The Au-Ag-Cu-Zn-bearing mineralized zones at the Horne deposit No. 5 zone, Rouyn-Noranda, Québec – new observations and preliminary results

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1. Introduction

The Horne deposit is the single largest gold-rich volcanogenic massive sulphide deposit in the world, with 325.4 t Au extracted from the Upper H and Lower H zones. Total resources (indicated and inferred) of the unexploited No. 5 zone, located down-plunge of the H orebodies, currently amount to 113.4 Mt grading at 1.54 g/t Au (174.9 t Au).

The deposit is located in the Horne block of the Blake River Group (2704-2695 Ma) in the Abitibi greenstone belt, Québec, Canada (Fig. 1). Hosted in a steeply-dipping succession dominated by volcaniclastic units, it is bounded by the Andesite and Horne Creek faults. Thick layers of lapilli tuffs intruded by a swarm of sterile mafic dykes are the host rock of most gold-bearing intervals in the No. 5 zone, which forms a tabular body comprising a low grade gold envelope and high grade gold zones (Fig. 2). Mineralization is characterized as a series of massive to semi-massive sulphide lenses of variable thickness alternating with zones of disseminated and stringer sulphides (Fig. 3, geology column). Pyrite is the dominant sulphide with lesser chalcopyrite, sphalerite and magnetite.

The objectives of this project are to determine the precise relationships between gold mineralization, sulphide phases, host rocks, and deformation, and to define the controls on gold distribution within the No. 5 zone of the Horne deposit. These objectives will lead to a better understanding of Archean synvolcanic gold-bearing systems.

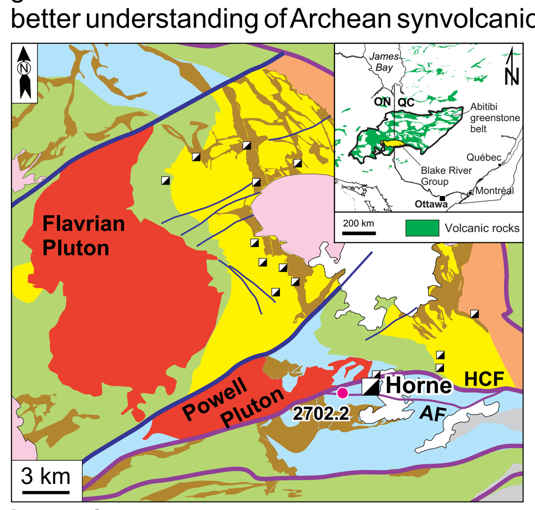


Figure 1: Geological map of central section of the Blake River Group (modified from Mercier-Langevin et al., 2011). Stratigraphy based on new U-Pb geochronology (McNicoll et al., 2014). The Horne deposit is located in a structural block bounded by the Andesite (AF) and Horne Creek (HCF) faults, in rocks that were dated at 2702.2±0.9 Ma. Overlay map gives location of Blake River Group within the Abitibi greenstone belt, straddling the border of Québec and Ontario.

2. 3D model of No. 5 zone

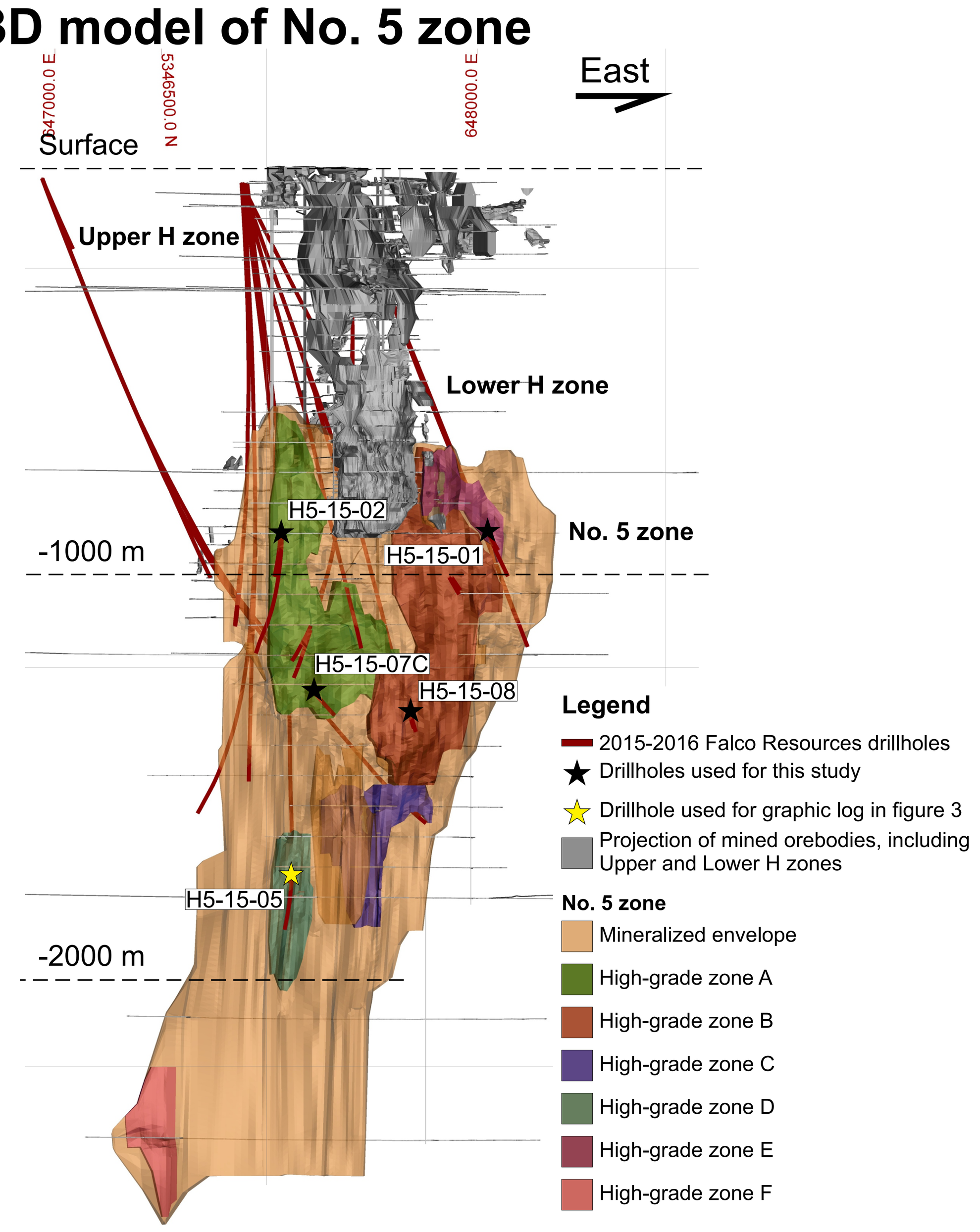
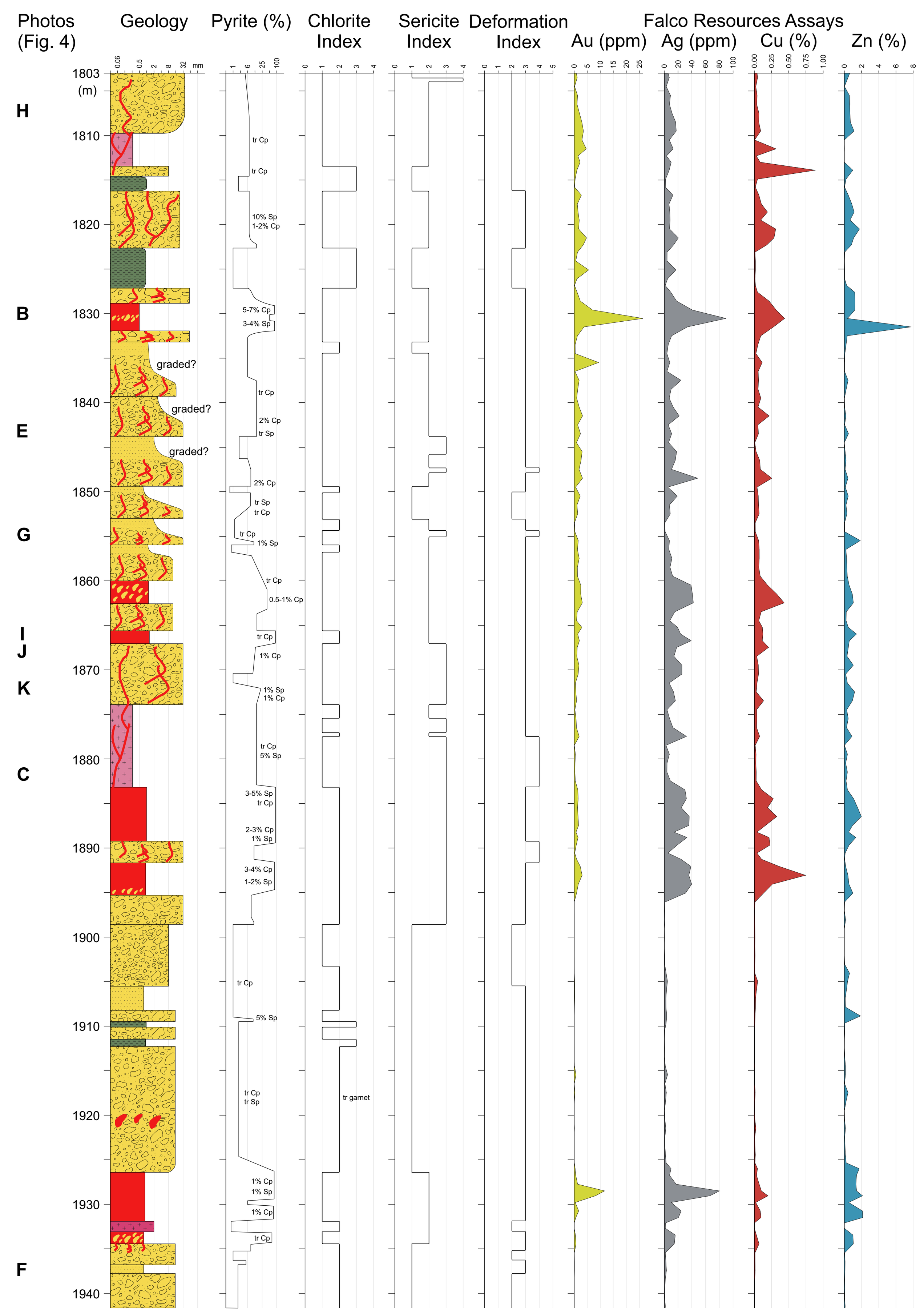


Figure 2: 3D model of No. 5 zone, showing the low-grade mineralized envelope (0.5 g/t Au cut-off), high-grade gold zones (2.5 g/t Au cut-off), as well as workings of the historic Horne mine (model generated by InnovExplo for Falco Resources, 2016). Five new holes (2015) belonging to Falco Resources were used to prepare detailed core logs during the summer of 2016 (see Fig. 3).

3. Results



Legend

- felsic volcaniclastics (lapilli tuffs to breccia)
- felsic tuffs
- coherent felsic rocks (intrusions?)
- mafic dykes
- syenite/monzonite dyke
- massive sulphides
- semi-massive sulphides
- stringer + matrix-hosted (diss.) sulphides
- massive sulphide fragments

Sericite alteration intensity visual index
1. Non existent to weak and local
2. Weak but pervasive
3. Well developed and dominant
4. Intense, texturally destructive

Chlorite alteration intensity visual index
1. Weak and local (plans, fractures, diss.)
2. Patchy or pervasive along veinlets
3. Well developed and dominant
4. Chlorite schist to massive chlorite

Deformation intensity visual index
1. No fabric
2. Weakly developed penetrative planar fabric
3. Well developed penetrative planar fabric
4. Intensely developed planar fabric
5. Schist

Observations

- Two major types of mineralization are recognized: semi-massive to massive sulphides (Fig. 4A), and more extensive zones of disseminated to stringer sulphides (Fig. 4B, C). The latter often contains massive sulphide clasts (Fig. 4D).
- Massive sulphides are composed mainly of recrystallized pyrite with minor sphalerite, chalcopyrite and rare pyrrhotite. Contacts are transitional (gradual increase/decrease of sulphides) to relatively sharp and these massive sulphides are where relict felsic fragments are often most visible. Sulphide emplacement occurred at the seafloor or near-seafloor interface or as sub-seafloor replacement of permeable host rock.
- Sphalerite occurs as finely disseminated grains in the matrix of the felsic volcaniclastics (Fig. 4E) and as disseminations and fine bands in massive sulphide bodies, chalcopyrite is generally remobilized in secondary sites (inclusions, fractures and pyrite grain boundaries; Fig. 4I) and pyrrhotite is very rare and found mostly as inclusions in pyrite (Fig. 4J).
- Felsic fragments in the volcaniclastic host rocks are composed of fine, recrystallized quartz and one to ten percent sericite. The matrix is dominated by a combination of fine grained sericite, quartz and pyrite with trace chlorite (Fig. 4H), indicating widespread alteration.
- Gold distribution is variable but higher gold contents are generally present in the massive to semi-massive sulphide intervals. A decrease in gold values is present in the lower stratigraphy. It is unclear if this relationship is indicative of an evolving hydrothermal system up-hole or if it's associated with deformation-induced gold remoblization.
- Massive sulphides are generally associated with coarser-grained felsic volcaniclastic units (tuff breccia to breccia). Distribution of the mineralization is likely influenced in part by the host volcanic rocks. Controls on distribution include changes from coarse grained massive beds to finer grained graded beds (e.g., 1860 m on Fig. 3; Fig. 4F), and the presence of coherent felsic units directly above massive sulphides acting as impermeable cap rocks to ascending fluids (e.g., DDH H5-15-07C, not shown).
- Deformation intensity varies throughout the mineralized zone but a well developed foliation is prevalent. This foliation is strongest in zones of stringer mineralization surrounding massive sulphide intervals and often associated with and emphasized by strong sericitic alteration (Fig. 4G, K).

Figure 3: Stratigraphic section through the mineralized zone of DDH H5-15-05, showing volcanic units and style of mineralization. Adjoining downhole plots display abundance of sulphides, intensity of chlorite and sericite alteration, intensity of deformation, and gold, silver, copper and zinc assays (analyses from Falco Resources). The visual index represents a series of criteria used to quantify the intensity of alteration and deformation during fieldwork. Letters on left margin show position of photos (Fig. 4) along hole.

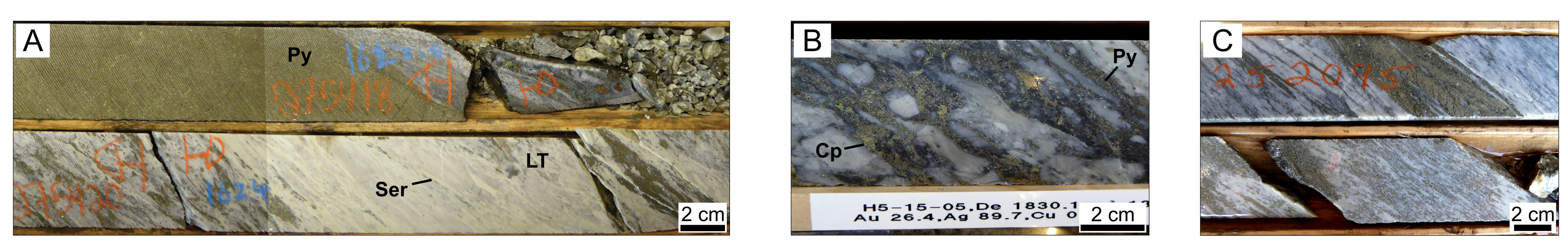


Figure 4: A) Massive pyrite (Py) zone with underlying stringer sulphides in felsic lapilli tuff (LT). LT is strongly bleached with finely banded sericite (Ser) parallel to main foliation (from hole H5-15-07C). **B)** Pyrite (Py) and chalcopyrite (Cp) in matrix of felsic lapilli tuff. Fragments appear partly replaced by sulphides. **C)** Zone of stringer and disseminated sulphides (Py ± Sp ± Cp) directly above a massive sulphide interval.

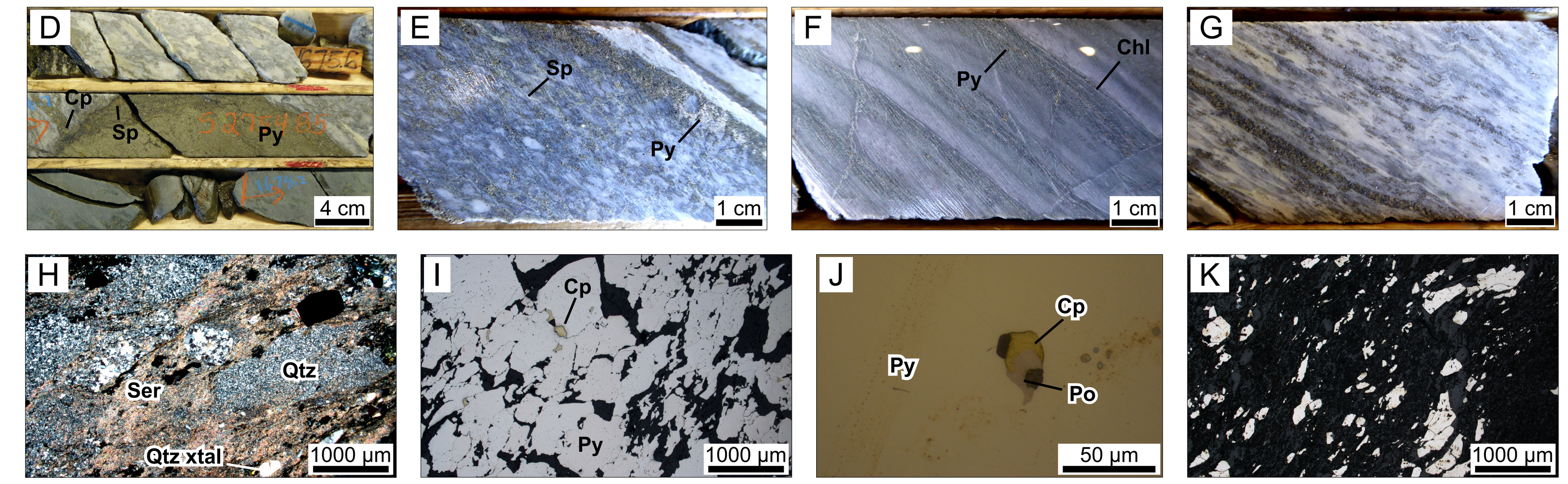


Figure 4 (cont'd): D) Rounded massive pyrite (Py) and sphalerite (Sp) block with traces chalcopyrite (Cp), in moderately bleached and sericitized felsic lapilli tuff (from hole H5-15-07C). **E)** Finely disseminated honey-coloured sphalerite (Sp) and pyrite (Py) in matrix of coarse felsic tuff. **F)** Finely laminated felsic tuff with disseminated pyrite and associated chlorite (Chl) alteration. **G)** Bleached and sericitized felsic lapilli tuff with strong foliation and kink band. **H)** Photomicrograph of felsic lapilli tuff. Fragments are composed mainly of finely recrystallized quartz (Qtz), while the matrix consists of foliated sericite (Ser) and minor quartz crystals (Qtz xtal). **I)** Photomicrograph of massive pyrite (Py) with chalcopyrite (Cp) along fractures, grain boundaries and inclusions. **J)** Photomicrograph of inclusion within a grain of pyrite (Py), containing chalcopyrite (Cp) and pyrrhotite (Po). **K)** Photomicrograph of disseminated pyrite (Py) along wavy foliation, within stringer zone between two massive sulphide intervals.

4. Bivariate plots of metal assays

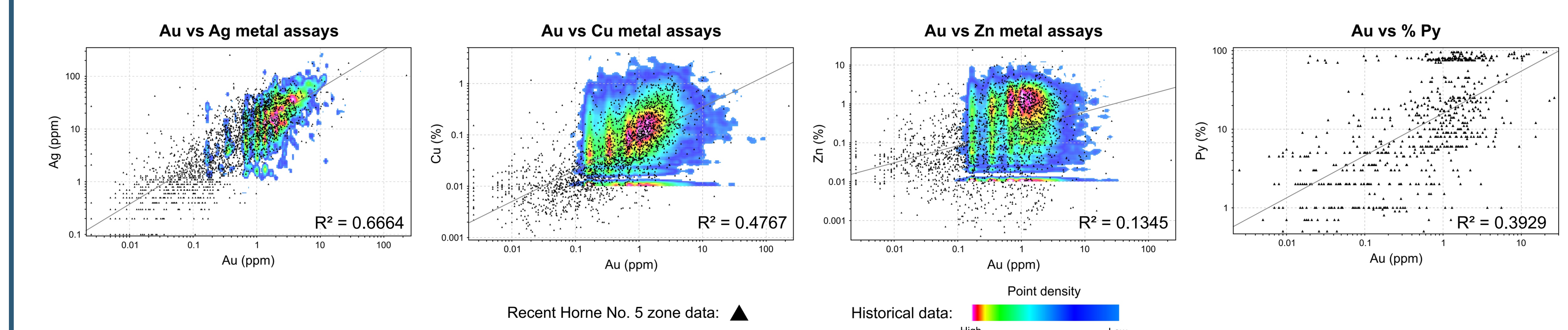


Figure 5: Bivariate plots showing the correlation between gold and silver, copper, zinc and pyrite abundance within the Horne No. 5 zone. Recent assays by Falco Resources (2279 assays from 9 holes drilled in 2015) overlay a coloured cloud in background representing all historical data compiled by InnovExplo (1090 historical assays for Au-Ag, 35737 historical assays for Au-Cu and 29336 historical assays for Au-Zn). Pyrite abundance was determined from field logs for the five holes that were studied. Linear regression lines for recent assay data are in grey with corresponding R^2 values.

5. Conclusion

- The No. 5 zone of the Horne deposit consists of:
  1) massive pyrite clast-bearing felsic volcaniclastic units with stringer sulphides and disseminated pyrite;
  2) relatively compact intervals of semi-massive to massive sulphides (generally ≤10 meter-thick) .
- Gold grades are typically less than 5 g/t, with higher grades associated with stringer, semi-massive and massive sulphide zones.
- Distribution of sulphides is associated with coarser-grained volcaniclastic units (tuff breccia to breccia). Changes in grain size in the host volcaniclastic beds can influence the style of mineralization. Coherent felsic units may act as an impermeable cap rock to some mineralized zones.
- A strong correlation exists between Au and Ag grades and Au-Cu and Au-pyrite associations correlate well. There is a poor correlation between Au and Zn values.
- In conjunction with this study, future work on the No. 5 zone will include lithogeochemical analysis of sulphide phases, host rock units and altered zones; LA-ICP-MS analysis of sulphide phases; 3-D modelling of metal distribution and alteration; and geochronological analysis. This work will test the hypothesis of a relationship between Au mineralization and primary sulphide deposition and possible deformation-induced modifications.

6. References

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7. Acknowledgements

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