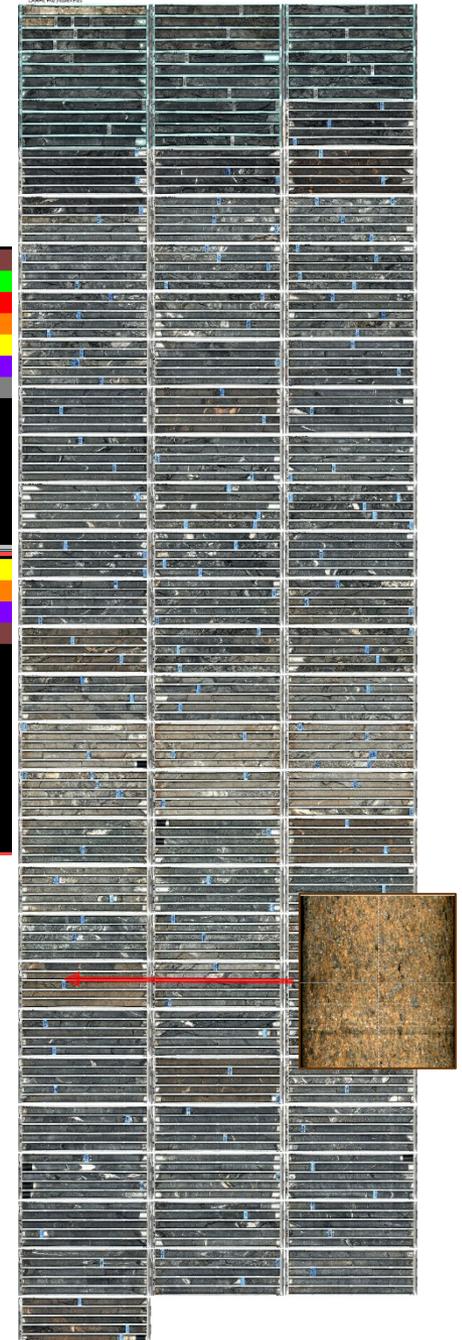
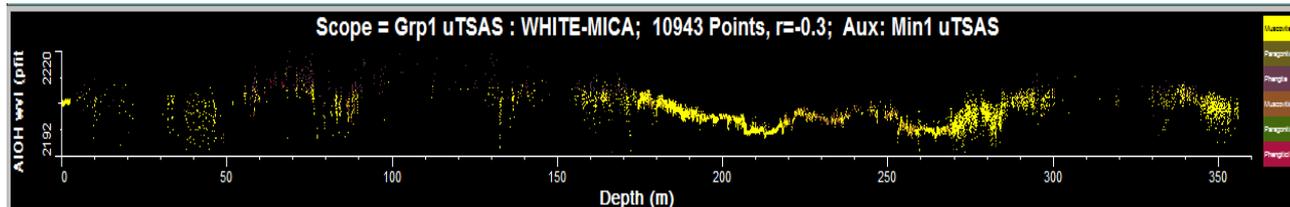
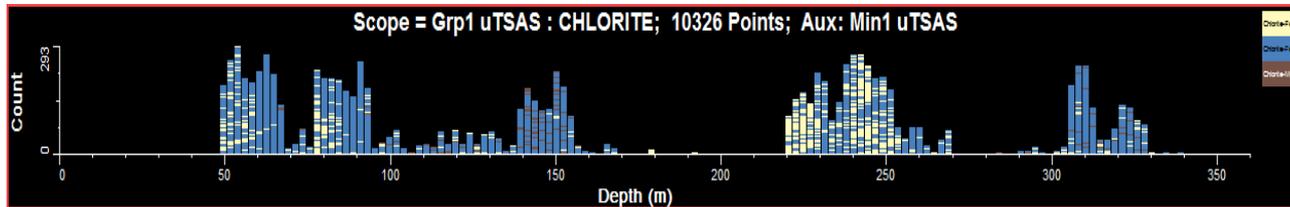
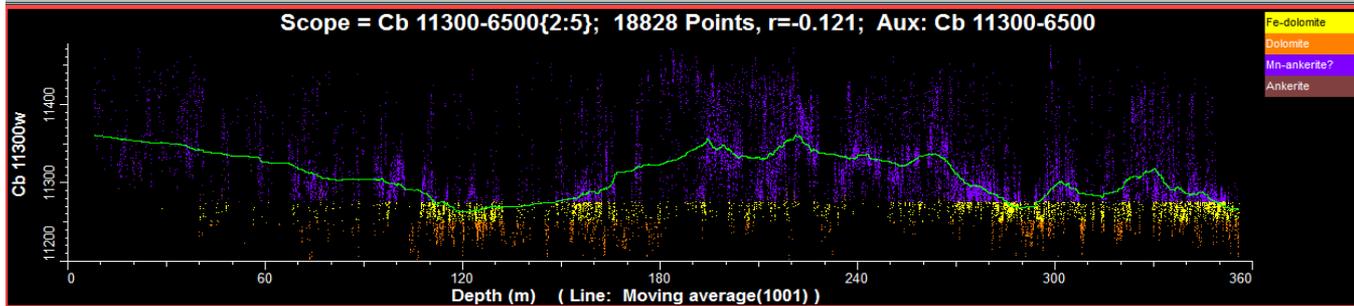
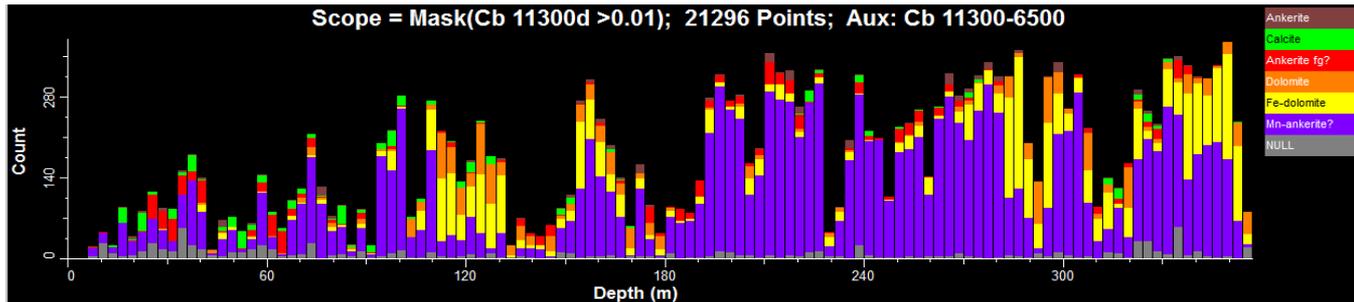


LCD-01 Lode Creek

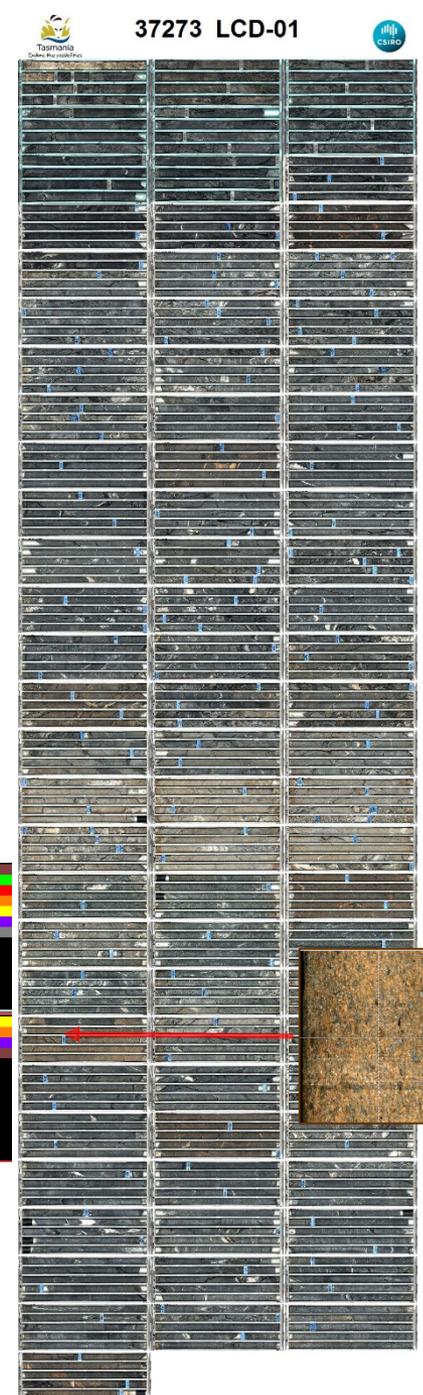
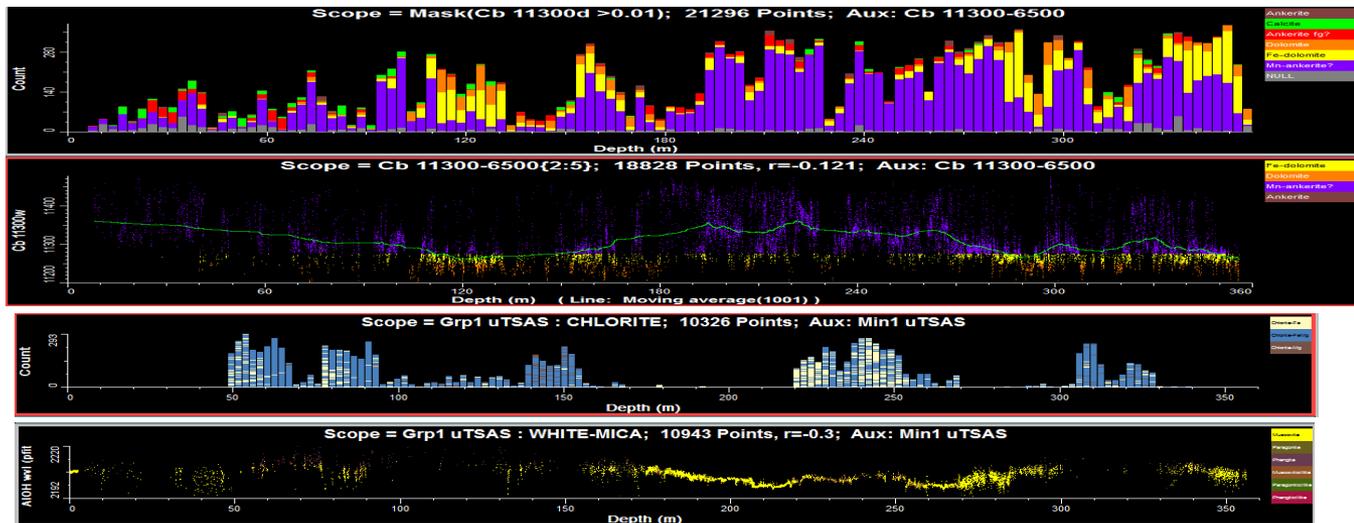
HyLogger-3 scan 13 December 2017



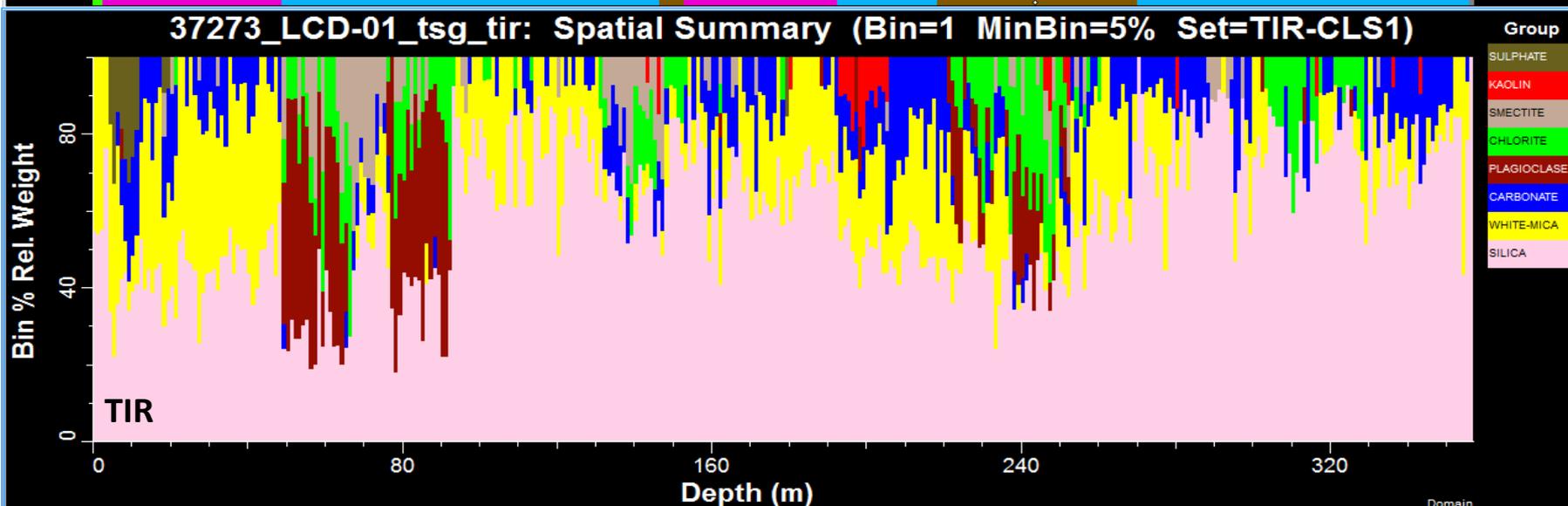
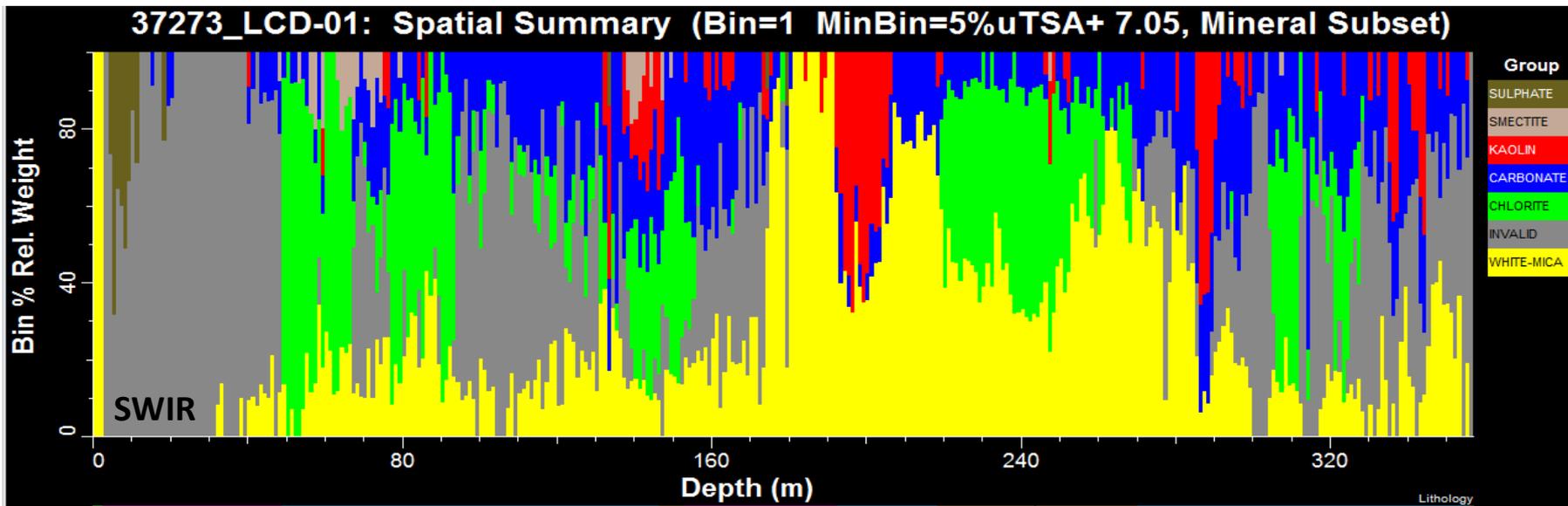
LCD-01 Lode Creek

Summary

- The transition from the upper shale to muscovite + chlorite-bearing volcanoclastics is sharp (at 48.7 – 48.9m).
- The entire sequence appears to be quite mafic.
- Narrow zones of oxidation are marked by light brown colour.
- Low intensity chl - ser - Mn-ankerite alteration 173-294m.
- The alteration zone has gradational boundaries and is centred on a chlorite-rich zone (with slightly elevated Fe content).
- Carbonates in the alteration zone are characterised by Mn-ankerite in the core, grading out to Fe-dolomite and dolomite. Calcite occurs outside the alteration zone.

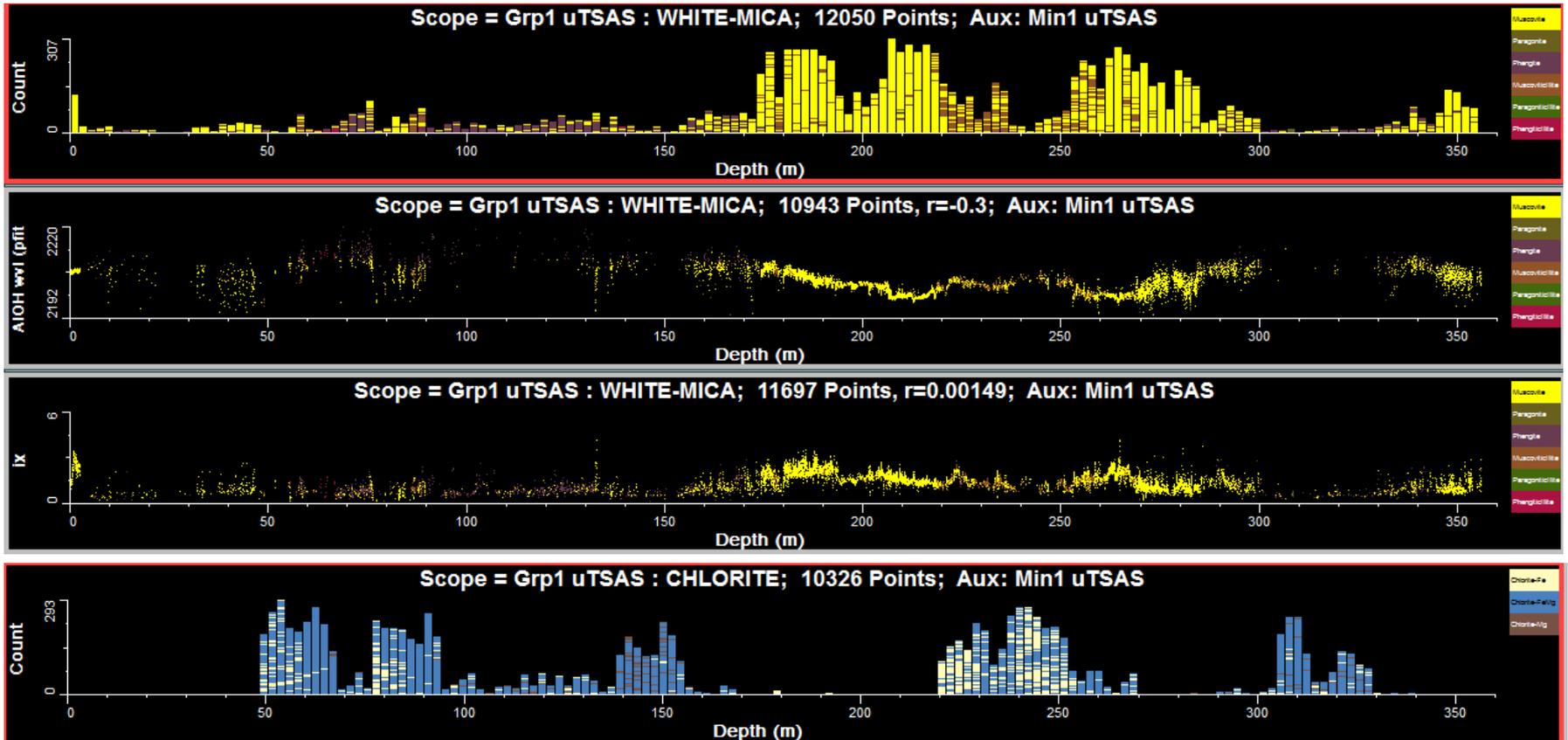


LCD-01 Lode Creek – Summary of mineralogy



LCD-01 Lode Creek - White mica

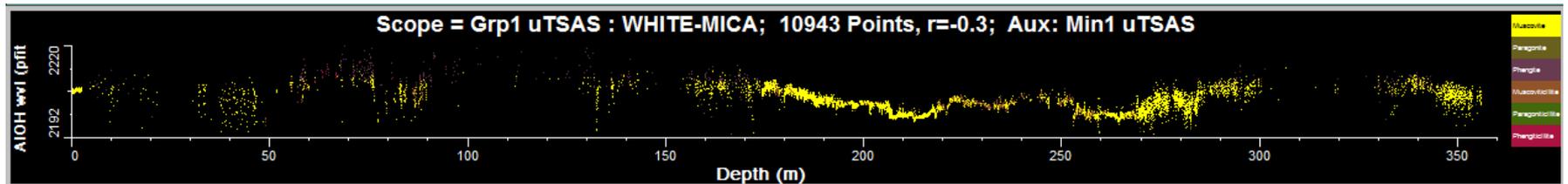
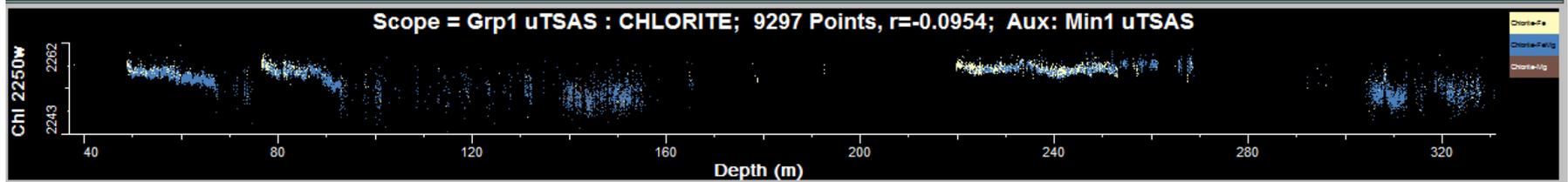
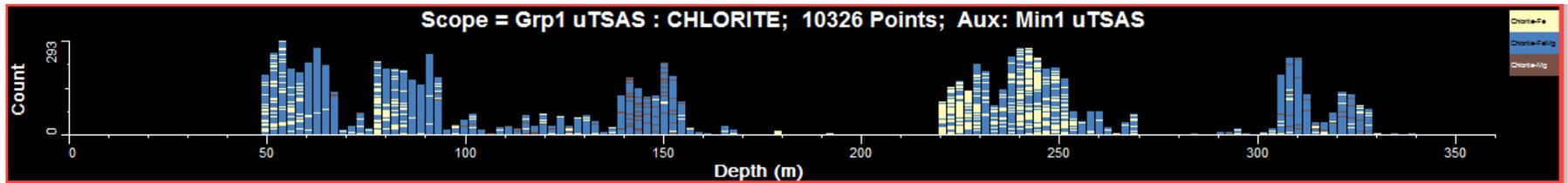
Zone of low wavelength white mica (i.e. muscovitic cf phengitic, possibly with some Na for K) centred on chlorite zone. Minimum 2200nm wavelength of 2198nm.



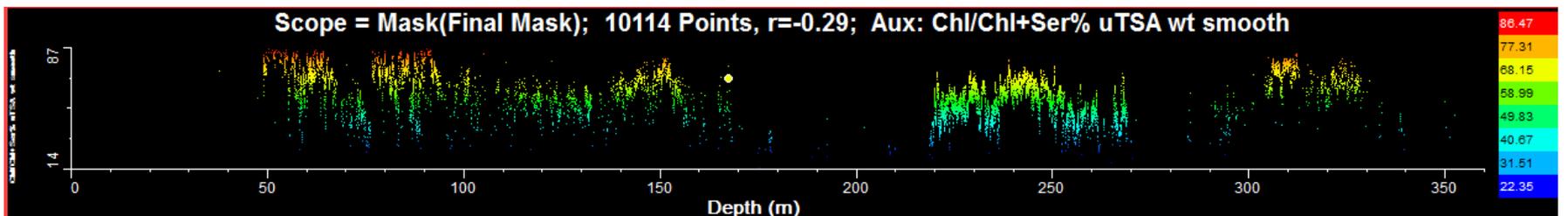
LCD-01 Lode Creek - Chlorite

Zone of Fe-rich chlorite within zone of low-wavelength white mica.

Two upper zones of chlorite both trend toward Mg-rich chlorite downhole ... possible repetition of the same unit?

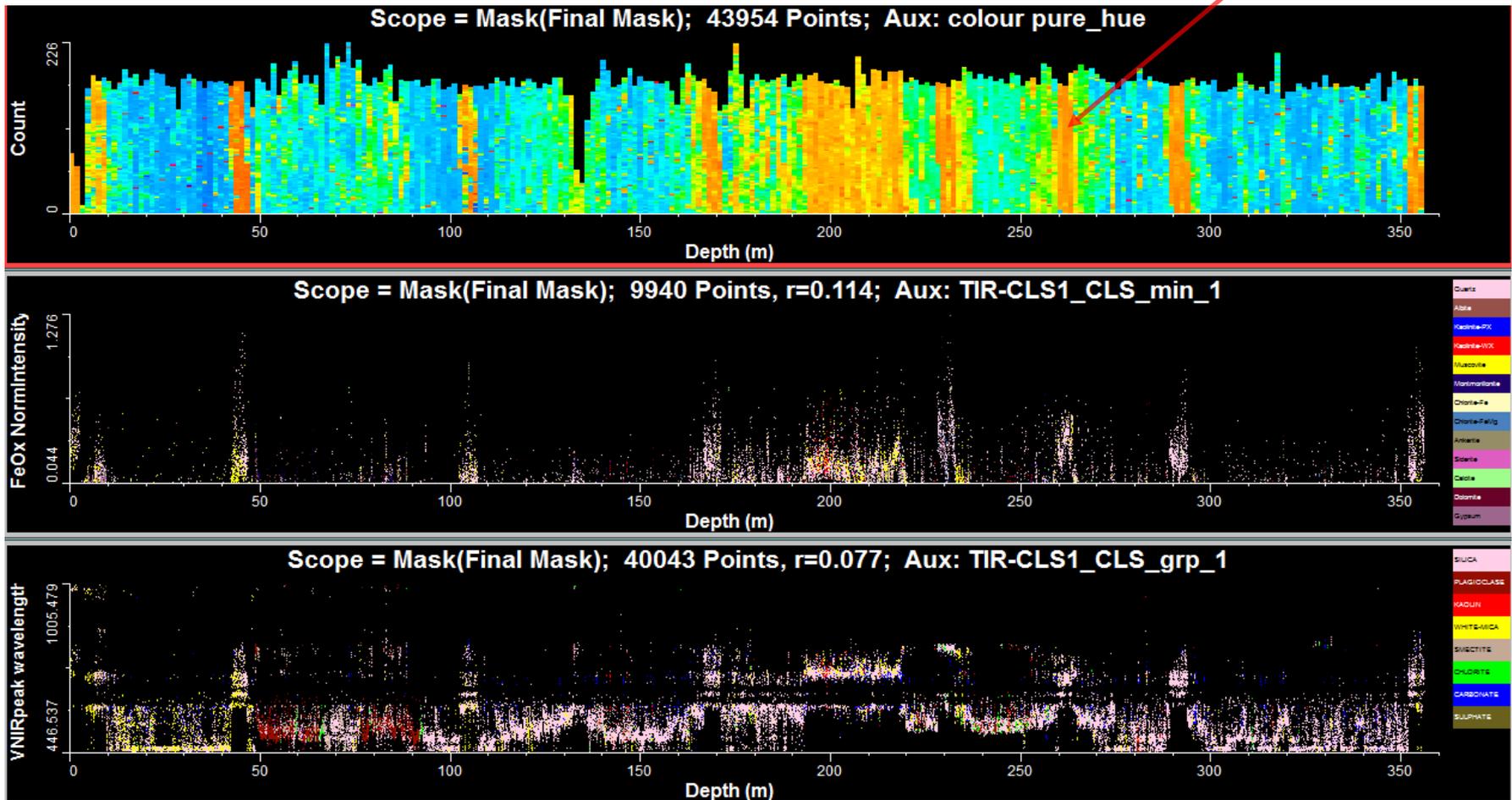


Chlorite:Sericite ratio (from uTSA weights)



LCD-01 Lode Creek - Core colour

Narrow zones of orange core correspond to high Fe-oxide features in the SWIR, indicating oxidation. Mineralogy is not affected.

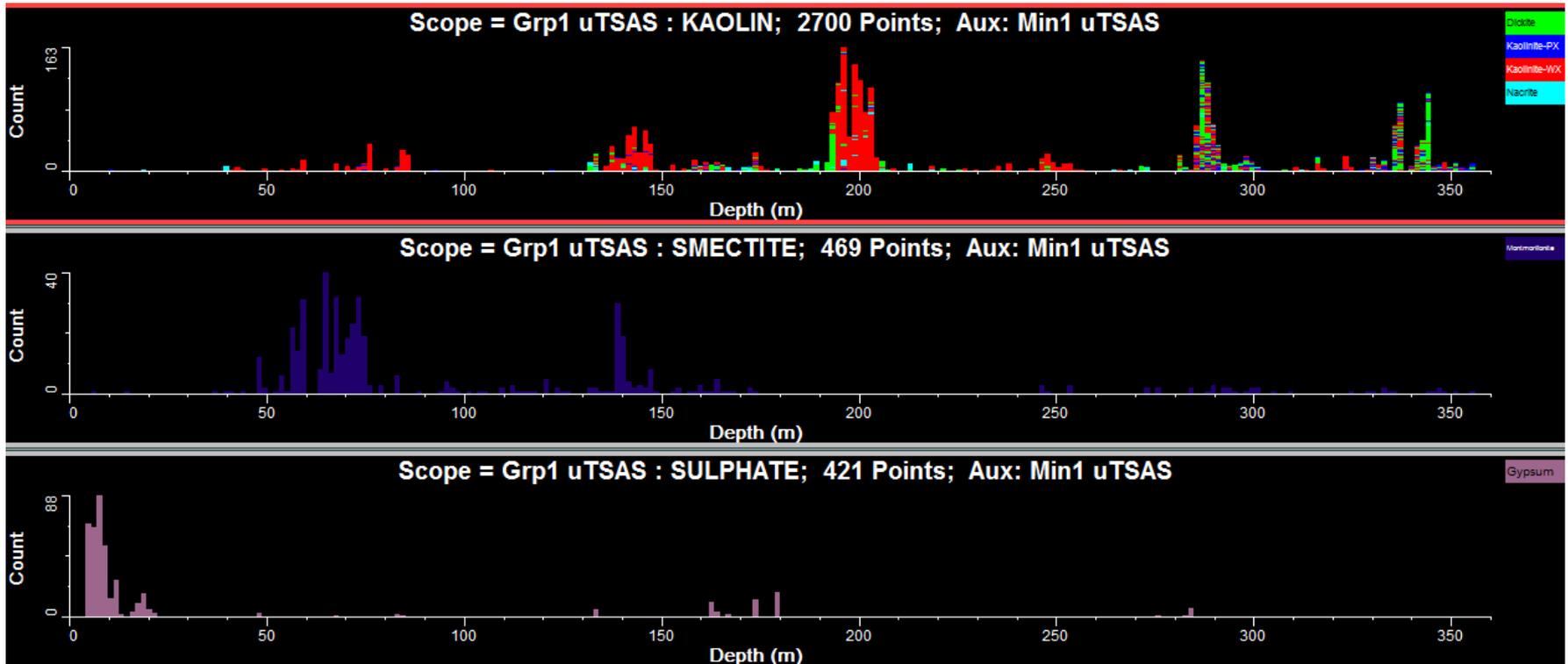


LCD-01 Lode Creek - Clay minerals and gypsum

Kandites occur on broken faces down to 150m, but deeper in the hole, is in the matrix (geologically logged as volcanoclastics).

Montmorillonite occurs on broken faces.

Gypsum occurs at the top of the hole, but may be a surface contaminant.



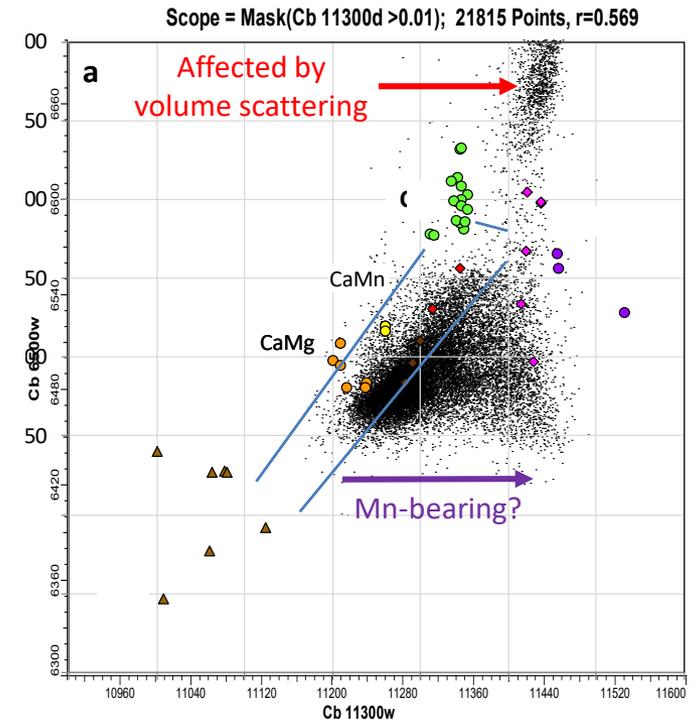
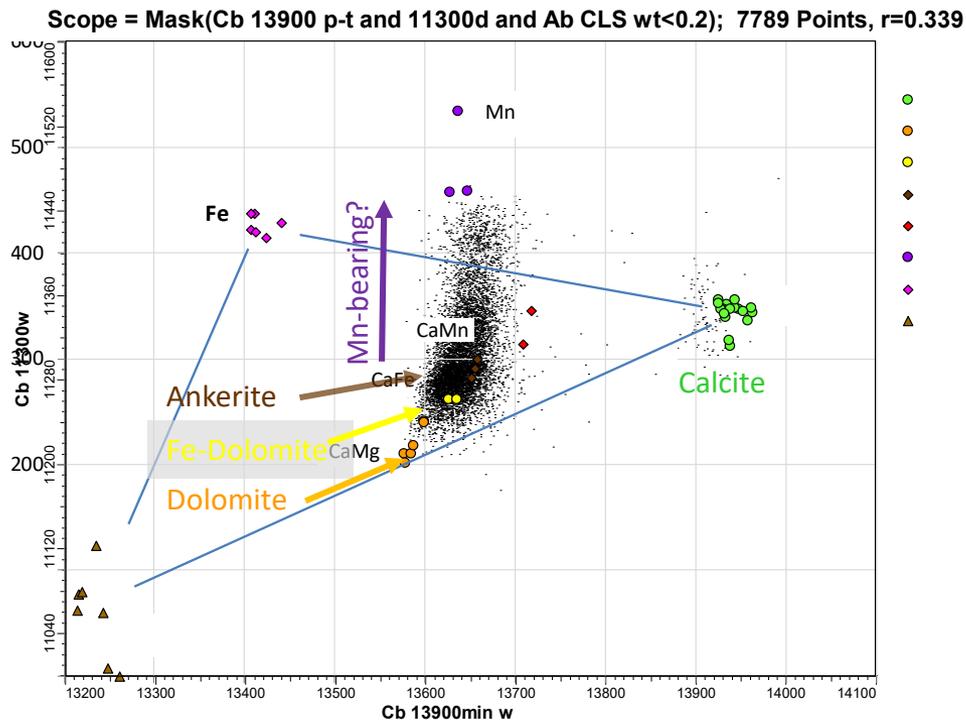
LCD-01 Lode Creek - Carbonates

Most carbonates with good diagnostic features plot near ankerite/Fe-dolomite.

A smaller population plots near calcite.

Many ankerites have an anomalously long wavelength 11300nm feature (and long wavelength 2350nm feature), consistent with being Mn-bearing.

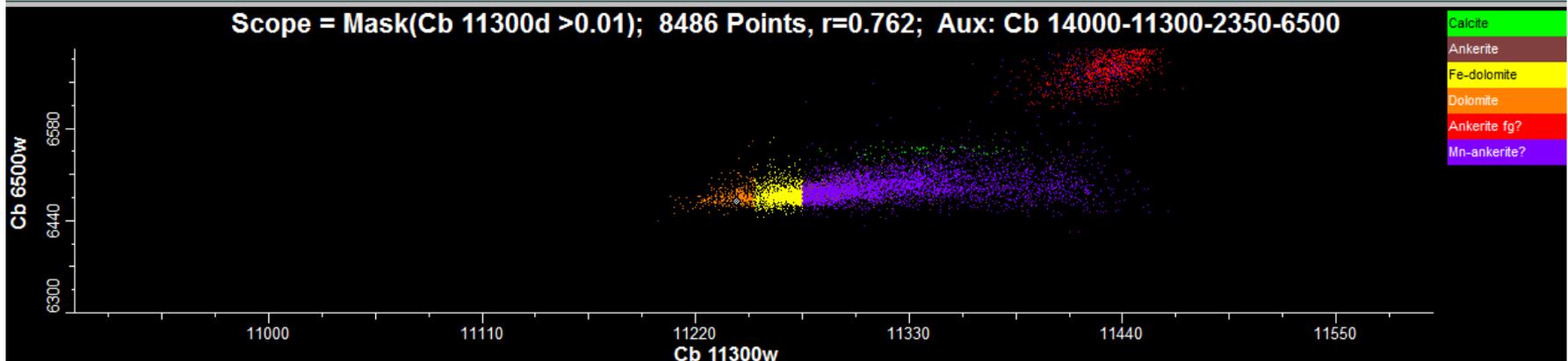
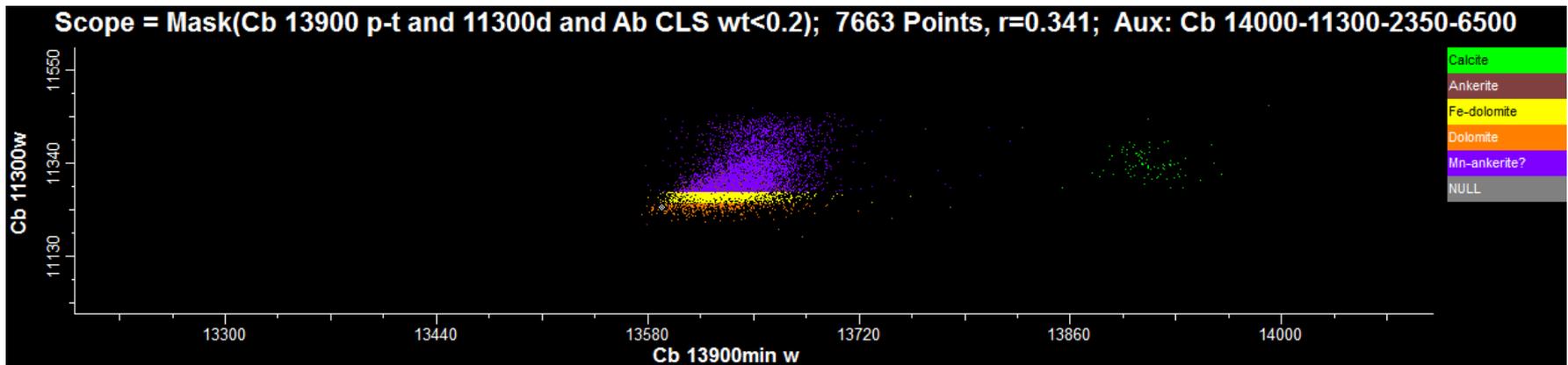
A population with a distinctively long wavelength 6500nm feature have been strongly affected by volume scattering, perhaps due to small grain size.



LCD-01 Lode Creek - Carbonates

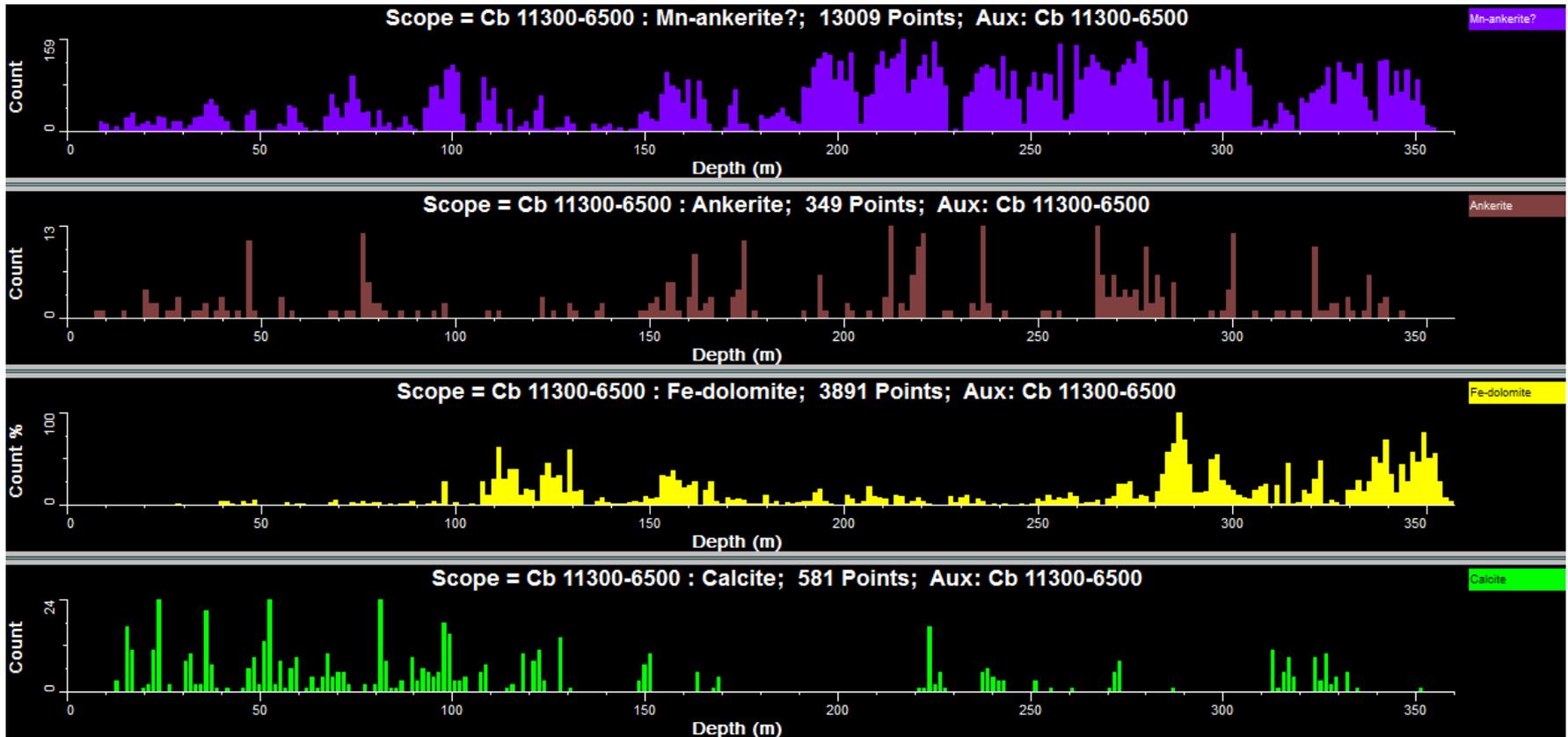
Based on proximity to the library end members, carbonates were classified to mineral classes:

Calcite, dolomite, Fe-dolomite, Mn-ankerite, ankerite (scattered within the Mn-ankerites in the graphs below and distinguished by a short-wavelength 2340nm feature) and fine grained ankerite.



LCD-01 Lode Creek - Carbonates

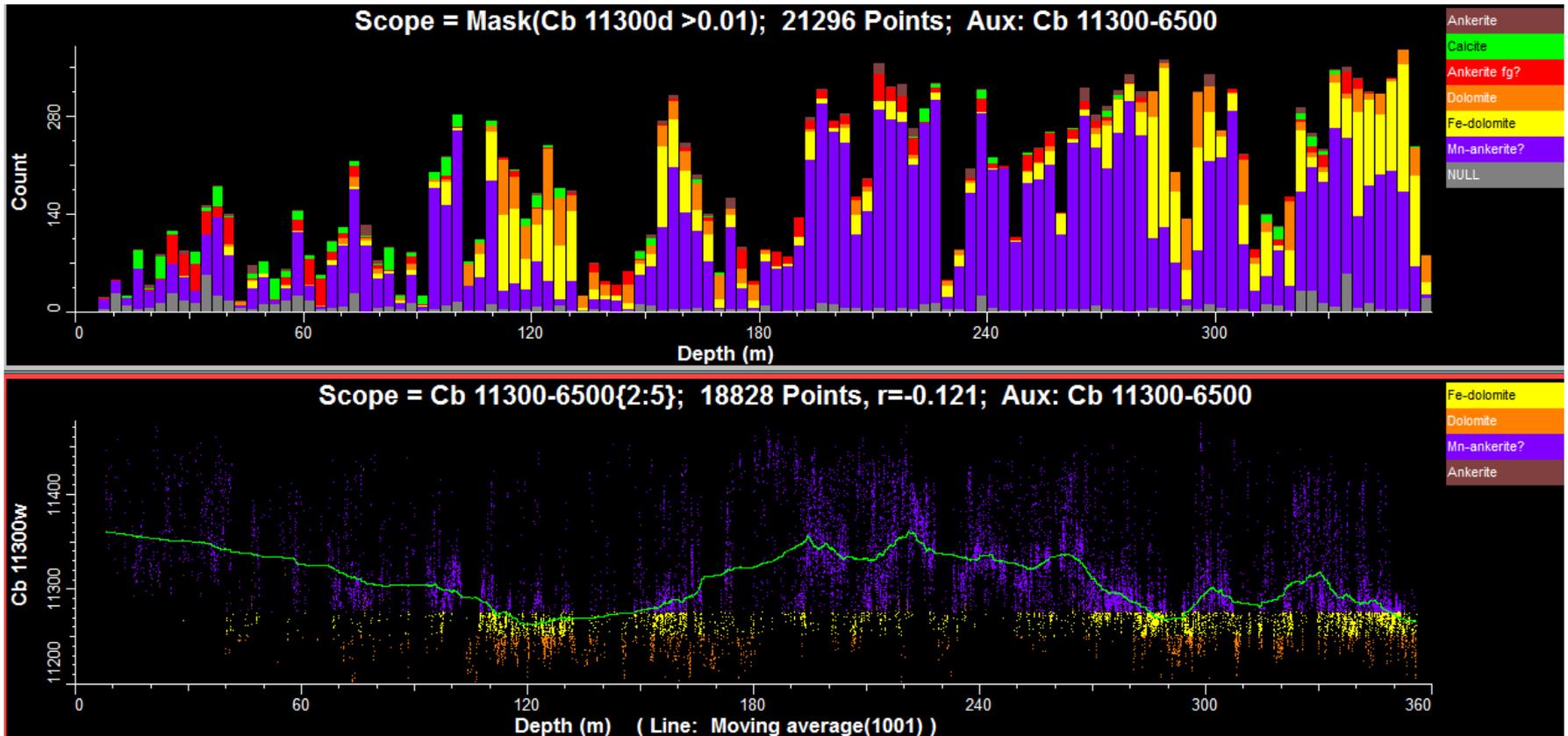
An inner (Mn-) ankerite zone is enveloped by an Fe-dolomite (+ dolomite) zone. Calcite dominates outside the ankerite and dolomite zones.



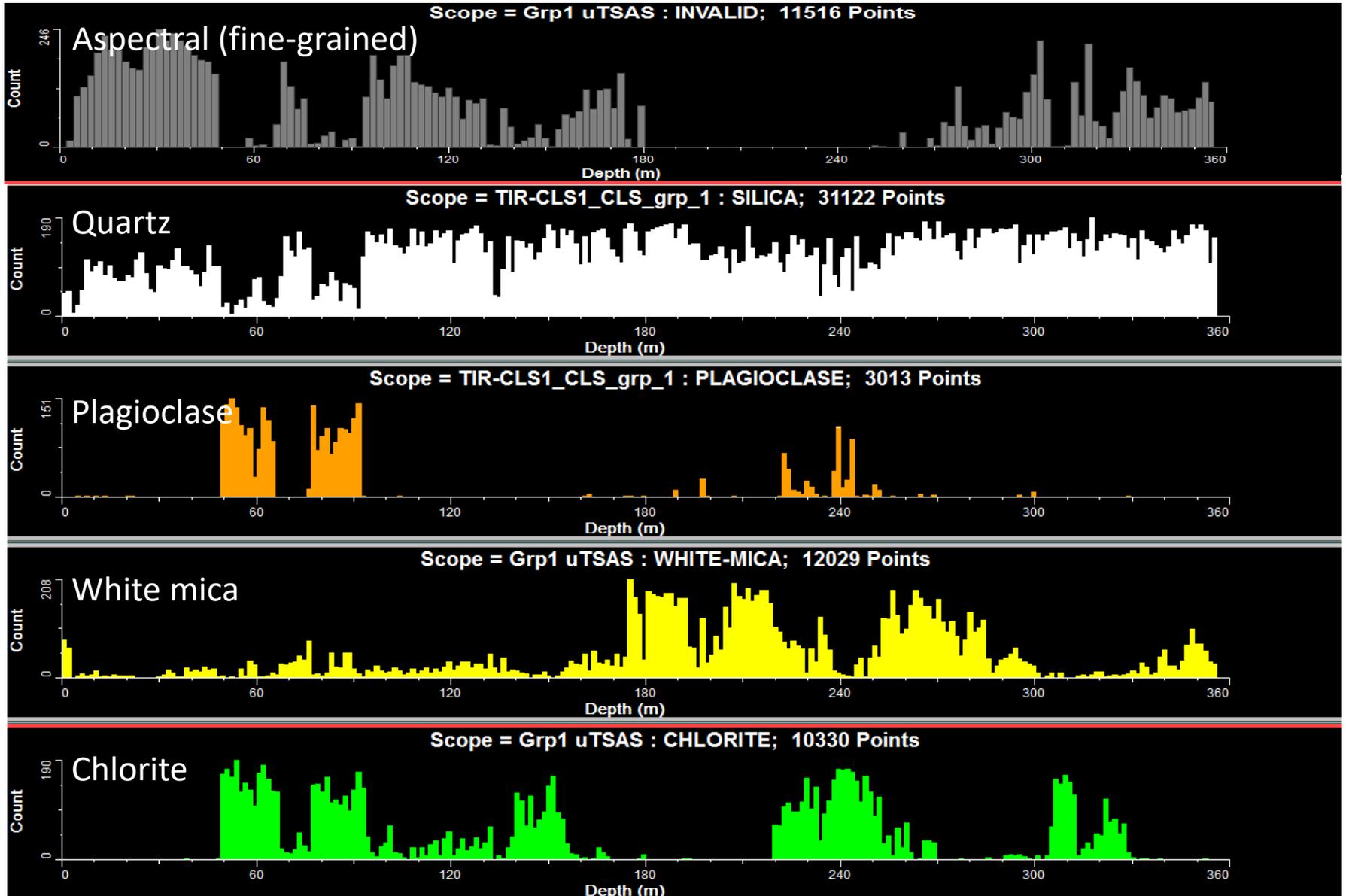
LCD-01 Lode Creek - Carbonates

Carbonates become more common downhole (upper graph).

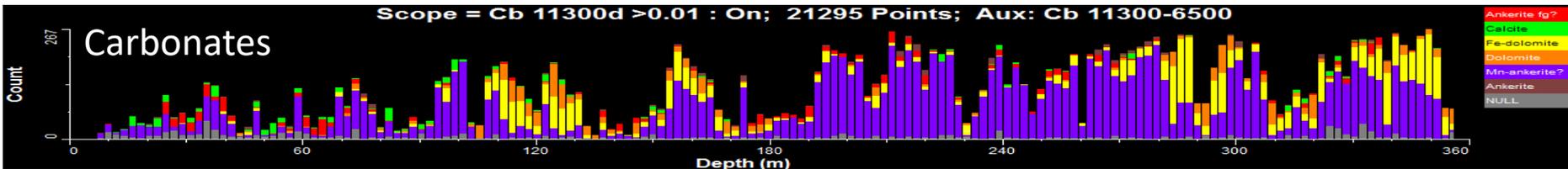
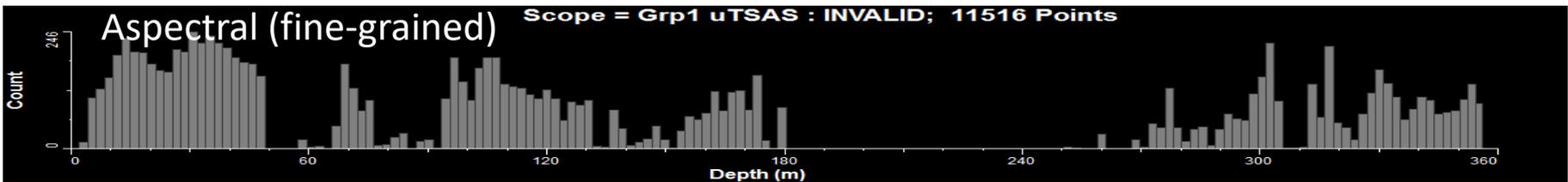
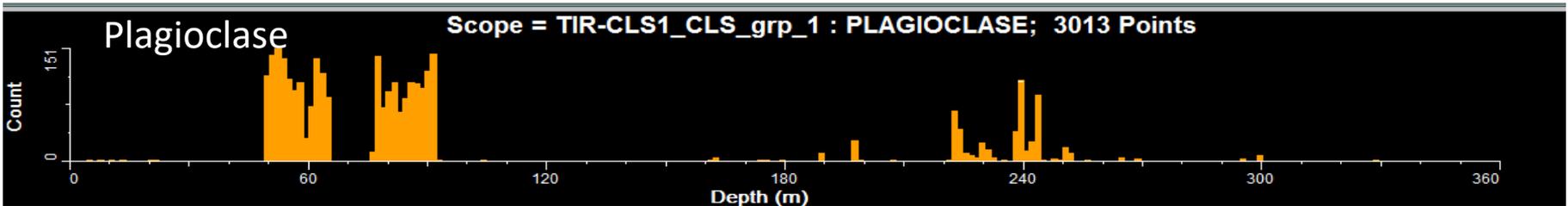
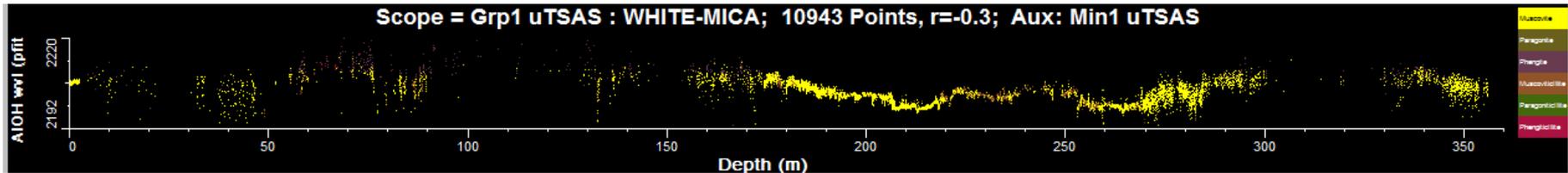
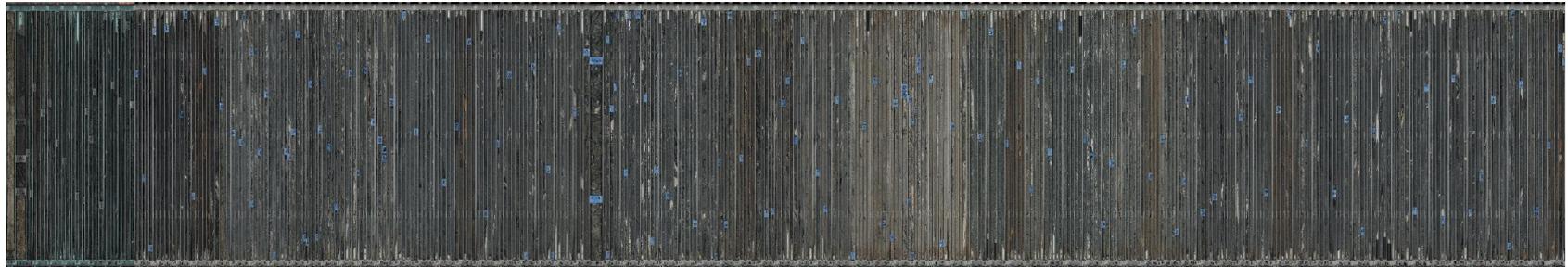
Continuous spatial variation in carbonate composition is apparent in a smoothed plot of the wavelength of the 11000nm feature (lower graph, green line).



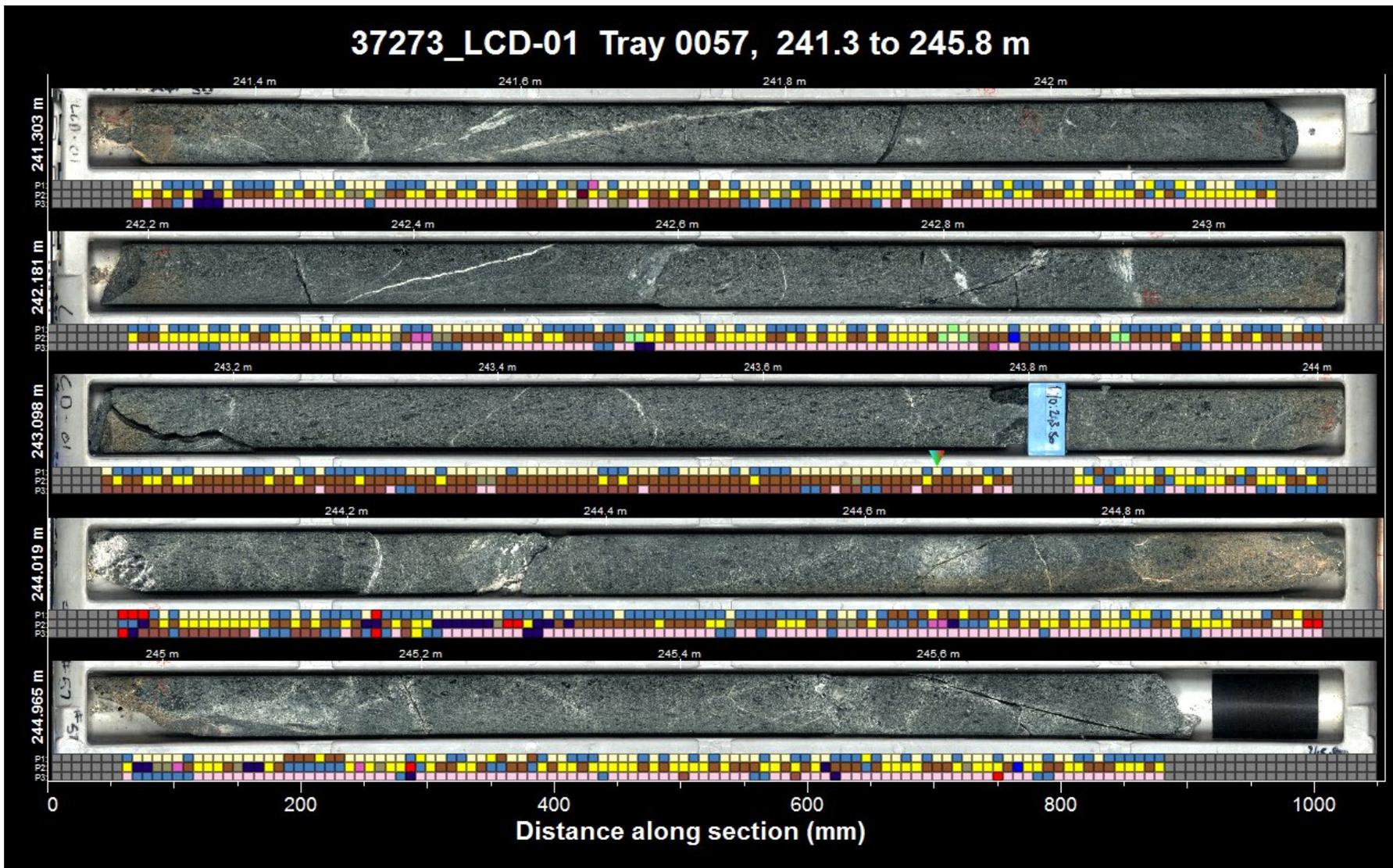
LCD-01 Lode Creek - Major minerals



LCD-01 Lode Creek – Scalars relative to hole image

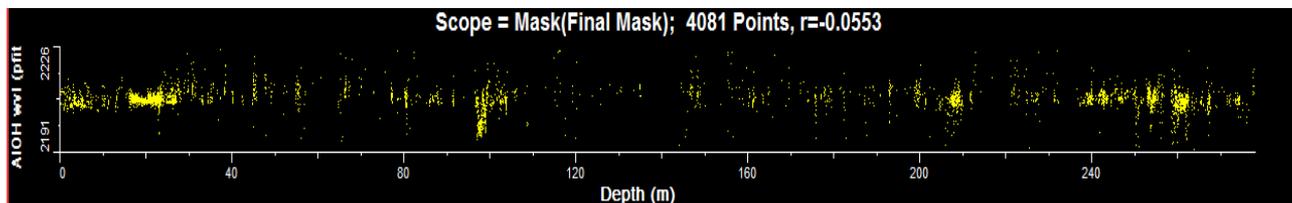
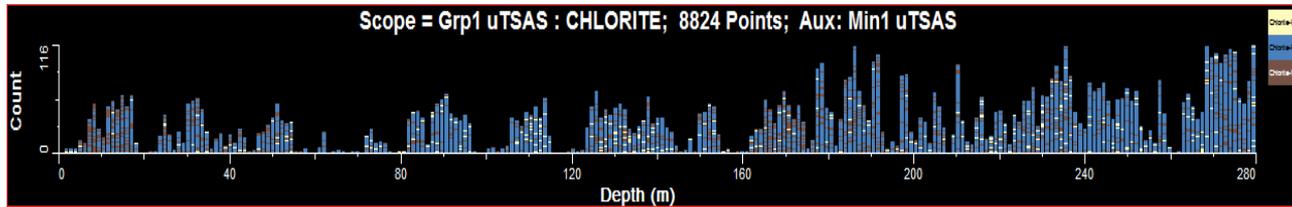
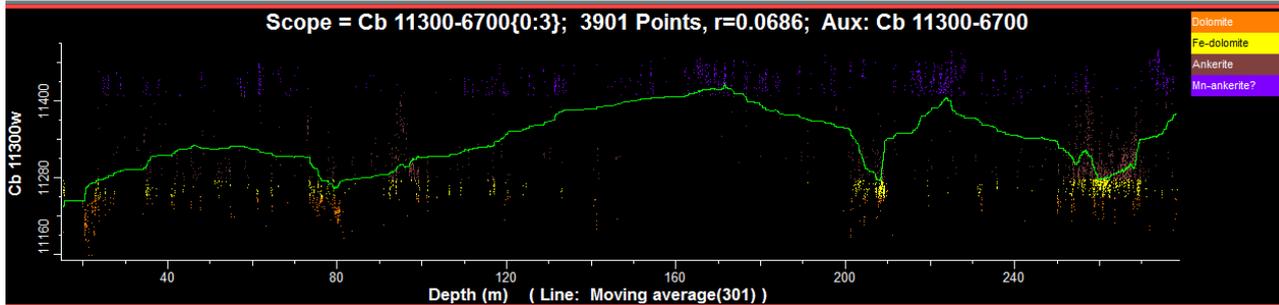
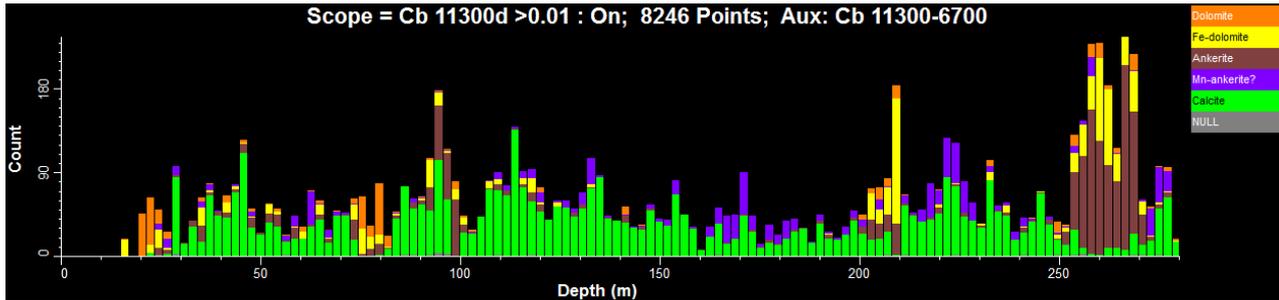


LCD-01 Lode Creek – Example tray image



LCD-04 Lode Creek

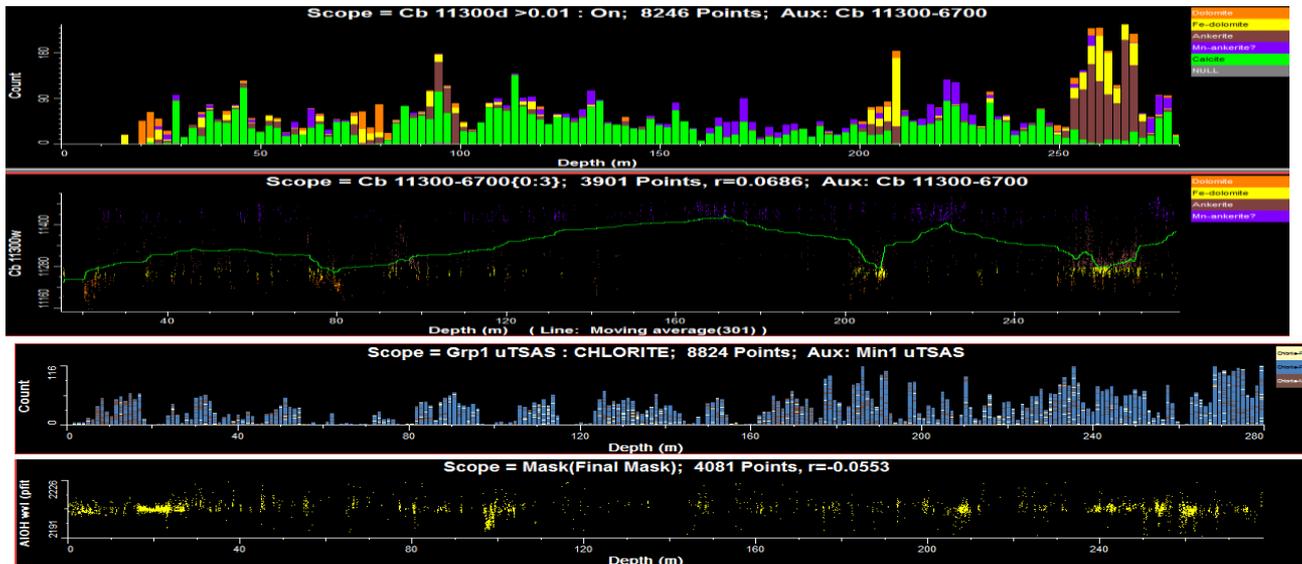
HyLogger-3 scan 15 December 2017



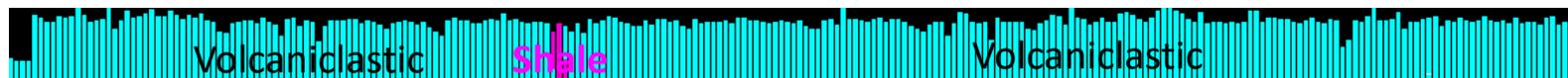
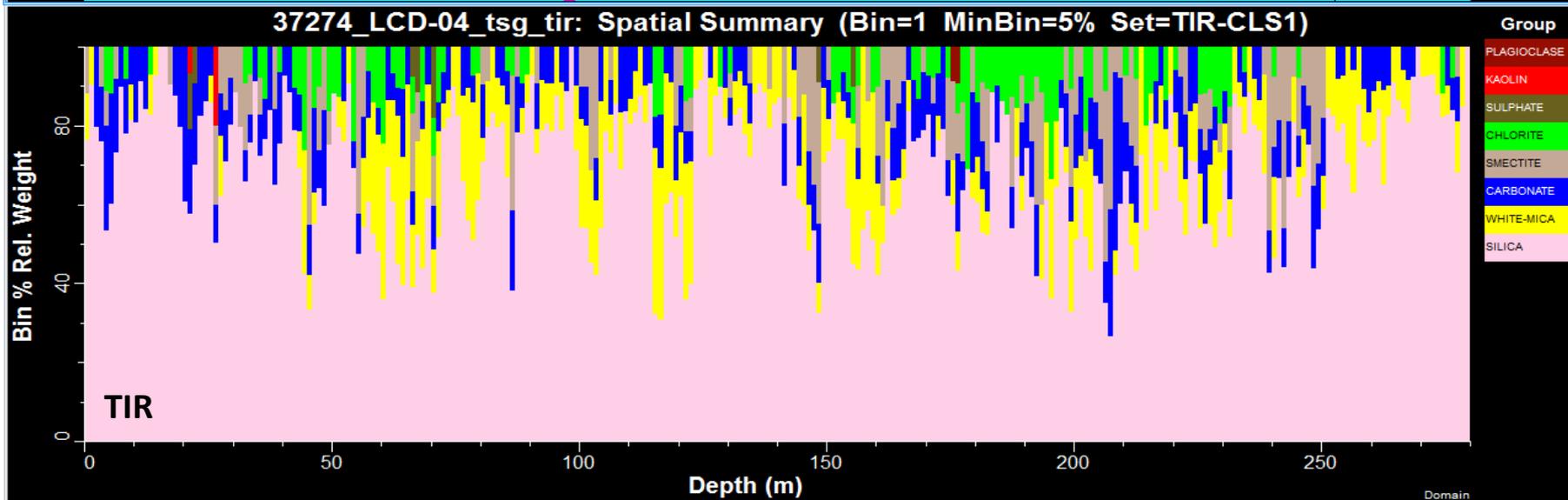
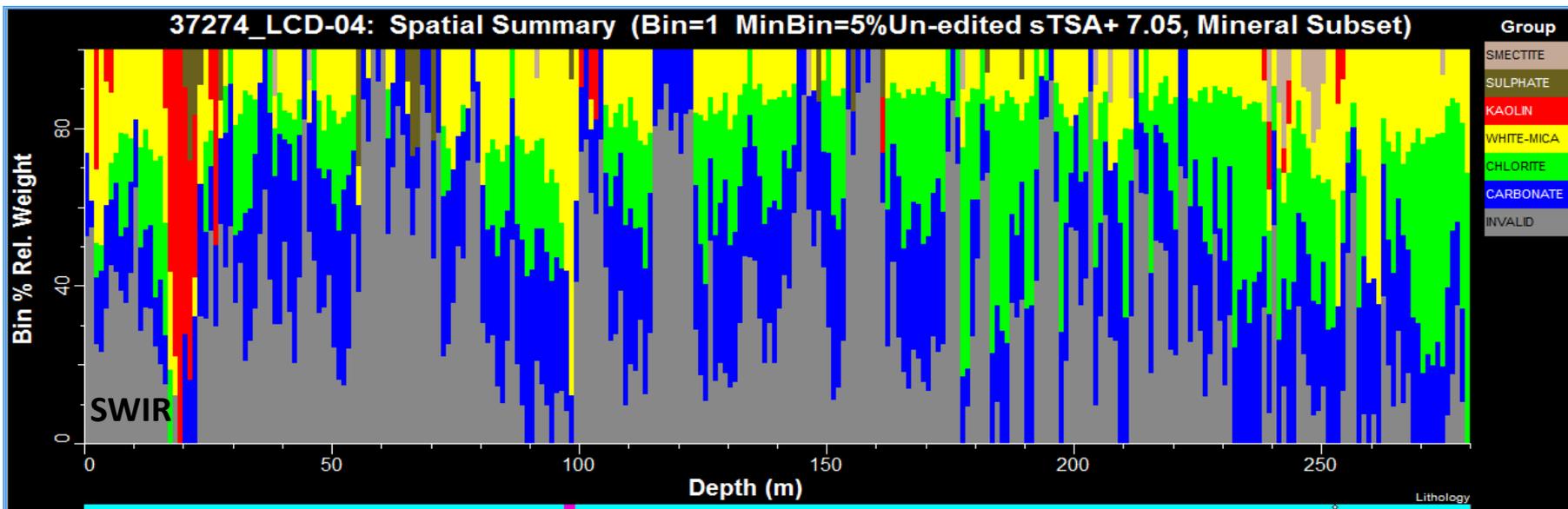
LCD-04 Lode Creek

Summary

- The sequence of alternating volcanoclastics and thinner bands of shale is punctuated by discontinuities marked by narrow zones of breccia or breakage (e.g. 55m, 66m, 99m, 115m, 122m, 161m, 193m). Shales do not occur below 222m.
- The relative proportions of white mica and chlorite and their chemistry indicate no alteration.
- Calcite is common throughout the hole, but ankerite (and dolomite) is largely restricted to 250-270m. Small amounts of Mn-ankerite occur at 160-220m.

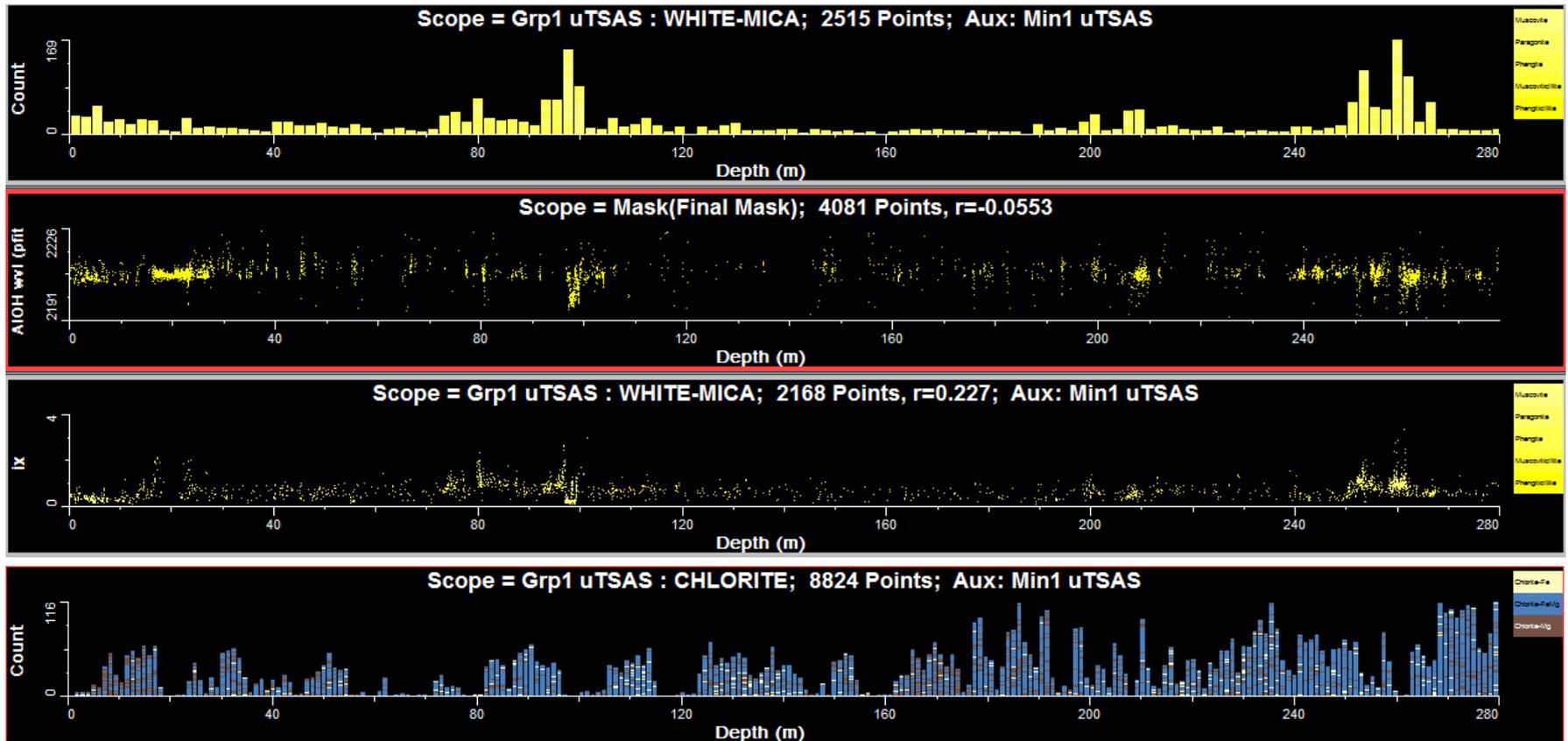


LCD-04 Lode Creek – Summary of mineralogy



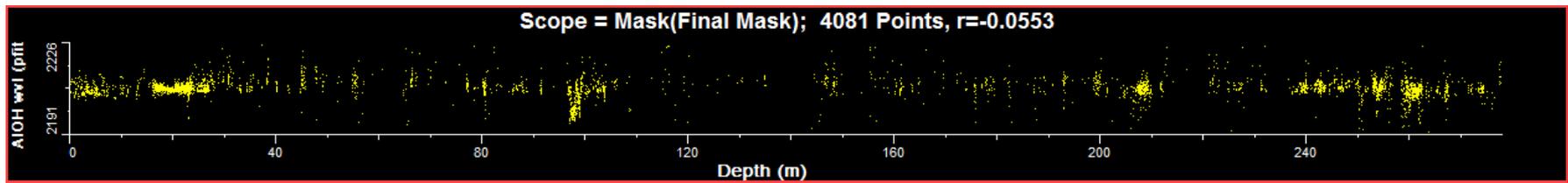
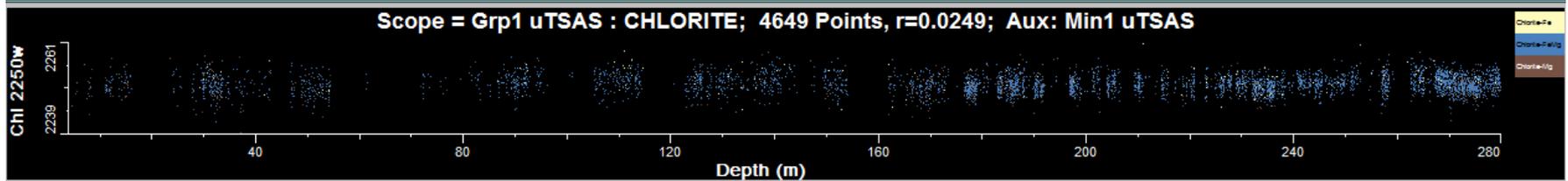
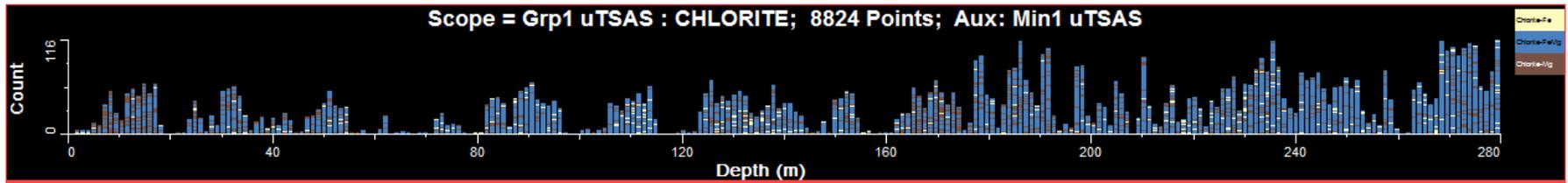
LCD-04 Lode Creek - White mica

White mica composition does not vary
(only 2nm smoothed variation in wavelength of the 2200nm feature).

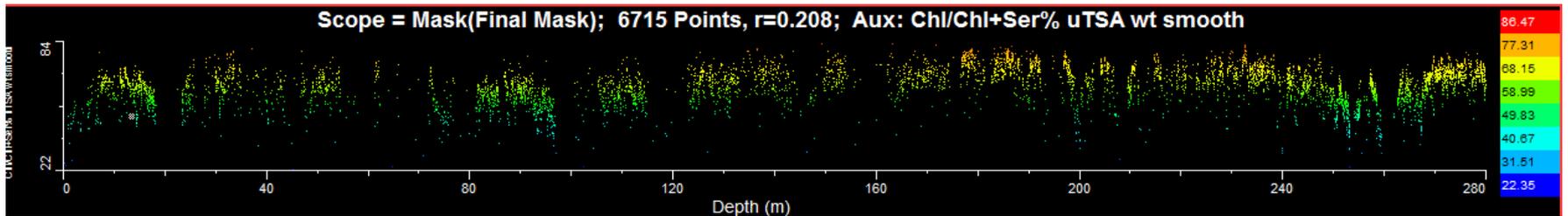


LCD-04 Lode Creek - Chlorite

There is a subtle compositional trend of decreasing Fe ($\text{Fe}_{50}\text{Mg}_{50}$ down to $\text{Fe}_{42}\text{Mg}_{58}$) to a minimum at about 183m.



Chlorite:Sericite ratio (from uTSA weights)

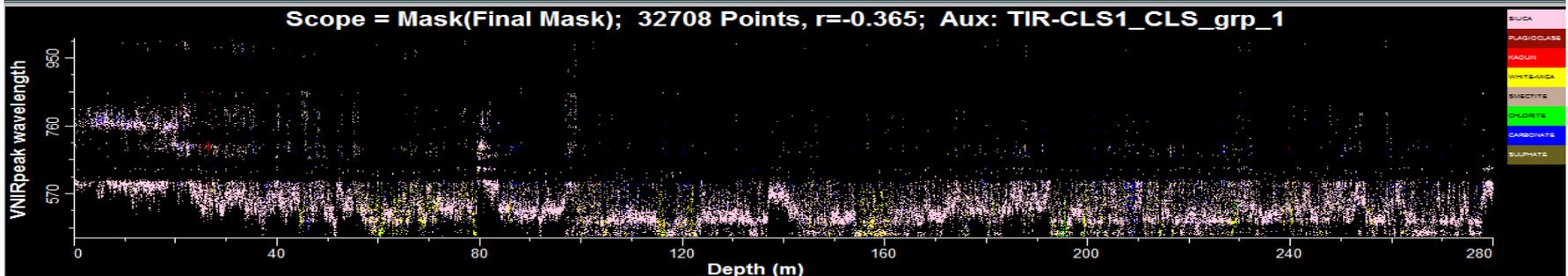
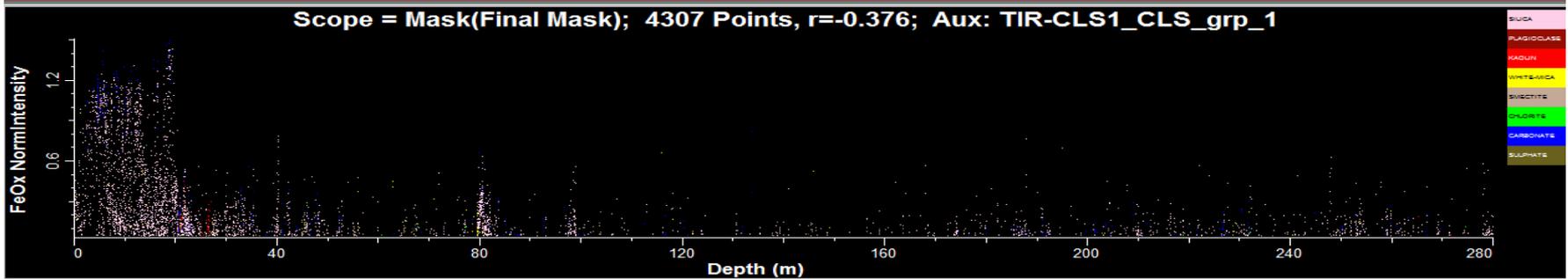
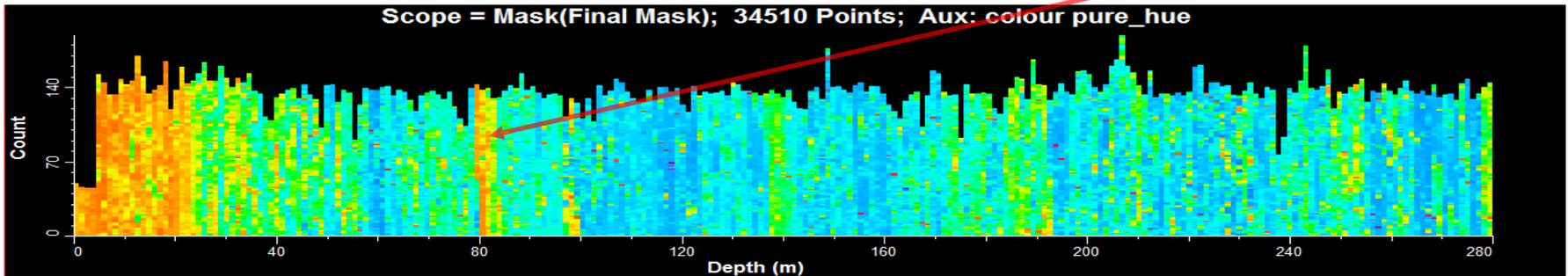
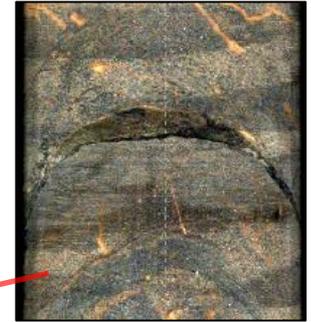


LCD-04 Lode Creek - Core colour

Narrow zones of orange core correspond to high Fe-oxide features in the SWIR, indicating oxidation. Mineralogy is not affected.

Orange colour at top of hole is due to oxidised surfaces of breaks.

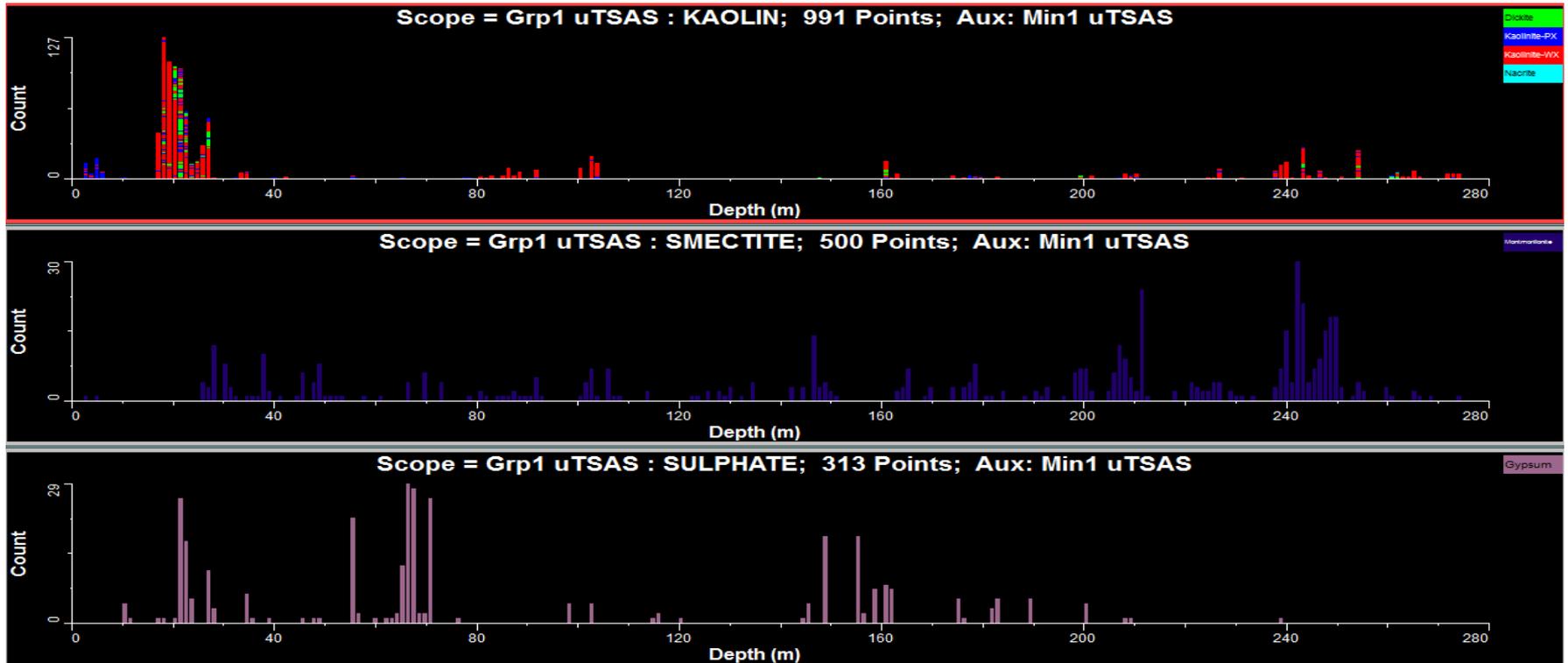
Coarser grained sediment near bottom of hole (~267-280m).



LCD-04 Lode Creek - Clay minerals and gypsum

Kandites and montmorillonite occur on broken faces.

Gypsum may be a surface contaminant.



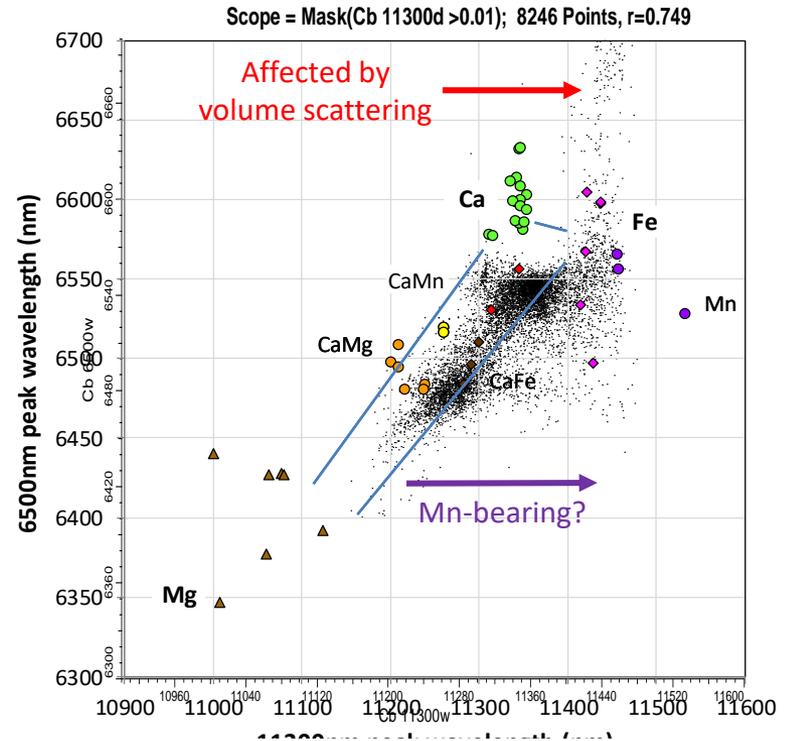
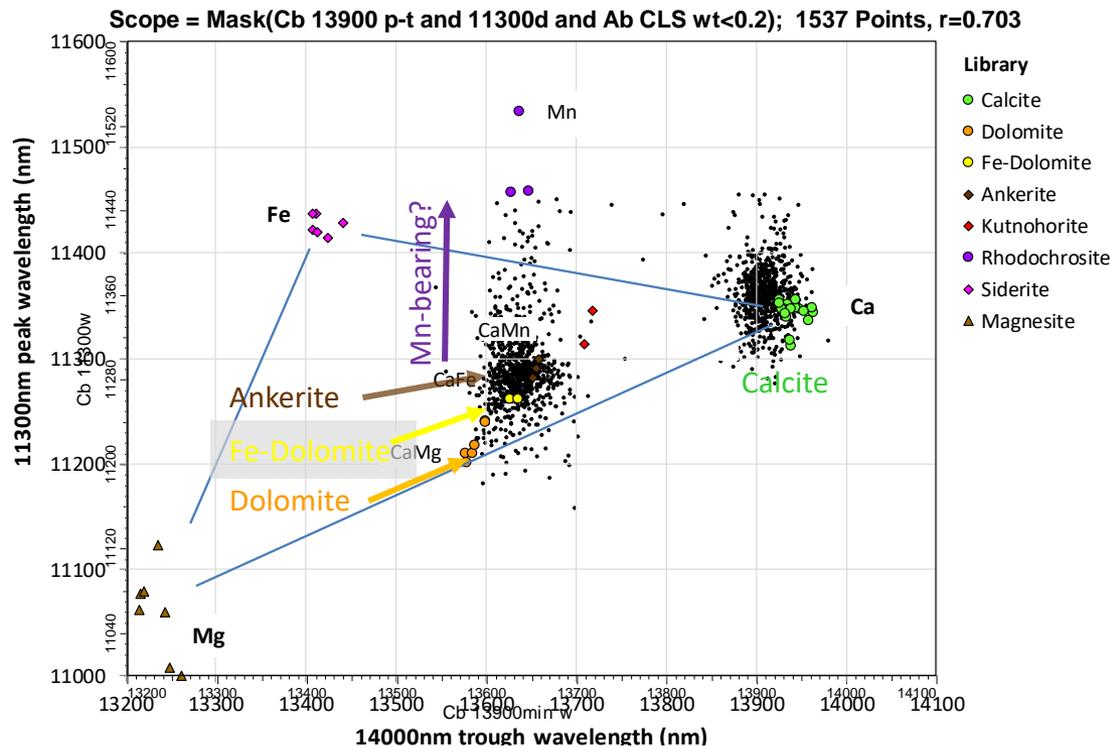
LCD-04 Lode Creek - Carbonates

Most carbonates with good diagnostic features plot near ankerite.

Another significant population plots near calcite.

Some ankerites (and calcites) have an anomalously long wavelength 11300nm feature (and long wavelength 2350nm feature), consistent with being Mn-bearing.

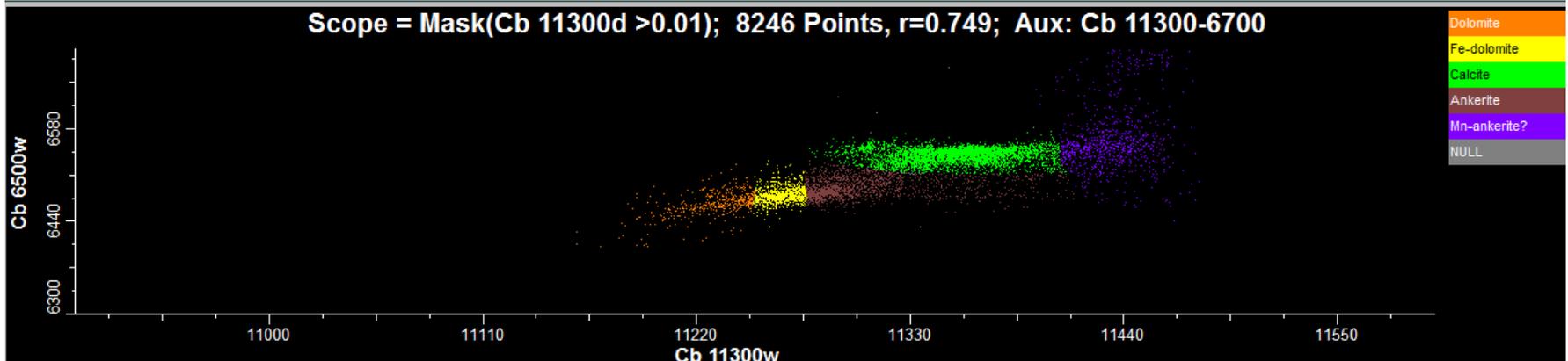
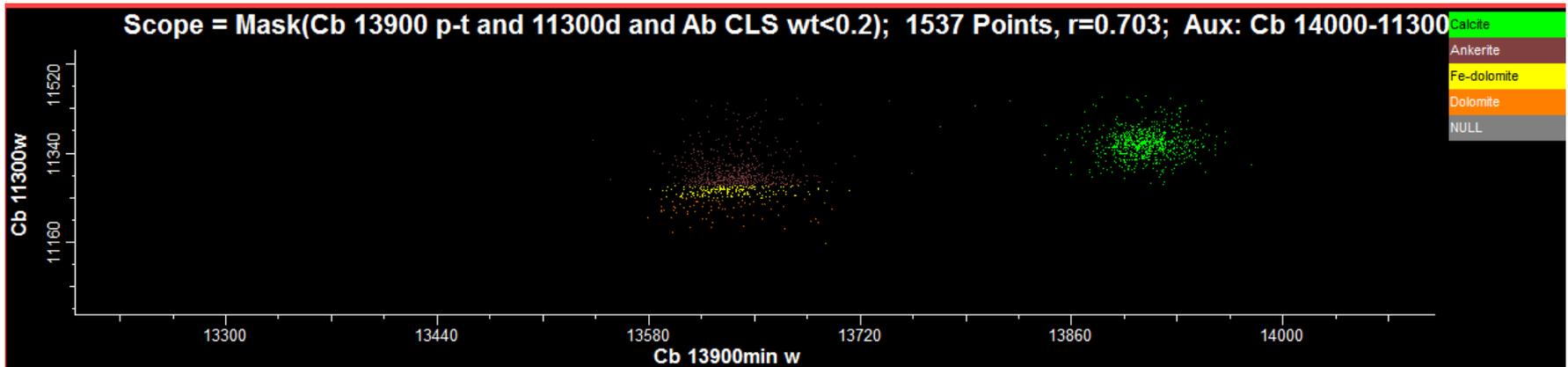
A small population with a distinctively long wavelength 6500nm feature have been strongly affected by volume scattering, perhaps due to small grain size.



LCD-04 Lode Creek - Carbonates

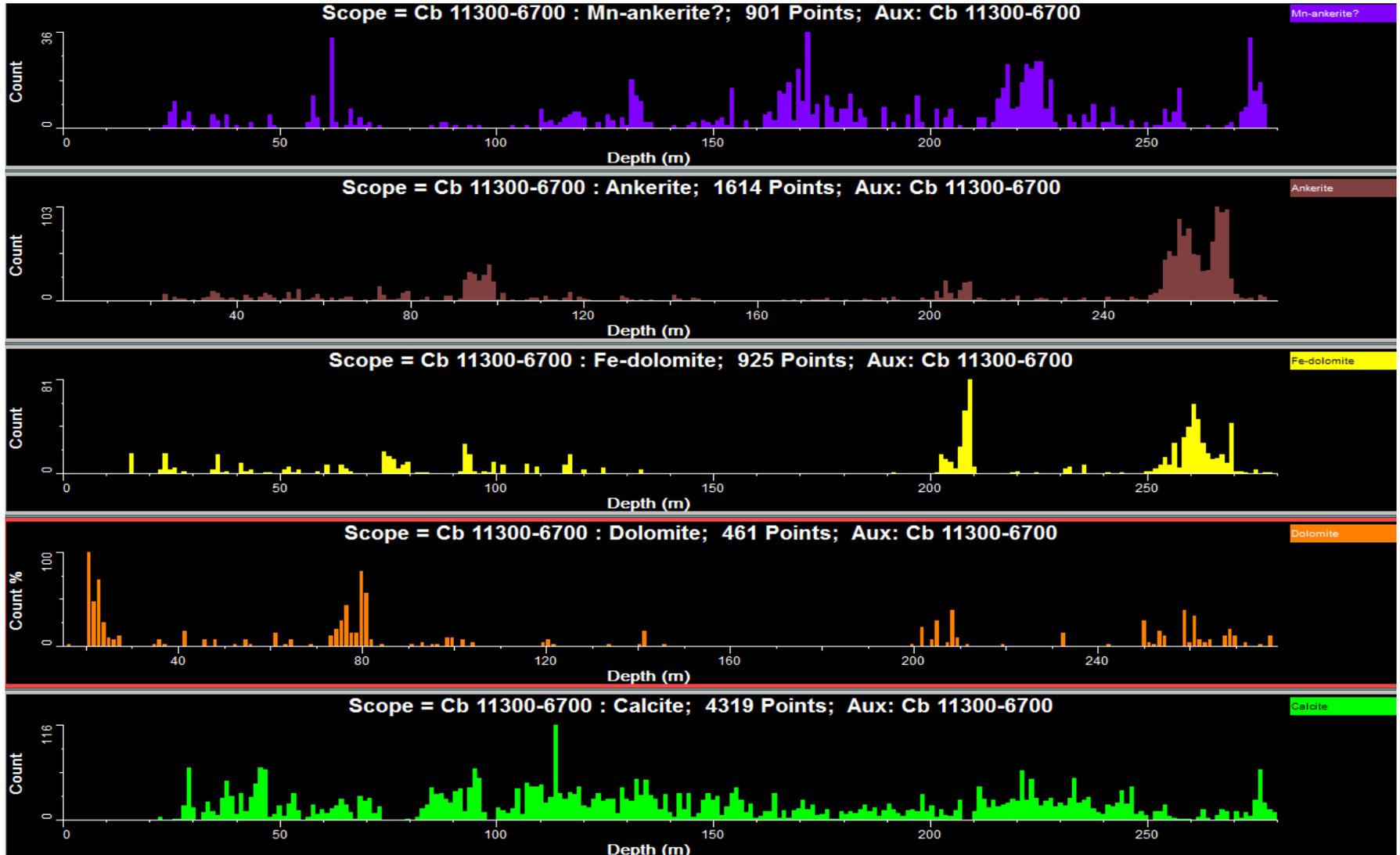
Based on proximity to the library end members, carbonates were classified to mineral classes:

Calcite, dolomite, Fe-dolomite, Mn-ankerite and ankerite.



LCD-04 Lode Creek - Carbonates

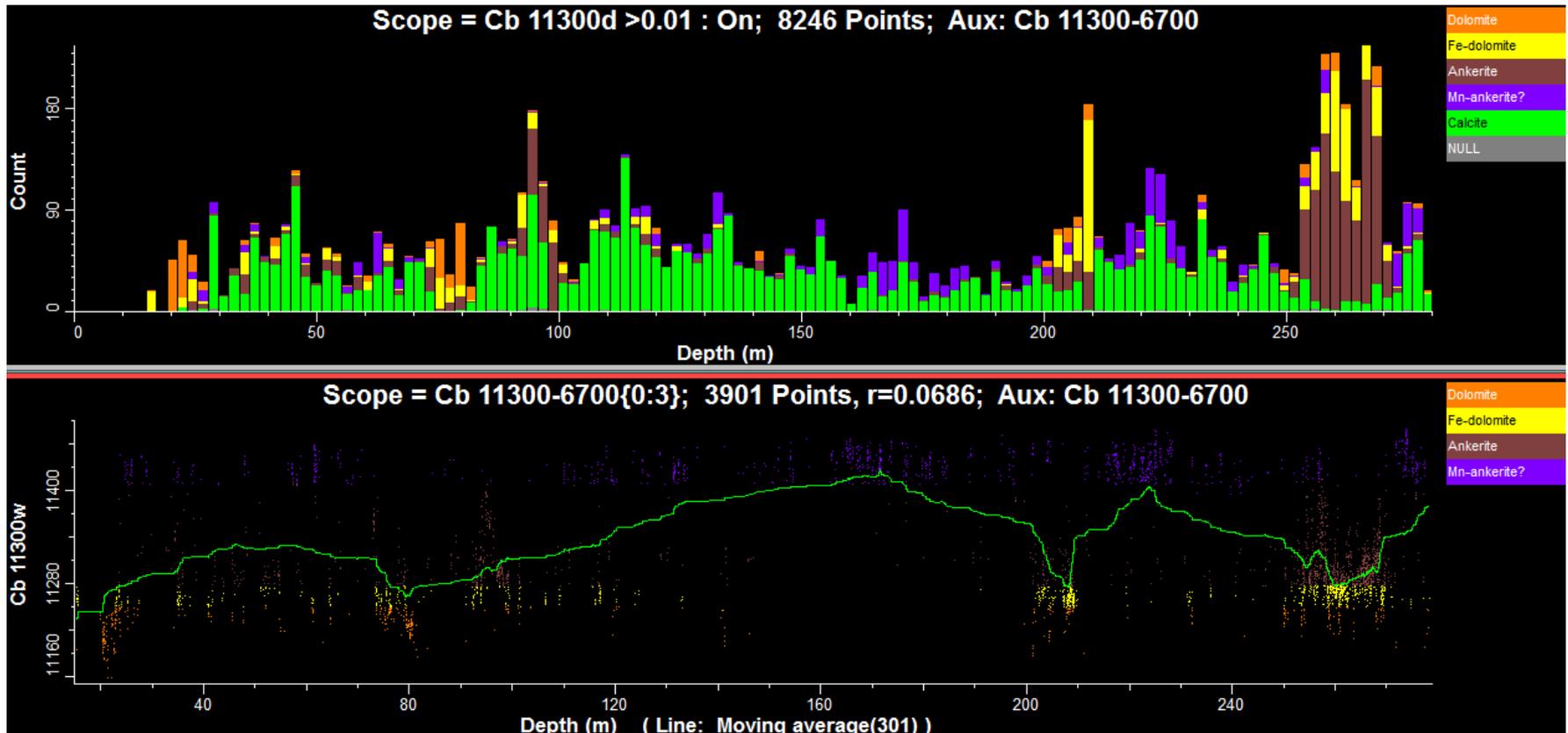
Calcite and Mn-ankerite are scattered throughout the hole, but ankerite, dolomite and Fe-dolomite occur in narrow zones.



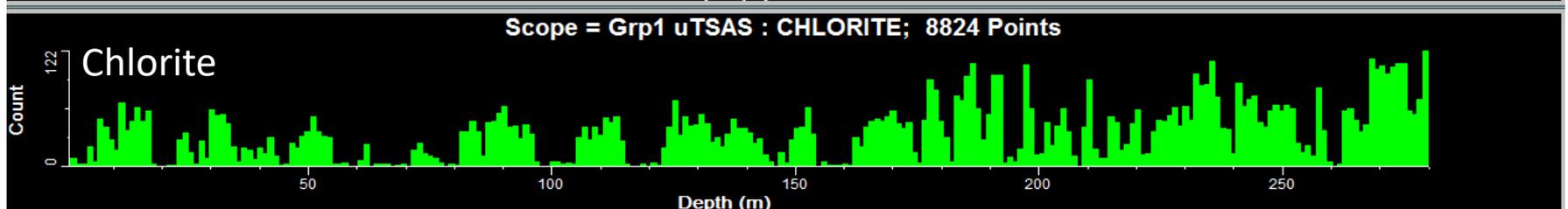
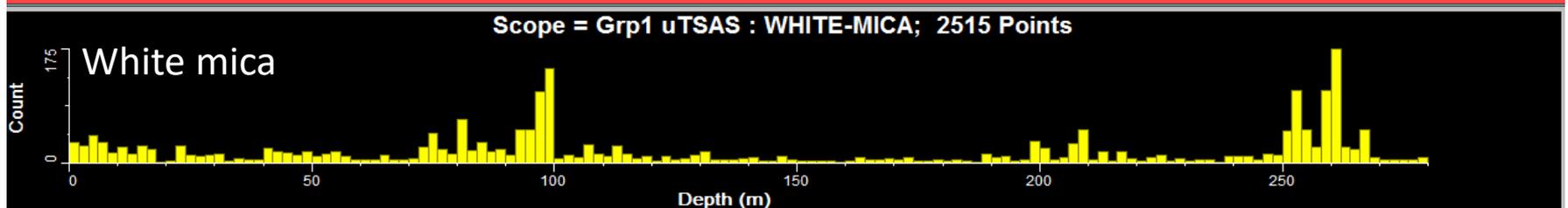
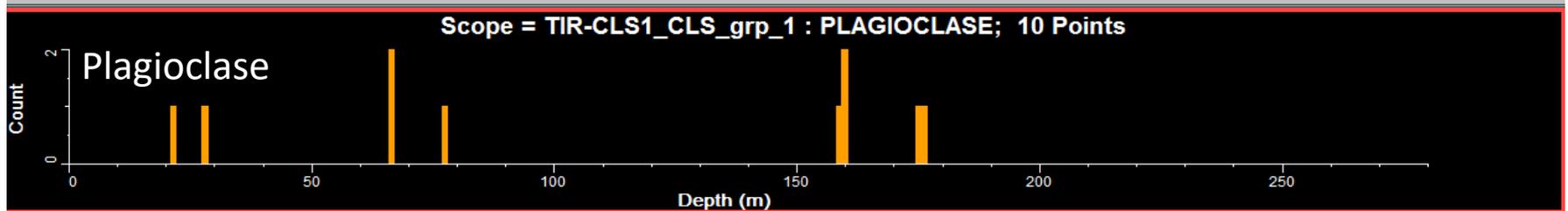
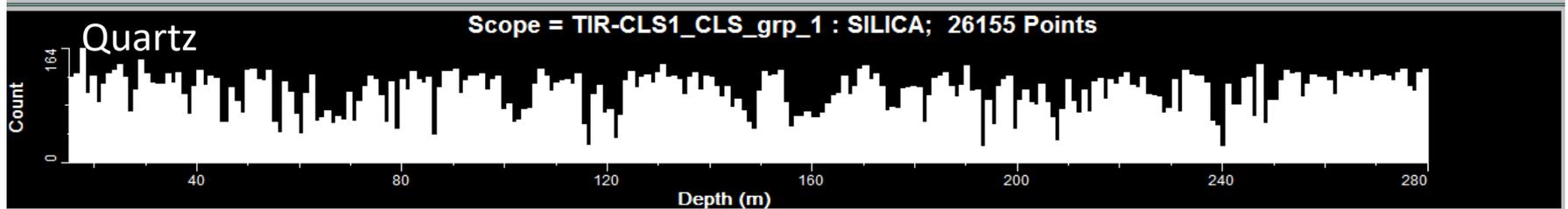
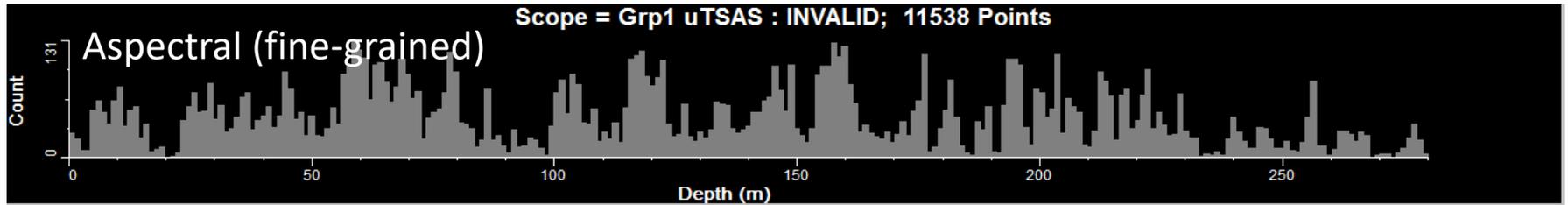
LCD-04 Lode Creek - Carbonates

Carbonates are scattered throughout the downhole, with an ankerite zone at 252-271m (upper graph).

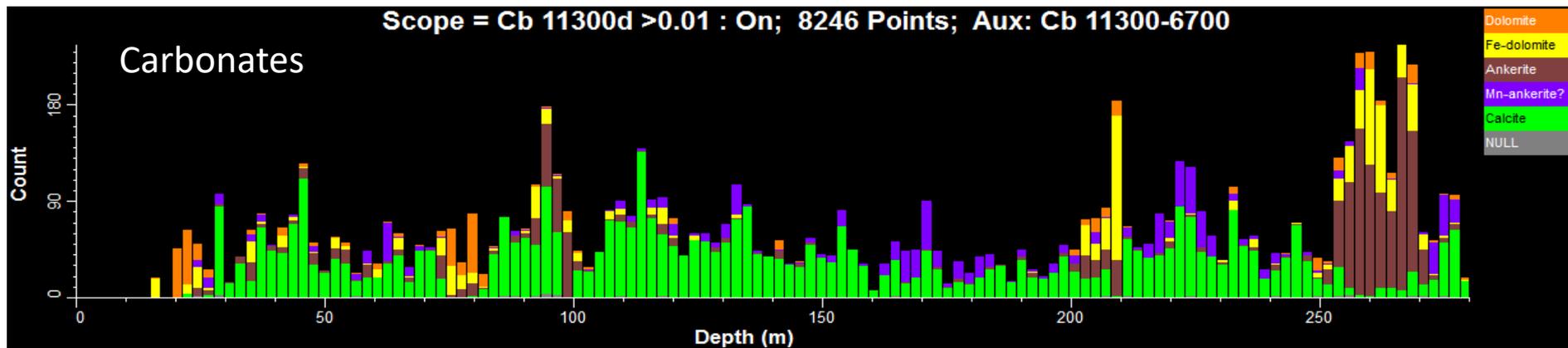
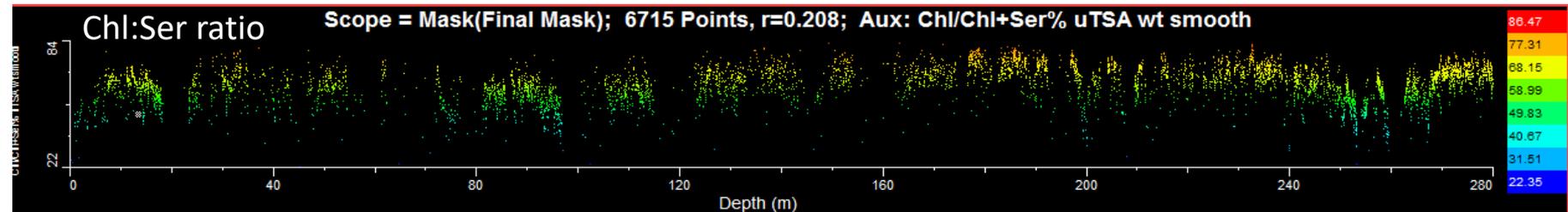
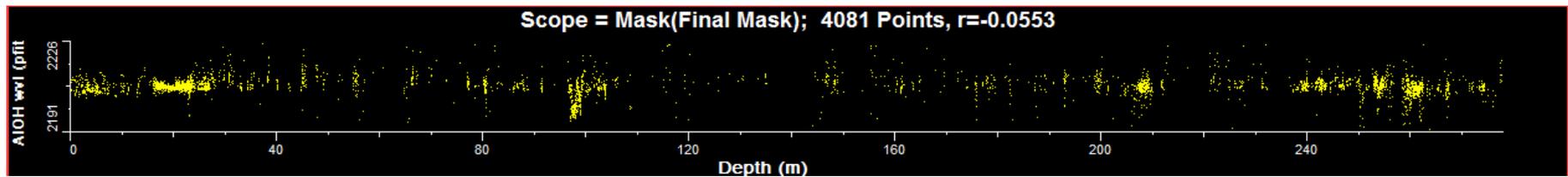
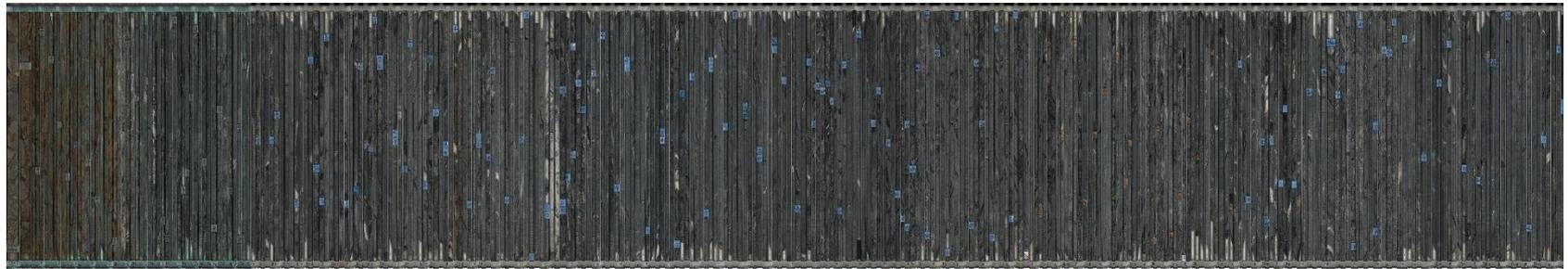
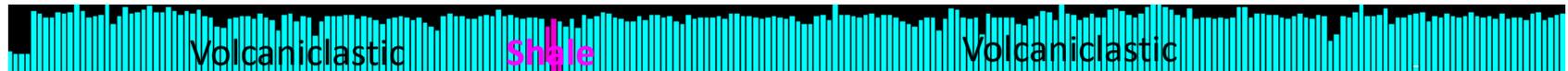
Continuous spatial variation in carbonate composition is apparent in a smoothed plot of the wavelength of the 11000nm feature (lower graph, green line). The smoothed line appears to depend on the occurrence Mn-ankerite.



LCD-04 Lode Creek - Major minerals

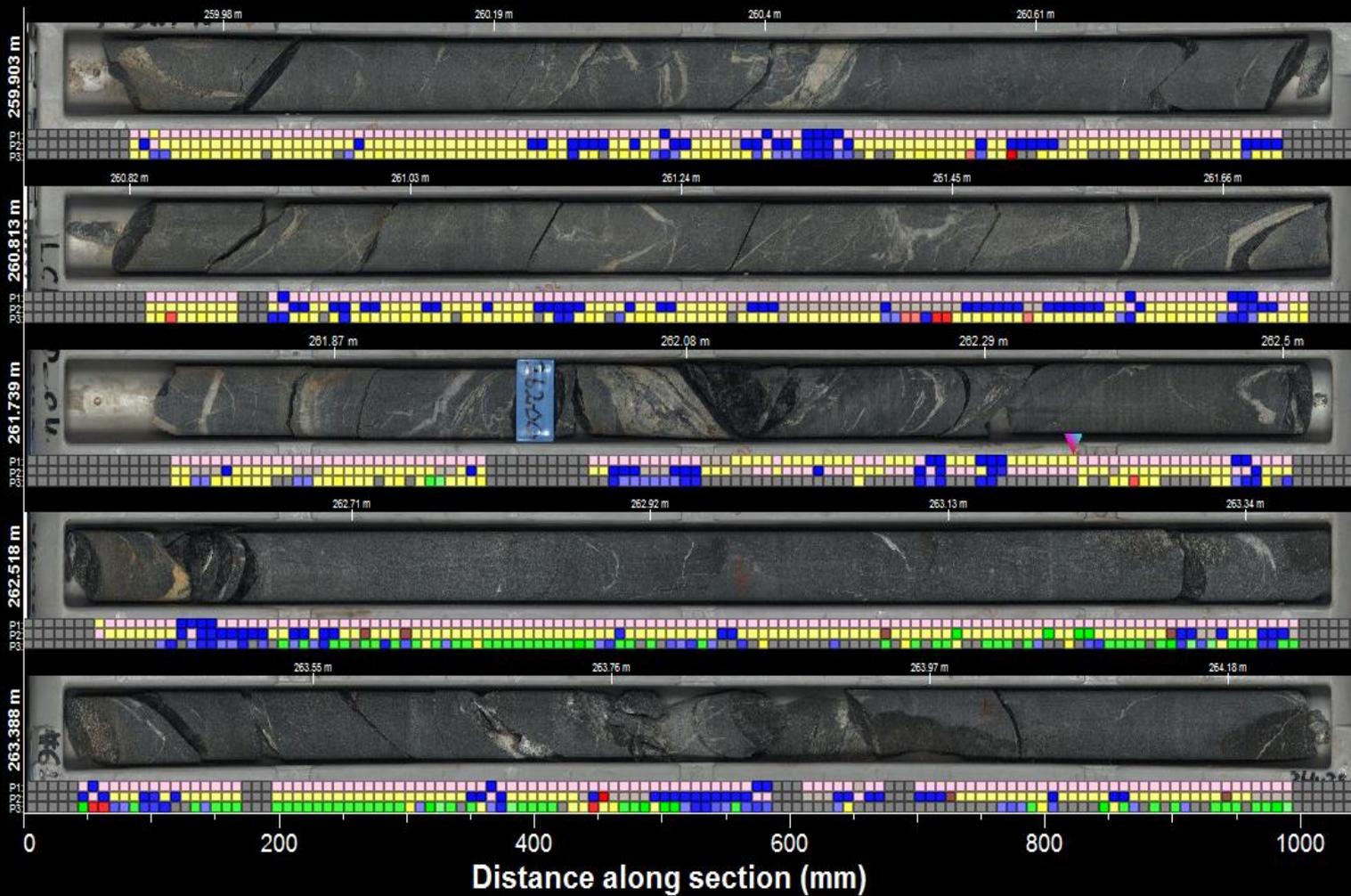


LCD-04 Lode Creek – Scalars relative to hole image



LCD-04 Lode Creek – Example tray image

37274_LCD-04_tsg_tir Tray 0064, 259.9 to 264.3 m



Plot1	Plot2
Quartz	Quartz
Muscovite	Albite
Montmorillonite	Kaolinite-ITX
Calcite	Muscovite
Dolomite	Montmorillonite
NULL	Chlorite-Pe/ig
	Siderite
	Calcite
	Dolomite
	NULL

Plot3
Dolite
Kaolinite-ITX
Kaolinite-ITX
Kaolinite
Muscovite
Paragonite
Phengite
Montmorillonite
Chlorite-Pe
Chlorite-Pe/ig
Chlorite-ig
Arsenite
Siderite
Calcite
Dolomite
Asbestos
NULL