Automating Tree Measurement and Analysis Using RIEGL LIS Tree Analyzer in RiSCAN PRO

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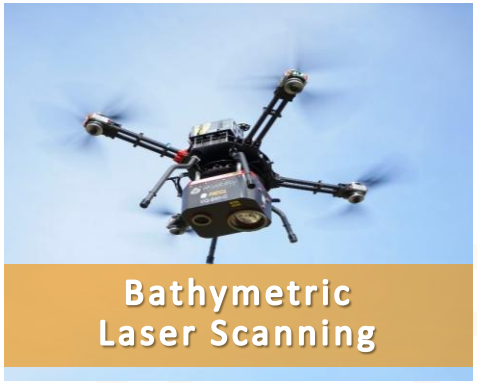

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Terrestrial Laser Scanning

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Terrestrial Laser Scanning

RIEGL VZ-600i

– High-Speed Laser Scanning for Professionals

- Survey/Engineering grade laser scanner
- broad range capability (0.5 m up to 1,000 m)
- 3D position accuracy up to 3 mm @ 50 m
- internal cameras & GNSS receiver (PPK or RTK)
- Scans are coordinated to real world coordinates without having to use survey control
- weight 6 kg / 13 lbs

- Can be used on a tripod or in mobile mode on a backpack, car, buggy, boat etc

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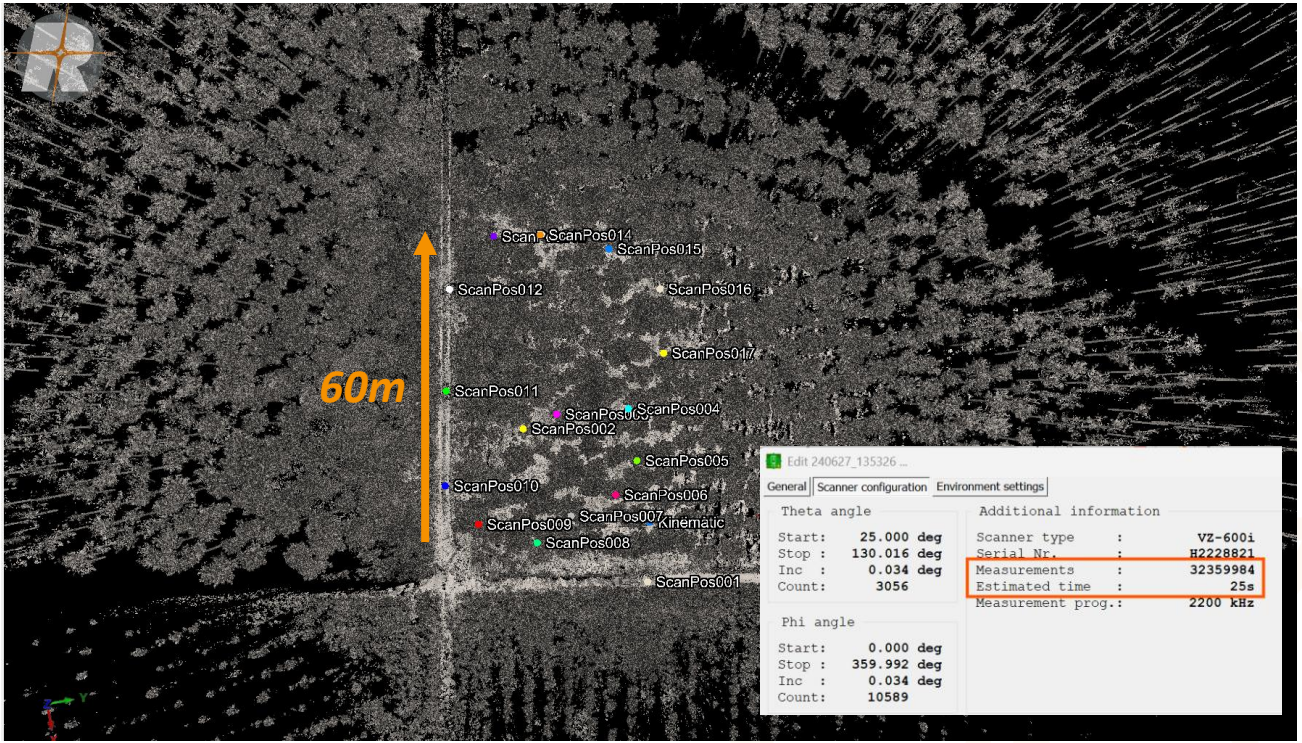
STATIC MODE

16x Scan Stations

1min each = 16min Total Scan time



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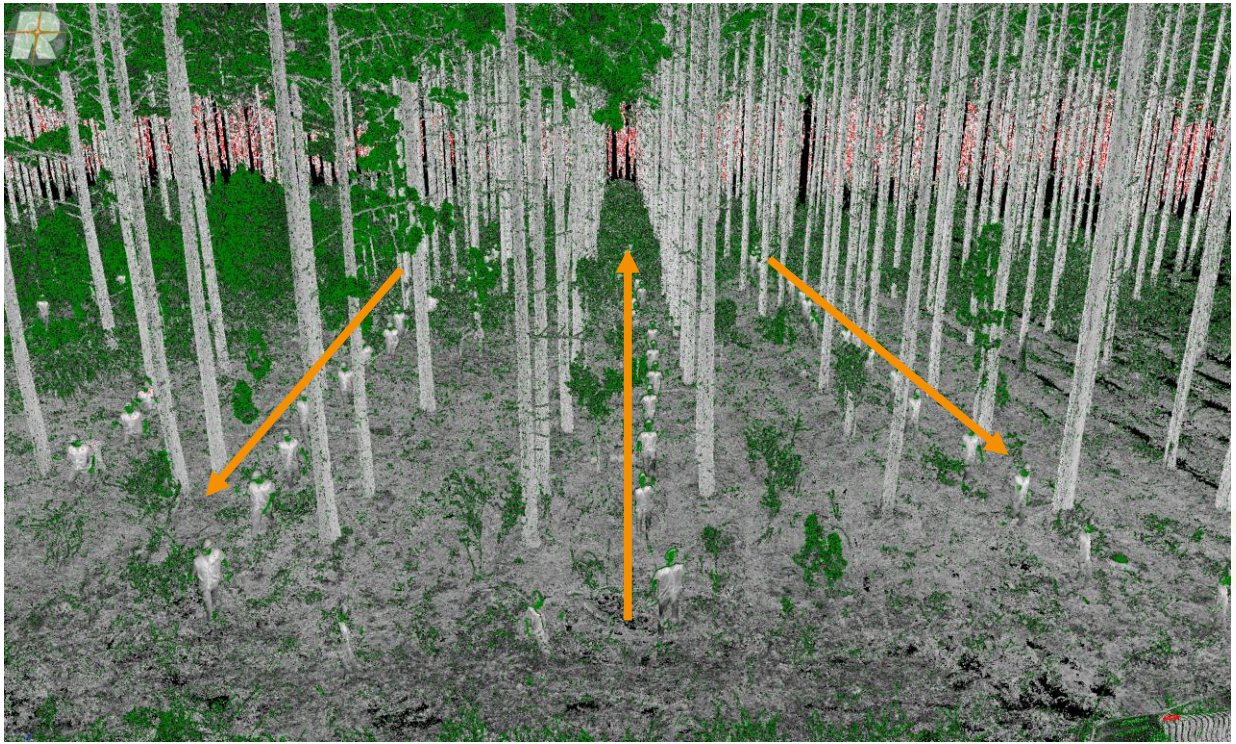
KINEMATIC MODE

~280m walked
~5km/hr = 3min 30sec



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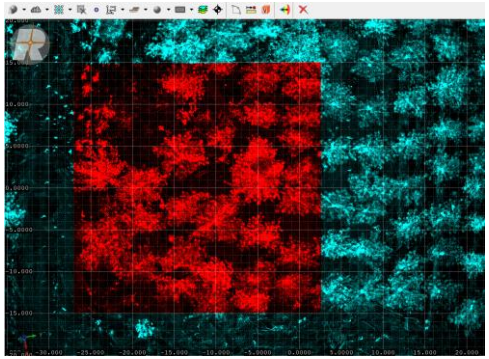
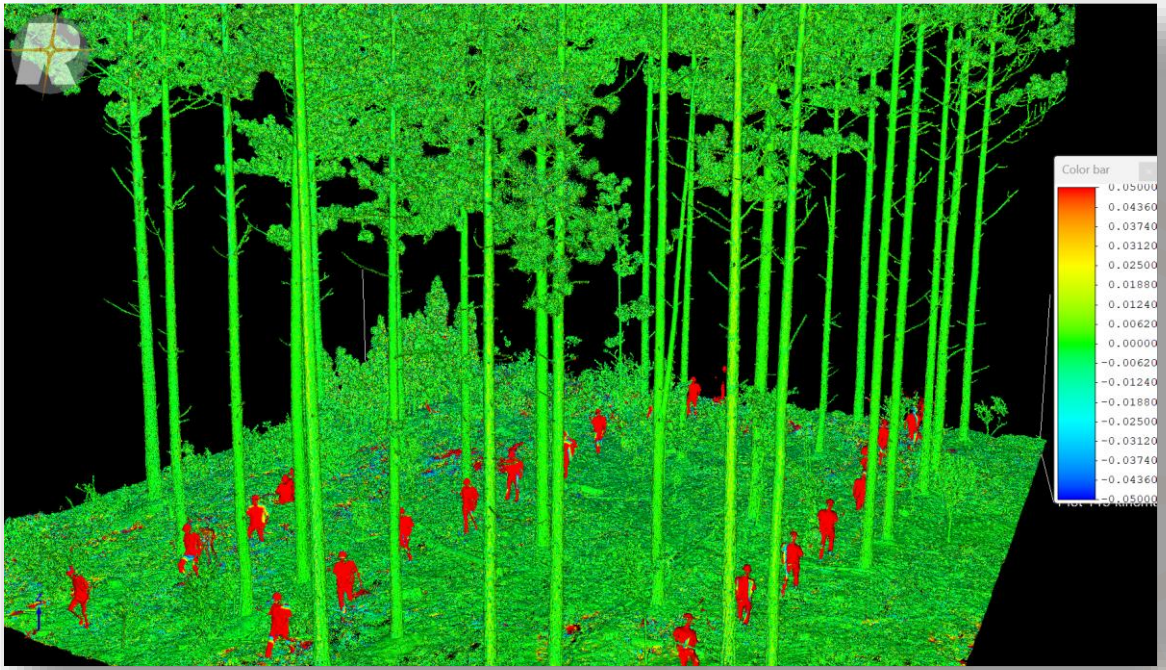
STATIC vs KINEMATIC MODE ACCURACY COMPARISON





The data comparison shows extremely tight 3D comparison, <2mm standard deviation on woody surfaces

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RIEGL RiSCAN PRO - LIS TreeAnalyzer Plug-in

The LIS Tree Analyzer Plug-In provides specific functionality to analyze terrestrial point clouds for forestry applications. It aims at extracting tree metrics like tree height, crown area and crown diameter, as well as the diameter at breast height.

Processing Steps

1) **Extract ground**
2) **Detect then extract stems**
3) **Segment point cloud into trees**
4) **Export metrics or**
5) **Pipe models for volumes**
6) **Export tree metrics with volumes and branching**

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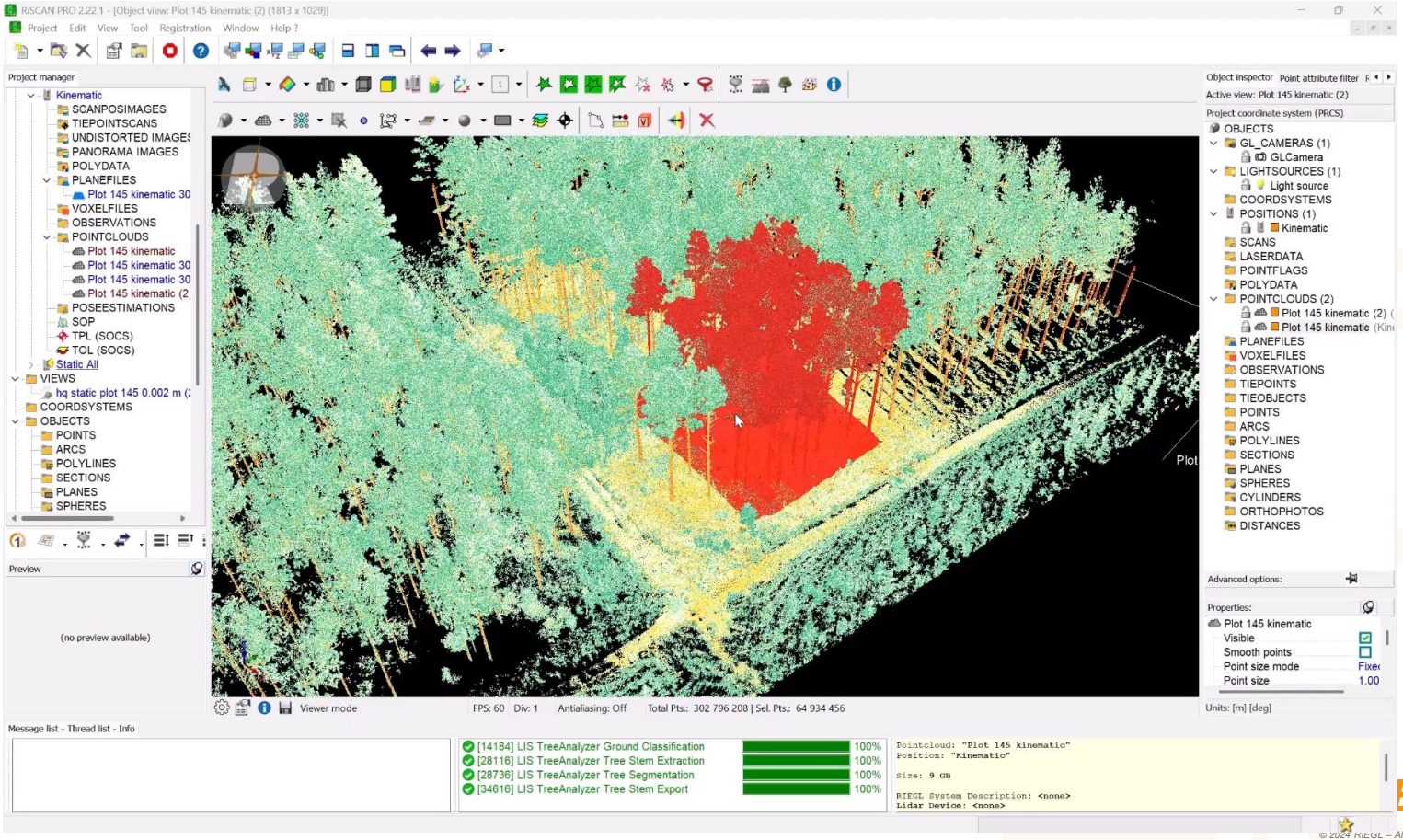
RIEGL RiSCAN PRO - LIS TreeAnalyzer Plug-in



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Exports - LIS TreeAnalyzer for RiSCAN PRO

	A	B	C	D	E	F	G	H	I	J
1	x	y	z	pt_idx	crn_area	crn_dia	dbh	tree_ht	tree_id	wv_large
2	-5102675	2620364	-2779623	15	17.06	6.54	0.29	23.07	43	1.08
3	-5102674	2620377	-2779613	28	35.29	7.64	0.41	25.47	42	2.3
4	-5102685	2620365	-2779603	42	21.54	6.28	0.41	26.46	41	2.58
5	-5102680	2620366	-2779611	40	15.28	5.16	0.31	22.98	40	1.28
6	-5102671	2620374	-2779621	18	23.7	7.47	0.29	21.9	39	1.09
7	-5102669	2620378	-2779621	17	29.1	7.38	0.35	23.11	38	1.67
8	-5102674	2620366	-2779623	14	21.89	6.77	0.35	23.67	37	1.72
9	-5102674	2620372	-2779618	20	29.98	7.37	0.41	24.14	36	2.22
10	-5102680	2620374	-2779605	36	15.26	4.88	0.27	22.32	35	1.01
11	-5102681	2620370	-2779606	37	12.98	4.95	0.25	20.13	34	0.69
12	-5102677	2620363	-2779620	23	18.75	5.88	0.35	24.43	33	1.78
13	-5102676	2620377	-2779609	26	16.09	4.93	0.29	26.26	32	1.29
14	-5102677	2620375	-2779609	25	15.24	5.25	0.31	22.3	31	1.32
15	-5102682	2620374	-2779602	38	10.94	4.18	0.29	23.24	30	1.15
16	-5102679	2620381	-2779601	35	16.48	5.08	0.31	22.15	29	1.3
17	-5102676	2620365	-2779619	19	16.57	5.21	0.27	20.14	28	0.76
18	-5102681	2620376	-2779601	34	17.23	5.59	0.33	22.41	27	1.47
19	-5102683	2620370	-2779603	39	16.77	5.41	0.33	23.75	26	1.48
20	-5102679	2620368	-2779611	31	14.12	5.16	0.27	24.19	25	1.02
21	-5102683	2620365	-2779607	41	15.98	5.21	0.27	22.6	24	0.97

Export

- **GIS ready Shape File with Metadata**
- **CSV with all available metrics**

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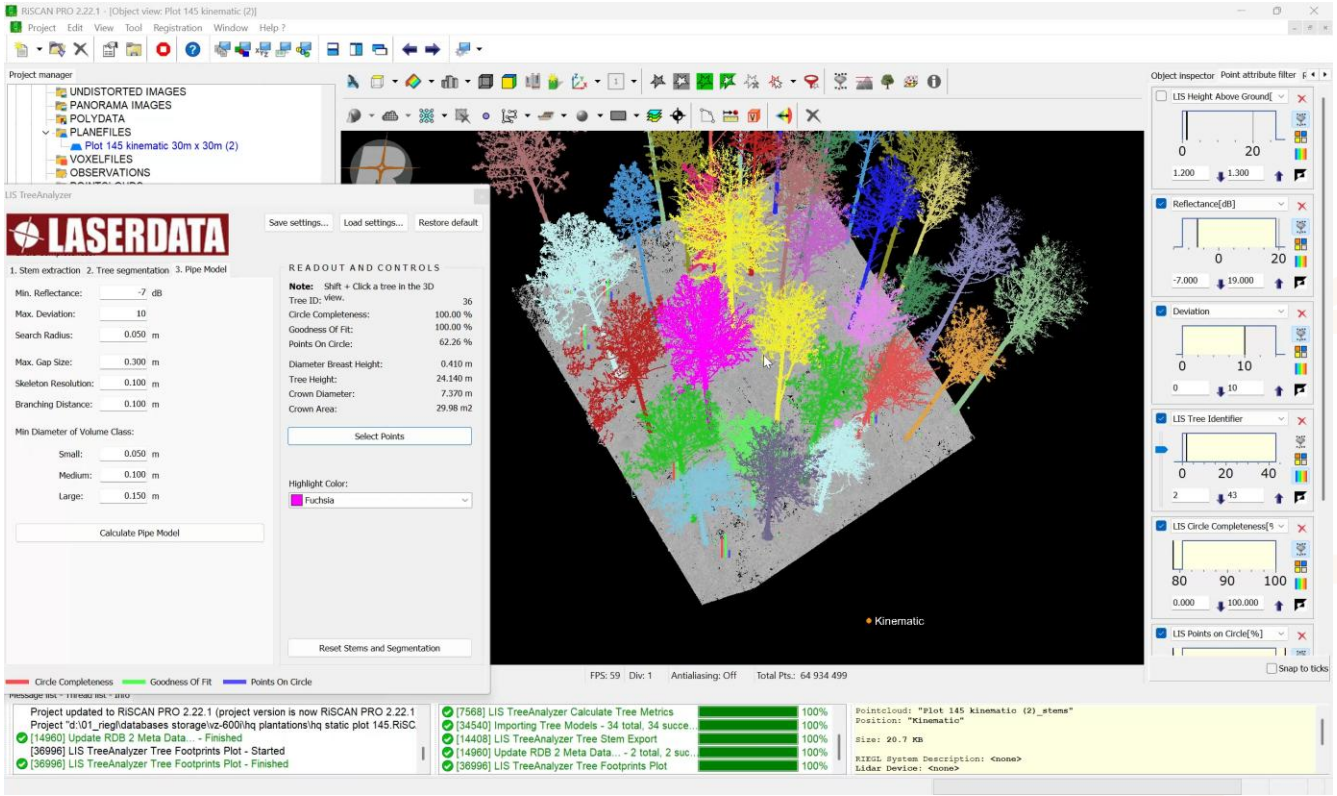
RESULTS - LIS TreeAnalyzer for RiSCAN PRO



Can isolate individual trees in 3D view and export segmented data

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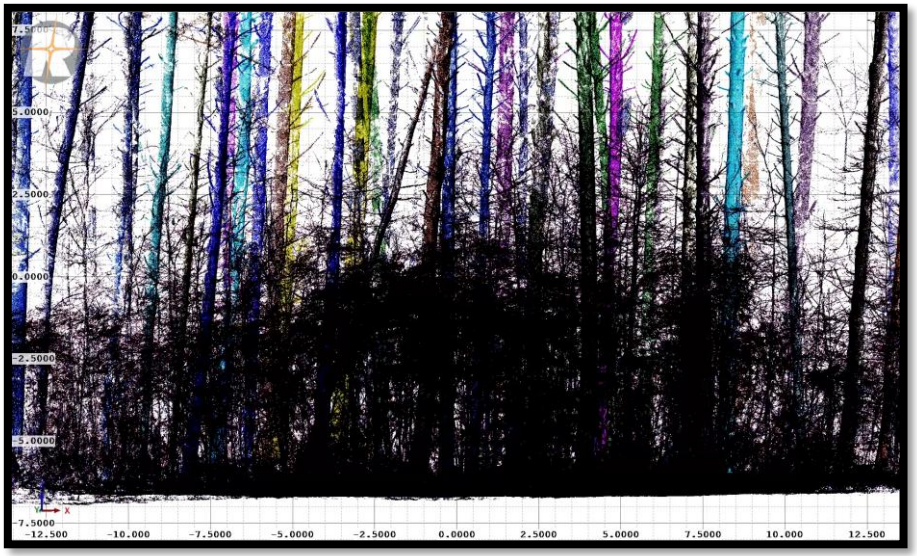
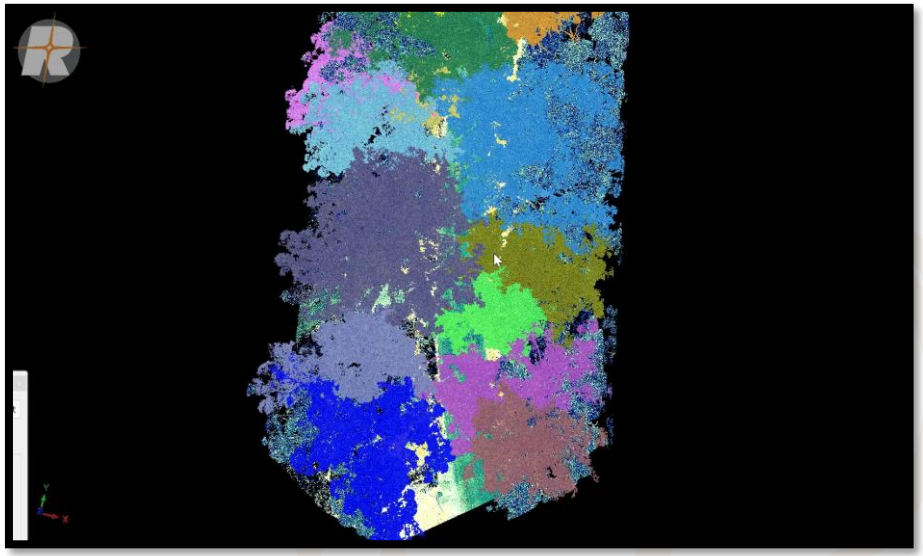
RESULTS - LIS TreeAnalyzer for RiSCAN PRO



Works well even with thick understory



Also in various native bush areas

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UAV-based Laser Scanning

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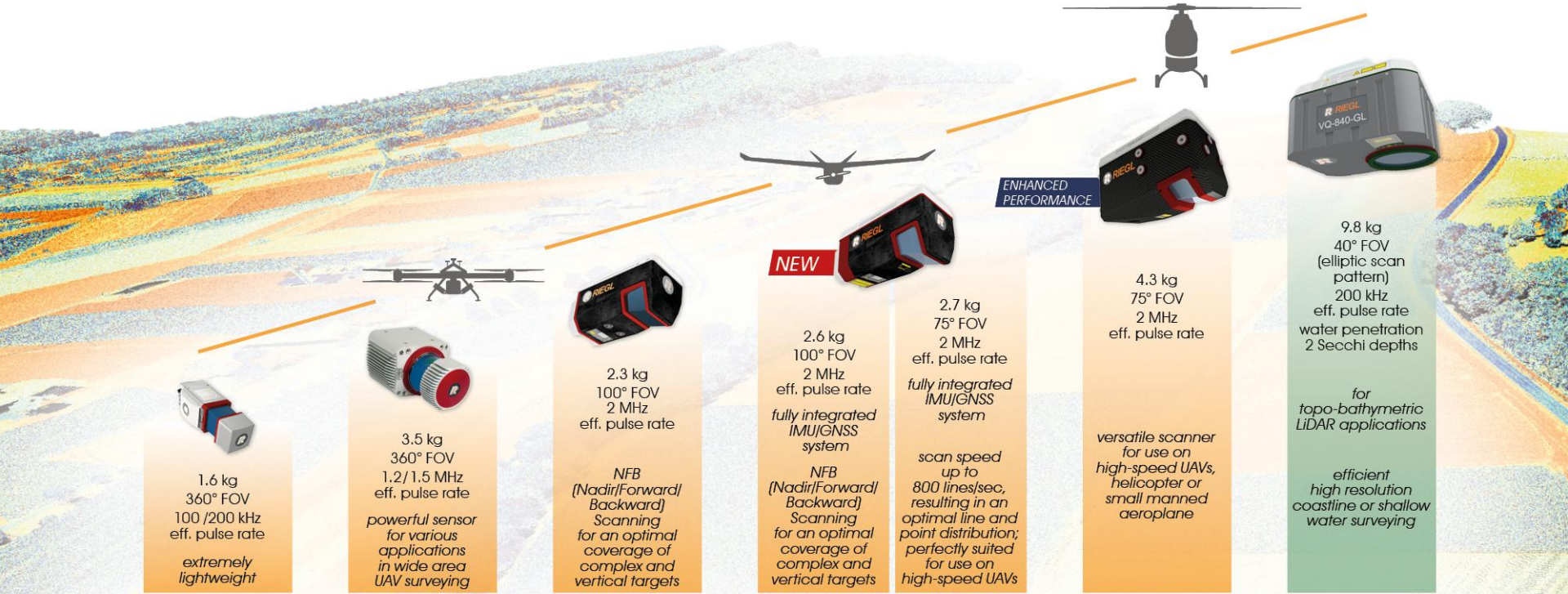
UAV-based Laser Scanning



miniVUX-1UAV, /-3UAV	VUX-1UAV[22] /-LR[22]	VUX-120[23]	VUX-160[23] / ***NEW*** VUX-180[24]	VUX-240[24]	VQ-840-GL
1.6 kg 360° FOV 100 /200 kHz eff. pulse rate *extremely lightweight*	3.5 kg 360° FOV 1.2/1.5 MHz eff. pulse rate *powerful sensor for various applications in wide area UAV surveying*	2.3 kg 100° FOV 2 MHz eff. pulse rate *NFB (Nadir/Forward/ Backward) Scanning for an optimal coverage of complex and vertical targets*	2.6 kg 100° FOV 2 MHz eff. pulse rate *fully integrated IMU/GNSS system* *NFB (Nadir/Forward/ Backward) Scanning for an optimal coverage of complex and vertical targets* 2.7 kg 75° FOV 2 MHz eff. pulse rate *fully integrated IMU/GNSS system* *scan speed up to 800 lines/sec, resulting in an optimal line and point distribution; perfectly suited for use on high-speed UAVs*	4.3 kg 75° FOV 2 MHz eff. pulse rate *versatile scanner for use on high-speed UAVs, helicopter or small manned aeroplane*	9.8 kg 40° FOV (elliptic scan pattern) 200 kHz eff. pulse rate water penetration 2 Secchi depths *for topo-bathymetric LiDAR applications* *efficient high resolution coastline or shallow water surveying*

for applications using low-flying small or mid-sized multi-rotor UAVs
e.g. mining, topography, forestry, landslide and avalanche monitoring

for applications using fixed-wing UAVs
e.g. corridor mapping, city modeling

for applications using higher-flying large UAVs or helicopters
e.g. mapping with the need of detailed high-resolution data

Integrations with various camera systems

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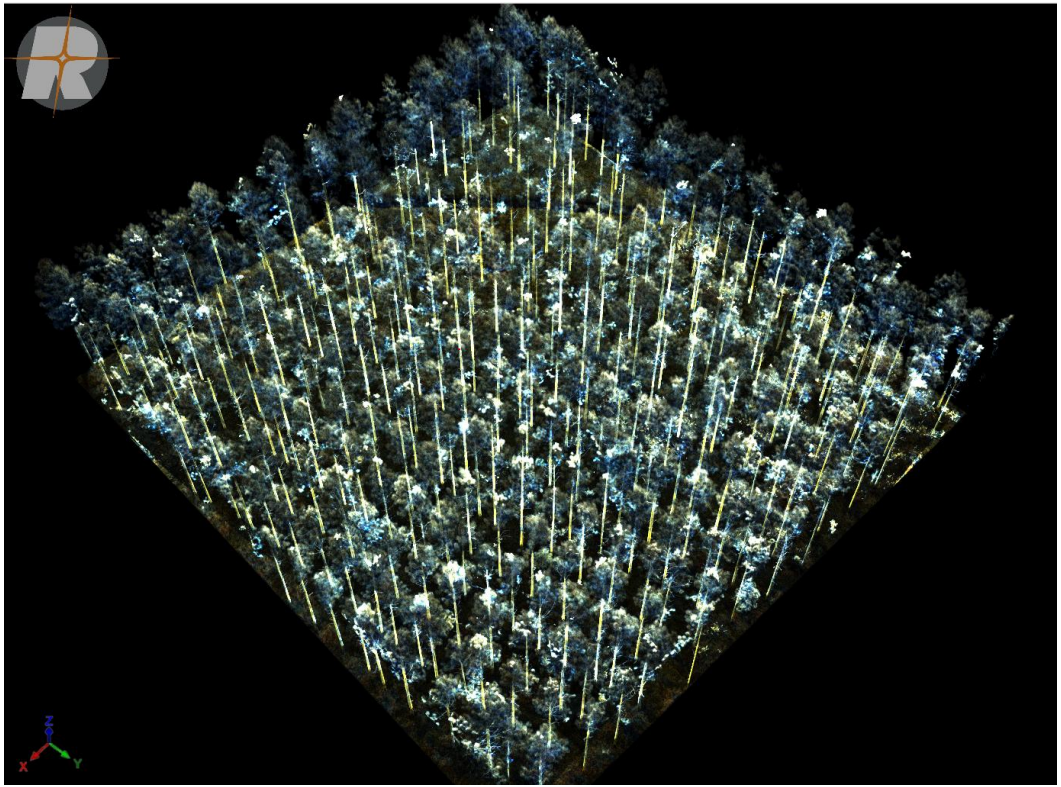
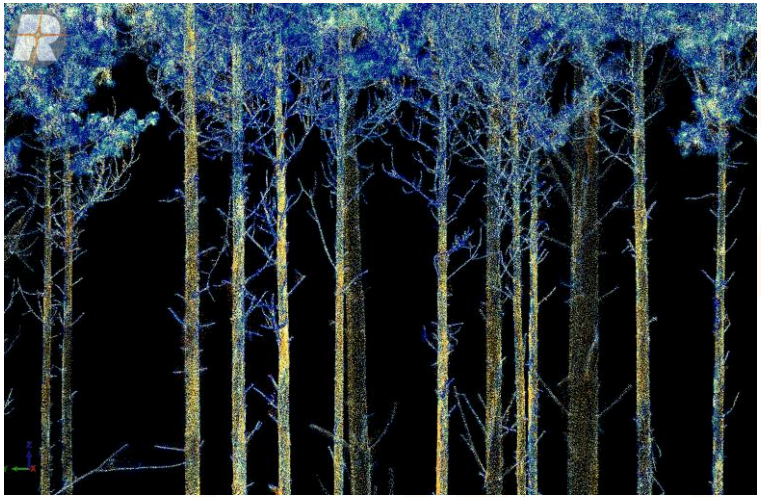
UAV-based Laser Scanning



- Latest LiDAR sensors with 800 profiles / 2.4 million points per second
- Multiple returns improve detail through canopy layers
- Data similar in detail to ground based LiDAR
- BVLOS needed for practical and scalable use



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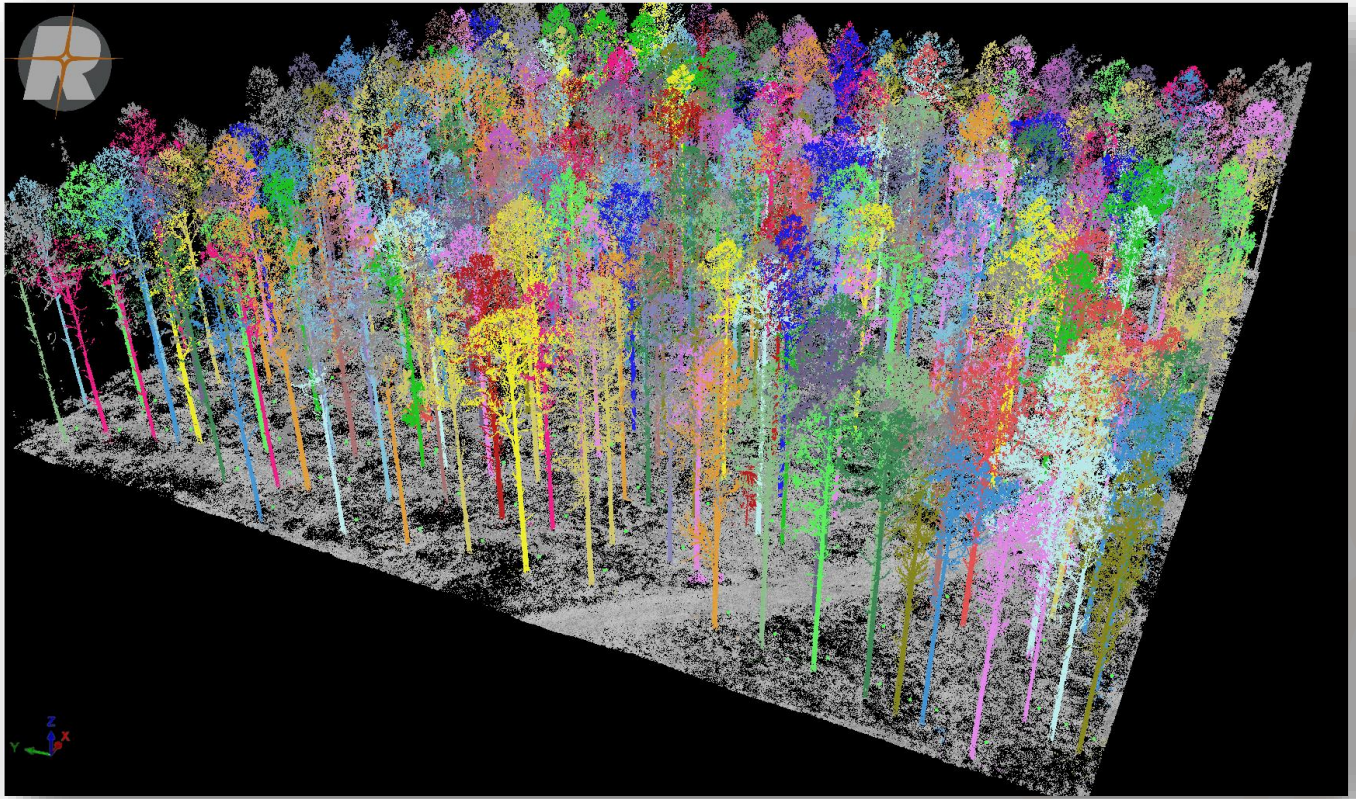

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Versatility.
Innovation.
Reliability.

Thank you for your attention

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