geoconvention
Virtual Event
September 21-23
2020
CSPG • CSEG • CWLS • GAC • MAC • IAH

Preliminary stratigraphy and geochronology of the Hazelton Group, Kitsault River area, Stikine terrane, northwest British Columbia

Rebecca C. Hunter[1] and Bram I. van Straaten[1]

[1]British Columbia Geological Survey

Summary

Based on new mapping northwest and east of Kinskuch Lake, we further resolve stratigraphic relationships in the lower part of the Hazelton Group and recognize three new facies and two new sub-facies. New U-Pb zircon data provide age constraints to the Hazelton Group in the area, including a maximum depositional age from detrital zircons (U-Pb, LA-ICPMS) of ca. 206 Ma (Rhaetian) for the onset of Hazelton Group volcanism. A ca. 191 Ma monzonite indicates that Au-Ag±Cu mineralizing systems in the Kitsault River area are Early Jurassic. A ca. 178 Ma felsic lapilli tuff from directly beneath the Wolf deposit suggests that upper parts of the Hazelton Group are developed in the Kitsault River valley area and host some VMS related mineralization.

Introduction

Detailed mapping of the Hazelton Group and better age constraints are vital for understanding the depositional and volcanic environments that were responsible for VMS and epithermal-type mineralizing systems throughout western Stikinia. Previous mapping in the region identified six informal stratigraphic units (Alldrick et al., 1986; Dawson and Alldrick, 1986; Greig, 1991) and include: 1) a ‘lower sedimentary unit'; 2) a ‘mafic volcanic unit’; 3) a ‘middle sedimentary unit’; 4) an ‘intermediate volcanic unit’; 5) an ‘epiclastic and felsic volcanic unit’; and 6) an ‘upper sedimentary unit’. Previous Hazelton Group geochronology in the area includes U-Pb zircon ages of 193.5 ±0.4 Ma (Mortensen and Kirkham, 1992) and 196 ±5 Ma (Greig and Gehrels, 1995) from feldspar-phyric lapilli tuffs near Kitsault Lake (Fig. 1), and 198 ±4 Ma from K-feldspar- and plagioclase-phyric dacite-andesite flows north of Kinskuch Lake and 198 ±10 Ma from feldspar-phyric lapilli tuff to tuff breccia east of Lavender Peak (Fig. 1; Greig and Gehrels, 1995).

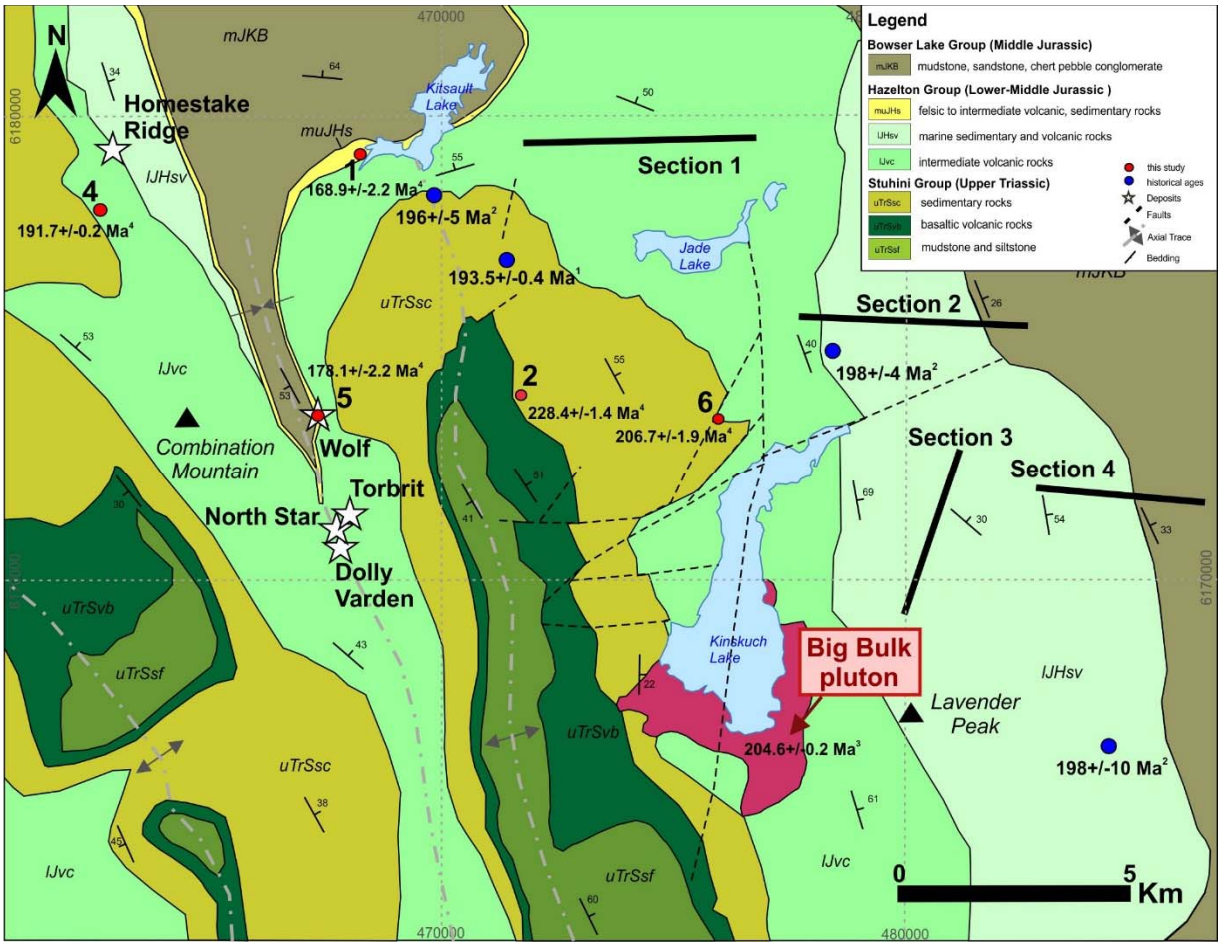

Fig. 1. Simplified geology of the Kitsault River area (after Alldrick et al., 1986; MacIntyre et al., 1994). Sources of geochronology: [1] Mortensen and Kirkham, 1992; [2] Greig and Gehrels, 1995, [3]Miller et al., 2020 [4]Hunter and van Straaten, 2020.

Discussion

We present four composite stratigraphic sections based on 2019 mapping north of Kitsault Lake. Facies 1 consists mainly of coarse-grained pyroclastic rocks, indicating proximal-type explosive volcanism; m-scale intercalations of limestone and chert may indicate a subaqueous setting but abundant accessory limestone and chert clasts in pyroclastic rocks indicate coeval erosional stripping. Epiclastic rocks of facies 2 may mark a relative hiatus in volcanism. Facies 3 also consists mainly of coarse pyroclastic rocks indicating proximal explosive volcanism. Sub-facies 3a is similar to facies 3 except that it contains abundant coarse-grained to megacrystic K-feldspar crystals and distinctly coherent and flow-banded textures. In facies 3b, the preservation of rhythmically laminated fine-grained sandstone to mudstone in sharp-based fining upward-sequences likely indicates mass flow sedimentation below fair-weather wave base. Sub-facies

3b also contains abundant limestone beds; local accretionary lapilli and glassy lapilli were likely derived from laterally adjacent subaerial eruptions.

Geochronology data presented above from the lower Hazelton Group yielded maximum depositional ages of 228.4 ±1.4 Ma and 206.7 ±1.9 Ma. The ca. 196 Ma lapilli tuff to tuff breccias of facies 1 and 3, may be temporal equivalents to the Unuk River andesite unit described by Nelson et al. (2018). Predominantly epiclastic-rocks of facies 2 are likely a local stratigraphic variation within the predominantly andesite unit. Sub-facies 3a (K-feldspar porphyritic unit) could be correlative to ca. 196 Ma porphyritic diorite (J. Nelson unpublished data, 2017) observed northwest of Brucejack Lake (Nelson et al., 2018) or alternatively related to the Brucejack Lake felsic unit (MacDonald, 1993). The altered ca. 191 Ma monzonite dyke sampled west of the Homestake Ridge deposit suggests the Homestake Ridge mineralization is Early Jurassic. Felsic lapilli tuff in the footwall of the Wolf deposit in the Kitsault River valley west of our 2019 study area (Fig. 1) gave a crystallization age of 178.1 ±2.2 Ma (Toarcian), indicating that the area is underlain by the upper part of the Hazelton Group (Toarcian and younger). Volcanic-derived sandstone with belemnite casts returned a preliminary maximum depositional age of 168.9 ± 2.2 Ma, which suggests rocks temporally equivalent to the Quock Formation.

Conclusions

Our preliminary mapping has further refined the stratigraphy of the Hazelton Group in the Kitsault River area. The geochronological data provide a ca. 206 to ca. 196 Ma depositional age for the lower Hazelton Group and the facies 1 and 3 are likely temporal equivalents to the Unuk River andesite unit. The ca. 191 Ma monzonite dyke at Homestake Ridge suggests the Au-Ag±Cu mineralization could be Early Jurassic and the ca. 178 Ma age from the Wolf deposit suggests the VMS mineralization system is potentially Toarcian, temporally similar to the VMS mineralization at Eskay Creek. Stratigraphically, however, these upper Hazelton Group units differ from those in the Eskay rift, which contain abundant bimodal felsic and mafic volcanic rocks. Nonetheless, these coeval syngenetic mineralizing systems are likely related and we interpret that VMS mineralization in the Kitsault River area reflects hydro-magmatic fluids flowing along syndepositional faults to near-surface levels. Extensional processes that operated at Eskay may have extended into in the Kitsault River area but without producing a large rift basin.

Acknowledgements

Dolly Varden Silver Corp. is thanked for their logistical and helicopter support. Thanks to JoAnne Nelson for initiating reconnaissance studies in the Kitsault River area, co-collecting geochronology samples in 2015, and inspirational mentorship.

References

Alldrick, D.J., Dawson, G.L., Bosher, J.A., and Webster, I.C.L., 1986. Geology of the Kitsault River area (NTS 103P). British Columbia Ministry of Energy, Mines and Petroleum Resources, British Columbia Geological Survey Open File 1986-02, 1:50,000 scale.

Dawson, G.L., and Alldrick, D.J., 1986. Geology and mineral deposits of the Kitsault Valley. In: Geological Fieldwork 1985, British Columbia Ministry of Energy, Mines and Petroleum Resources, British Columbia Geological Survey Paper 1986–1, pp. 219–224.

Greig, C.J., 1991. Stratigraphic and structural relations along the west-central margin of the Bowser Basin, Oweegee and Kinskuch areas, northwestern British Columbia. In: Current Research, Part A, Geological Survey of Canada Paper 91-1A, pp. 197–205.

Greig, C.J., and Gehrels, G.E., 1995. U–Pb zircon geochronology of Lower Jurassic and Paleozoic Stikinian strata and Tertiary intrusions, northwestern British Columbia. Canadian Journal of Earth Sciences, 32, 1155–1171. doi: 10.1139/e95-095.

Hunter, R.C., and van Straaten, B.I., 2020. Preliminary stratigraphy and geochronology of the Hazelton Group, Kitsault River area, Stikine terrane, northwest British Columbia. In: Geological Fieldwork 2019, British Columbia Ministry of Energy, and Mines, British Columbia Geological Survey Paper 2020-01, pp. 101-118.

MacDonald, A.J., 1993. Lithostratigraphy and geochronometry, Brucejack Lake, northwestern British Columbia (104B/08E). In: Geological Fieldwork 1992, British Columbia Ministry of Energy and Mines, British Columbia Geological Survey Paper 1993–1, pp. 315–323.

MacIntyre, D., Ash, C., and Britton, J., 1994. Geological compilation Skeena-Nass area, west central British Columbia. In: British Columbia Ministry of Energy, Mines and Petroleum Resources, British Columbia Geological Survey Open File 1994–14, 1:250,000 scale.

Miller, E.A., Kennedy, L. A., and van Straaten, B.I., 2020. Geology and structure of the Kinskuch Lake area and Big Bulk porphyry prospect, northwestern British Columbia: Syn-depositional extension and basin formation during the Rhaetian (latest Triassic) transition from the Stuhini to the Hazelton Group. In: Geological Fieldwork 2019, British Columbia Ministry of Energy, and Mines, British Columbia Geological Survey Paper 2020-01, pp. 77-99.

Mortensen, J.K., and Kirkham, R.V., 1992. A U-Pb zircon age for host rocks of a syngenetic strontium(-zinc) occurrence in the Kitsault Lake area, west-central British Columbia. In: Radiogenic Age and Isotopic Studies, Report 5, Geological Survey of Canada, Paper 91.2, pp. 181–185.

Nelson, J.L., Waldron, J., van Straaten, B.I., Zagorevski, A., and Rees, C., 2018. Revised stratigraphy of the Hazelton Group in the Iskut River region, northwestern British Columbia. In: Geological Fieldwork 2017, British Columbia Ministry of Energy, Mines and Petroleum Resources, British Columbia Geological Survey Paper 2018–1, pp. 15–38.