Fitting Rävliden North Zn-Pb-Ag-Cu deposit host stratigraphy into regional Skellefte district nomenclature

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Summary. Lithofacies logging from Rävliden North in the Skellefte district is presented, and the use of lithostratigraphic names in deposit scale mapping is discussed. The authors conclude that while Skellefte district nomenclature can be applied, it cannot preserve the level of detail relevant to exploration.

Results and discussion

Nomenclature is a system of naming objects and should be stable, understandable, consistent, self-evident, and easy to apply (Kumpulainen 2017) allowing geologists to communicate efficiently whilst preserving information. This study is an attempt to correlate observations at Rävliden North with established Swedish nomenclature. Rävliden North, c. 5 km west of the Kristineberg mine in the western Skellefte district, is a volcanic-hosted massive sulphide (VHMS) Zn-Pb-Ag-Cu deposit formed in a Palaeoproterozoic volcanic arc environment. The ore lenses are composed of semi-massive to massive sphalerite-pyrrhotite-galena-pyrite mineralisation structurally above vein-hosted chalcopyrite-pyrrhotite-pyrite mineralisation. Two principal lithostratigraphic units are recognised in the Rävliden area and broader Skellefte district: 1) the c. 1.90–1.88 Ga Skellefte group (SG) consisting of predominantly felsic–intermediate volcanic rocks, and 2) the overlying c. 1.88–1.87 Ga Vargfors group (VG) comprised of siliciclastic sedimentary rocks and lesser volcanic rocks. The SG-VG contact is important to exploration since most VHMS deposits in the Skellefte district are located at or adjacent to it. Additionally, it is important to target syn-volcanic faults and cryptodome-tuff volcanoes in the succession (Allen et al. 1996). Thus, mapping lateral variations along the regionally expansive contact is critical.

Systematic lithofacies observations (Figure 1) and review of available maps and profiles reveal that the Rävliden stratigraphy defines a transition from a weakly porphyritic rhyolite with sphalerite-galena-rich sulphide mineralization in tremolite skarn to a volcano-sedimentary succession. The overlying succession comprises interbedded graphitic phyllite, silt- and sandstones, and breccia conglomerates with clast populations possibly originating from stratigraphically deeper coherent and volcaniclastic andesitic-dacitic rocks. Some rocks have seen intense

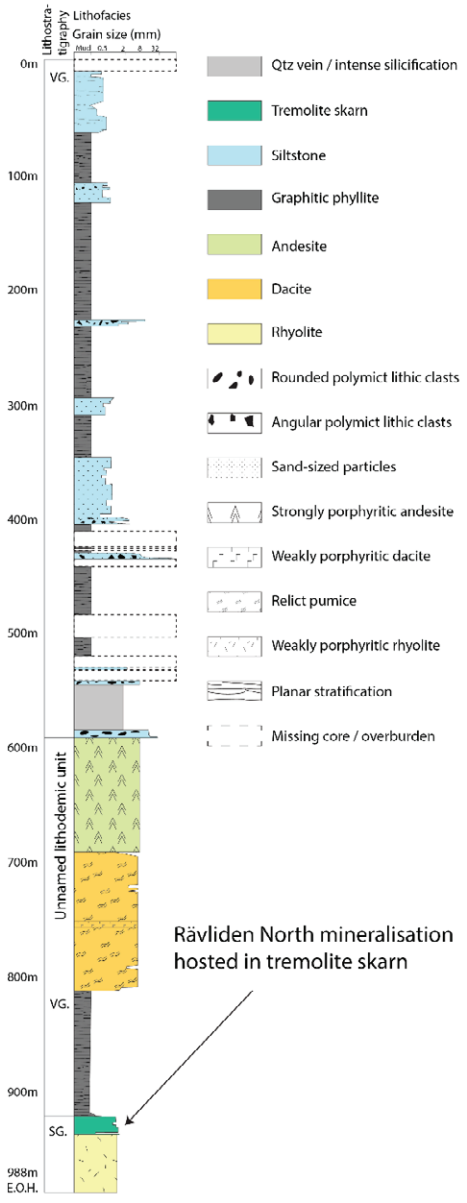

Figure 1. Graphical log and lithostratigraphy of Rävliden North.

Table 1. Logged lithologies and facies, type and suggested name in Skellefte district nomenclature.

Logged lithologies and facies	Type	Name in Skellefte district nomenclature	
		Formation / Suite	**Group**
Mafic sills and dykes	Lithofacies	Gallejaur volcanics?	VG?
Strongly porphyritic andesite	Lithofacies	Jörn GI?	VG?
Weakly porphyritic dacite	Lithofacies	Jörn GI?	VG?
Pumiceous dacite	Lithofacies	Unnamed	VG
Graphitic phyllite	Lithology	Elvaberg formation?	VG
Polymict clasts (breccia-conglomerate)	Facies	Unnamed (similar to Abborrtjärn conglomerate)	VG
Silt- and sandstone	Lithology	Elvaberg formation?	VG
Weakly porphyritic rhyolite	Lithofacies	Unnamed	SG

hydrothermal alteration overprinting many primary textures. All rocks are metamorphosed to greenschist-lower amphibolite facies (Barrett et al. 2005).

Lateral discontinuities and local occurrences of polymict breccia-conglomerate units indicate syn-volcanic faulting at the time of deposition. Altogether, this reflects a palaeoenvironment typical of waning volcanism and basin subsidence that is characteristic of host stratigraphies for VHMS deposits (Allen et al. 1996). Stratigraphic discontinuity, deformation, difficulty correlating rocks over short distances, and difficulty in interpreting relict textures, makes the systematic application of lithostratigraphic names to lithofacies observations challenging during logging. Correlating current observations with existing schemes results in the division into SG and VG with suggestions for possible lower ranked units within (Table 1). The andesitic-dacitic rocks could arguably belong to Jörn GI suite due to similarities with the Viterliden intrusion (a Jörn GI intrusion) described at the nearby Kristineberg mine (Jansson & Persson 2014). Alternatively, the co-genetic pumiceous volcaniclastic dacitic rocks could also be grouped with the coherent rocks as a complex. The breccia-conglomerates are comparable to the Abborrtjärn conglomerates (Allen et al. 1996; Kautsky 1957) with a key similarity being clasts from Jörn GI suite rocks, however, observations do not fully match original descriptions. The weakly porphyritic rhyolites have few primary textures preserved after intense quartz-sericite alteration and sub-division is done almost purely by lithogeochemistry (Barrett et al. 2005), rendering detailed lithostratigraphic subdivision virtually impossible. As such, we find that the conditions for applying a lithostratigraphic scheme differ in different parts of the stratigraphy.

With the uncertainties of applying finer ranking than “group” and “suite” at Rävliden, the only certain lithostratigraphic division is that of the SG and VG which does not show important information regarding lateral facies variation. Clearly, the usefulness of applying established nomenclature is scale-dependent, and at the deposit-scale a different approach that is understandable, consistent, self-evident, and easy to apply, is needed. A first-principles, observation-based approach is thus recommended since it forces us to first consider how rocks are recognised, before attempting at putting them into broad genetic groups. This will be of crucial importance for rigorous classification schemes needed to progress mineral exploration into the age of data-driven rock classification.

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