



Cardinia project; Comet case study of an orogenic gold system

Thanks to Patronus Resources for permission to use their Cardinia data for a demonstration of Comet.

This is an orogenic gold project in the Leonora district of the Yilgarn Craton.

The rocks here are dominated by an alteration assemblage of muscovite-paragonite-albite-chlorite-calcite-pyrite. This is a classic middle greenschist assemblage for these types of deposits. The paragonite is almost certainly a metamorphic overprint after smectite.

The assays were collected with ICP-AES+MS following a 4 acid digestion.

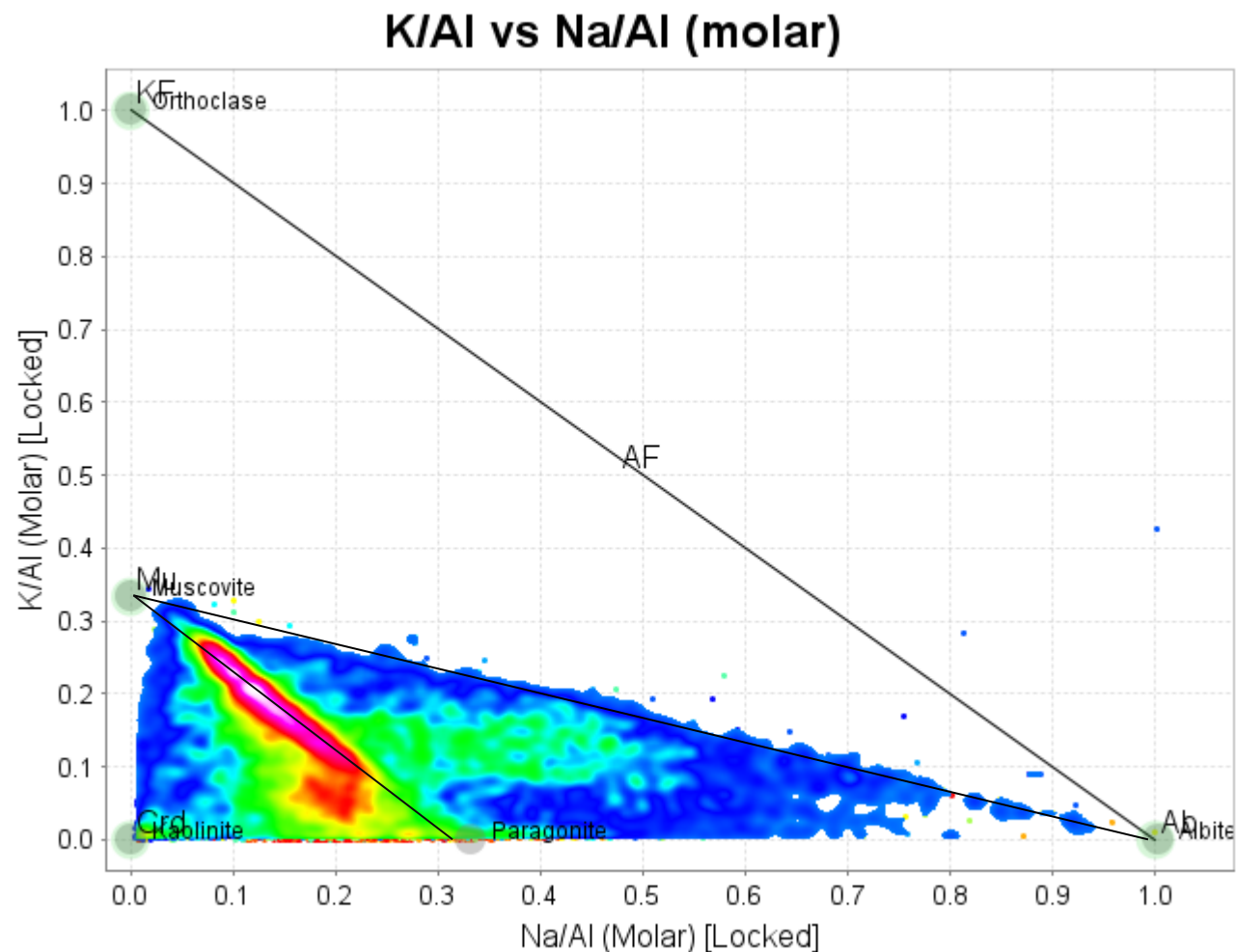
A list of minerals and solid solution compositions for those minerals was set up in Comet, and the assay table was converted to estimated percentages of minerals.

From that, quantitative mineralogy maps were produced.

In this kind of environment, the exploration target is a muscovite zone within a paragonite halo. Overlay pyrite abundance and arsenic as a pathfinder, and start drilling.

K/Al vs Na/Al (molar)

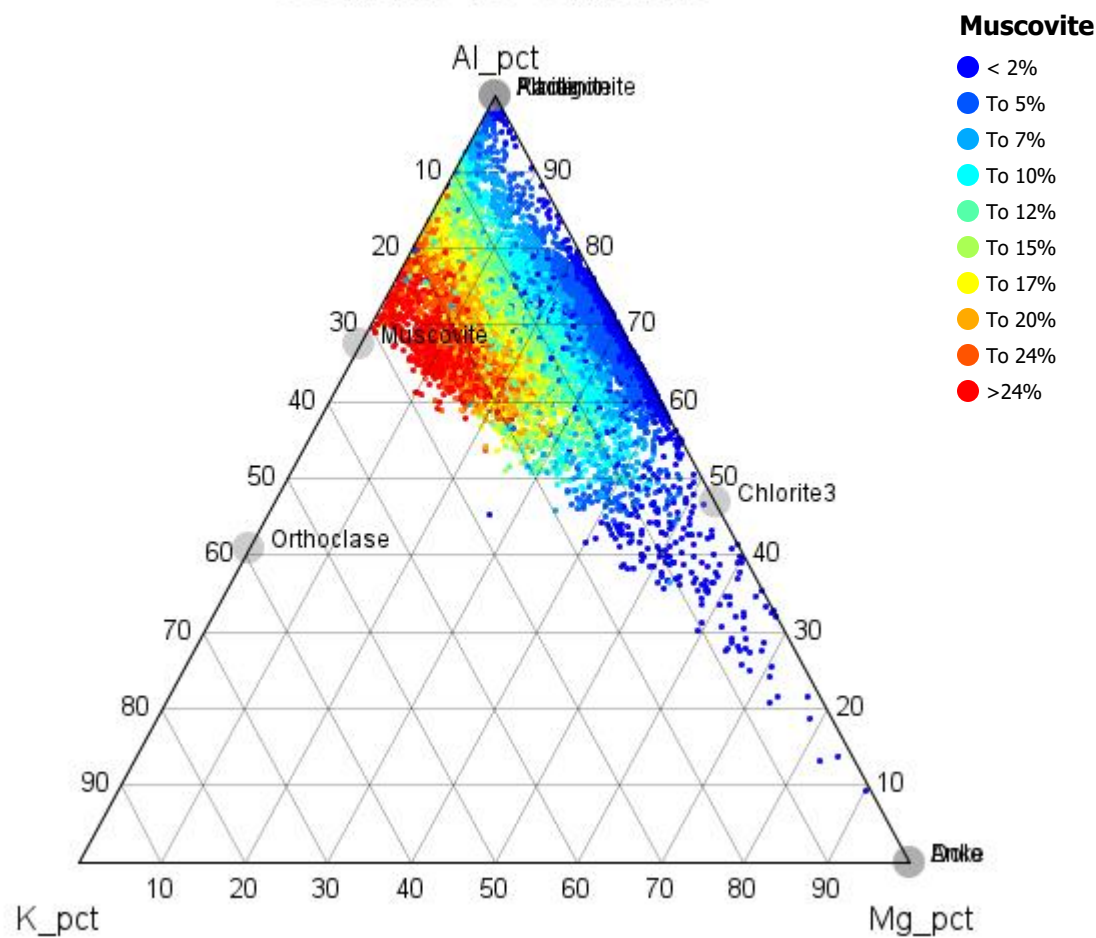
In alteration diagrams like, linear trends in data or linear edges to data clouds are controlled by mineral mixtures. In this plot there are 2 dominant mineralogical controls, a muscovite-paragonite trend and an edge to the data cloud between the muscovite and albite nodes.



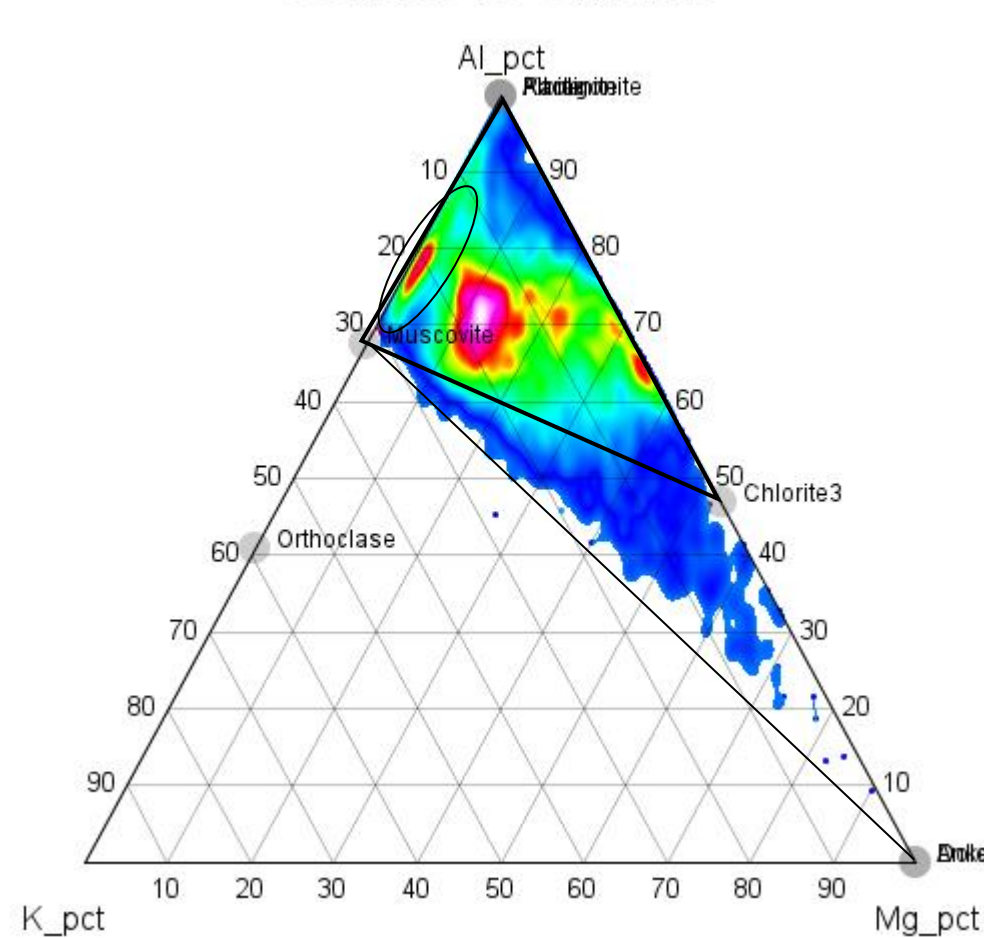
Al-K-Mg ternary

Most of the data plot in a triangle between the muscovite node, chlorite node and Al apex (albite/paragonite). There is a small cluster of data between the muscovite node and Al apex, with no Mg. These are lower saprolite, where chlorite is weathered out.

Sericite vs Chlorite



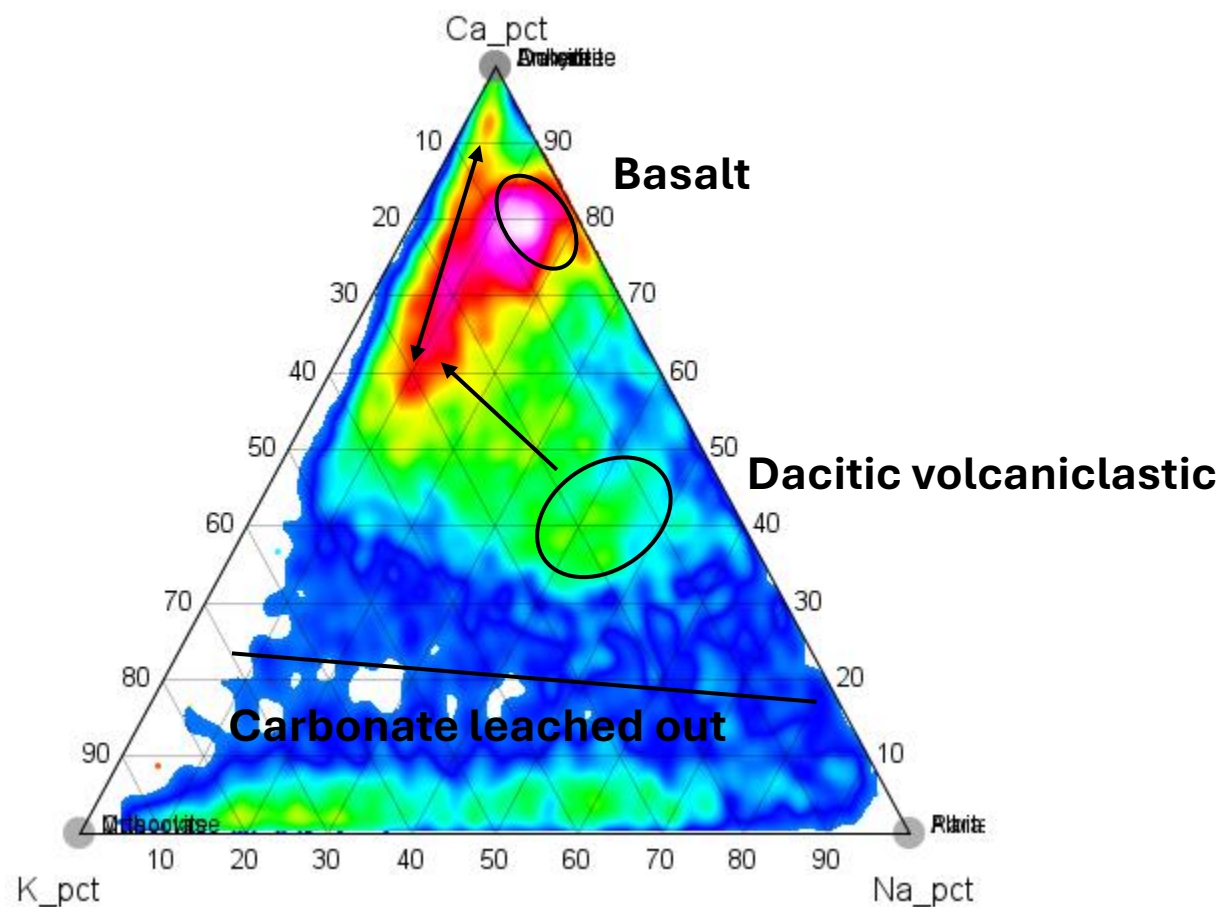
Sericite vs Chlorite



Ca-K-Na ternary

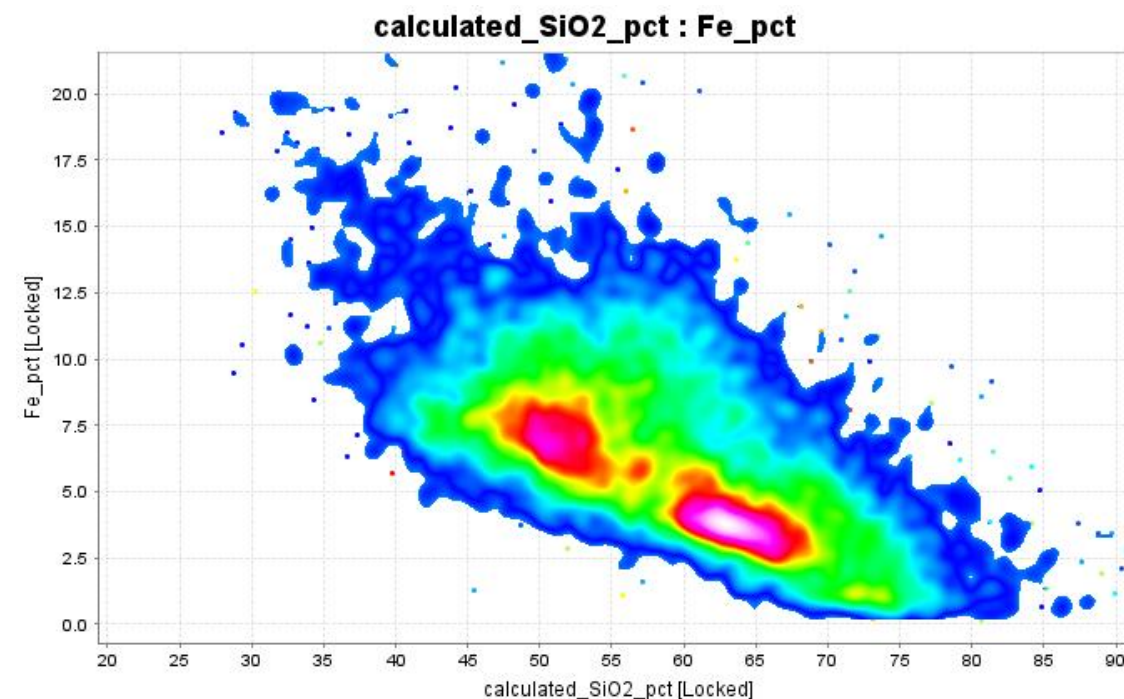
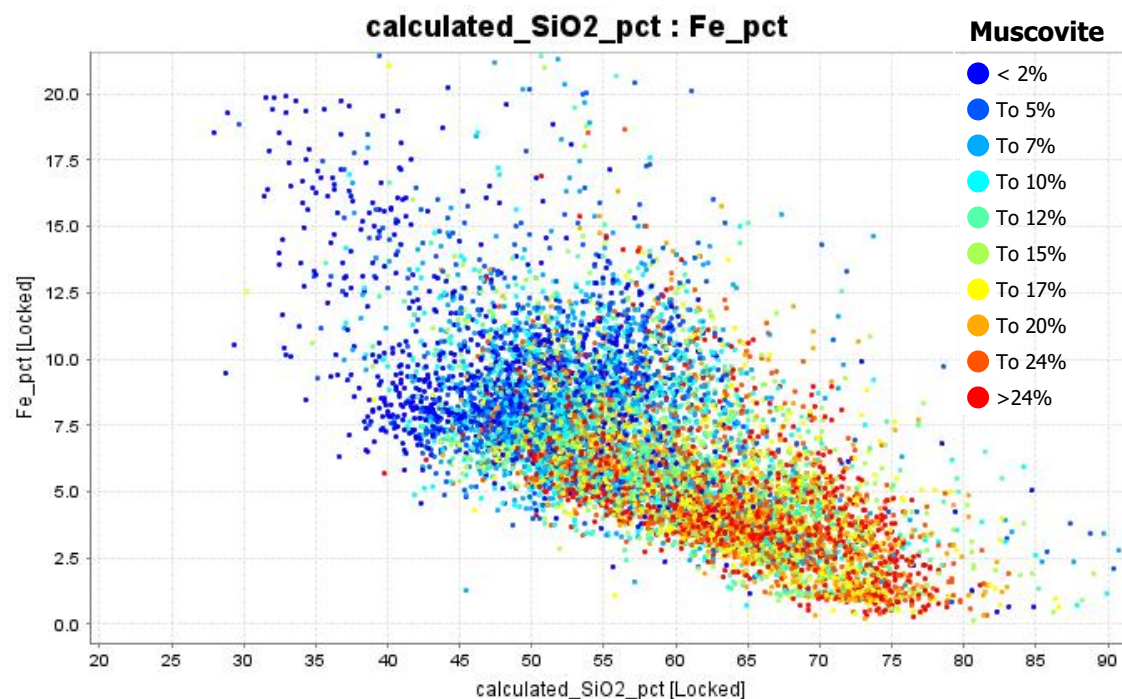
Basalt has high Ca, modest Na and little K. Altered basalts have gained K and retained most of their Ca as carbonate. The dacitic rocks have lost Na but retained Ca as carbonate. In a saprolitic weathering profile, carbonates are the first minerals to leach out (these are the points plotting along the K-Na join).

Feldspars vs Carbonate



Estimated SiO₂

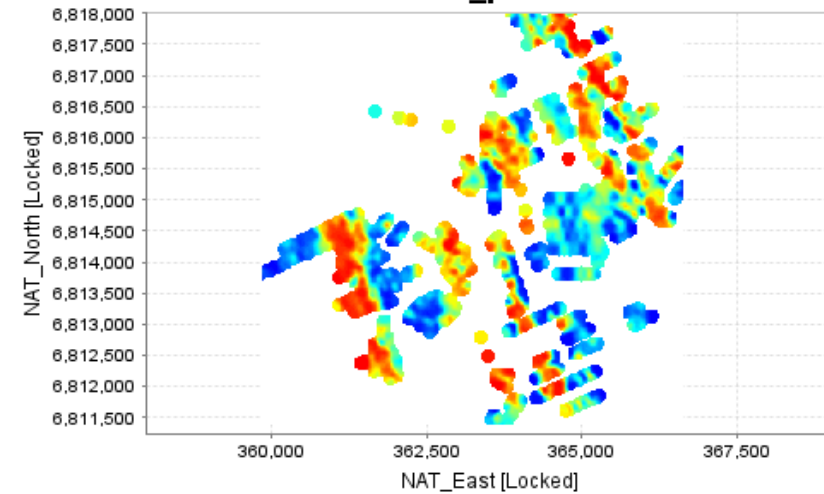
Calculating the abundance of minerals allows us to back-calculate whole rock SiO₂. This shows calculated SiO₂ vs Fe, and highlights the basalts and dacitic volcanoclastics as 2 distinct populations. The data is coloured by muscovite weight%. Host rock obviously has a strong influence on bulk mineralogy, but muscovite in a mafic host is especially interesting.



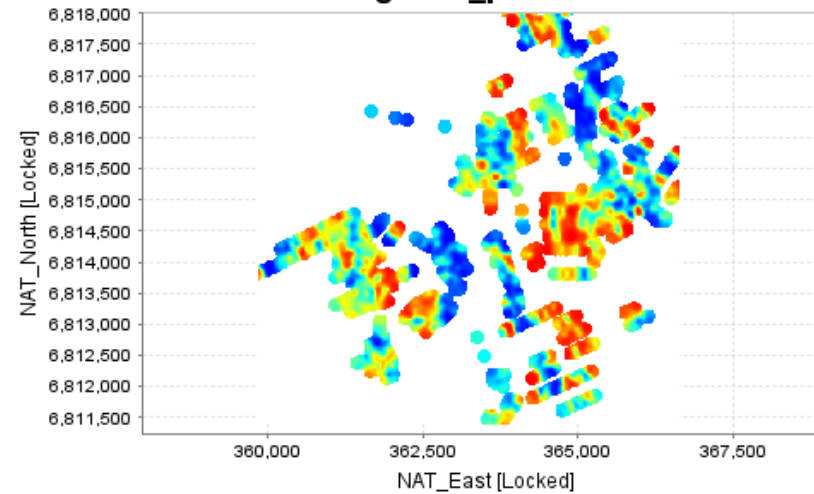
These are maps of mineralogy generated from a 25m thick depth slice below the base of carbonate dissolution.



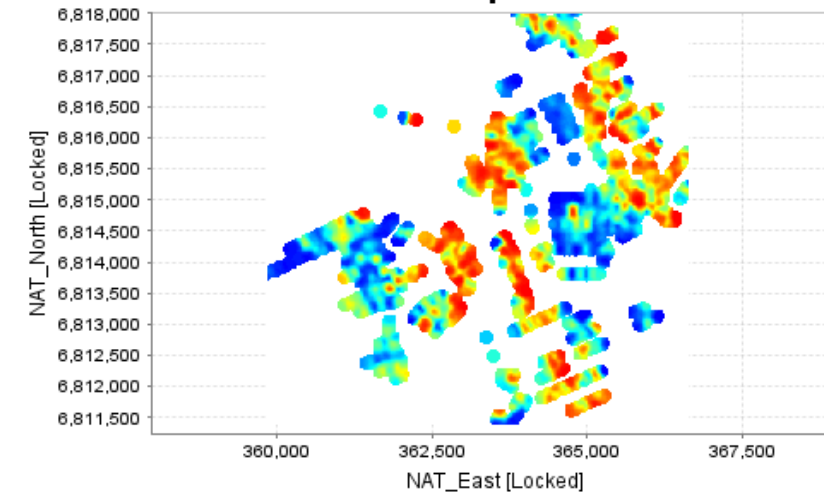
Muscovite_pct



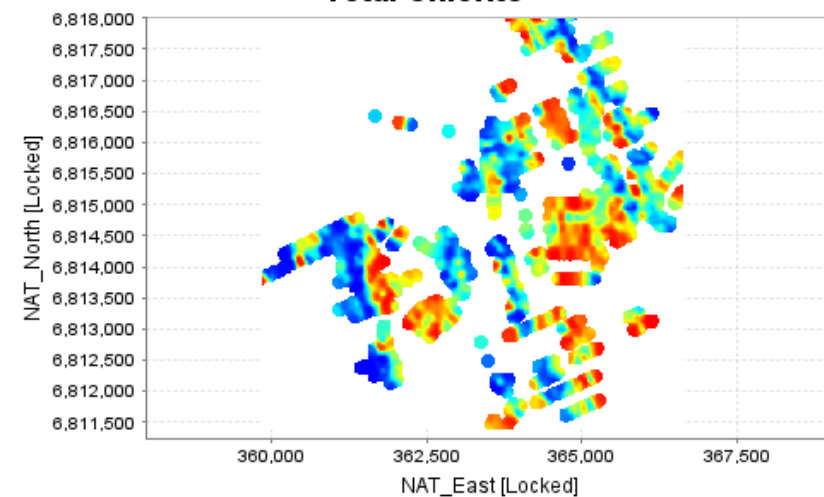
Paragonite_pct



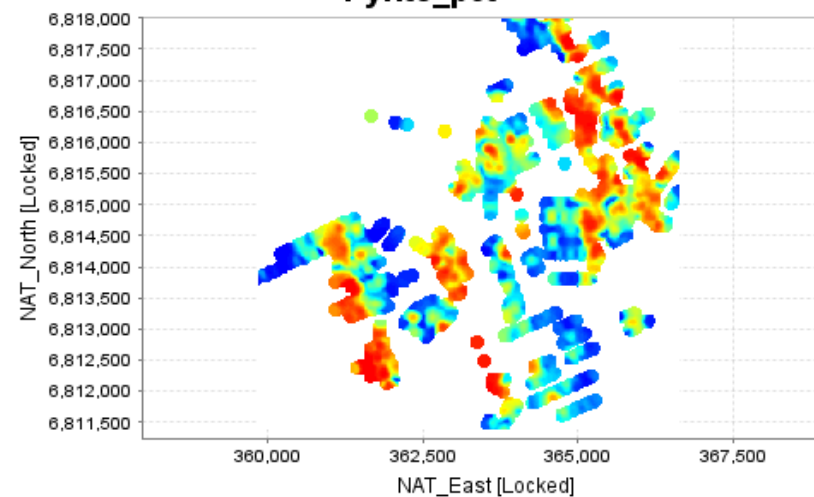
Total Feldspar



Total Chlorite



Pyrite_pct



Quartz_pct

