

HyLogger Review 2025 – transitioning to a new era

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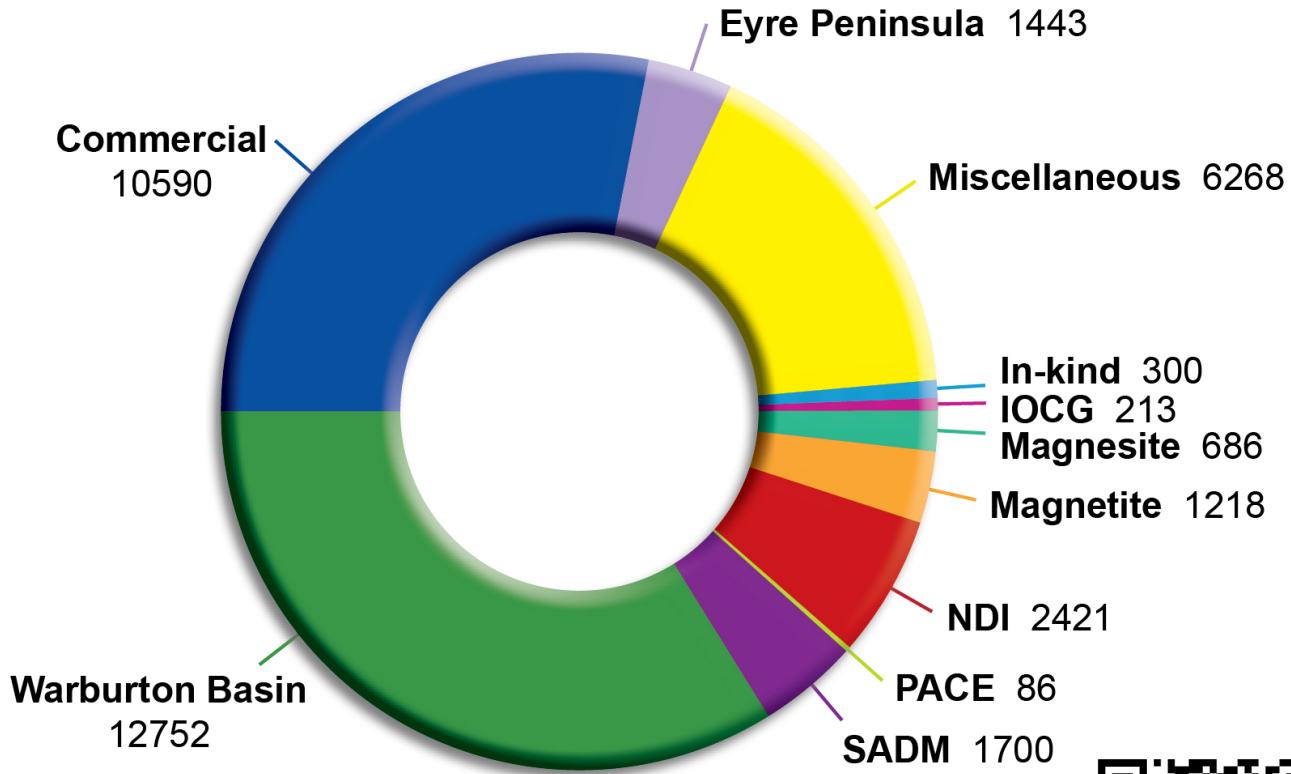
**GEOLOGICAL
SURVEY OF**
South Australia

DISCOVERY DAY

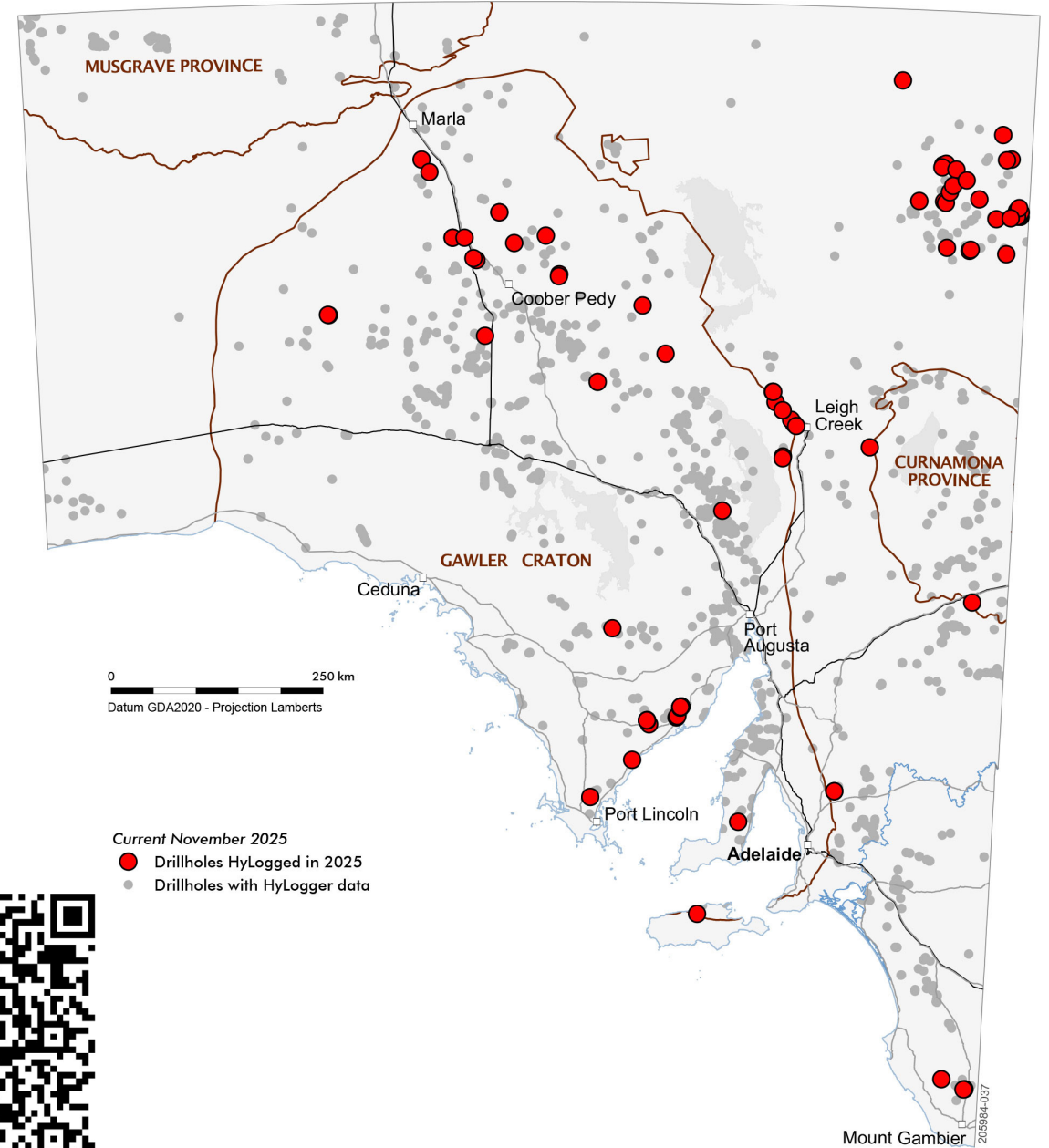


2025 Review

2025 Production: 37,677 m

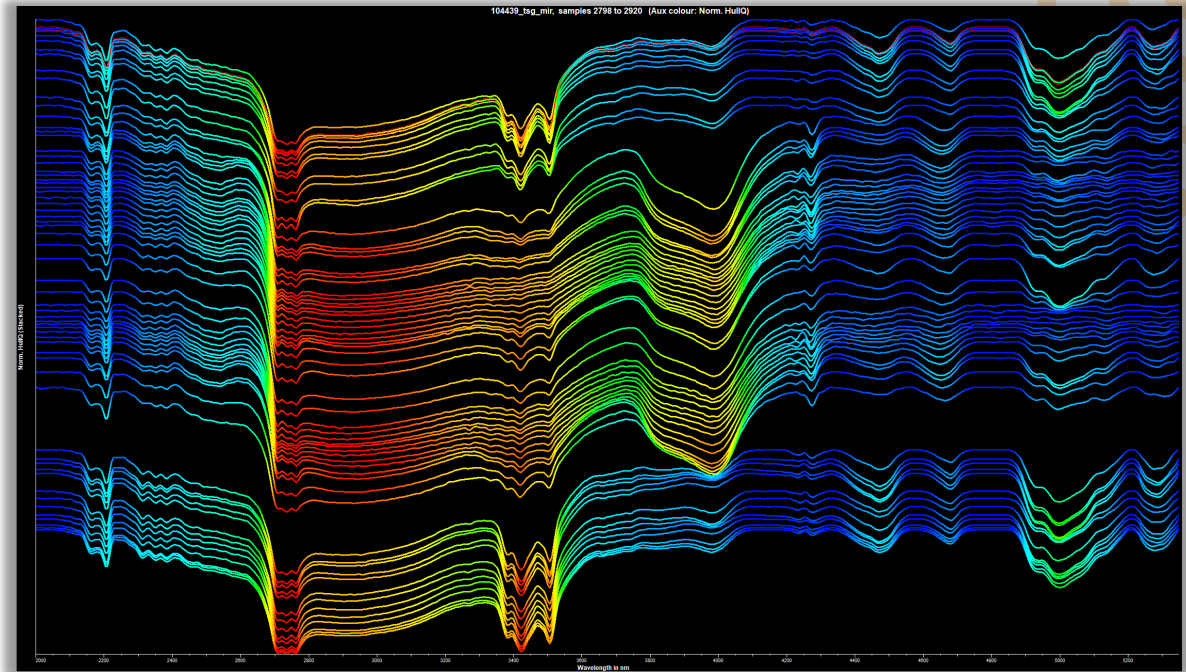


HyLogger-3 Commercial
Scanning Information



HyLogger-4 Transition

- 2025 focused on campaign scanning/testing and raising issues with engineering team
 - Exploring Mid Infrared and applications
 - All states with HL4 contributing feedback
- Initial data upload testing successful
- Some engineering improvements remain, aiming for production February 2026
- Network connectivity and data management solutions ongoing with PIRSA
 - Including architecture for delivery of high-resolution imagery



DH Ulandi 3 Mid Infrared data

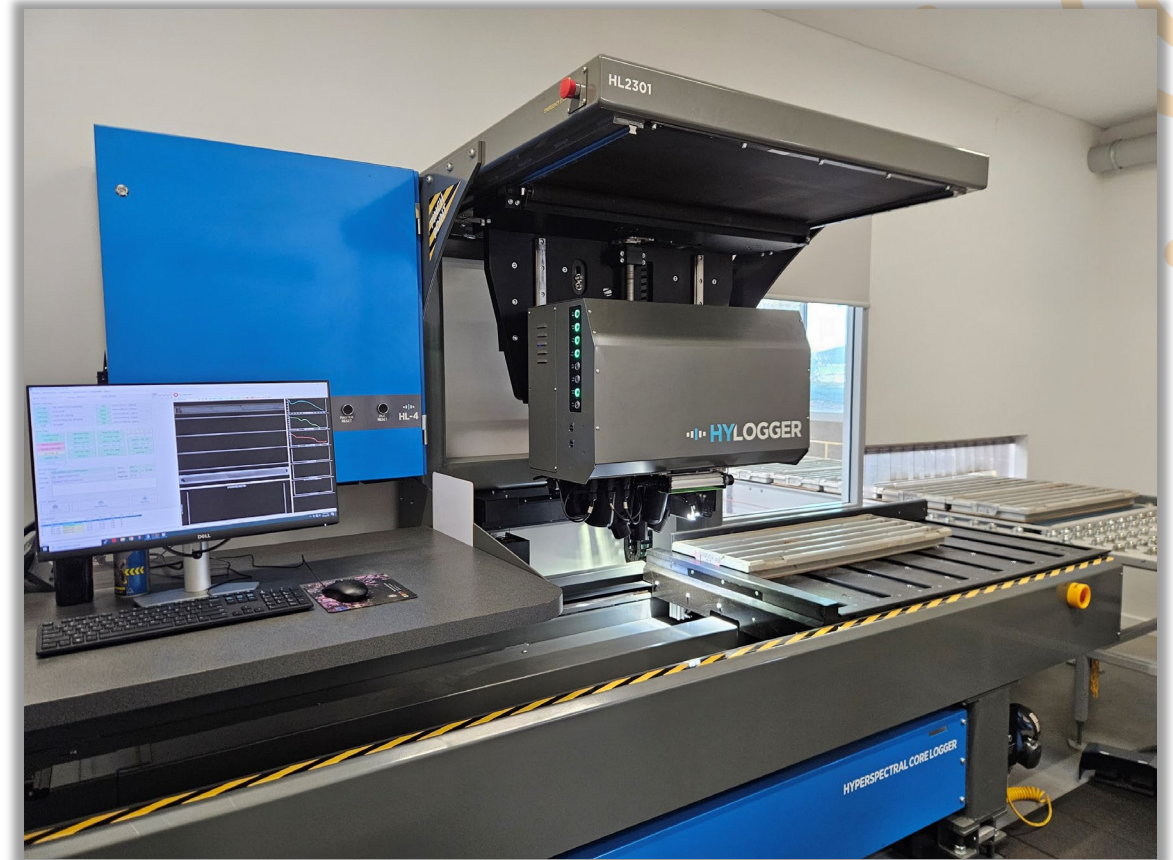


NDING_04



HyLogger-4™

- HyLogger-4™ advancements:
 - High resolution imagery: 25 µm
 - New MIR FTIR spectrometer
 - VNIR – SWIR – **MIR** – TIR reflectance data (392 – 15,000 nm)
 - 1,477 wavelength channels
 - Improved TIR spectral resolution
 - Tray weighing
 - 3D profilometer



GSWA

GSNSW

GSSA



HyLogger-4™

- HyLogger-4™ advancements:



GSSA



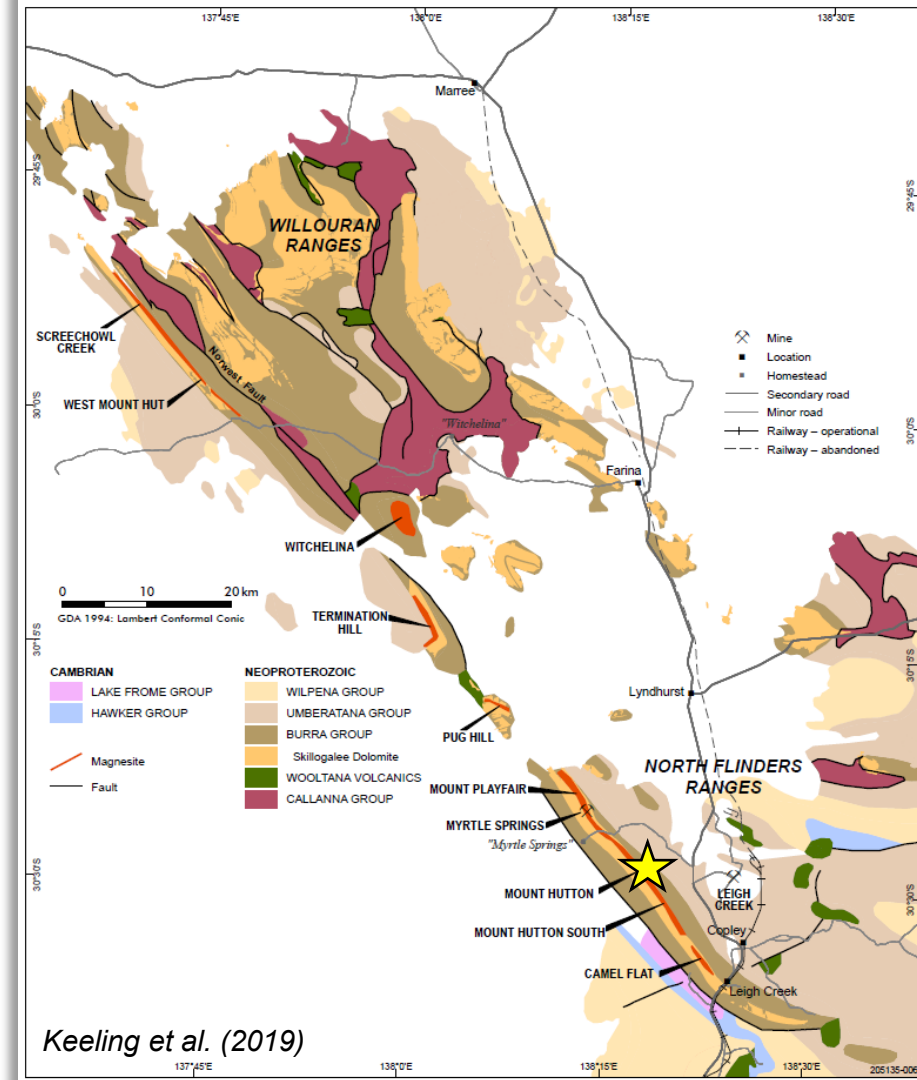
GSNSW



GSWA

Mount Hutton $MgCO_3$, SA

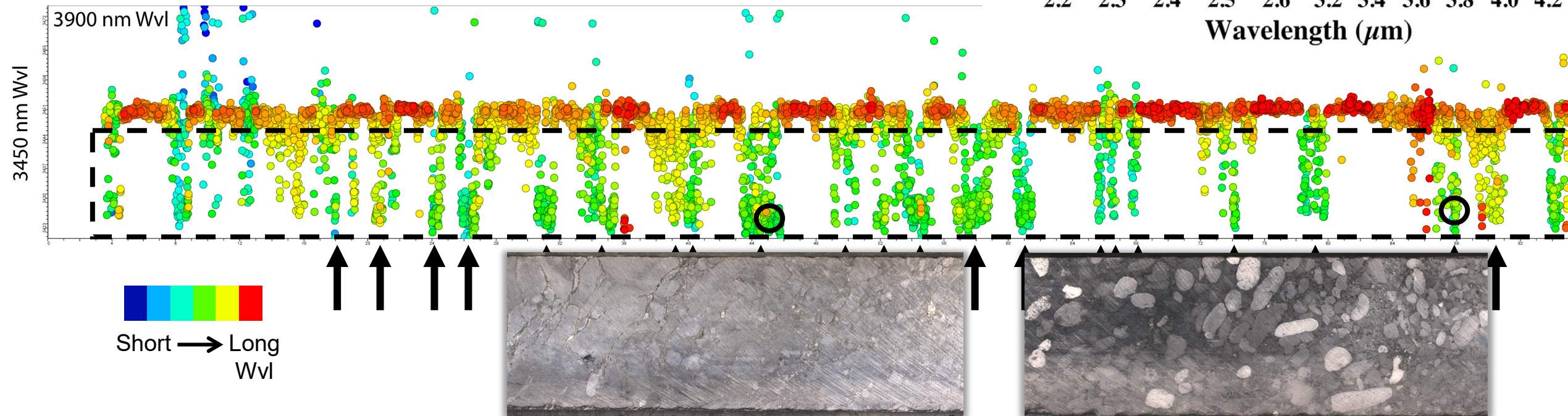
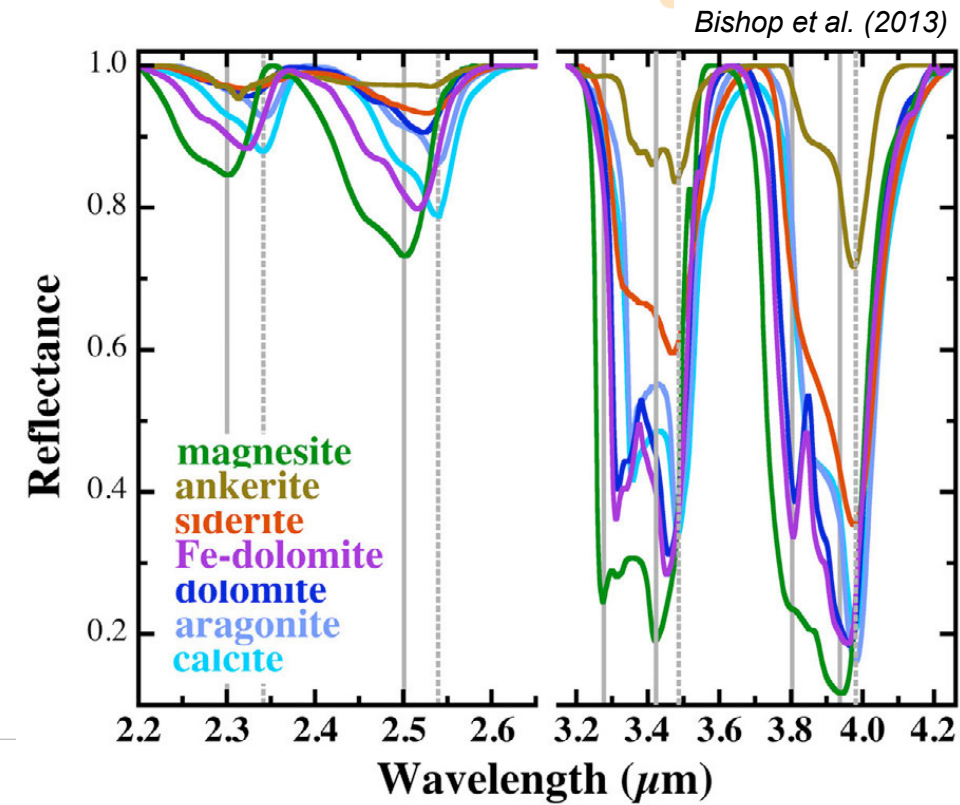
- >120 km laterally extensive magnesite beds - northern Flinders Ranges
- Renewed interest in region with critical minerals focus on Magnesium
- Hosted within Neoproterozoic Skillogalee Dolomite
- Lithological sequence of dolomite, magnesite, siltstone and sandstone
- 25 magnesite beds identified with thicknesses from 0.3 - 2.6 m
- MgO grade: 38 – 45 %
- Talc present throughout deposit



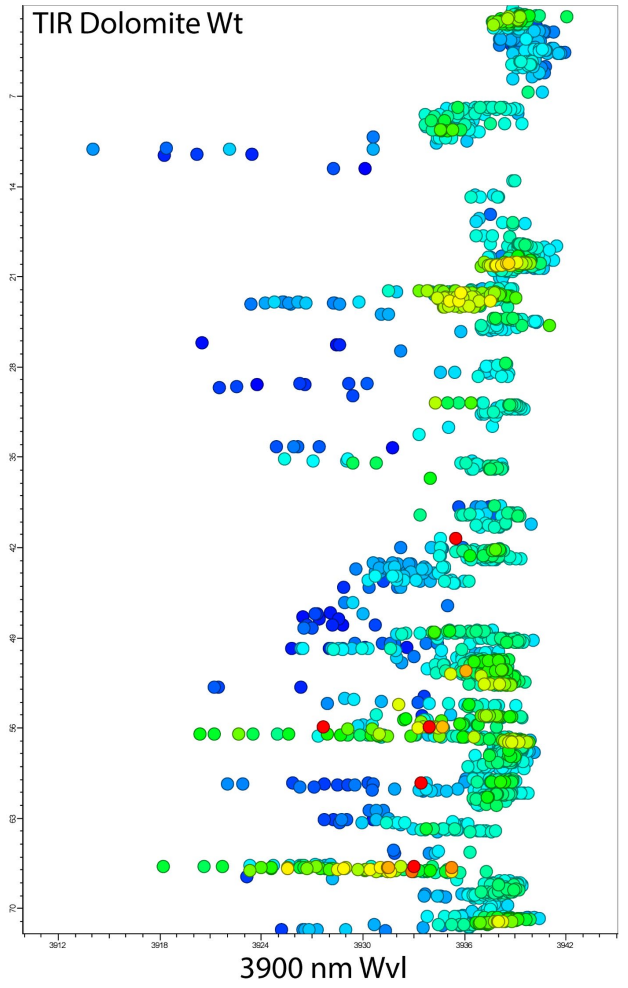
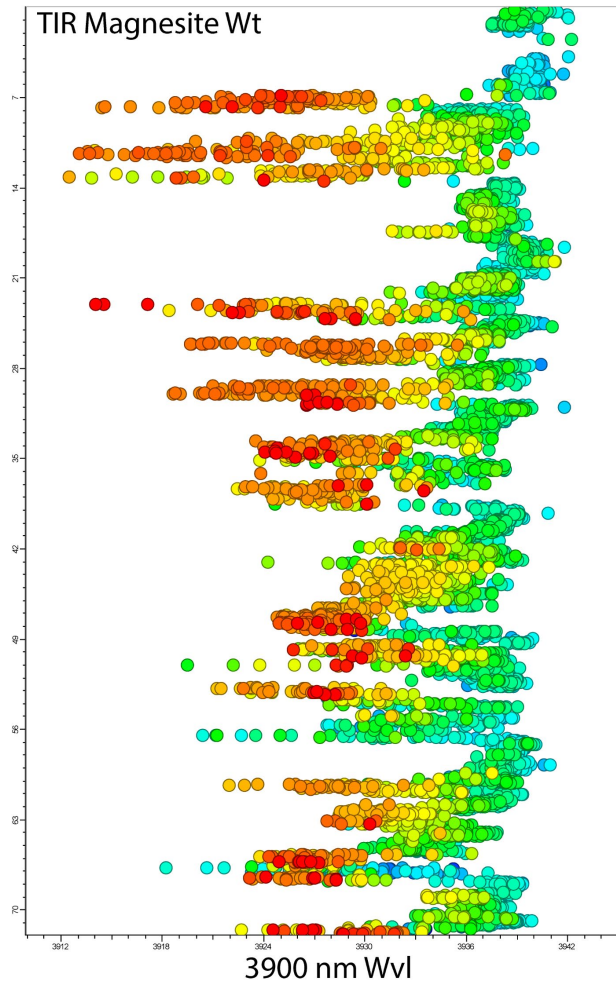
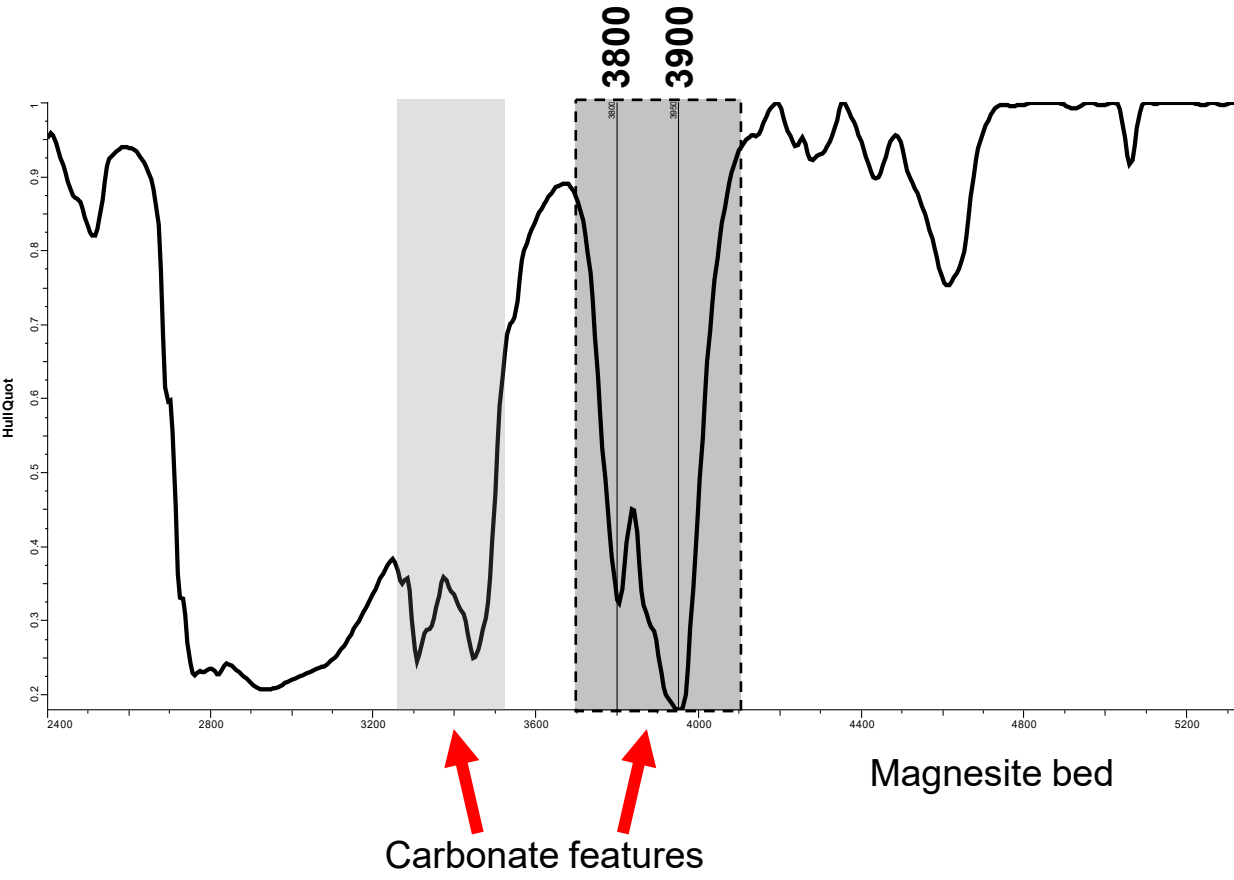
Examples of magnesite beds within drill hole MHDDH08

MIR Carbonate Compositional Variation

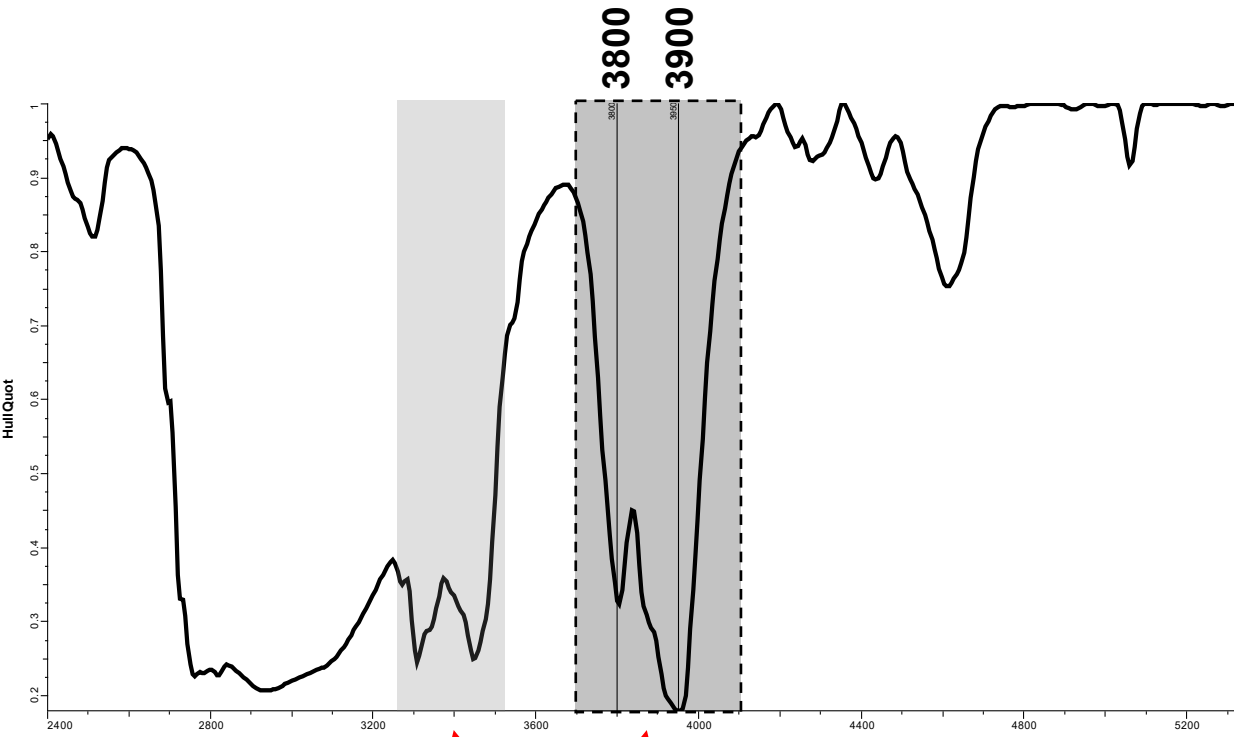
- ~3270, 3480, 3800, 3930 nm MIR doublet features
- Shorter wavelengths for Mg-rich carbonates (Bishop et al. 2013)



MIR Carbonate Confidence

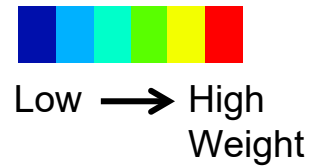
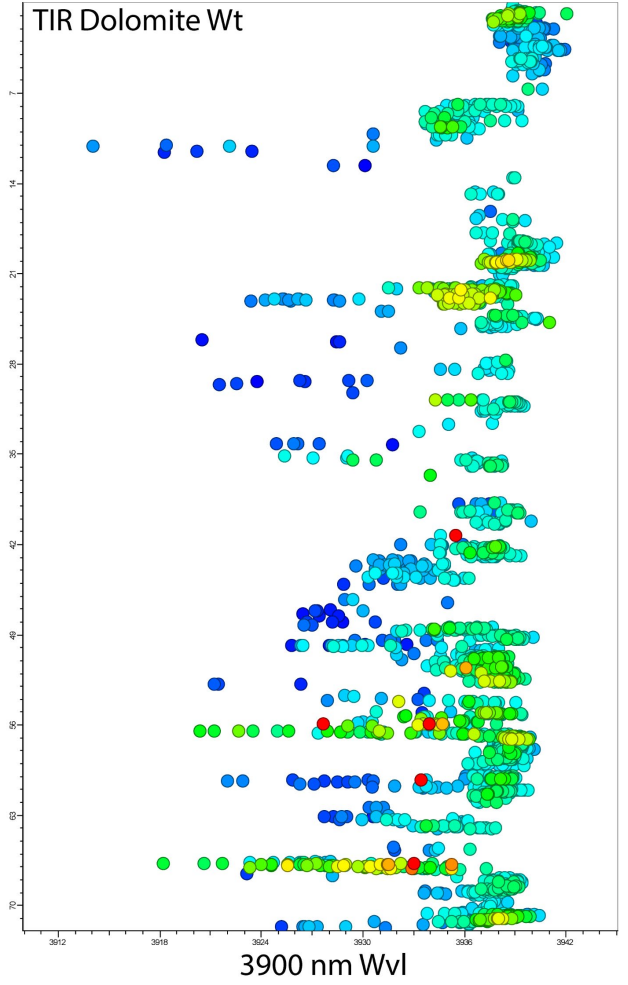
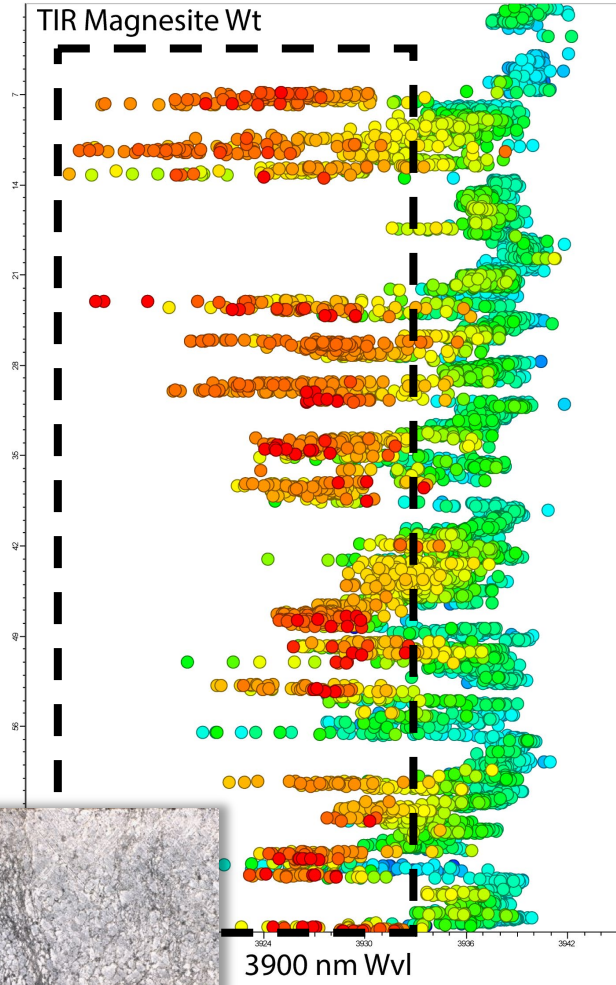


MIR Carbonate Confidence

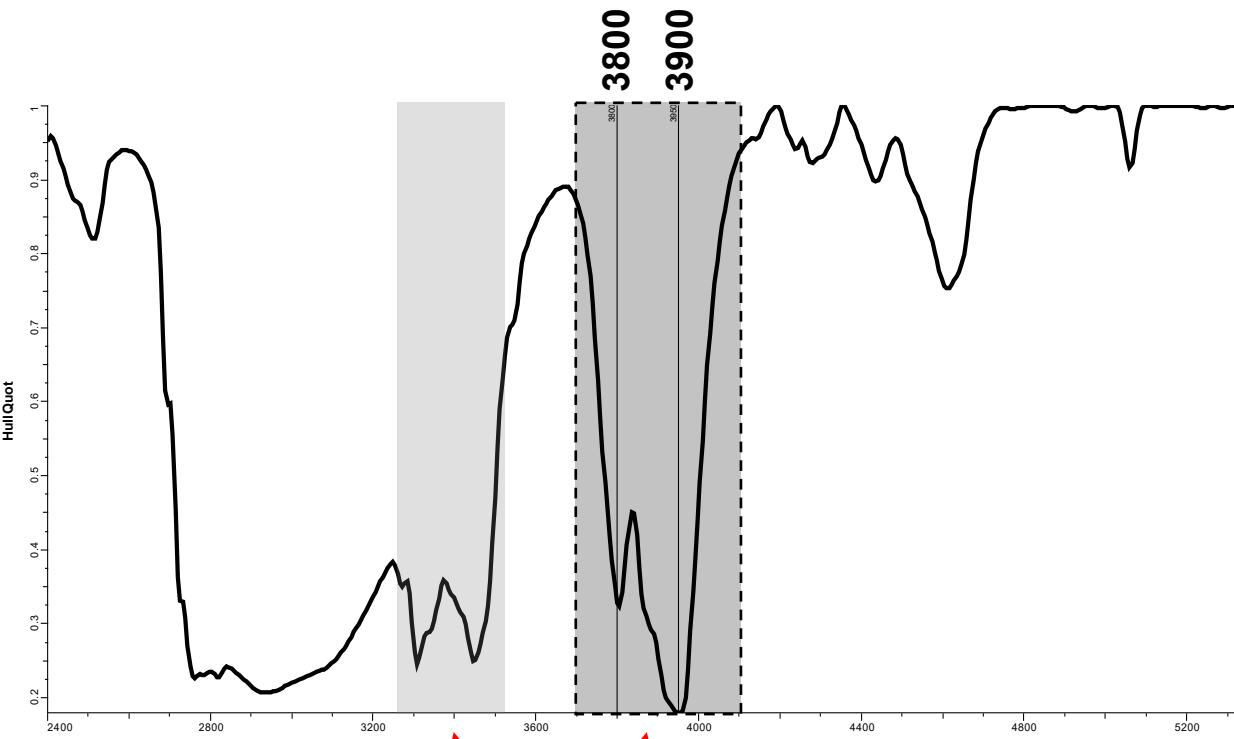


Carbonate

Magnesite bed

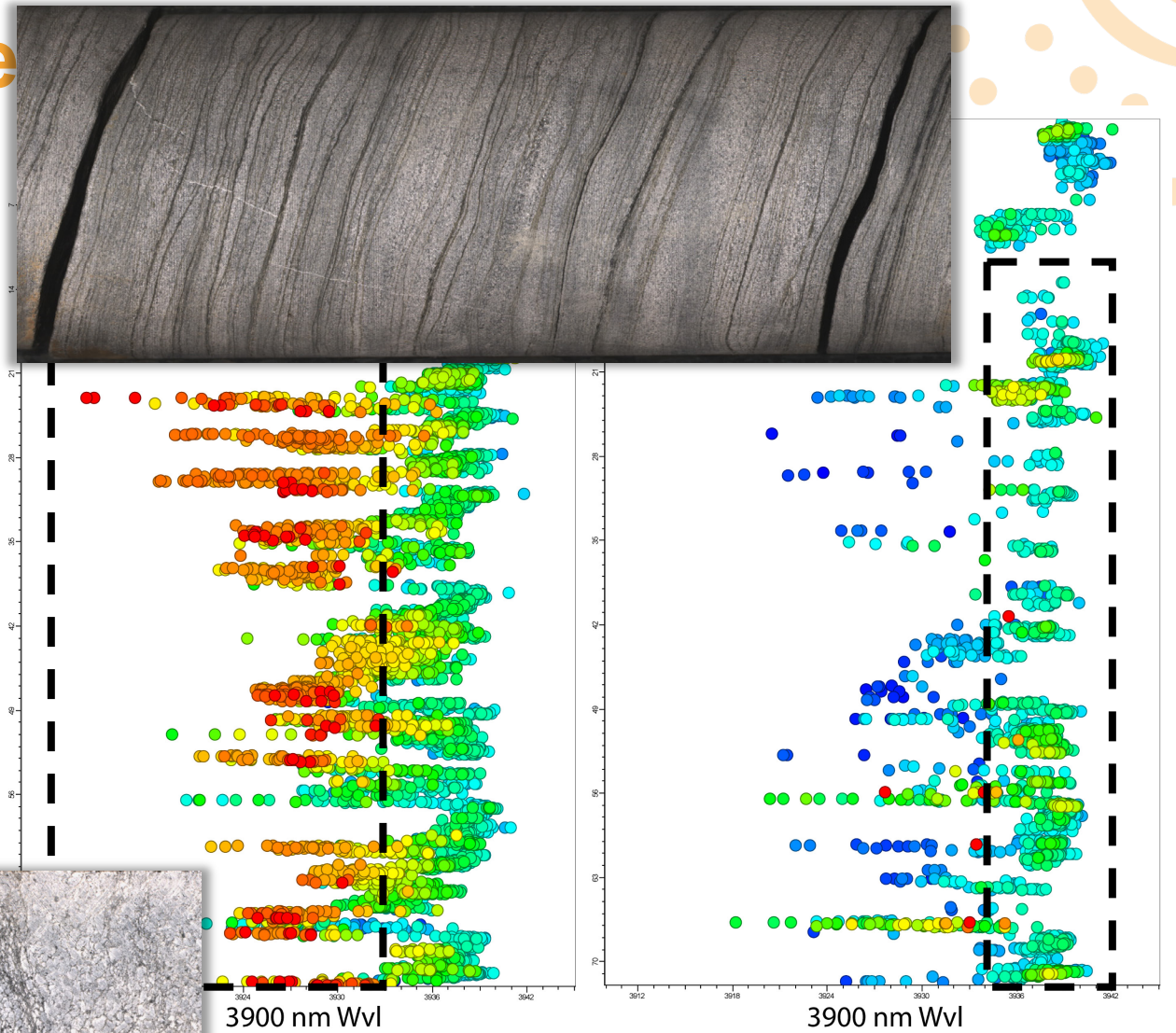


MIR Carbonate Confidence



Carbonate

Magnesite bed



Dolomitic siltstone

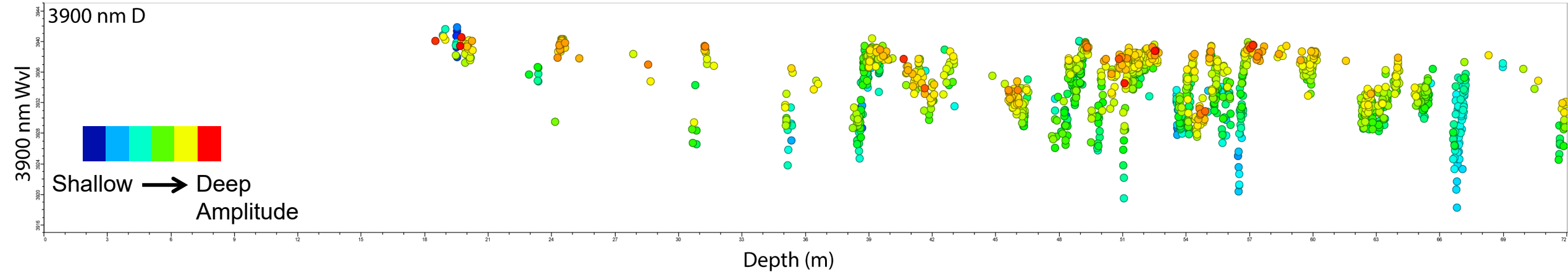
3900 nm Wvl

3900 nm Wvl

Low → High
Weight

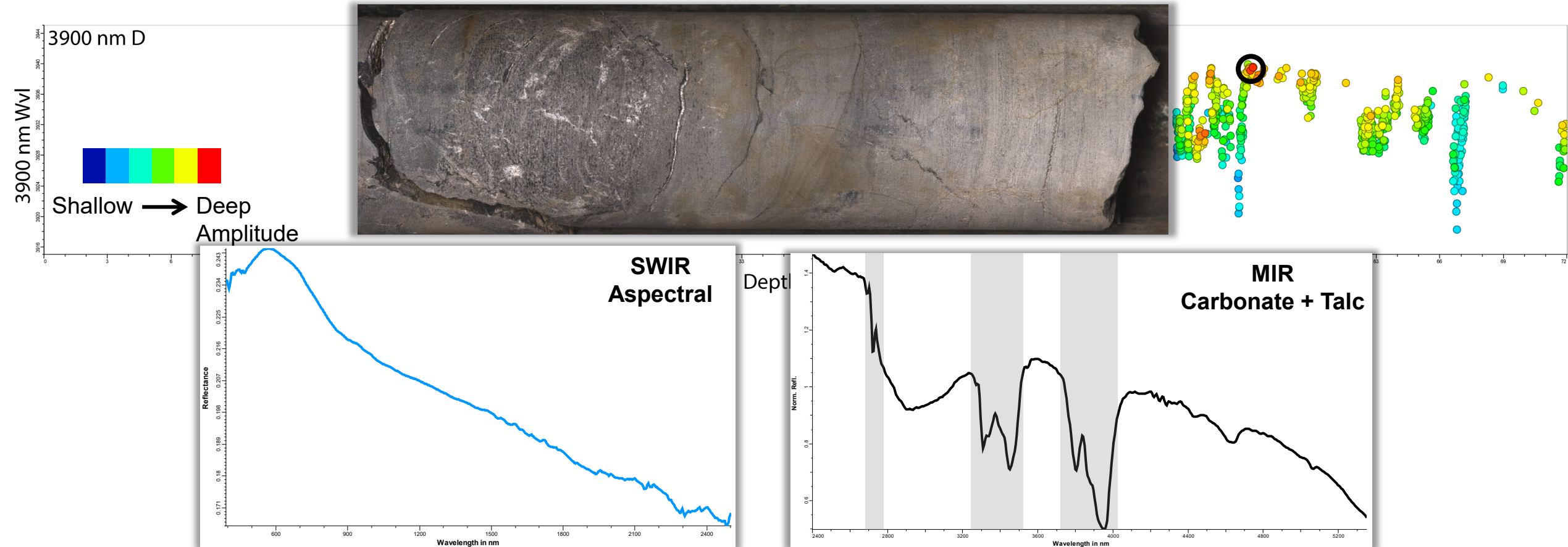
'Aspectral' Carbonates

- Sometimes SWIR spectra show no features (ie. aspectral) due to organics or dark material
- SWIR aspectral data – MIR is not aspectral and provides mineralogical information



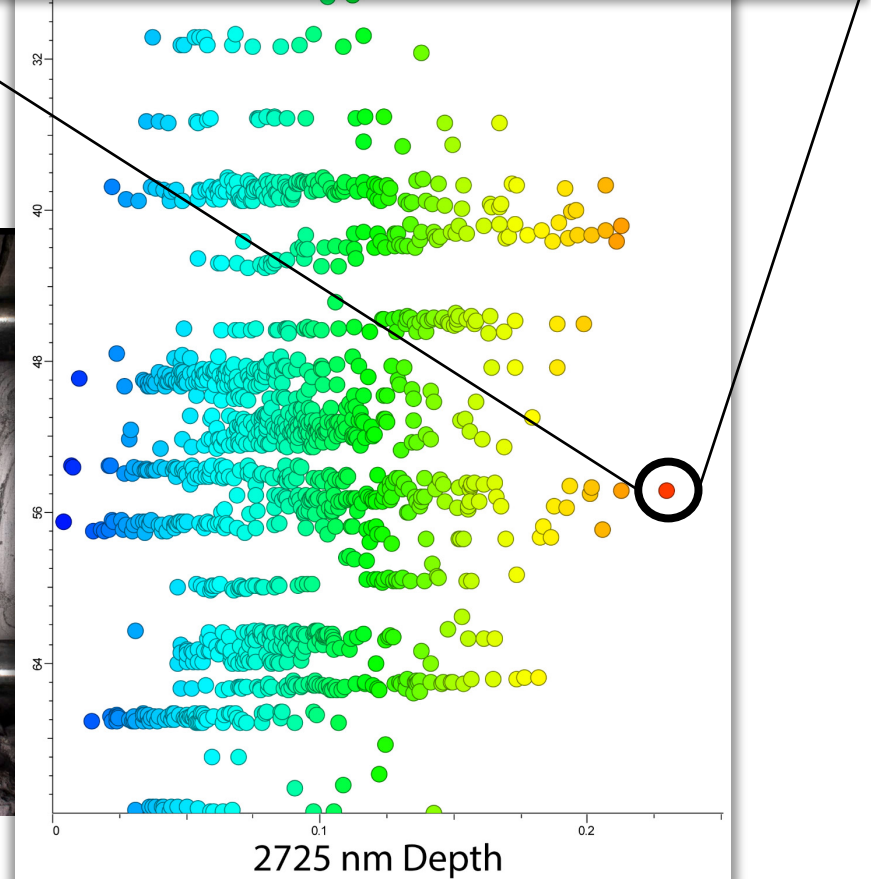
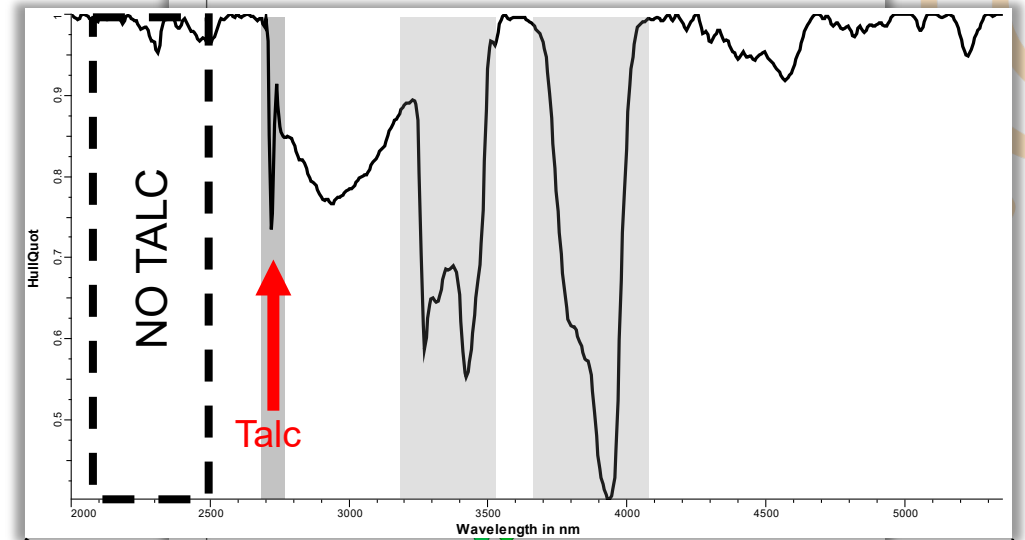
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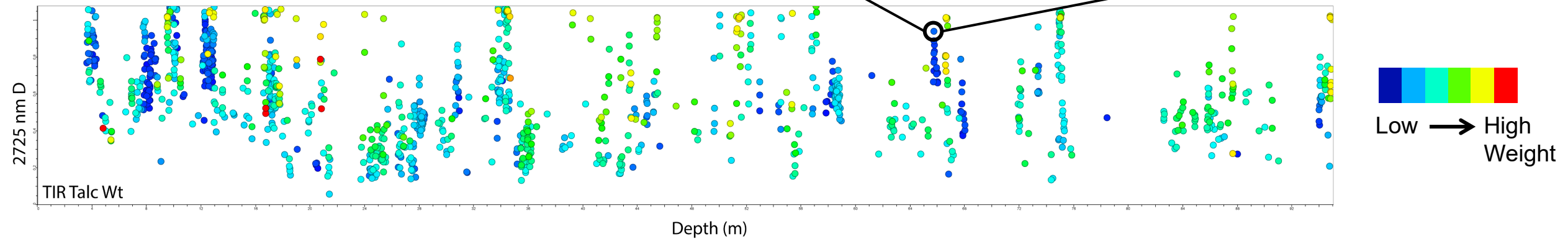
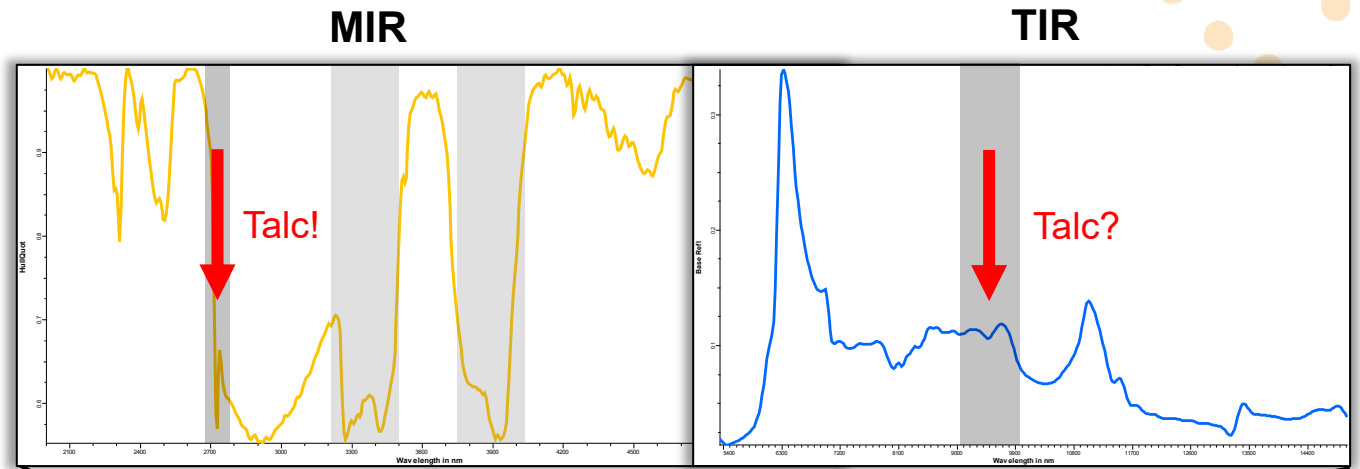
MIR Talc Identification

- Carbonate and talc mixtures present
- Known diagnostic features of ~2390 nm (SWIR) and 9500 nm (TIR)
- Can now include 2725 nm Talc-OH feature (MIR)
- SWIR spectral features can also be resolved

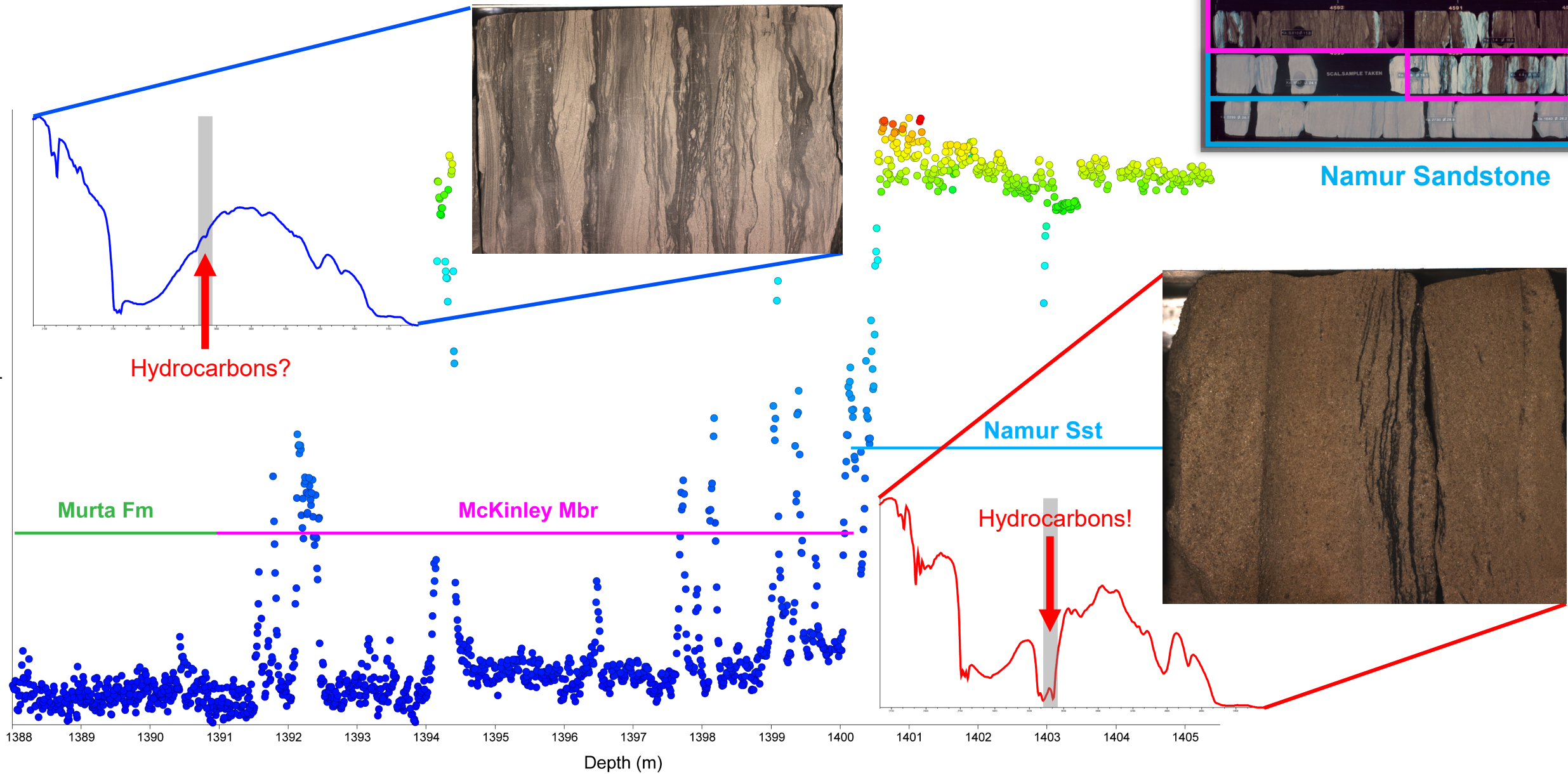


Magnesite-Talc Mixtures

- Mixtures are difficult - MIR can help resolve
- MIR sensitive to presence of Talc
- MIR sometimes less ambiguous than TIR

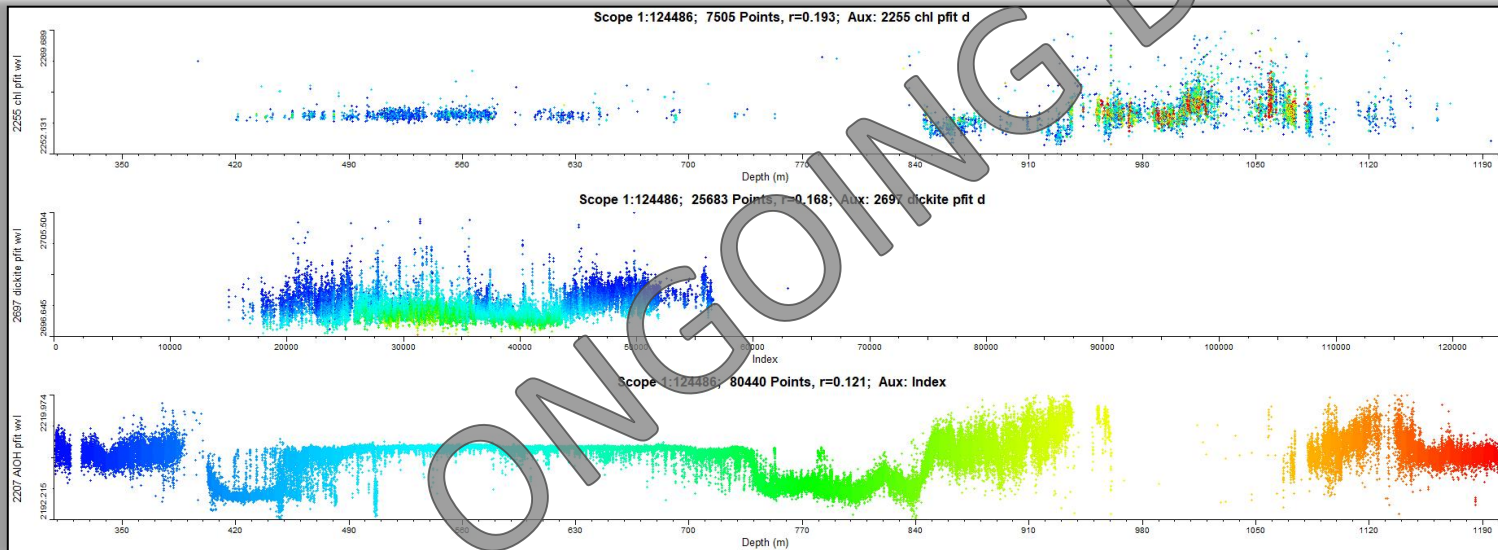
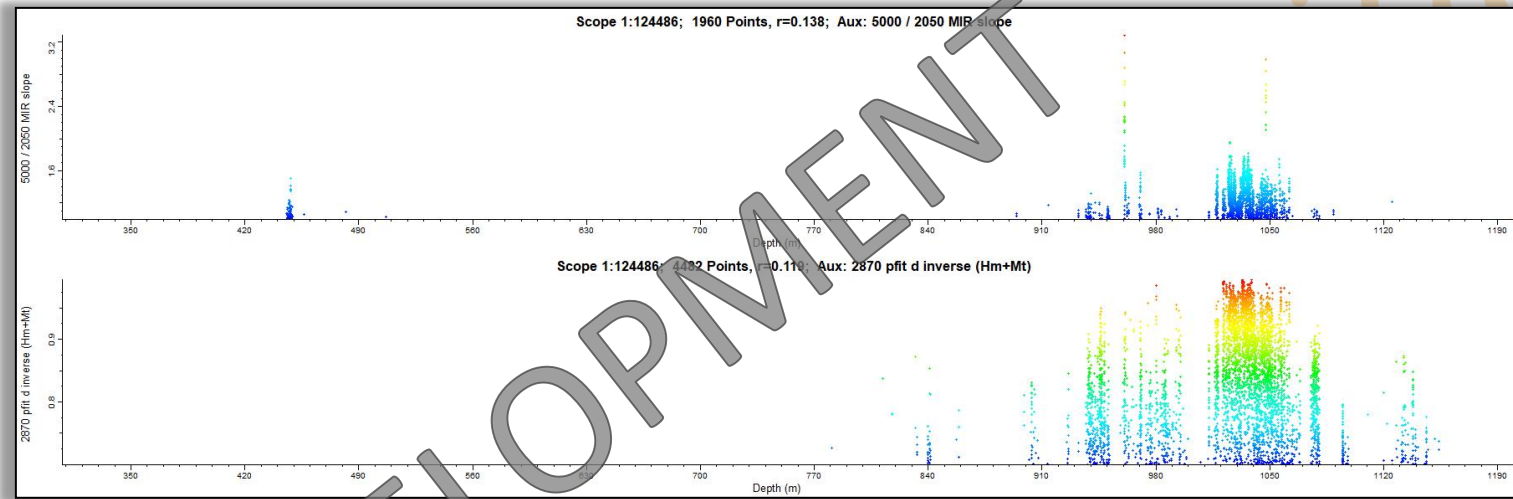


MIR - Oil Shows



Future Work

- Developing algorithms and methods to interrogate MIR for various applications
- Hardware and software development ongoing



Mineral Group	Mineral Species (Examples)	Assignment of Absorption	Lower Limit (nm)	Upper Limit (nm)	Literature	Intensity Script	Wavelength Script
all hydroxylated minerals		vOH	2667	5000	[23,65]	-	-
di-oct. sheet silicate	kaolin group	vOH	2705, 2725, 2738, 2761		[41]		
di-oct. sheet silicate	white mica	vOH	2677, 2762, 2775, 2799, 2807		[58]		
tri-oct. sheet silicate	dark mica	vOH	2668, 2677, 2680		[68]	2830D	2830W
di-/tri-oct. sheet silicate	white and dark micas	vOH	2810 (Mg-rich)	2853 (Fe ²⁺ -rich)	[69,70]		
double chain silicate	amphibole	vOH	2723 (Mg-rich)	2759 (Fe ²⁺ -rich)	[67,71]		
cyclosilicate	tourmaline	vOH	2675 to 2890		[49,72]		
iron oxides	goethite	vH-O-H	2899	2903	[66]	-	-
di-oct. sheet silicate	Al-smectites	vH-O-H	2946 (Mg-rich)	2987 (K-rich)	[73]	-	-
all H ₂ O-bearing minerals		vH-O-H		3000	[74]	3000D	-
iron oxides		vOH	3113	3131	[66]	-	-
cyclosilicate	tourmaline	2vBO ₃		3704	unpublished	-	-
cyclosilicate	tourmaline	2vBO ₃		3811	unpublished	3800D	3800W
carbonate	carbonate	2vCO ₃ v + vCO ₃	3930	4150	unpublished	4000D	4000W
tectosilicate	quartz	2vSiO		4470	unpublished (inferred from [75])	4470D	-
tectosilicate	quartz	2vSiO		4670	unpublished (inferred from [75])	-	-
phosphate		2v ₃ (PO ₄)		4805	unpublished	-	-
tectosilicate	quartz	2vSiO		4920	unpublished	-	-
sulphate	jarosite	2v ₃ (SO ₄) ²⁻ , 2d(OH)		4960	[35]	4500D	4500W
sulphate	jarosite	2v ₃ (SO ₄) ²⁻ , 2d(OH)		5099	[35]	-	-
tectosilicate	quartz	2vSiO		5330	unpublished	5330D	-
di-oct. sheet silicate	kaolin group	2vSiO		5480	unpublished	5480D	-

Laukamp et al. (2021)

The 2026 Era

- Supporting internal projects:
 - Eyre Peninsula
 - SADM eastern Gawler Craton mapping
- Scanning new legacy drill holes donated to Core Library:
 - Olympic Dam
 - Oak Dam West
 - Hillside
- Commercial scanning available
- Planning HyLogger-3 production end-of-life - completion of incomplete datasets
- Improving and streamlining internal workflow using automation
- Exploring applications across various mineral systems with HyLogger-4
 - Ongoing work with Epiroc engineering team

**More wavelengths,
more minerals,
more clarity.**



HyLogger-3 Commercial
Scanning Information

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Acknowledgement of Country

As guests here on Kurna land, the Department for Energy and Mining (DEM) acknowledges everything this department does impacts on Aboriginal country, the sea, the sky, its people, and the spiritual and cultural connections which have existed since the first sunrise. Our responsibility is to share our collective knowledge, recognise a difficult history, respect the relationships made over time, and create a stronger future. We are ready to walk, learn and work together.



DISCOVERY DAY

