Leveraging real time assays and global connectivity for exploration success
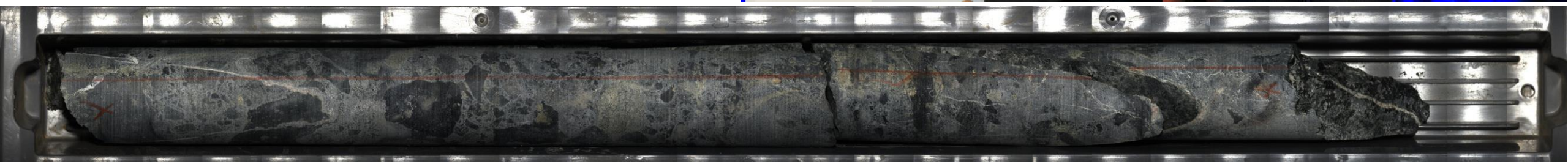
Dr. Sasha Krneta

20/03/2019

Overview

- What is the TruScan?
- What does it do?
- How does it do it?
- What data is generated?
- How do I get the data?
- How do I use the data?
- What is the value proposition?
- What does the future hold?

What is the TruScan?

- Automated core/chip[1] imaging and XRF-analysis system housed in a mine specification compliant trailer.

- Deployable in a number of ways (BLY drill crew, TruScan technicians or client staff during long deployments.

- As comfortable in the field as it is in a core yard.

- Provided internet connectivity is available core images can be delivered instantly and the geochemical data once per day[2].

1*Chip scanning developments are ongoing and results up until now have been excellent

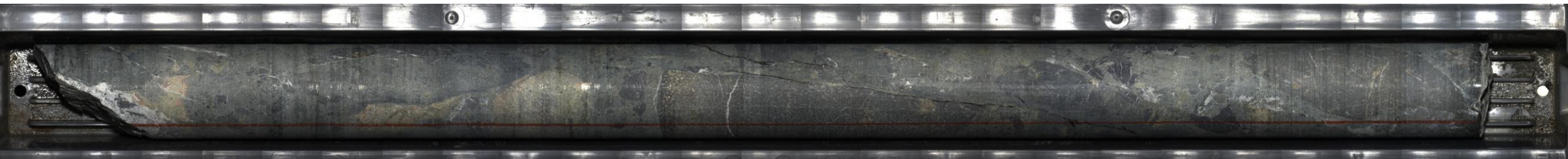2*Soon to change to instantly

What does it do?

Provides high-definition images and XRF- geochemical data on freshly drilled or legacy core.
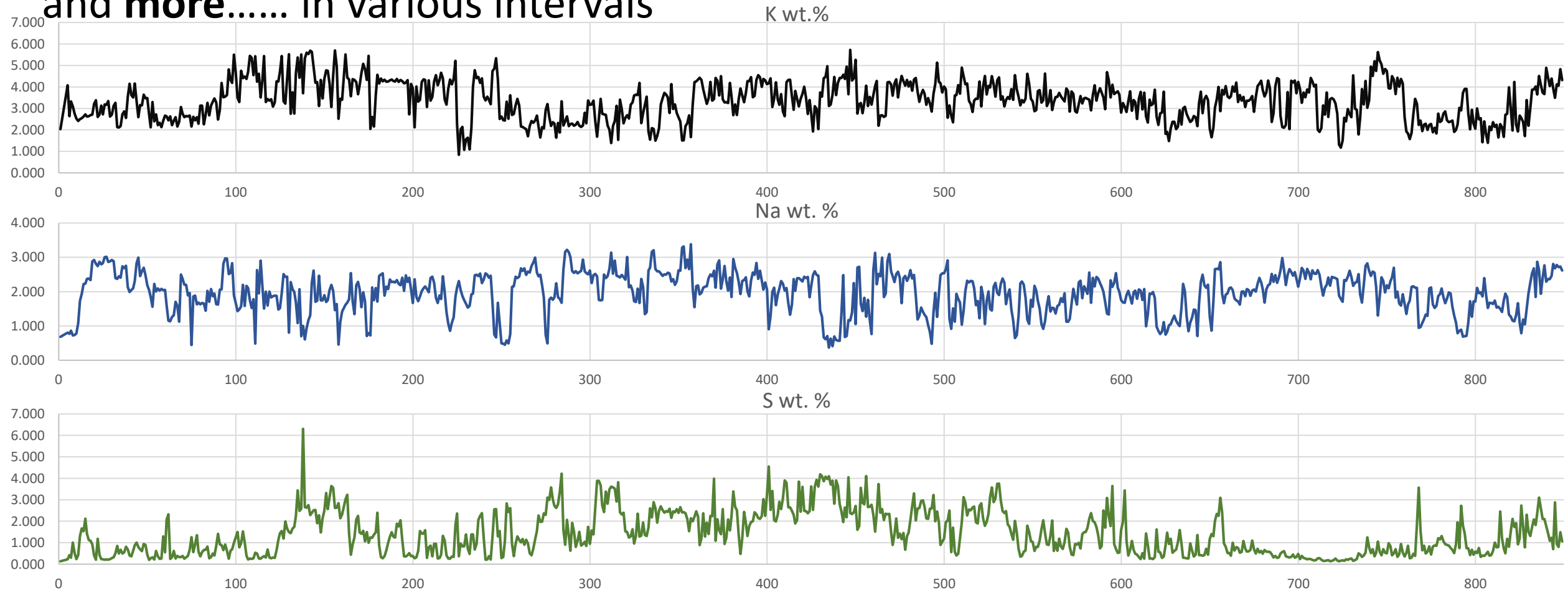
DRY, WET and Close-up images are taken, saved and transferred

What does it do?

- Delivers geochemical data from Li to U and **more**...... in various intervals

1 m average data

How does it do it?

- Standard unit operation involves scanning the core with two phases

- Phase 1 focuses on the light elements Li-Cr in a He atmosphere

- Phase 2 focuses on the heavy elements Mn-U

- Scanning is tailored to customers needs and the information needed >>> dictates throughput and cost/m (very competitive rates and best results)
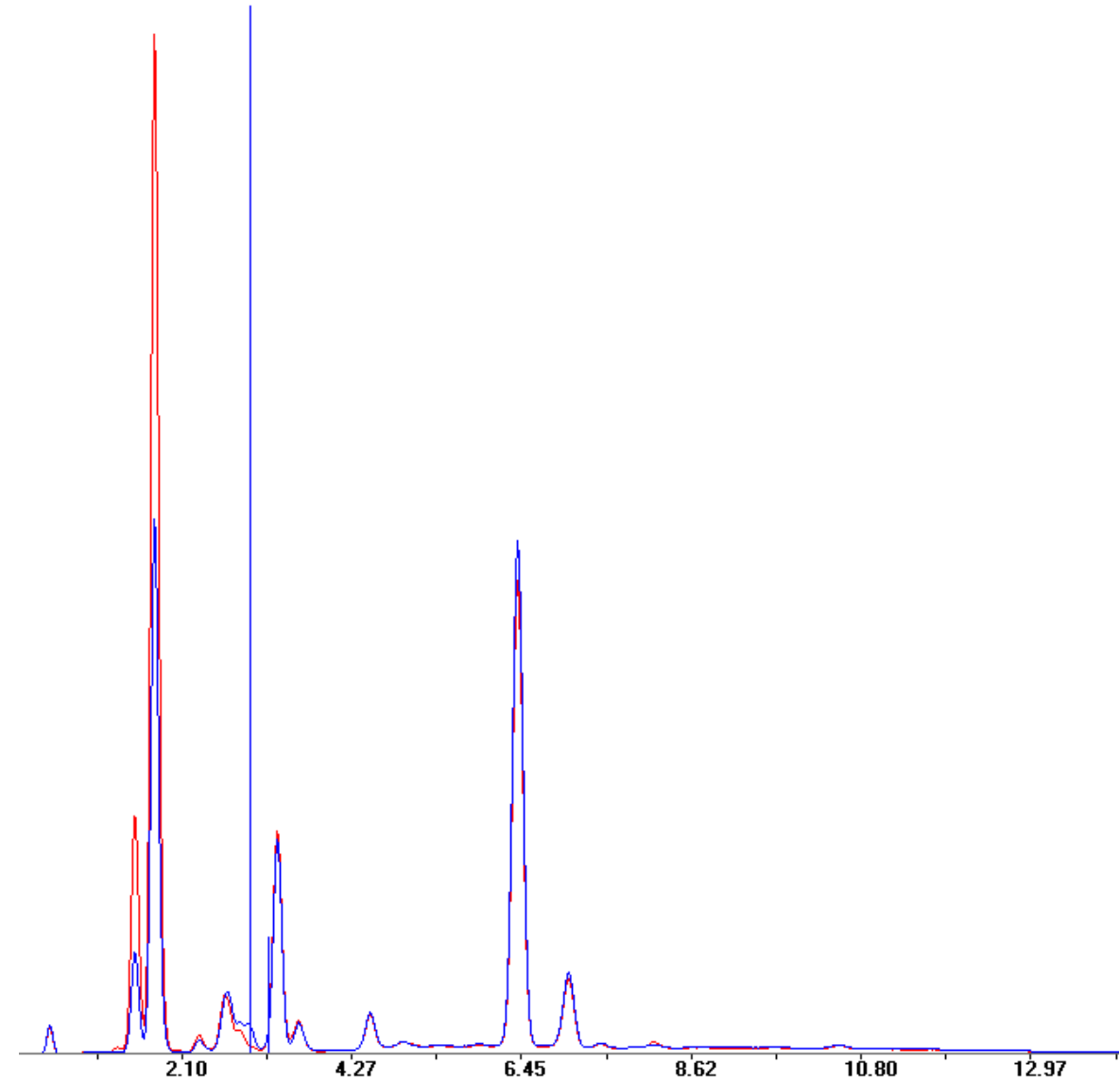
How does it do it?

Scanning is tailored to customers needs

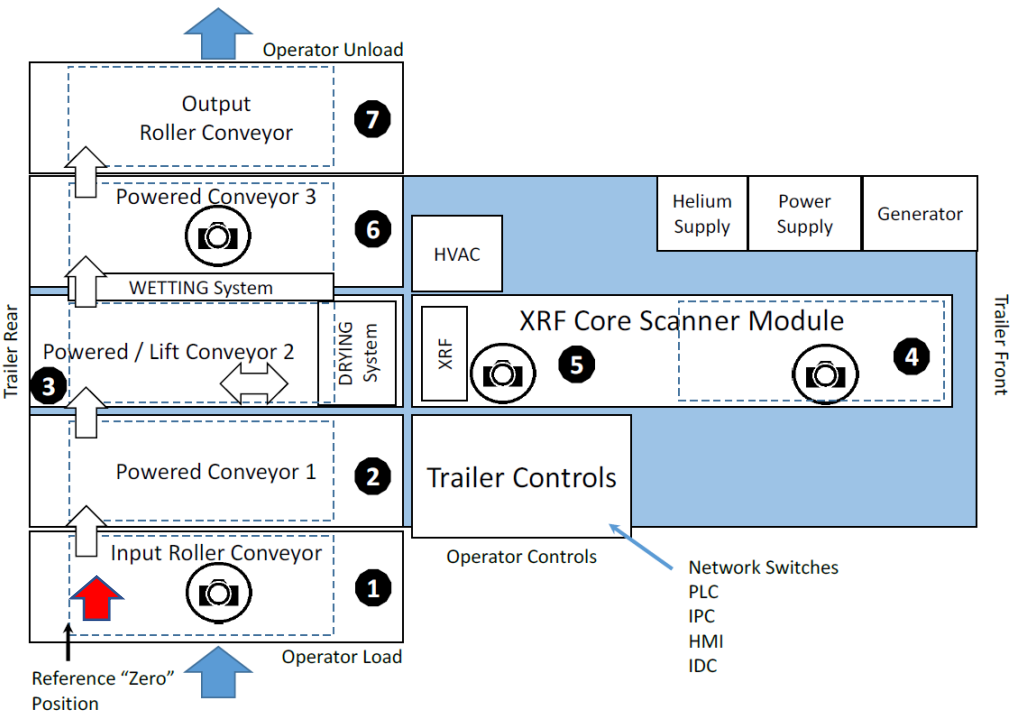X-interval and scan speed is varied to give good dwell time and signal to noise ratio.

X=100mm

Speed=7mm/sec

Most common settings

How does it do it?

Operator Unload

| Output Roller Conveyor | ❼ |

Powered Conveyor 3 — ❻

| HVAC | | Helium Supply | Power Supply | Generator |

WETTING System

XRF Core Scanner Module

XRF — ❺ — ❹

Powered / Lift Conveyor 2 — ❸

DRYING System

Trailer Rear

Trailer Front

Powered Conveyor 1 — ❷

Trailer Controls

Operator Controls

Network Switches
PLC
IPC
HMI
IDC

Input Roller Conveyor — ❶

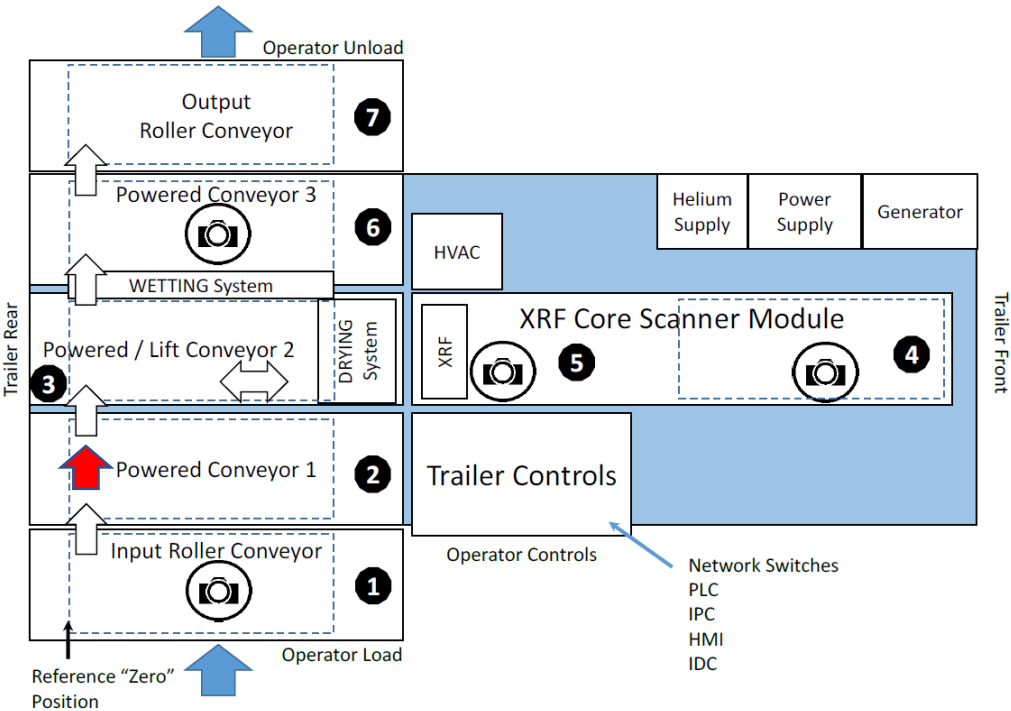Reference "Zero" Position

Operator Load

Core is loaded onto rollers and critical information is recorded (tray number, start and end)

Meter marking is performed by our techs or by clients employees
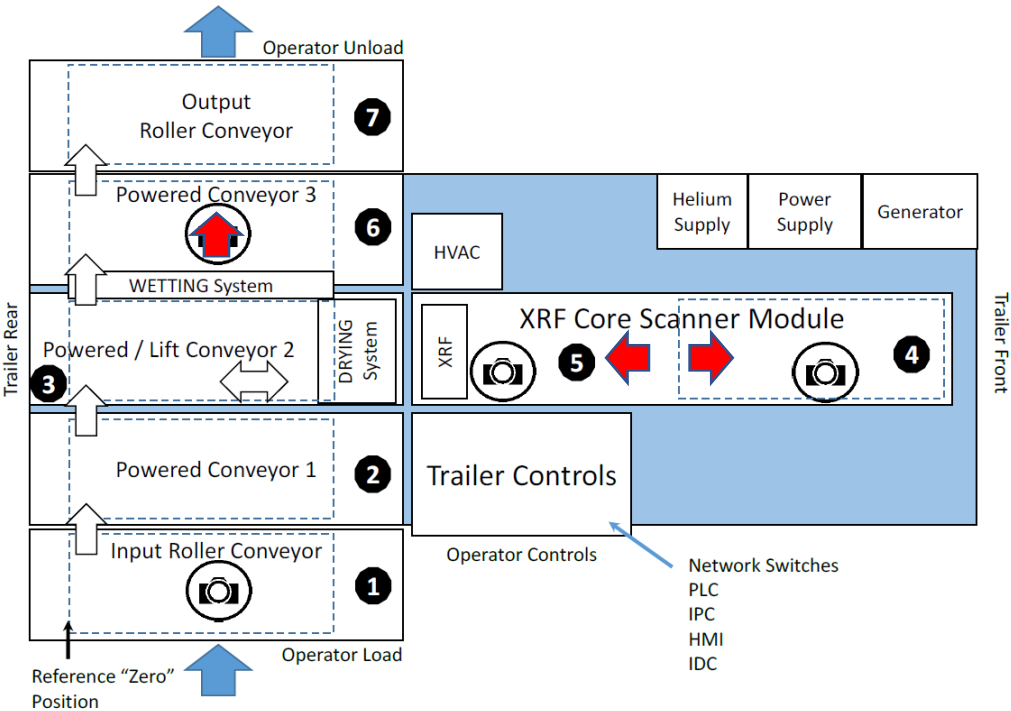
How does it do it?

Scanned core needs to be "tagged" as inclusion or exclusion.

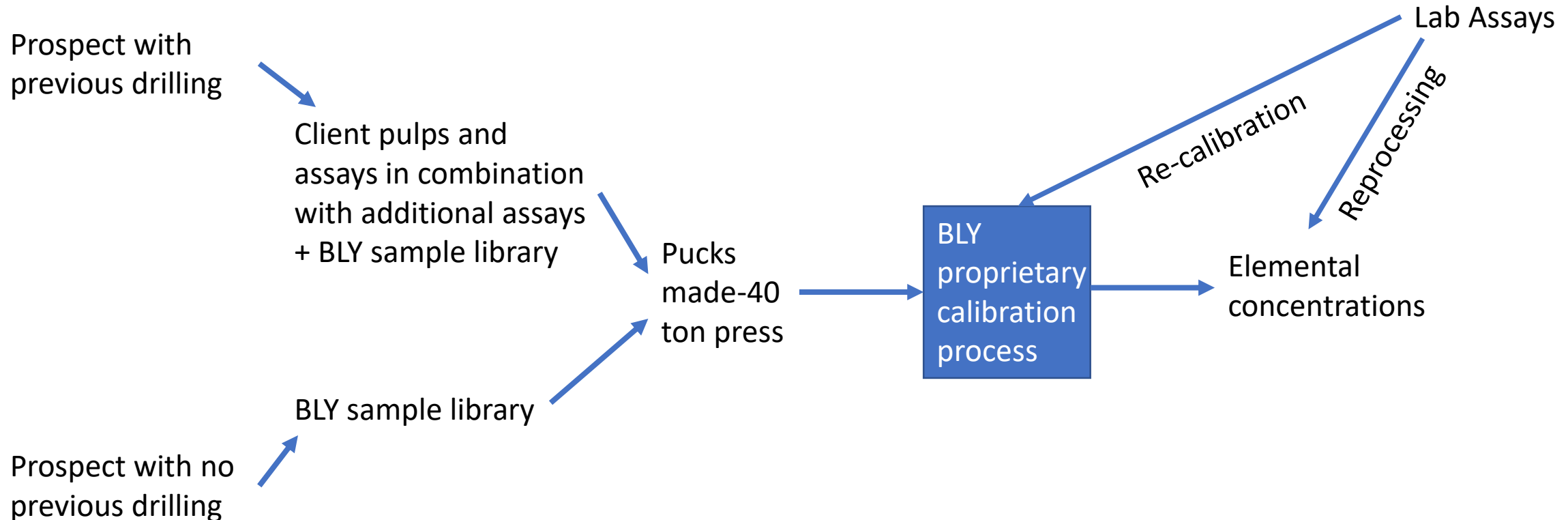Core loss is accounted for

Core is dried

How does it do it?

Dry image taken

Sample images taken

Core is scanned

Wet image taken

How does it do it?

Data validation and processing of spectra from raw-counts to elemental concentration is where the magic happens

Matrix matched Calibration

Prospect with previous drilling

Client pulps and assays in combination with additional assays + BLY sample library

Prospect with no previous drilling

BLY sample library

Pucks made-40 ton press

BLY proprietary calibration process

Lab Assays

Re-calibration

Reprocessing
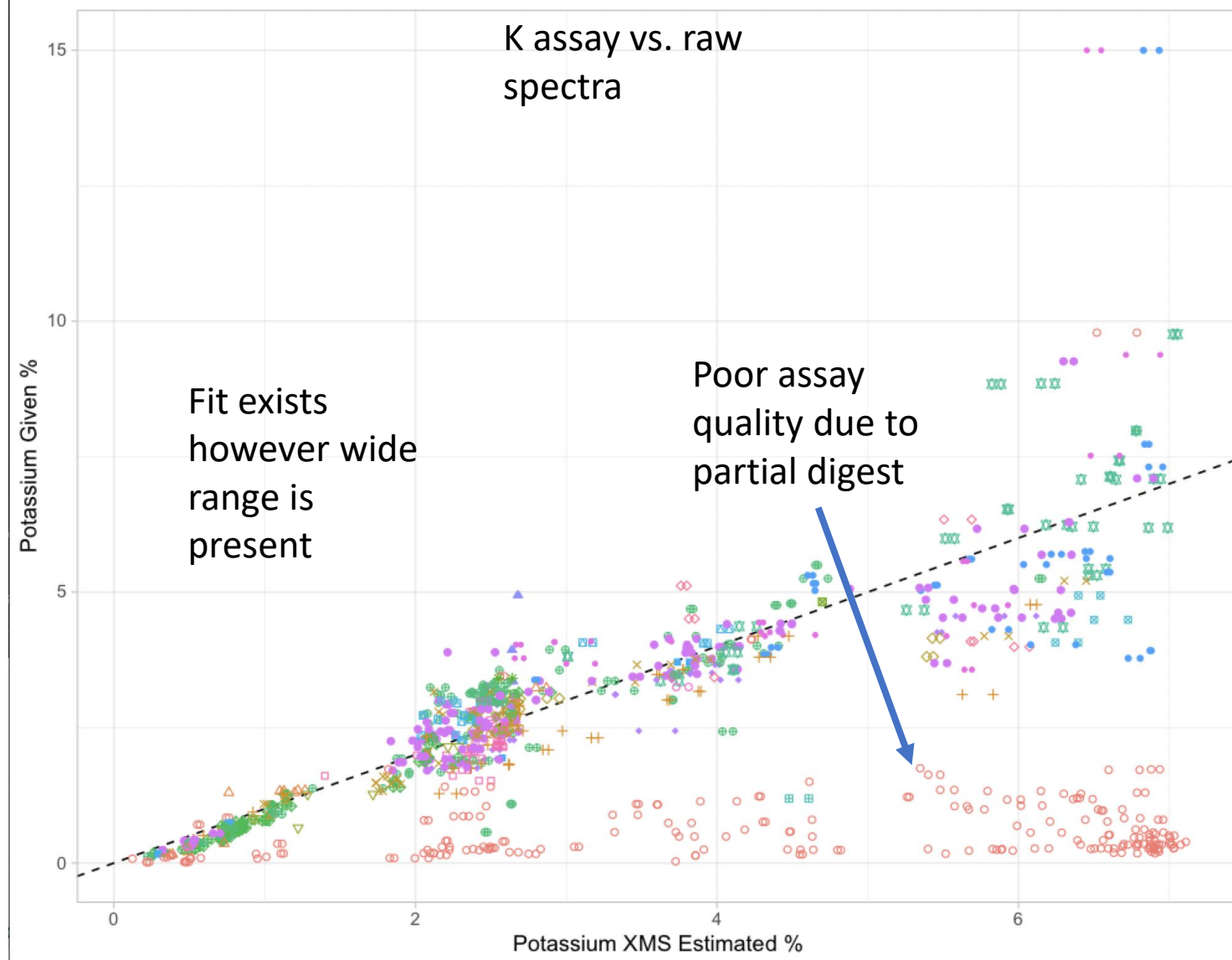
Elemental concentrations

How does it do it?

Detection limits and precision?

Multiple factors

- XRF stability

- He-flow stability

- Core to detector distance

- The rock itself

- Assay Quality e.g. if laboratory accuracy is low then TruScan accuracy will be low as well

- Truscan can only give results for elements and rock characteristics that it is calibrated for

K assay vs. raw spectra

Fit exists however wide range is present

Poor assay quality due to partial digest

- Assay Quality e.g. if laboratory precision is low then TruScan precision will be low as well

All assays in this case collected by p-XRF except P, S, Fe and LOI

Sample	Na ppm	MgO wt. %	Al2O3 wt. %	SiO2 wt. %	P ppm	S wt. %	Cl ppm	K2O wt. %	CaO wt. %	TiO2 wt. %	Mn wt.%	Fe wt. %	As ppm	LOI
1	26.58	11.27	4.33	-14.97	-0.911	4.90	26.98	-16.26	83.28	-4.22	545.2	0.678	-22.41	-3.62
2	-13.79	19.66	-10.20	-9.54	1.83	-0.398	29.41	29.71	224.9	-10.52	NA	1.57	-17.93	-7.67
3	-7.41	-25.54	-1.03	-9.77	2.73	-4.98	0.000	-11.69	146.5	-10.52	116.2	0.440	-17.41	-1.10
4	-7.41	-7.57	-10.09	-13.22	4.79	1.21	-5.88	-34.11	-80.20	-14.15	-39.58	1.47	-27.00	5.01
5	17.65	0.94	-9.52	-13.30	-0.644	0.806	-11.39	17.86	37.46	-29.88	-18.60	1.20	-3.01	-4.45
6	-6.54	8.02	-11.37	-17.04	-2.82	1.50	-9.09	43.64	142.3	3.96	8.71	-1.26	7.82	4.40
7	-32.43	-58.50	-27.56	-36.95	-9.52	-16.32	-3.85	17.00	-3.41	-26.17	16.78	3.23	-19.72	-0.950
8	-10.71	5.81	1.19	-4.69	1.58	6.38	14.58	21.16	210.8	5.17	-18.24	-0.874	30.52	2.77
9	-15.25	0.85	18.57	-2.93	-1.95	-0.943	1.01	-9.64	40.16	17.90	-7.49	-1.74	21.76	4.56
10	-7.41	-15.06	-7.29	-0.643	9.06	-11.76	9.76	3.77	123.4	-16.97	-9.14	0.226	37.04	-1.35
11	-16.67	-51.56	-15.93	-14.67	2.67	-2.44	-11.11	-48.52	83.28	0.848	23.97	0.447	31.59	1.22
12	23.97	-1.42	2.17	-12.47	2.72	-27.19	5.26	-13.49	1.39	2.16	36.01	-0.846	59.37	0.485
13	3.63	4.39	14.78	-6.50	3.63	-0.612	20.00	8.37	16.23	-2.00	-23.22	2.03	26.55	1.96
14	-2.91	-4.10	7.73	14.49	-10.05	0.299	25.75	19.21	-0.72	3.96	8.42	-6.63	22.45	3.29
15	-2.91	3.98	-9.09	15.83	-0.574	-11.26	-11.11	16.53	-3.41	-1.72	146.474	-4.36	-25.69	2.18
16	-35.90	-57.38	7.68	22.93	1.98	0.707	-35.48	-20.94	-23.14	18.02	159.7	-1.86	10.18	-4.17
17	12.36	-53.79	-4.74	-20.95	11.11	-1.36	-31.03	-50.91	-71.41	-21.32	290.6	0.204	-0.079	5.72
18	-9.09	-19.59	-2.97	-13.20	-3.51	-0.169	-24.53	-62.83	-61.57	15.29	1900.0	0.230	1.10	1.12
19	-12.28	-43.10	-0.29	-13.06	6.34	3.88	-41.18	-74.59	-50.36	20.28	NA	0.100	1.48	4.99
20	-18.03	-5.77	1.08	-12.55	2.36	3.40	-14.29	-78.71	-48.20	-0.294	NA	0.147	7.00	1.21
21	-15.25	-19.59	9.27	-16.19	-1.64	5.50	-28.57	-89.88	-50.36	-4.27	NA	-0.362	1.53	3.20
22	-10.71	-37.18	5.20	2.41	-0.348	3.18	0.000	-81.95	-39.42	-9.76	NA	-1.00	8.34	6.45
23	-18.03	-32.99	1.21	3.96	0.000	2.80	-14.29	-85.69	-35.02	0.966	NA	-0.343	-18.55	0.815
24	-15.25	-16.24	1.91	6.57	9.74	-1.99	-23.08	NA	-5.95	-13.54	NA	-0.074	7.89	-1.28
25	23.46	-61.09	0.62	-22.36	1.11	5.73	-28.57	-90.98	-36.18	-9.85	81.82	0.257	-34.80	2.00
26	12.36	-29.05	3.89	-10.37	3.70	4.01	0.000	NA	-29.92	4.36	NA	0.285	-17.67	0.460
27	-15.25	11.69	4.73	-0.34	-0.208	-2.19	11.11	-70.35	-27.06	0.754	127.273	-0.136	-57.55	1.78
28	14.94	18.25	-2.99	-1.75	2.23	-2.40	6.38	NA	-45.85	-1.32	NA	0.303	-17.93	-5.16
29	23.46	0.52	-3.05	3.06	3.23	-3.17	8.70	3.77	-32.57	8.02	NA	0.792	-28.86	-5.72
30	-19.35	-43.64	1.50	-4.78	5.79	-7.59	-4.76	NA	-5.95	-19.94	NA	-0.907	-16.81	0.183
31	13.64	-23.17	-14.85	31.69	1.71	0.386	-27.27	-16.22	-8.36	-24.66	-58.05	-0.536	-16.37	-1.85

Formula for excellent results

High quality assays → Covering the full range of concentrations for all elements in all lithologies → Assays go through QAQC → BLY proprietary calibration process
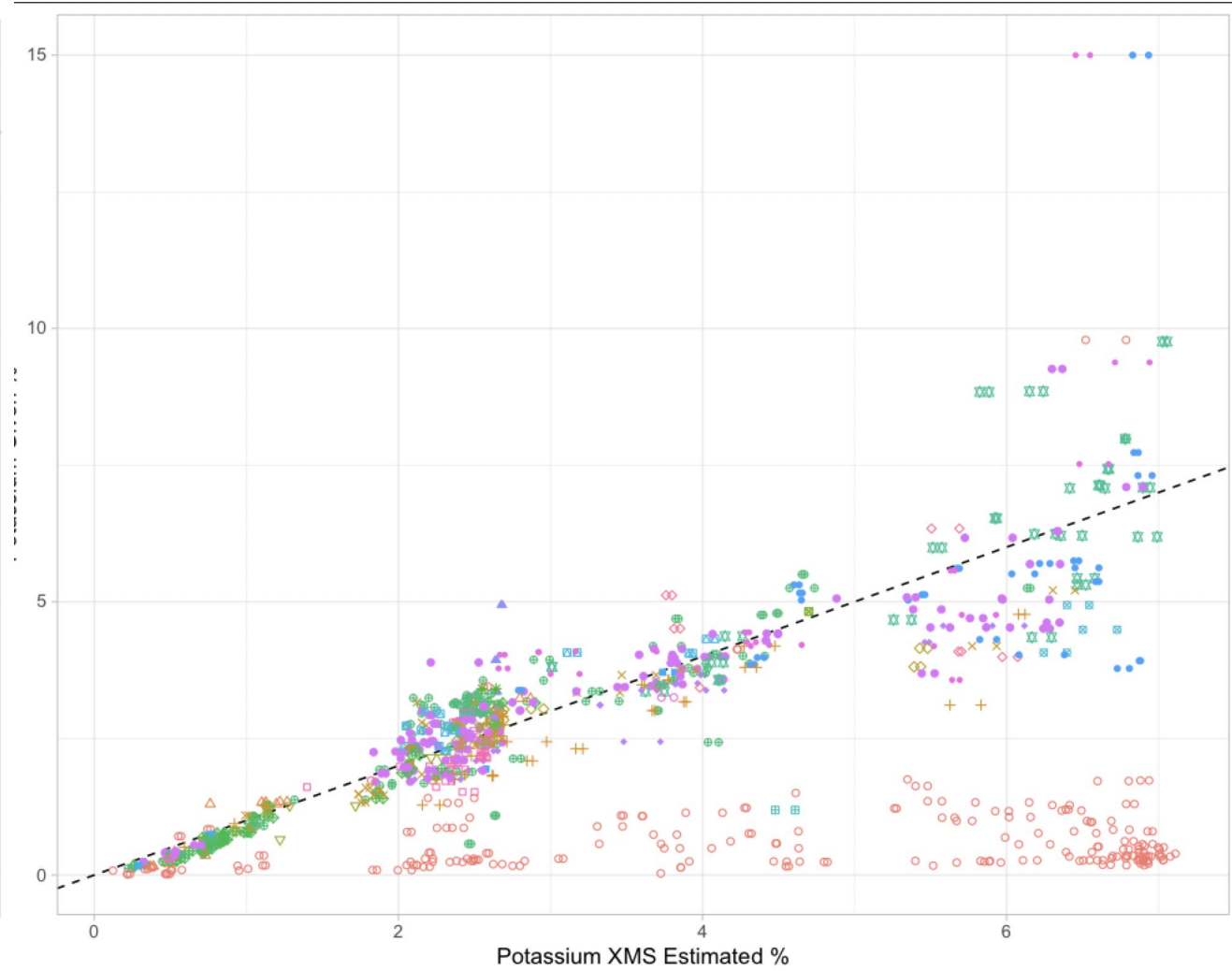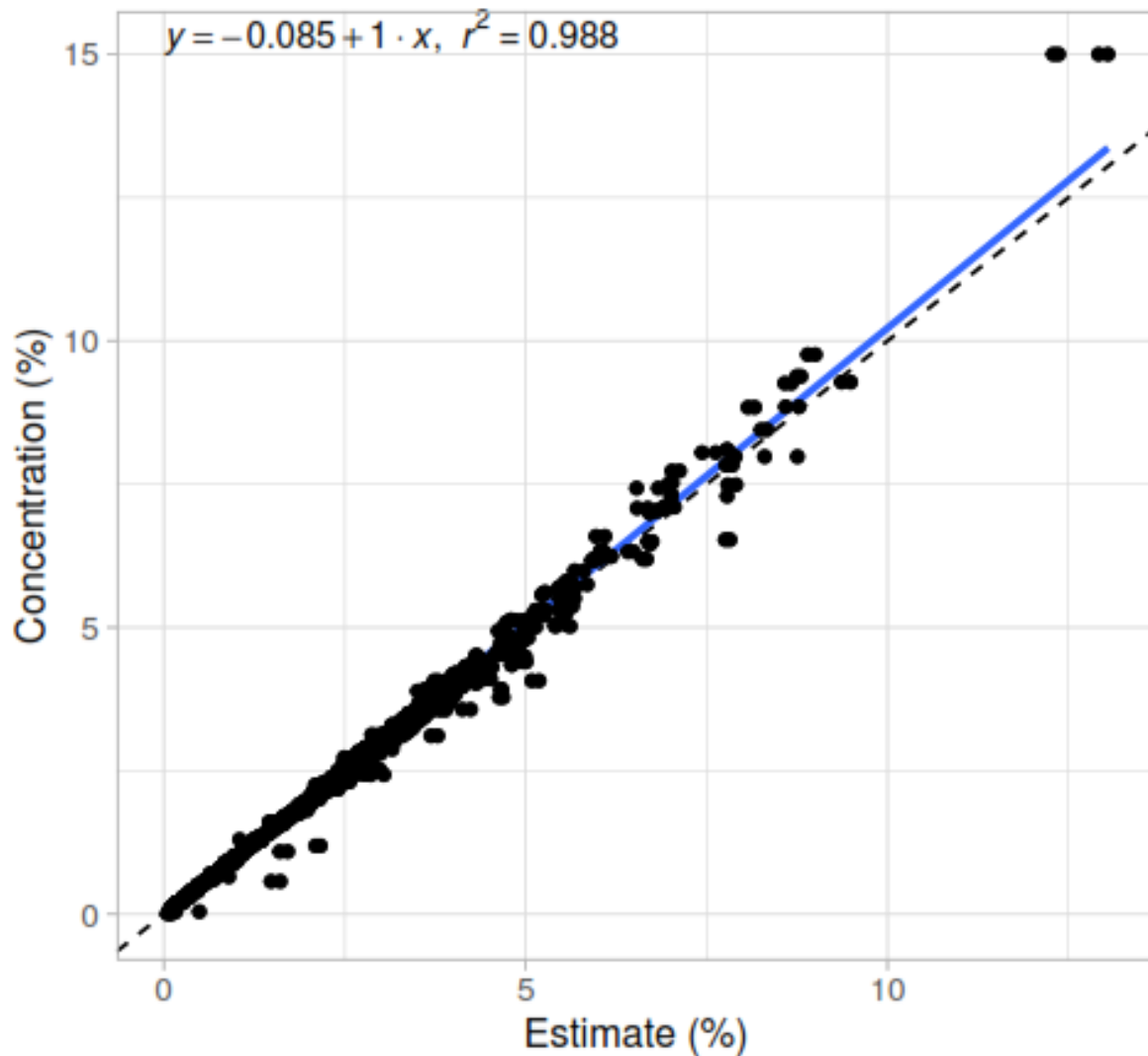
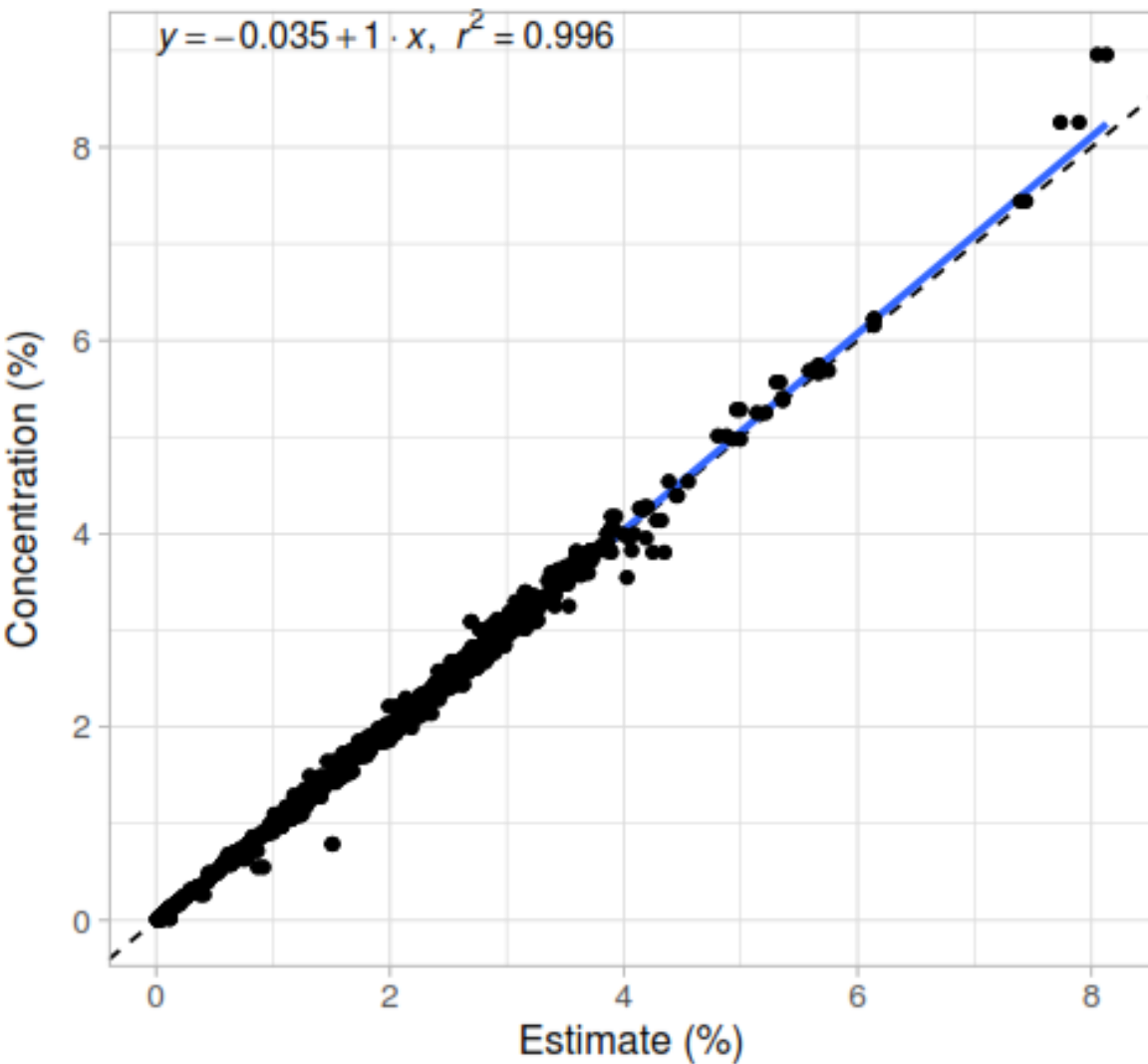Calibrate once and scan indefinitely

How does it do it?

K.K.alpha

$$y = -0.085 + 1 \cdot x, \quad r^2 = 0.988$$

Left plot axes: Concentration (%) vs Estimate (%)

Right plot x-axis: Potassium XMS Estimated %

How does it do it?

Na.K.alpha
$y = -0.035 + 1 \cdot x, \ r^2 = 0.996$

Ca.K.alpha
$y = -0.0094 + 1 \cdot x, \ r^2 = 0.987$

How does it do it?

P.K.alpha

$y = -0.0015 + 1 \cdot x, \ r^2 = 0.997$

S.K.alpha

$y = -0.0097 + 1 \cdot x, \ r^2 = 0.995$
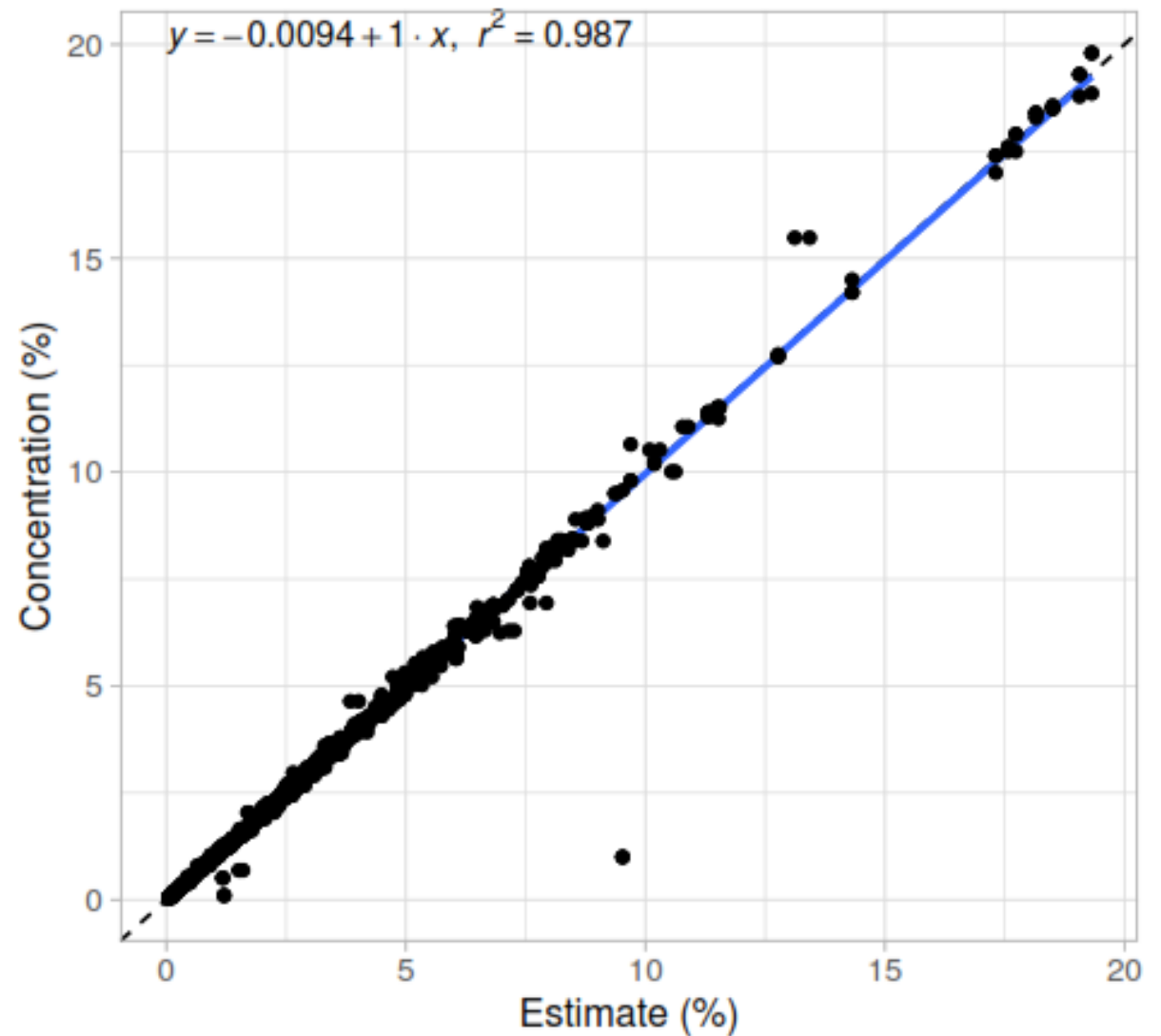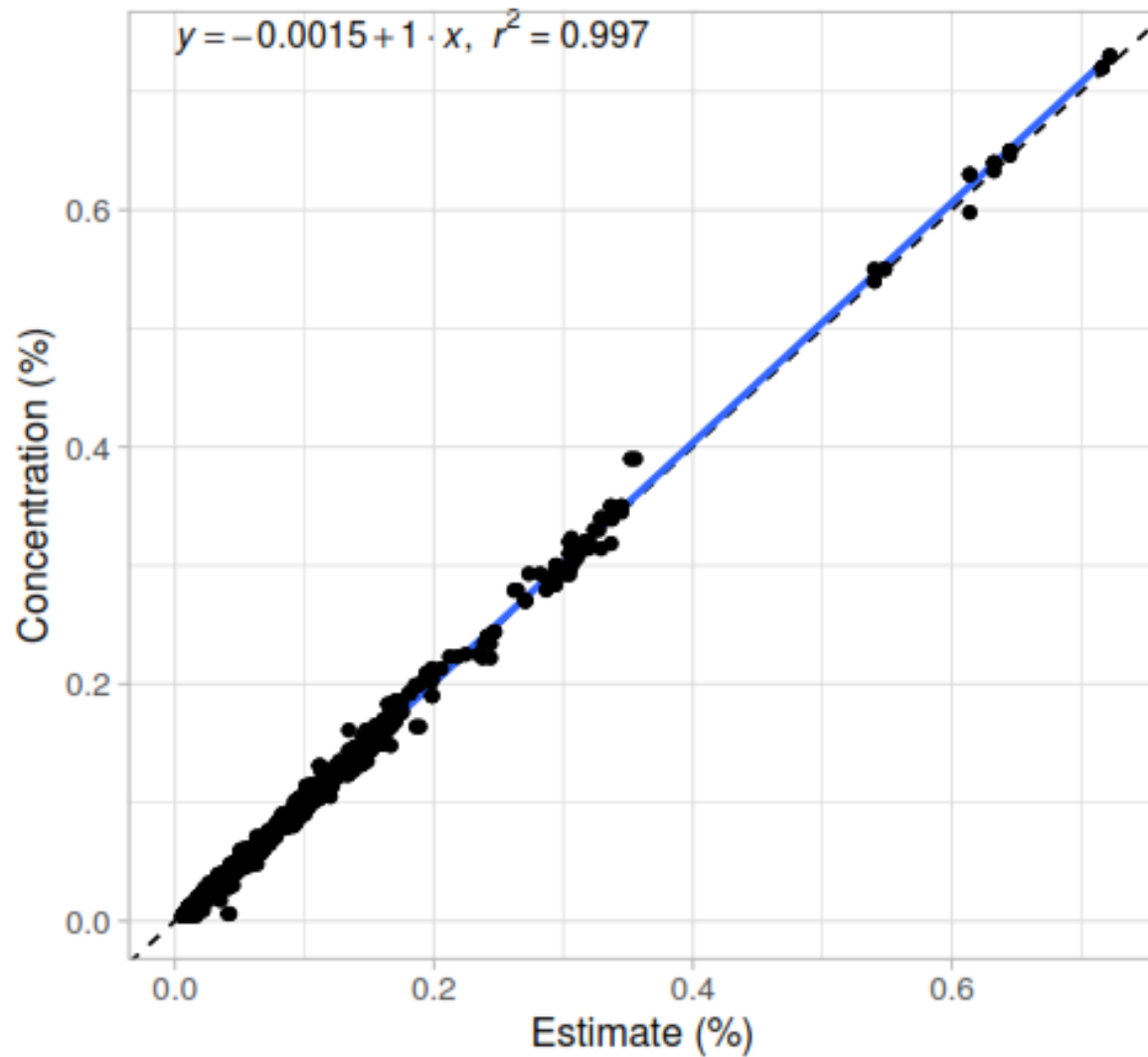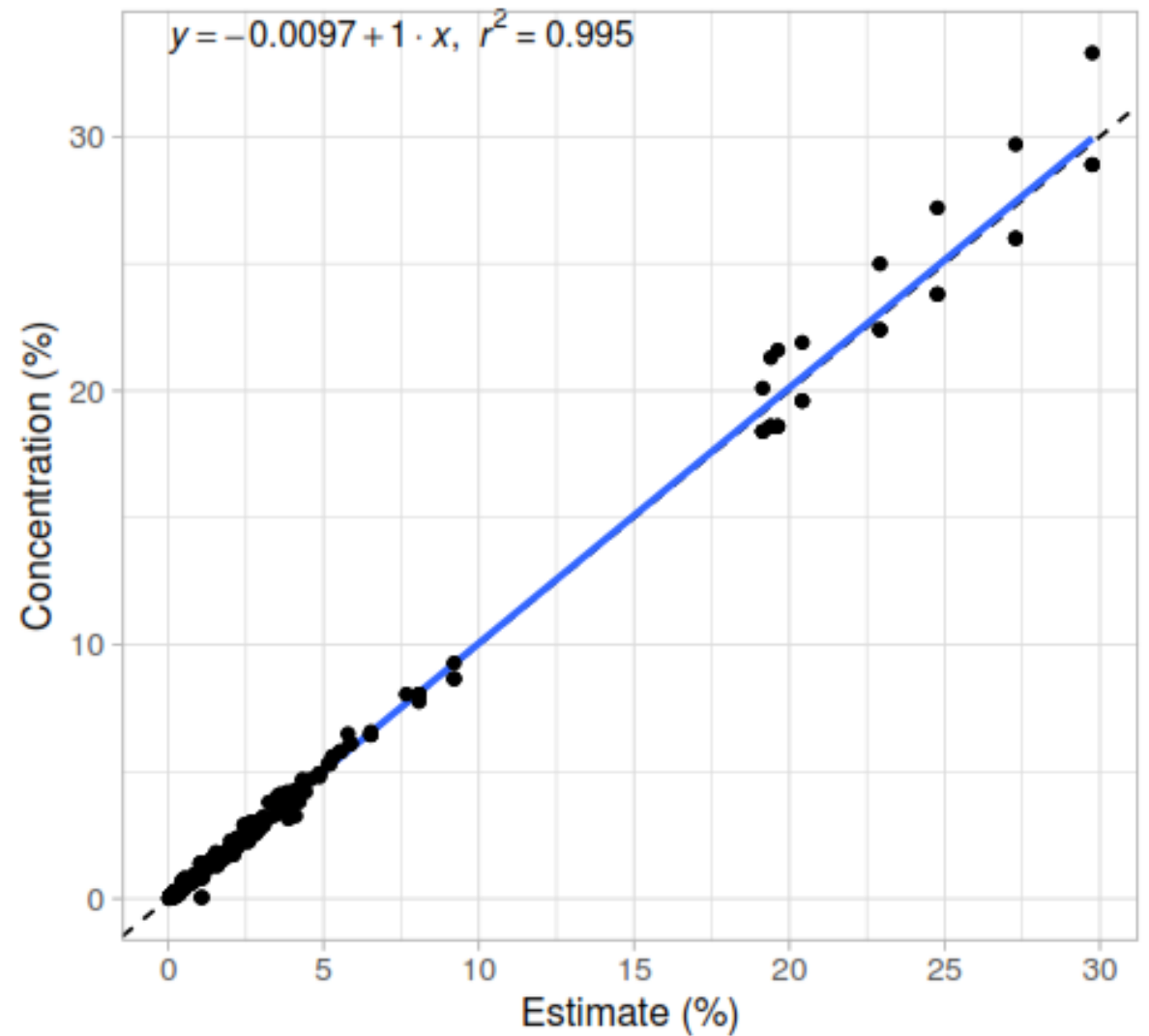
How does it do it?

Sr.K.alpha

$y = -0.0021 + 1.1 \cdot x, \; r^2 = 0.994$

Rb.K.alpha

$y = -0.00011 + 1 \cdot x, \; r^2 = 0.994$
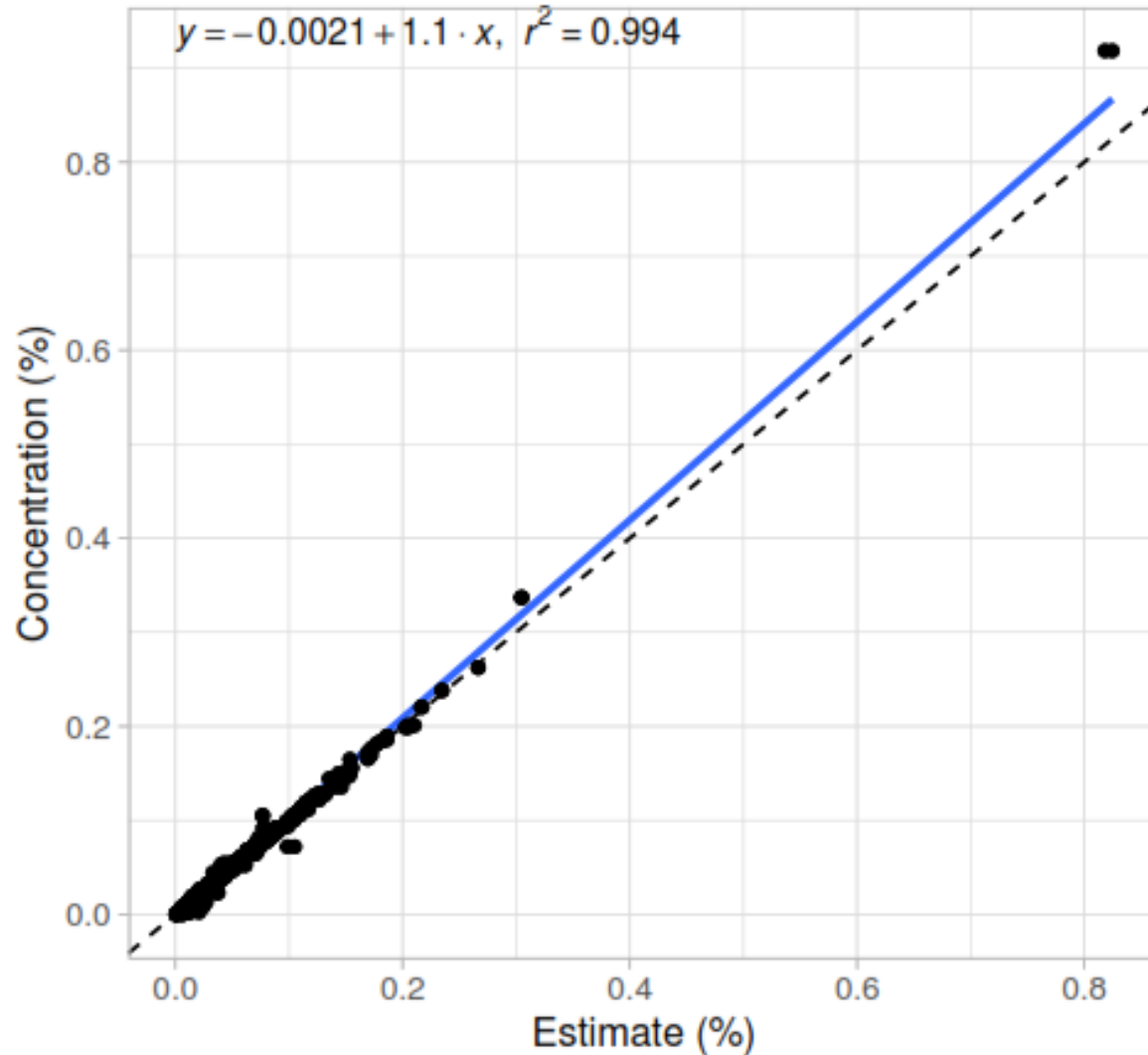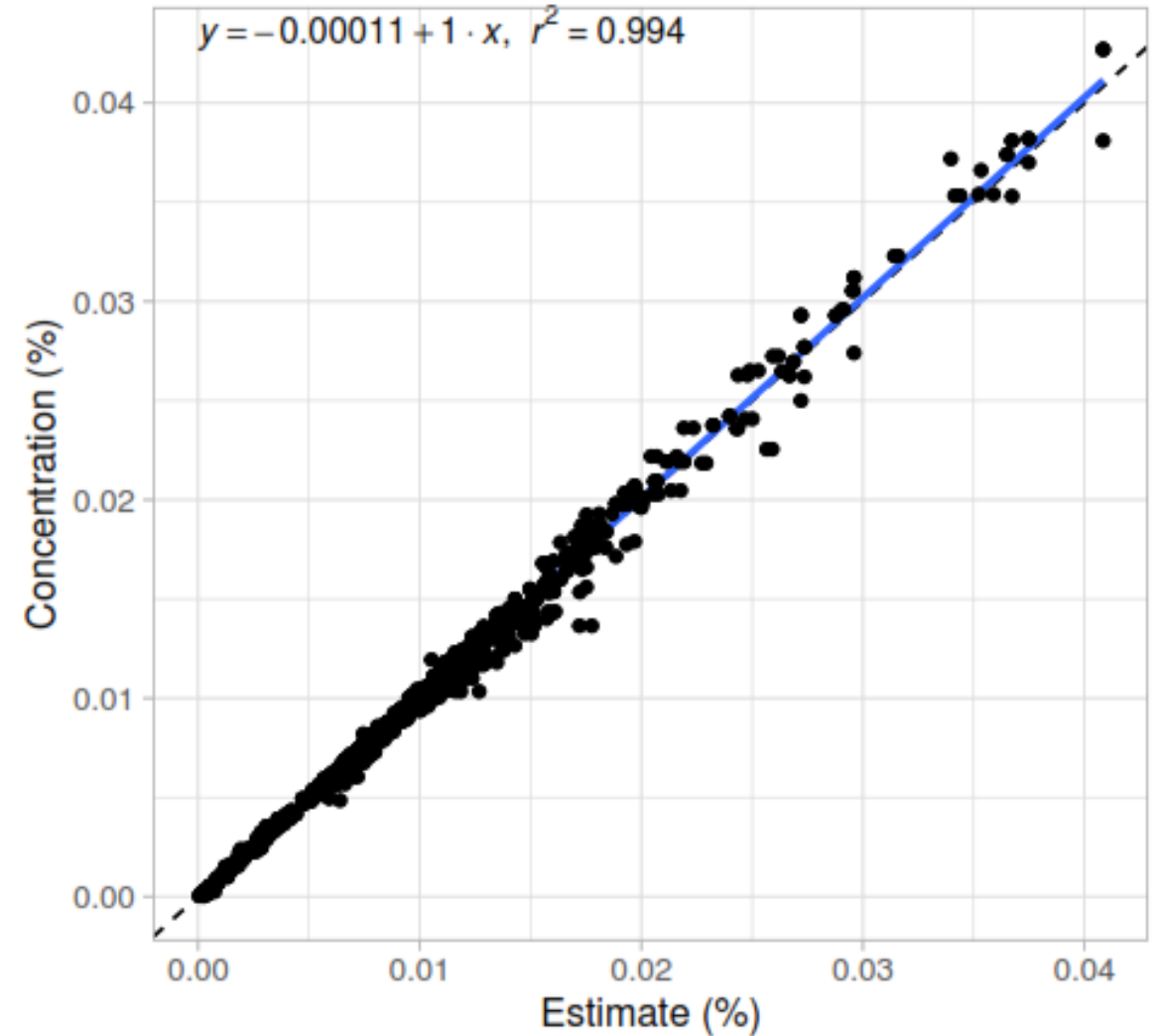
How does it do it?-Calibration fits

Ag.K.alpha

$y = -2.6e{-}05 + 1 \cdot x, \; r^2 = 0.98$

Cu.K.alpha

$y = -0.0024 + 1 \cdot x, \; r^2 = 0.997$

How does it do it?

TI.L.alpha

$y = -9.2e{-}06 + 1 \cdot x, \ r^2 = 0.996$

Concentration (%) vs Estimate (%)

Te.K.alpha

$y = -1.9e{-}05 + 1.1 \cdot x, \ r^2 = 0.978$

Concentration (%) vs Estimate (%)

How does it do it?

LOI

$y = -0.43 + 1.1 \cdot x, \ r^2 = 0.966$

Li

$y = -0.00053 + 1.1 \cdot x, \ r^2 = 0.985$

Au.L.beta

$y = -2.2e-05 + 1.2 \cdot x, \quad r^2 = 0.973$
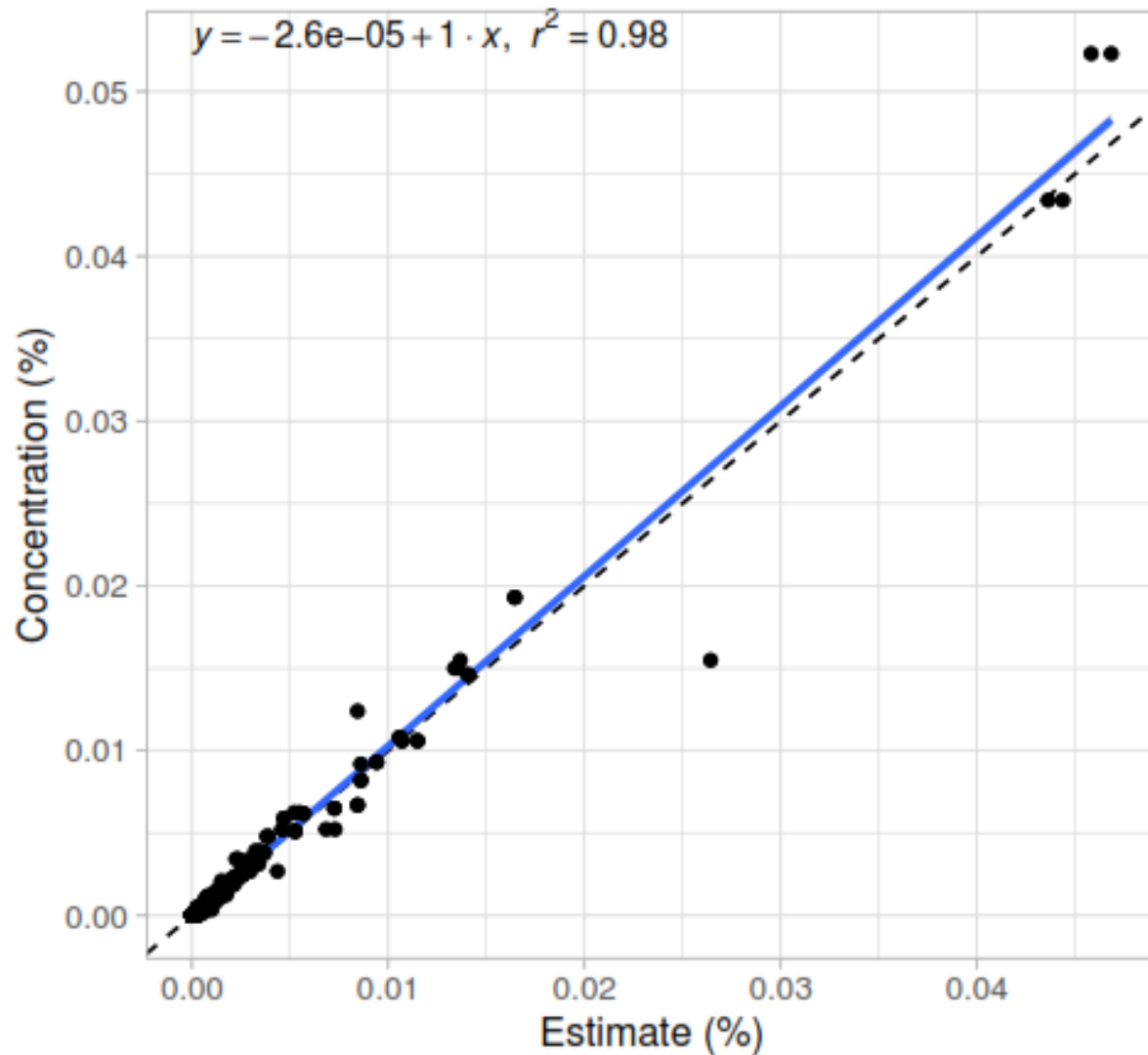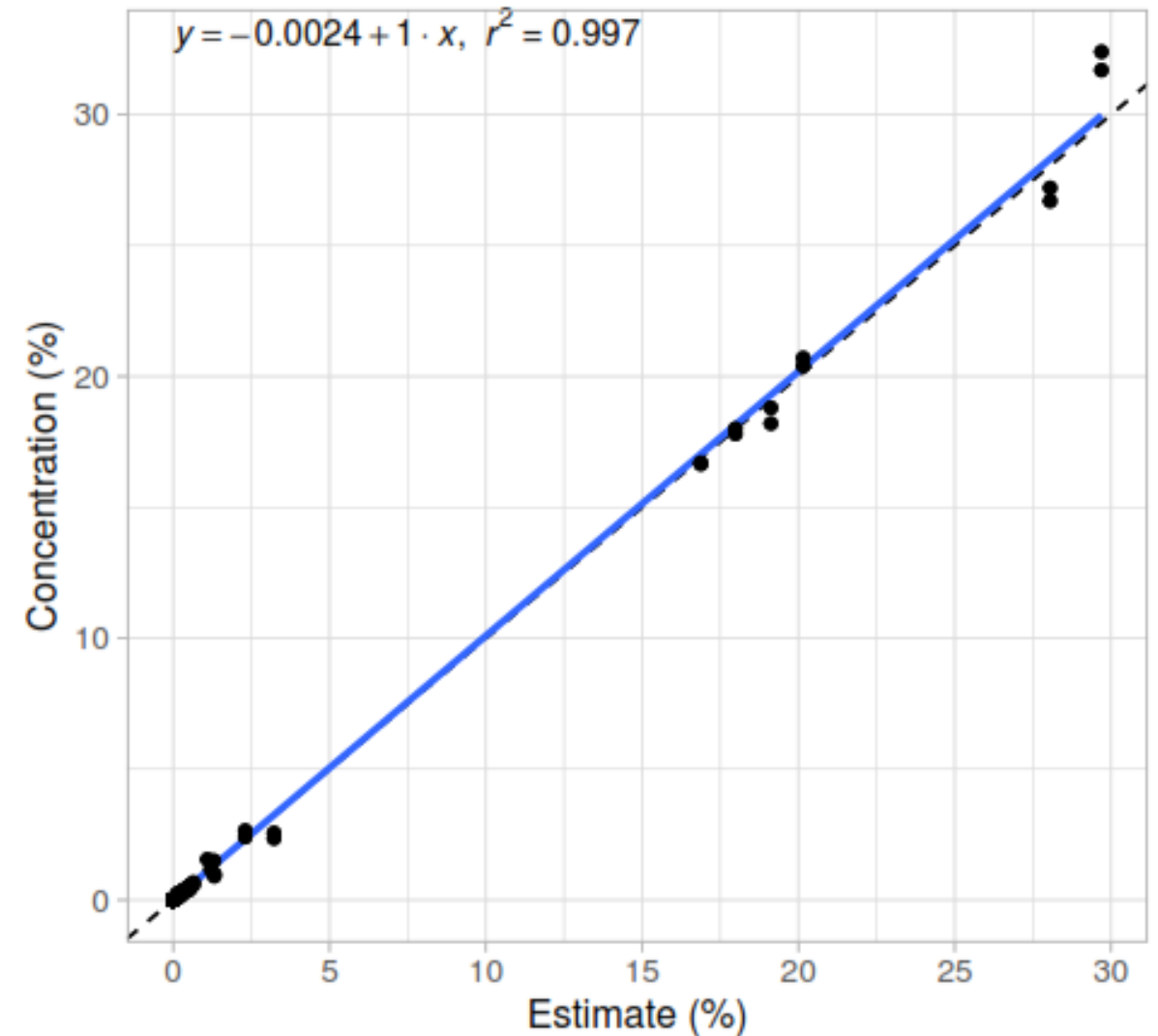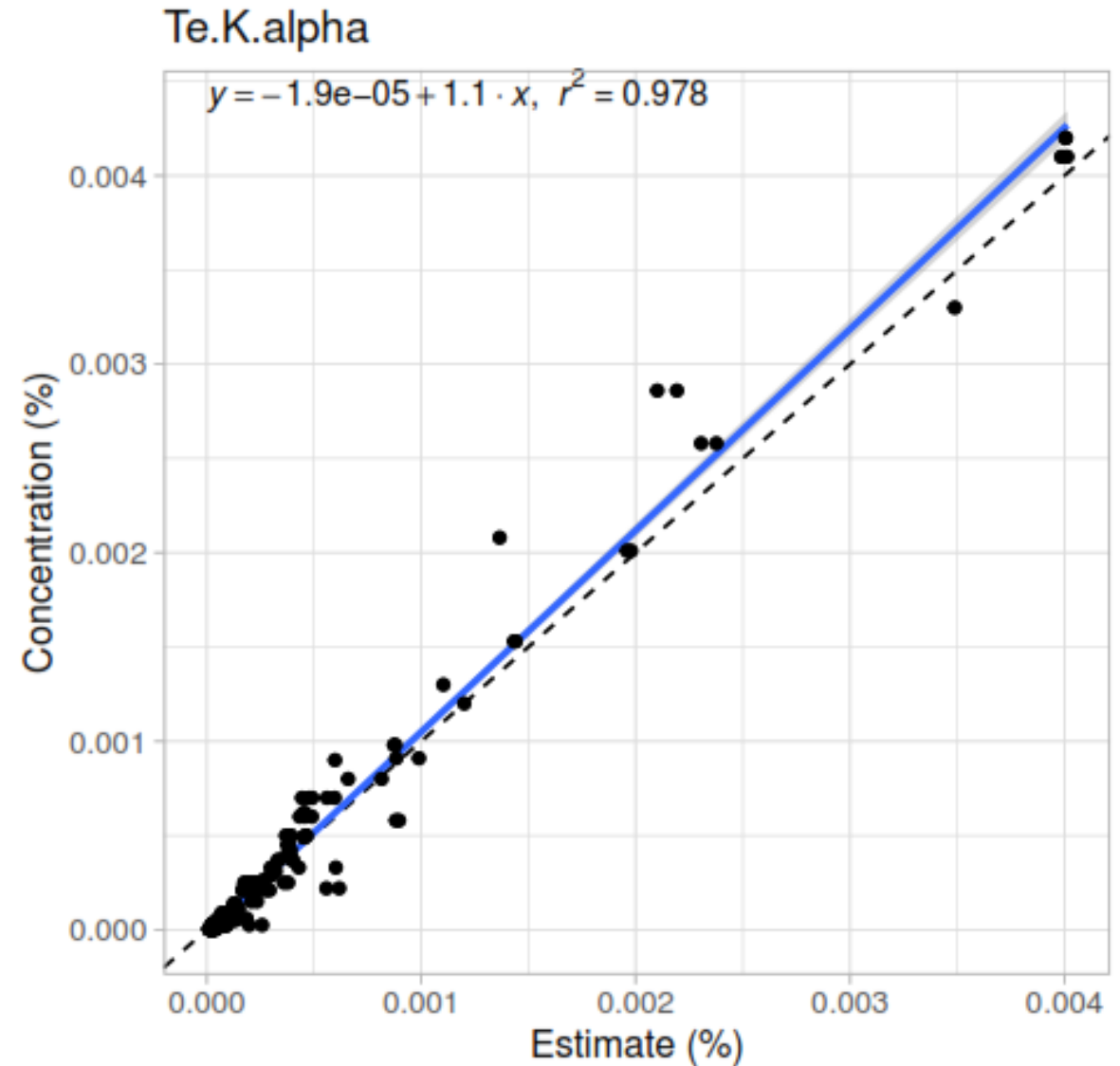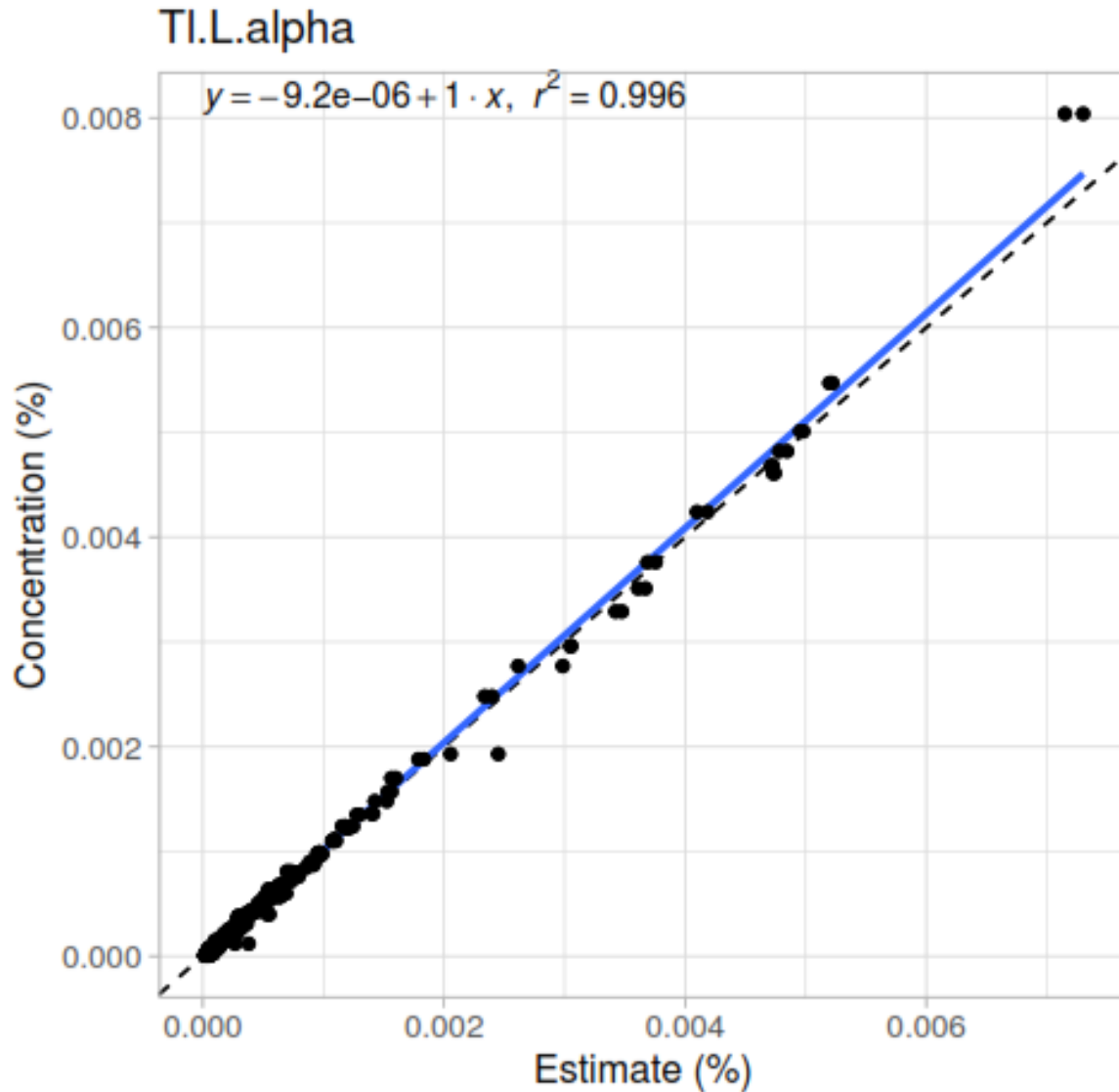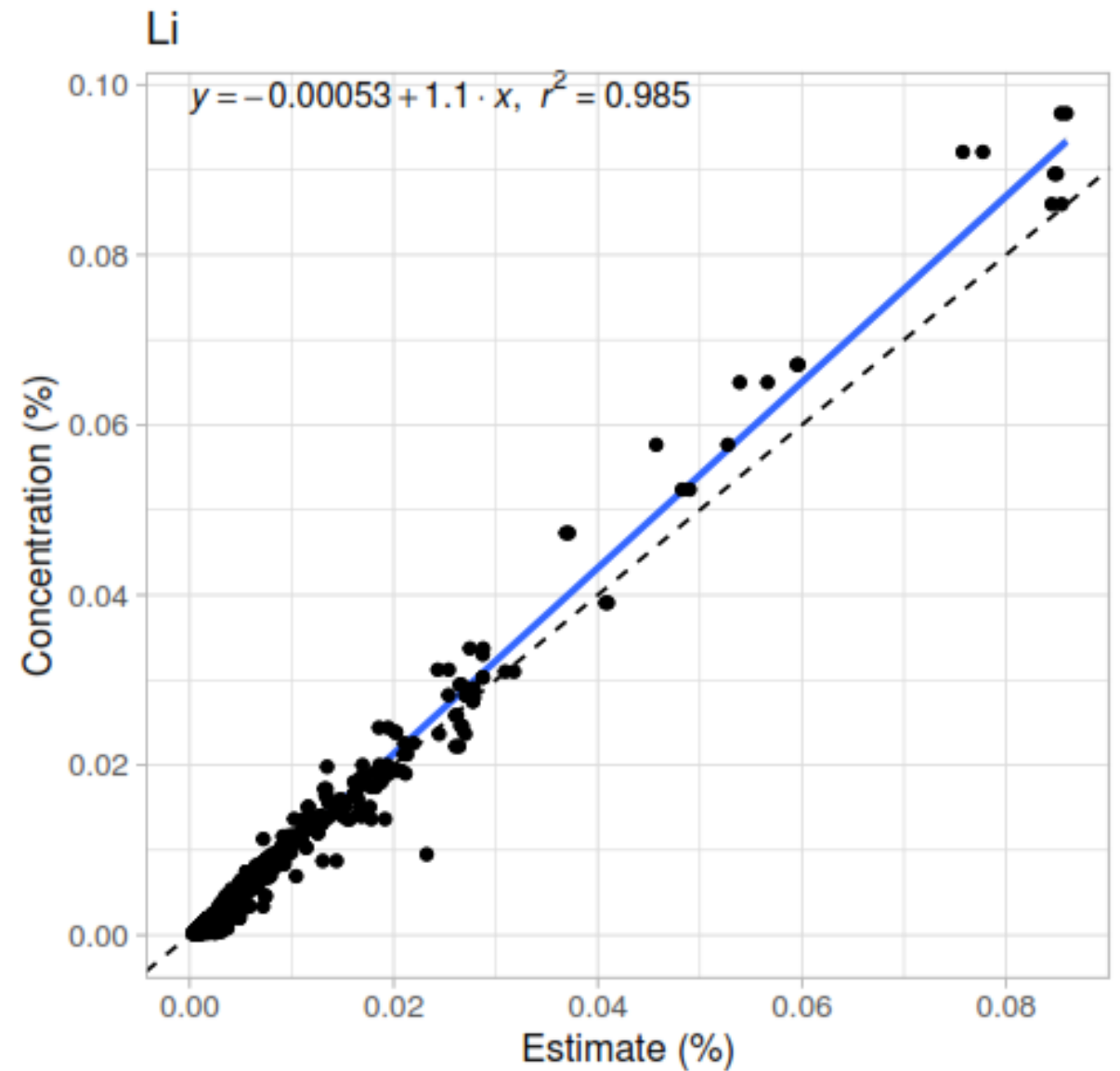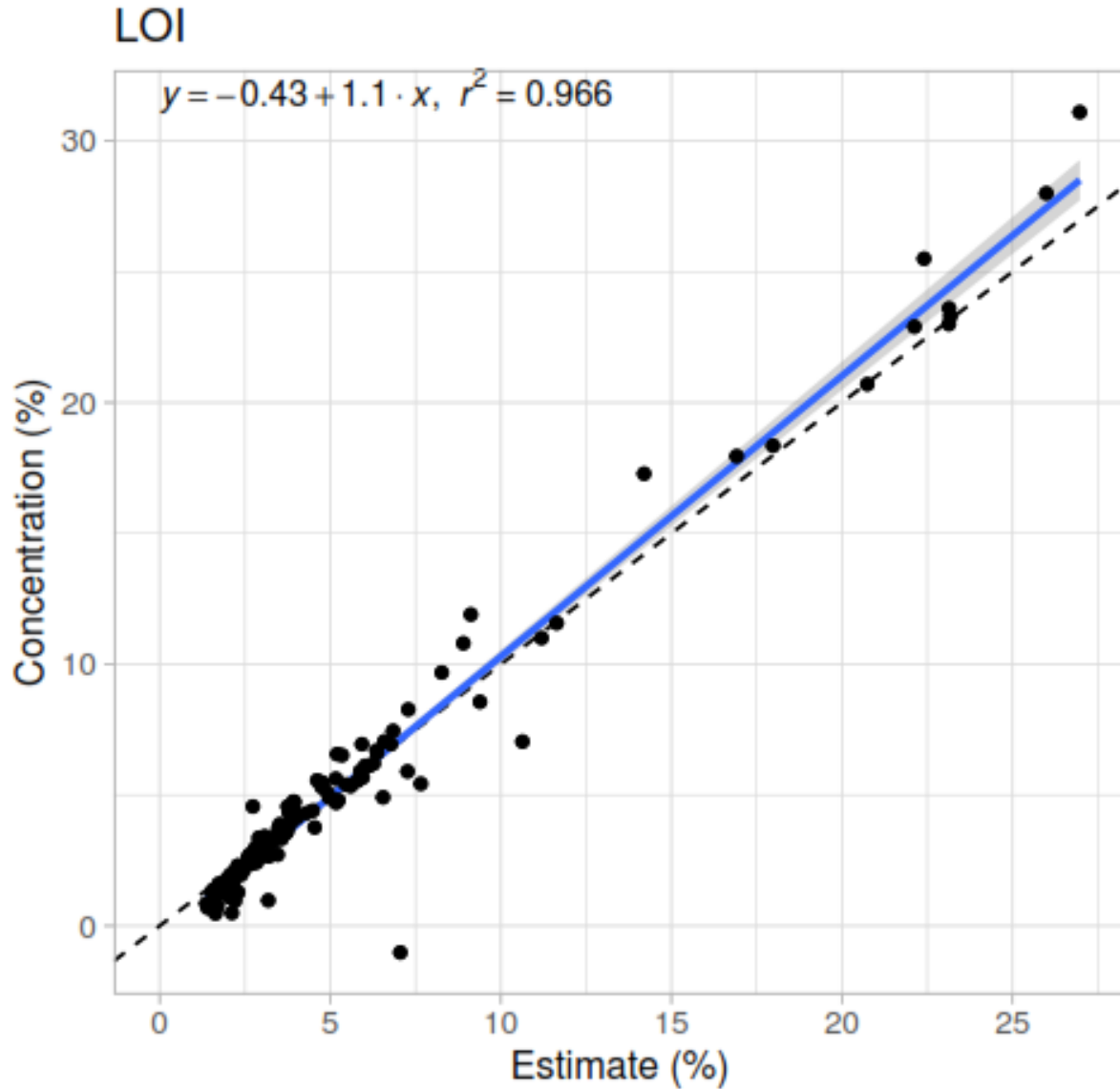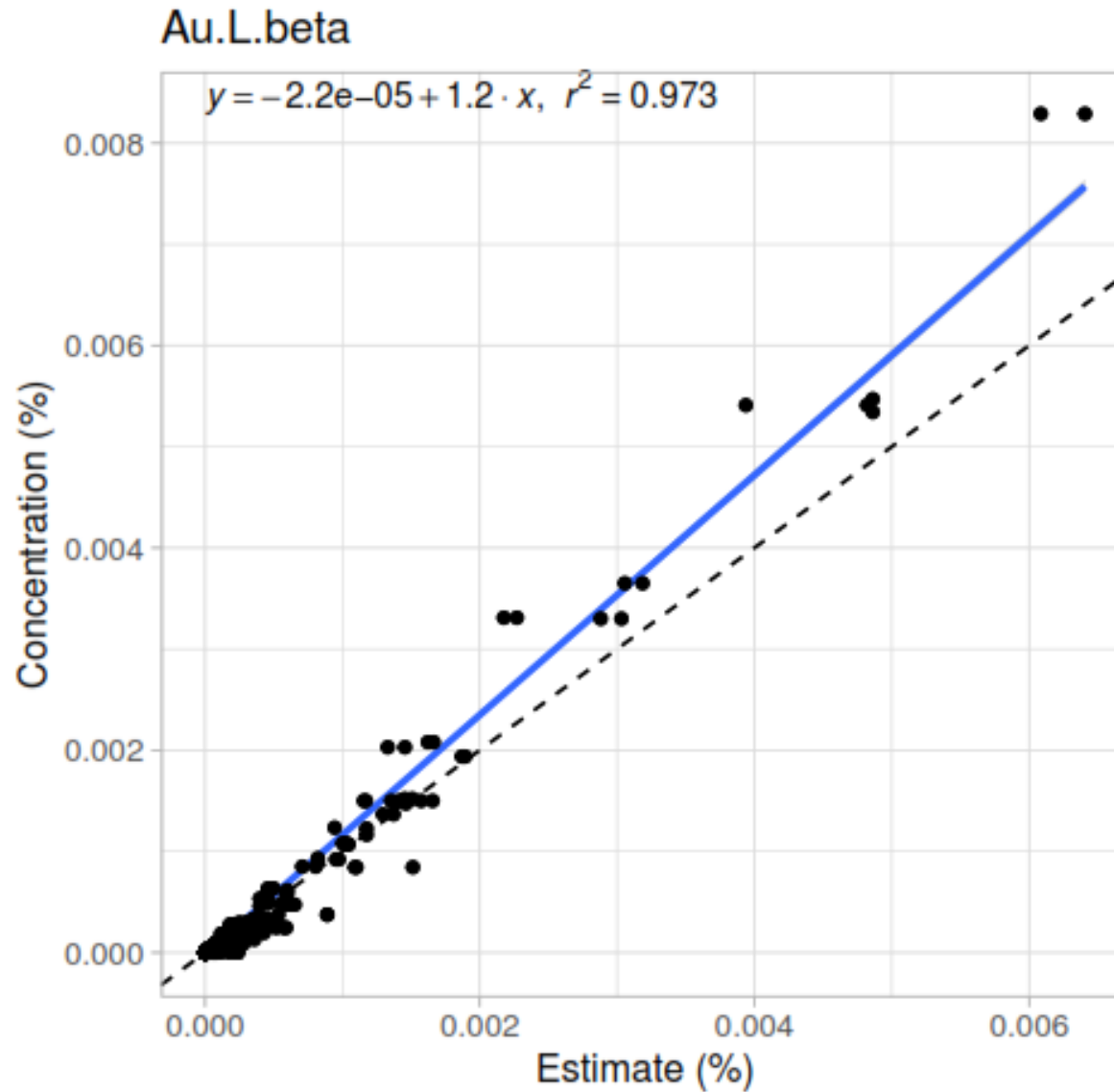
What data is generated?

Great calibrations give great results

### Au ppm TruScan Vs Lab
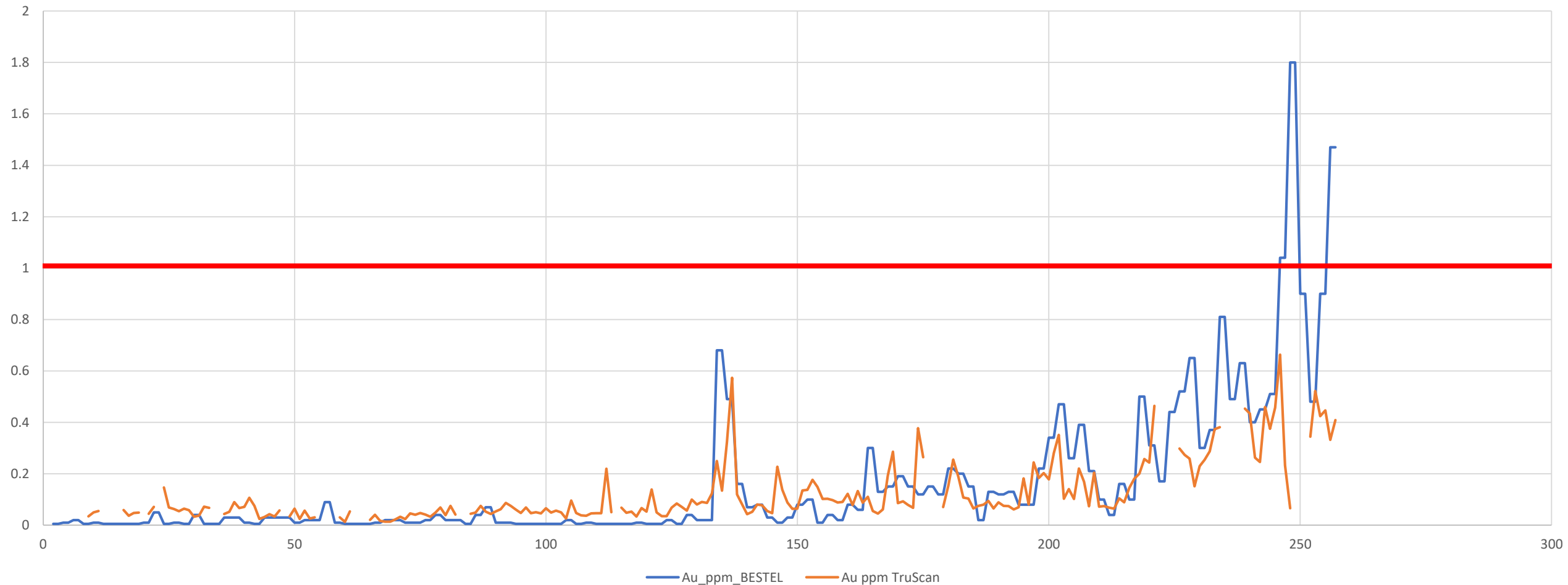
What data is generated?
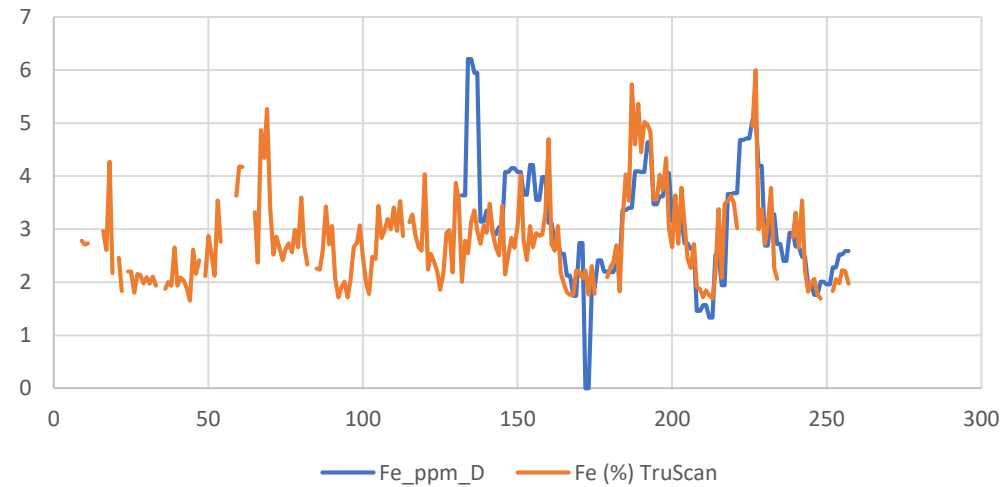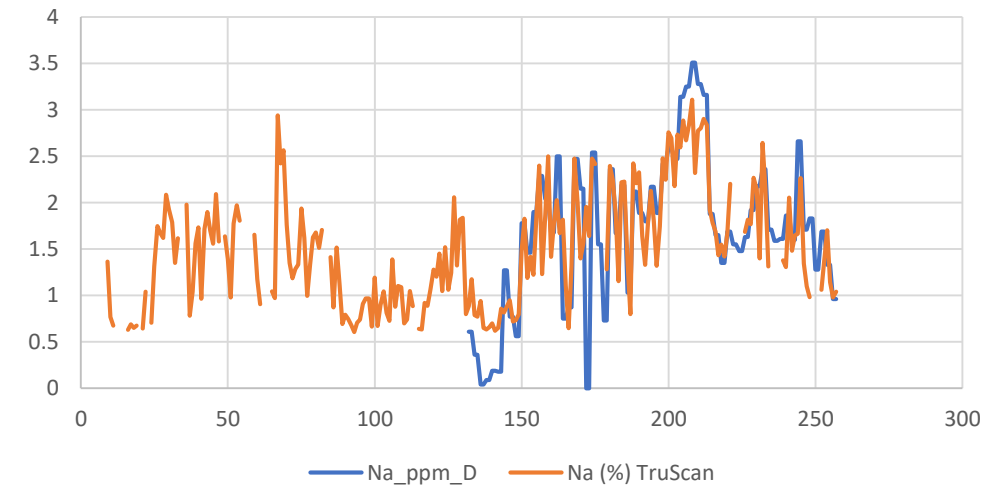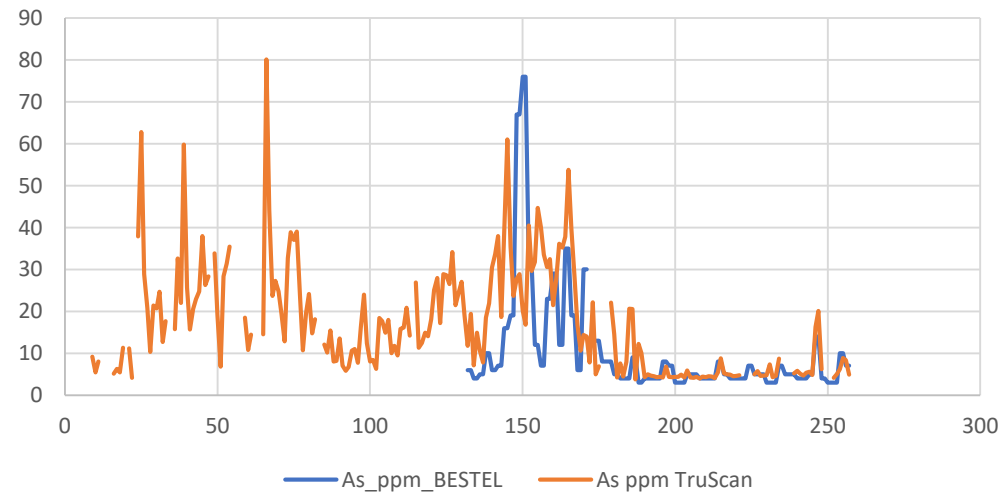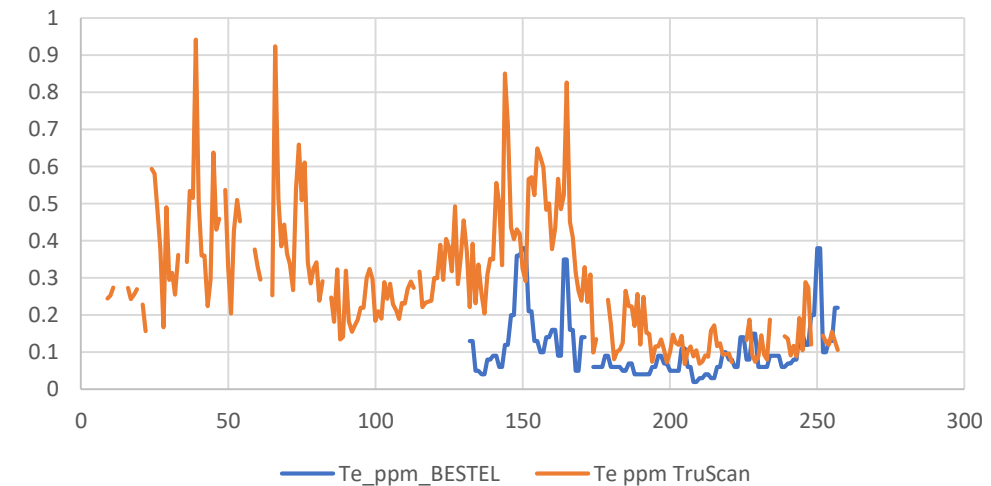
What data is generated?

- Chemical assays are given in N-mm intervals 1m, 2m, 4m and client prescribed intervals as CSV's one or multiple times per day

- Dry, Wet and Stitched core images are provided instantly

- In instances where no internet is available assays are provided to the geologist on site and the images are uploaded every shift change

- TruScans are operating on 3 continents in conditions ranging from the arctic circle to tropical jungle and high Andean desert

What data is generated?

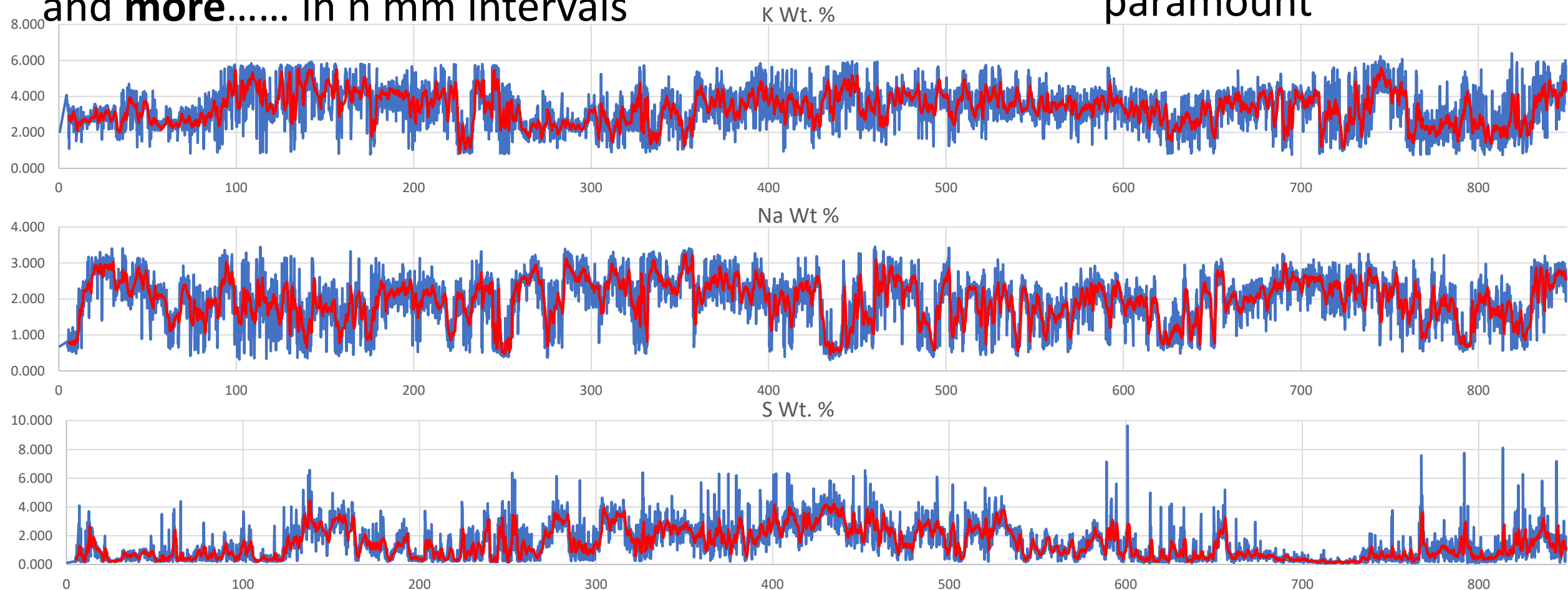- Delivers geochemical data from Li to U and **more**...... in 1m intervals
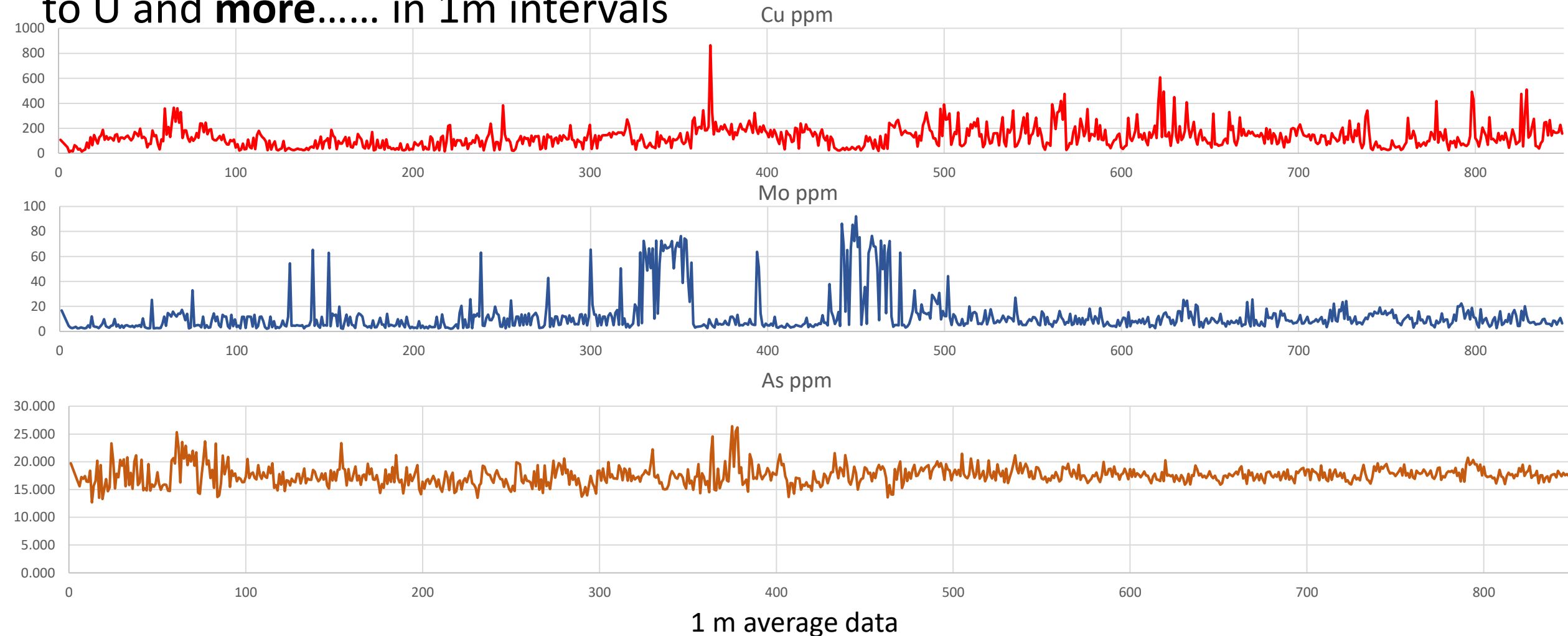
Cu ppm

Mo ppm

As ppm

1 m average data

What data is generated?

- Delivers geochemical data from Li to U and **more**...... in n mm intervals

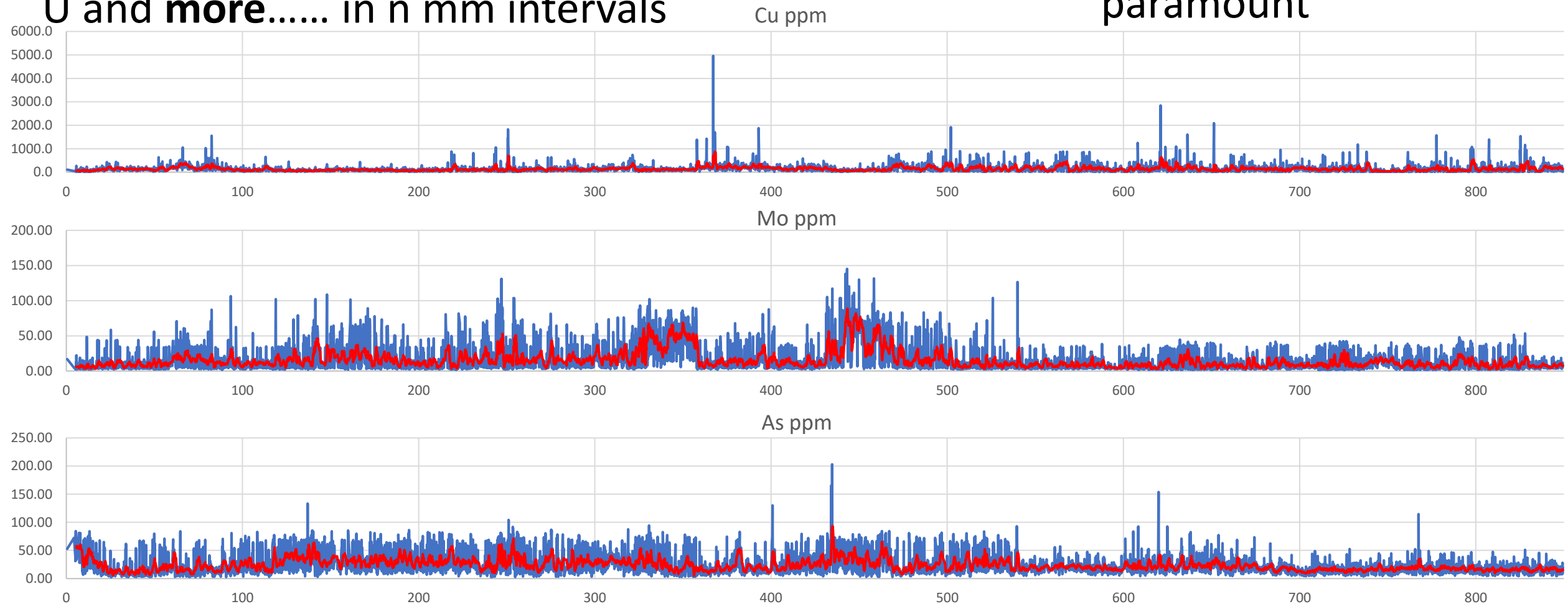Considering scale is paramount

K Wt. %

Na Wt %

S Wt. %

100 mm data, Red Line 10 period moving average

What data is generated?

- Delivers geochemical data from Li to U and **more**…… in n mm intervals

Considering scale is paramount
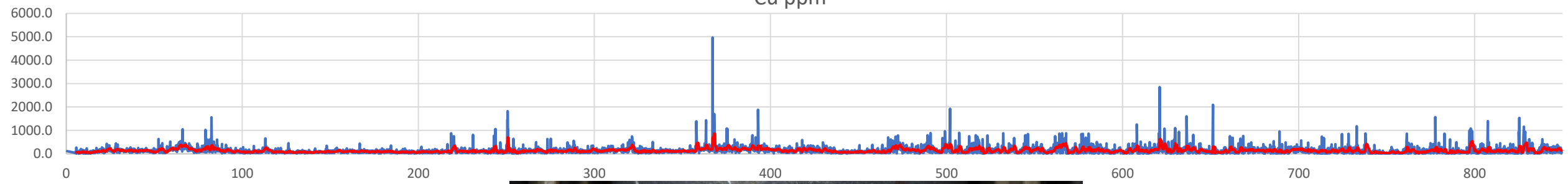

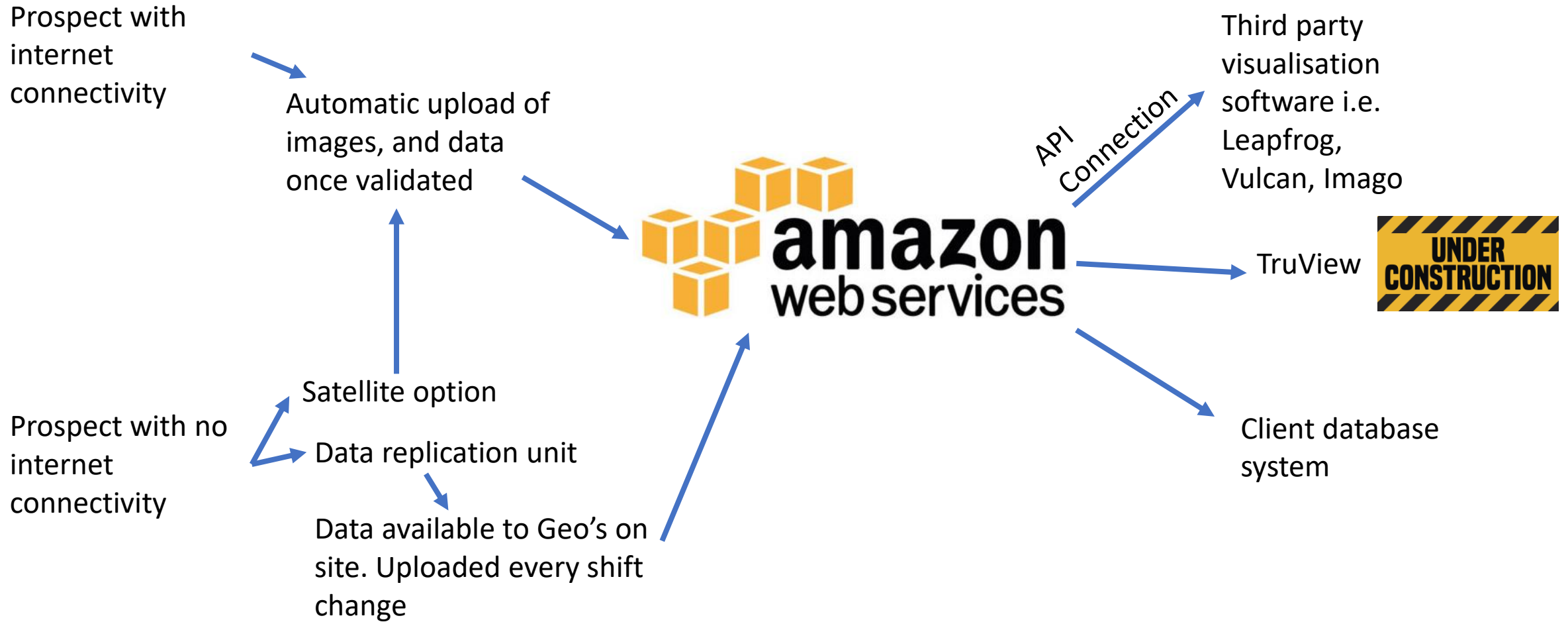100 mm data, Red Line 10 period moving average

What data is generated?
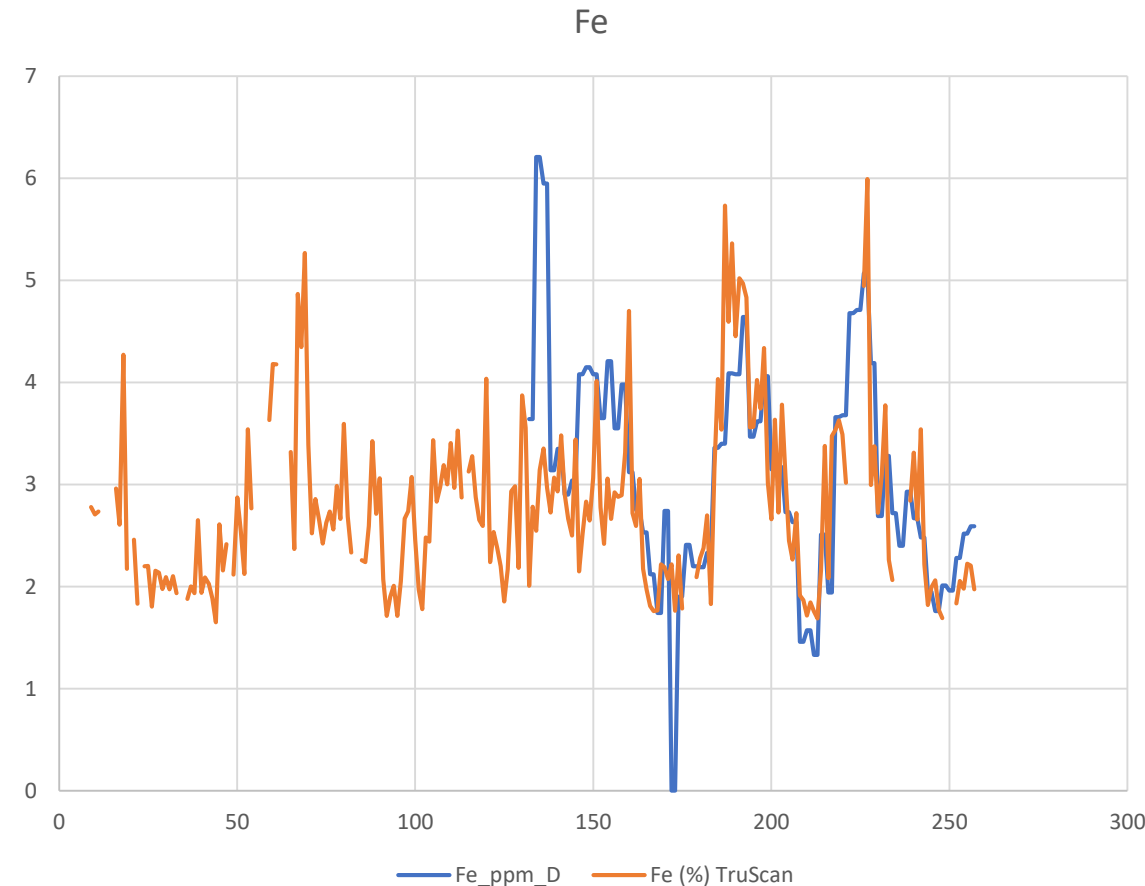
Considering scale is paramount

Cu ppm

How do I get the data?

Prospect with internet connectivity

Automatic upload of images, and data once validated

Satellite option

Prospect with no internet connectivity

Data replication unit

Data available to Geo's on site. Uploaded every shift change

amazon web services

API Connection

Third party visualisation software i.e. Leapfrog, Vulcan, Imago

TruView

UNDER CONSTRUCTION

Client database system

- Assay previously skipped core

- Stop drillholes on time (no more intersects to EOH), or stop drilling early

- Leverage global geological expertise...anywhere

- Determine what to send for further assay...no more 5m or 10m composites

- Build sophisticated geochemical and mineralogical models of operations and targets
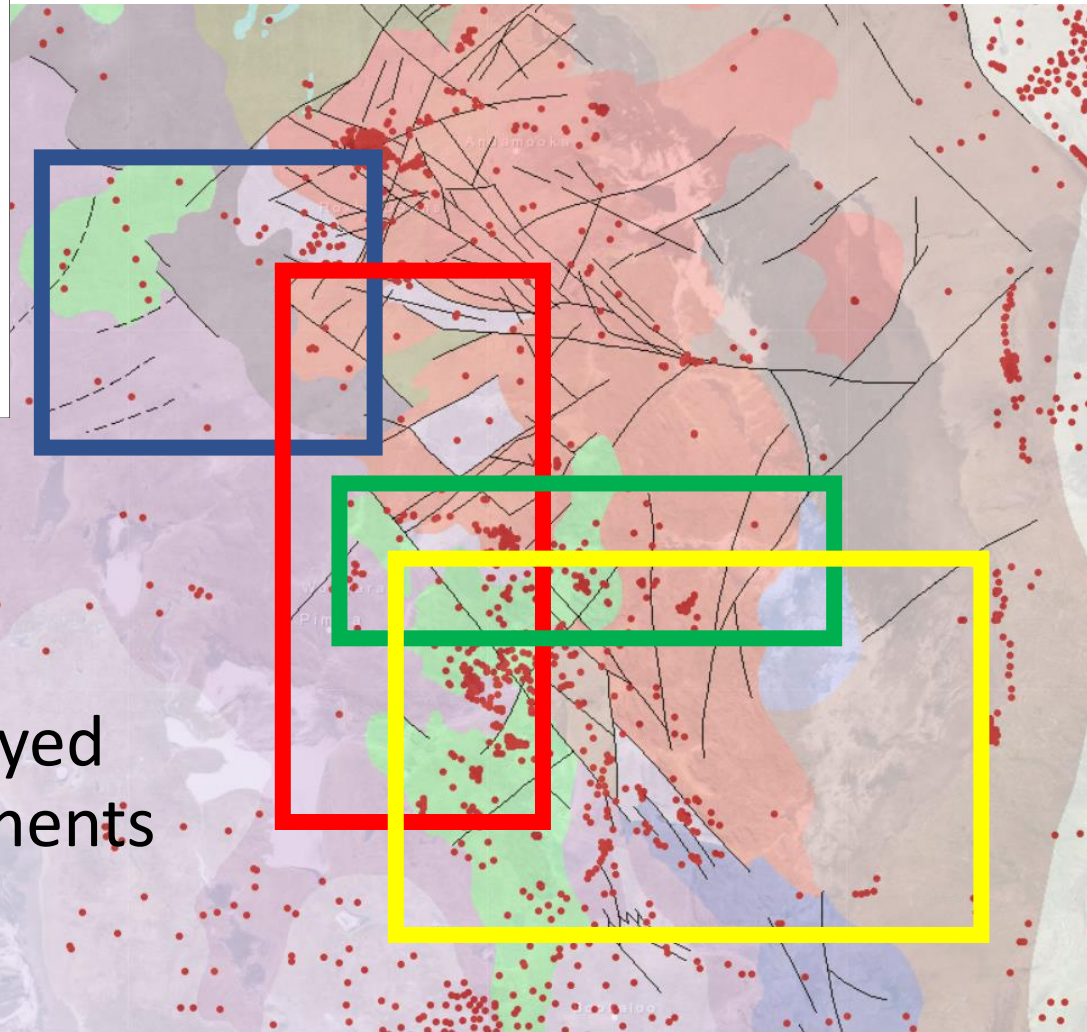
- Save money

Fe

But the biggest value proposition

Old drill holes assayed poorly for few elements and incompletely

Biggest value proposition

Standardisation of historical data

Blue resources- Did not assay for gold
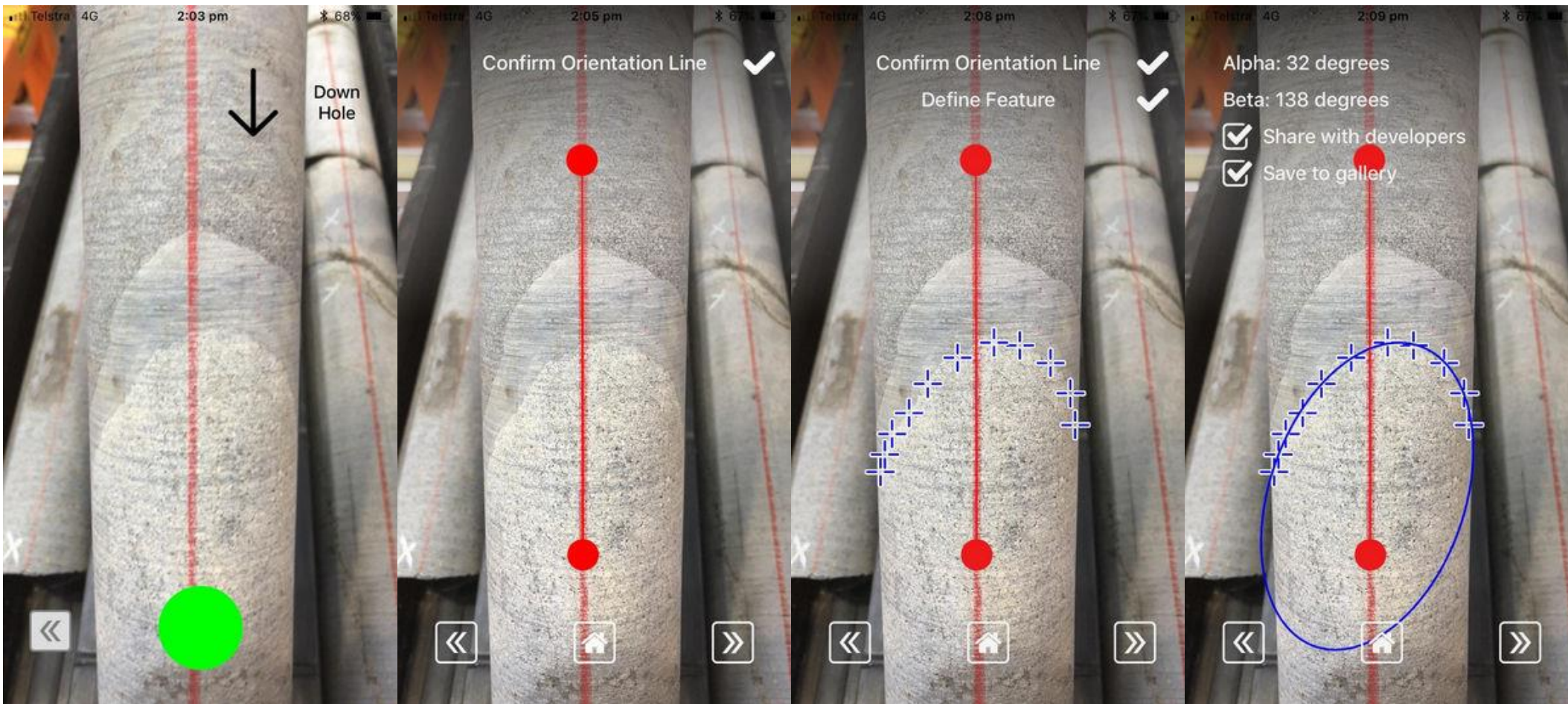
Red resources did not assays beyond Cu, Au and Ag

Green battery metals only assayed pegmatite material

Yellow gold resources only assayed for Au and Ag

What does the future hold?

Free mobile app>>>>> just search Geovision in the app store

Thank you........Questions?