is, the chlorite patches are former volcanic clasts within a more felsic matrix. A second interpretation is that this texture is related to a network of microfractures in a previously chloritized rock with sericitization and/or albitization of the plagioclase concentrated along the fracture network. Subsequent deformation would then have flattened the stockwork fabric, generating the observed texture (Figure 11). Petrographic and geochemical analyses would help unravel the origin of this particular texture.

Economic considerations

Considered as one of the largest undeveloped Zn and Cu resources in Canada, the potential economic value of the Izok Lake VMS deposit is obvious given its resources in Zn, Cu, Pb and Ag and the expected growing demand for these metals (Modor Intelligence, 2022). In addition, previous analyses have brought to light significant concentrations of cadmium (MMG Resources Inc., unpublished data, 2009–2015) and gallium (Indian and Northern Affairs Canada, 2006), which are commonly found in the structure of sphalerite (Schwartz, 2000).

Conclusion

Drillcore from three boreholes was studied in detail to document the relationships between the mineralized zones and the host units of the Izok Lake deposit. The dominant rock type in the area is volcanic and felsic in composition, presenting variable chlorite and sericite alteration intensity and style, and intensity of deformation.

Hydrothermal alteration is present above and below the mineralized zones, although it is stronger in the underlying units. This suggests that mineralization was either formed as a sub-seafloor replacement, or that the hydrothermal system was still active at the time of hanging wall emplacement. In both cases, although speculative, hydrothermal activity in the hanging wall of the known sulphide lenses may suggest the possible presence of sulphide zones higher up in the stratigraphy. The presence of well-developed tectonic foliation within and around the mineralized zones, as well as the occurrence of the durchbewegung texture in the massive-sulphide lenses, demonstrates that strain was concentrated in the less competent units (i.e., massive-sulphide and chlorite-sericite zones).

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