



GATHERS-hack datadive

13th & 14th April 2023

Kick-Off

Overview

Hosts for the Kick-Off: Anna, Gottfried, Norbert

- Timetable
- Organization & People
- Finals
- Lidar tech & Data sets
- Jupyter & IT environment
- Aims & challenges
- Group forming

Timetable

- Coffee Break
- Lunch at Mensa
Thu/Fri 10:00-14:30
- Final presentation on Friday
17:00
- Jury Feedback
- Closing Dinner



GATHERS-hack datadive*
AUSTRIA Vienna

	THURSDAY 13th April 2023	FRIDAY 14th April 2023
9:00 - 10:30	Welcome Session Topics and more	working in GROUPS
10:30 - 11:00	Coffee break	
11:00 - 12:30	Group forming	
12:30 - 14:00	LUNCH	LUNCH
14:00 - 17:00	working in GROUPS	working in GROUPS
OPEN END		Final Presentation
		Jury Feedback and Dinner

*We ask for understanding, that there may be changes at short notice . All information is therefore subject to change.



Organization

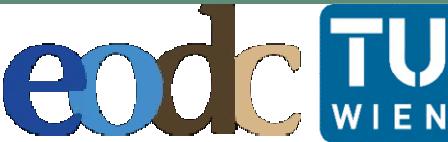
- Mentors
 - Wilfried Karel
 - Benjamin Wild
 - Taskin Özkan
- Flying Juror
 - Gottfried Mandlburger
- Jury
 - Christian Briese (EODC)
 - Johannes Otepka (TU Wien)
- Administrational Contact – Anna (+43 676 9317 117)
 - Catering
 - WIFI Codes
 - Keys and Key cards

running up for ... Finals

- Embedding



UNIWERSYTET
PRZYRODNICZY
WE WROCŁAWIU



TECHNISCHE
UNIVERSITÄT
WIEN

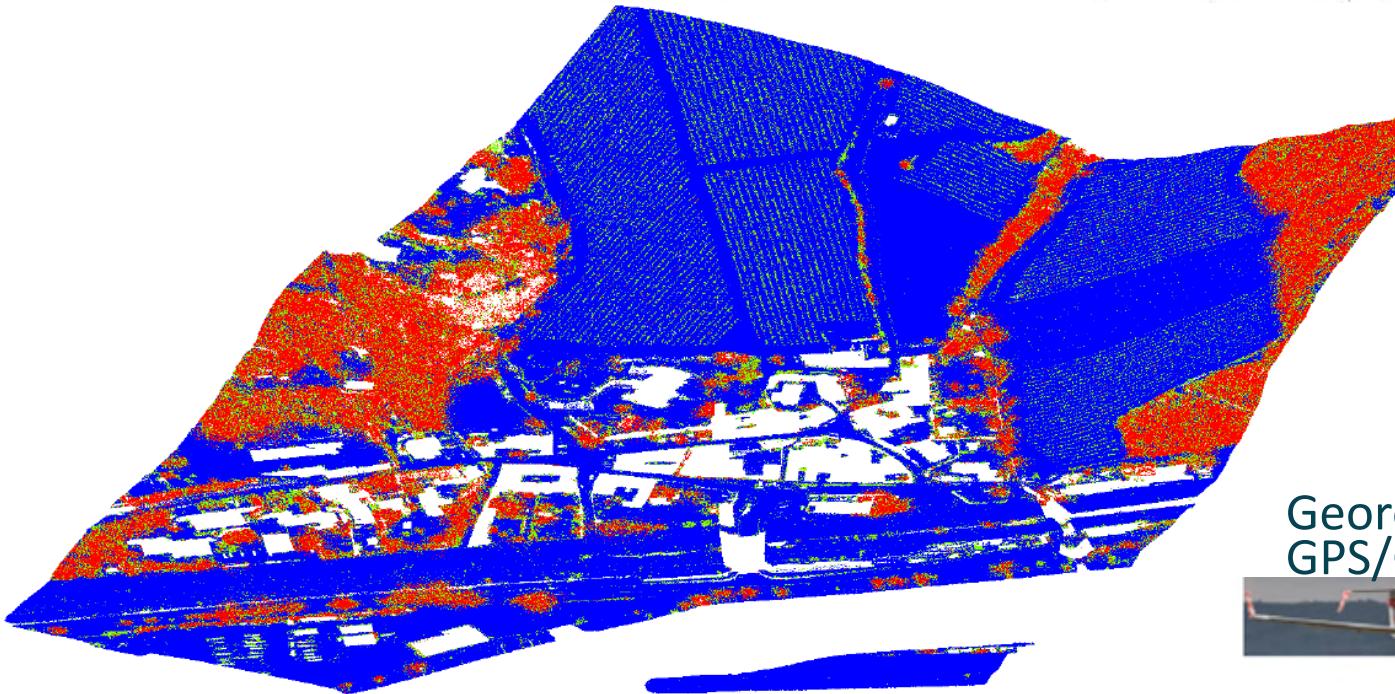
- EU projects: integration of Geodetic and imAging TecHiques for monitoring and modelling the Earth's surface defoRmations and Seismic risk
- Starting point Earth Observation – EO Data → DATA DIVE
- Hackathon Sponsors
 - 1: GATHERS / EU funding
 - 2: EODC Earth Observation Data Center
 - bridging Satellite EO ESA-Sentinel & Super Computing Power
 - 3: UWPr Wrocław University of Environmental and Life Sciences
 - 1 ECTS for participation, use in your curriculum

Finals

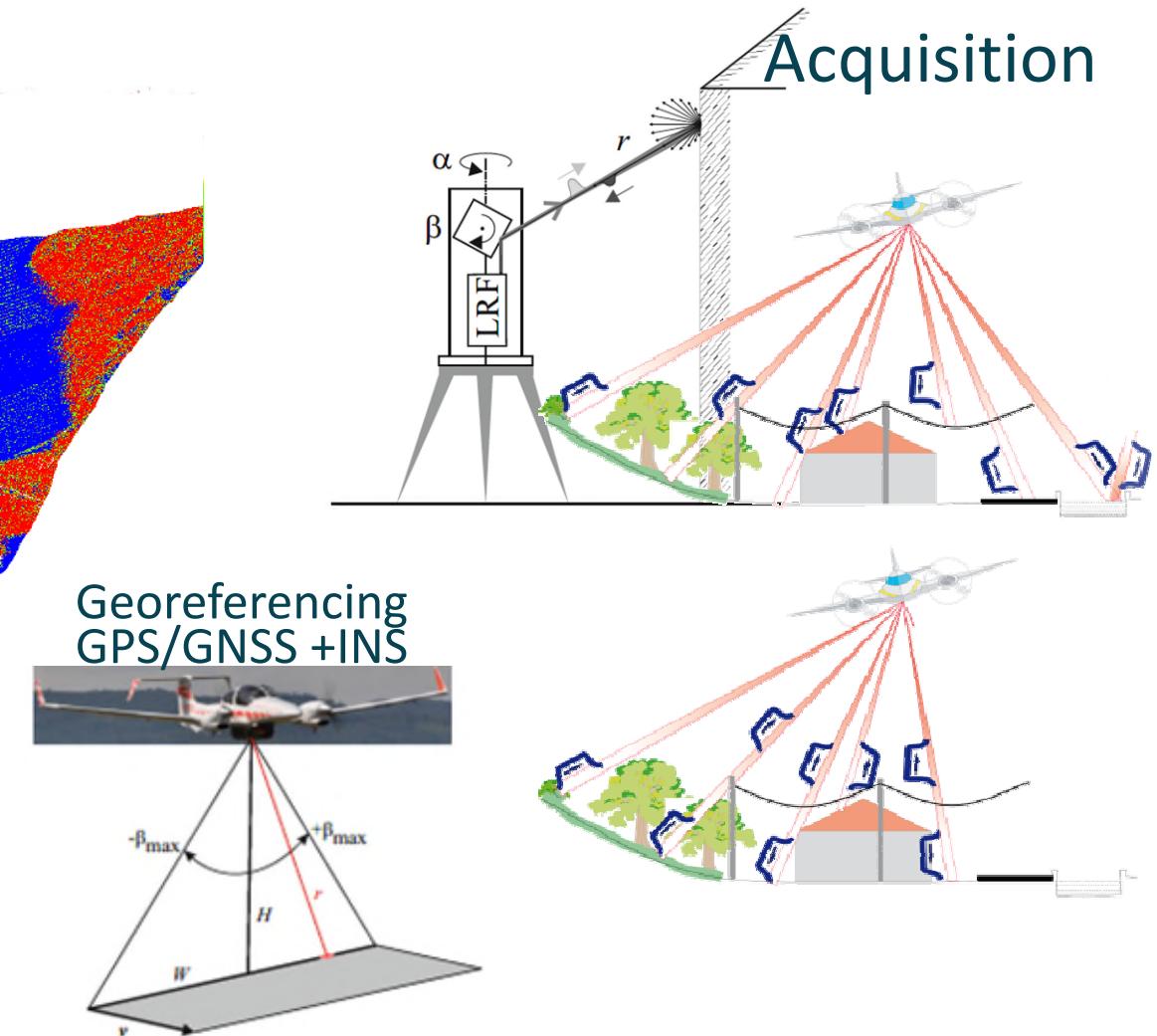
- Tomorrow, 17:00, this meeting room / Jupiter
- Prices
 - IT : computing power with EO data - EODC sponsored
 - LIDAR : TLS for a day – get your own point cloud
 - Gadgets
 - Energy
- Jury decision based on presentation & spirit
- Dinner & 1 ECTS

Getting to the topic : Point Clouds / Lidar tech

What's in a point cloud



Set of 3D points, georeferenced,
with additional attributes



Lidar tech & Data sets

- Introduction of data sets
 1. Airborne Laser Scanning Vienna (Full Waveform, FWF)
 2. Airborne Laser Scanning Vienna (Single Photon LiDAR, SPL)
 3. Multi-temporal Airborne Laser Scanning Rybnik, Poland (mining area)
 4. Multi-temporal Airborne Laser Scanning Pielach, Lower Austria (river area)
 5. Multi-spectral UAV LiDAR Forest, Lower Austria
 6. Multi-view ultra high density UAV LiDAR Rohrach, Vorarlberg, Austria
- Introduction of JupyterHub environment
 - Live demonstration
- Point cloud processing with OPALS
 - Short introduction (live demonstration)
- Additional Software
 - CloudCompare, QGIS

Data set 1: ALS Vienna (full waveform)

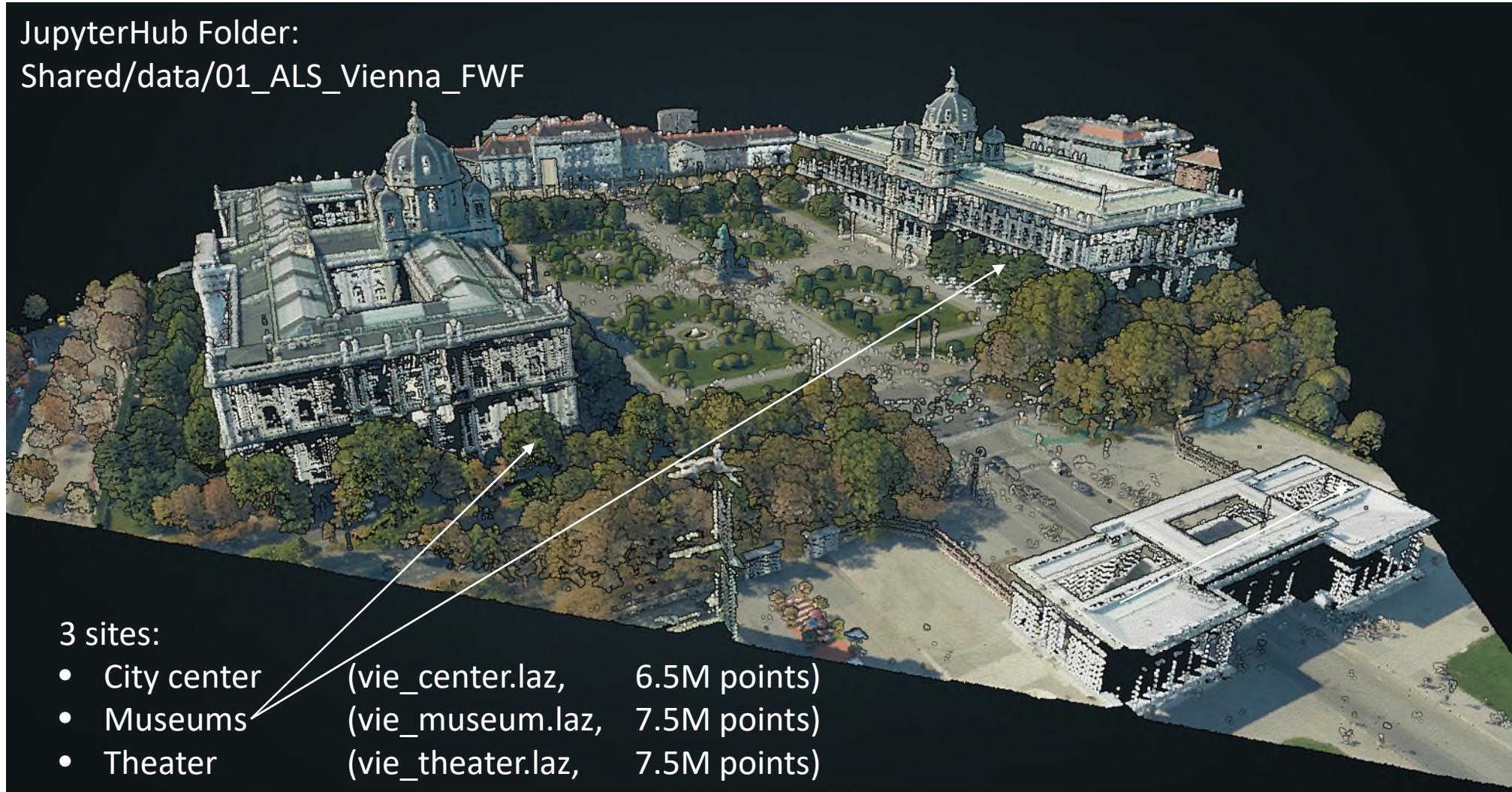


- Flight date: 09-2018
- Sensor: *RIEGL* VQ-1560i
- Point density: ~50 Pts/m²
- Attributes:
 - Intensity
 - Reflectance
 - RGB
 - Classification
 - NDVI
 - Surface normals
 -
- Data owner: *RIEGL LMS*

Data set 1: ALS Vienna

JupyterHub Folder:

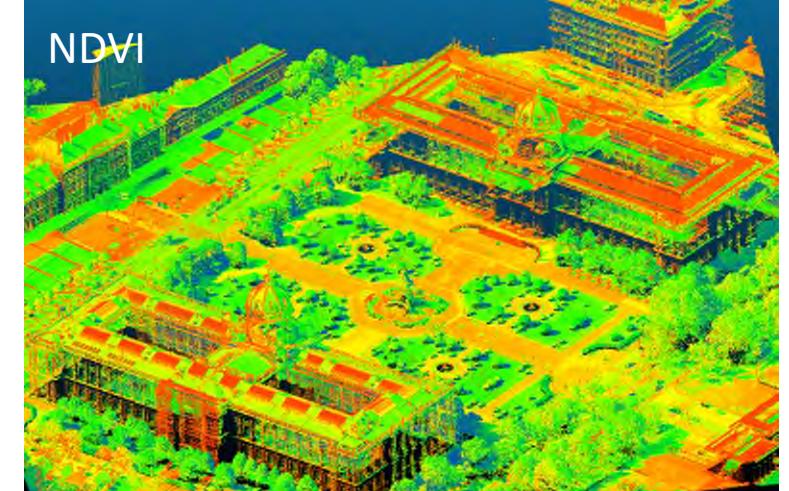
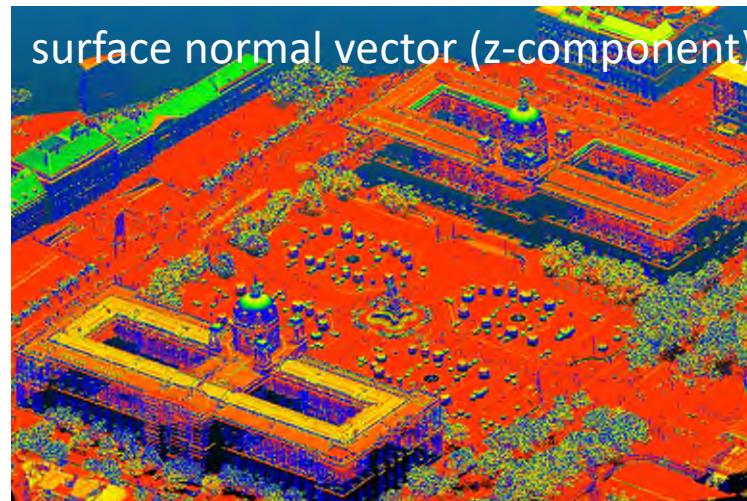
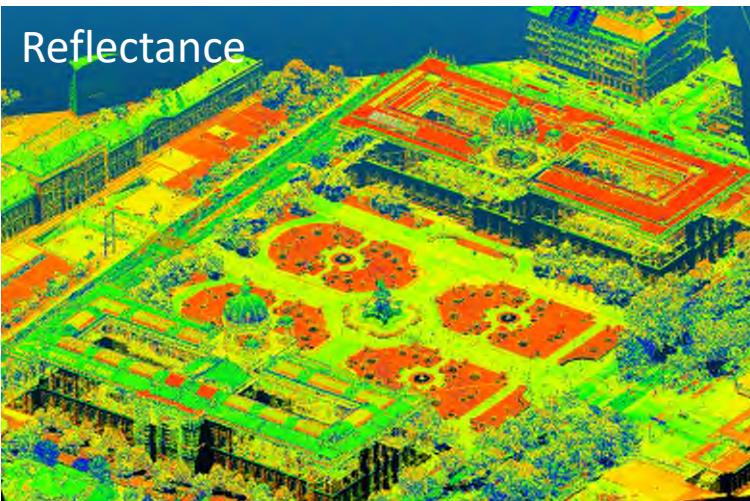
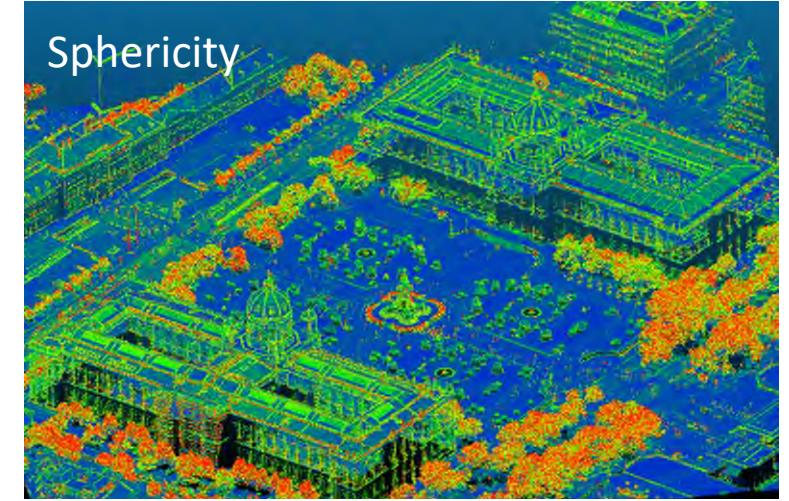
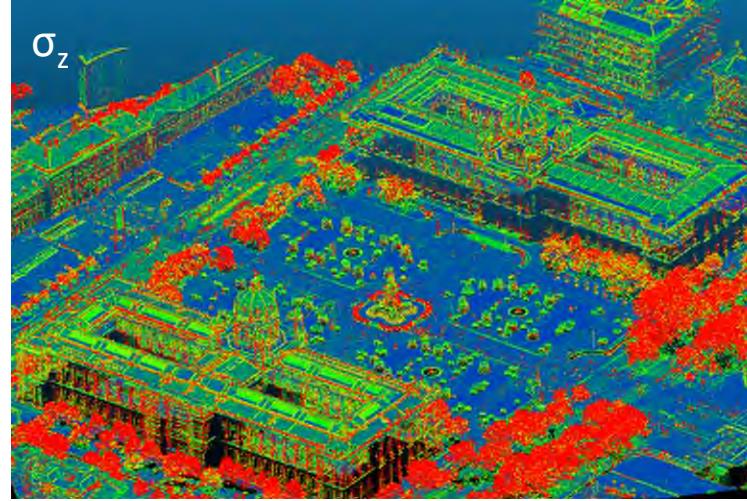
Shared/data/01_ALS_Vienna_FWF



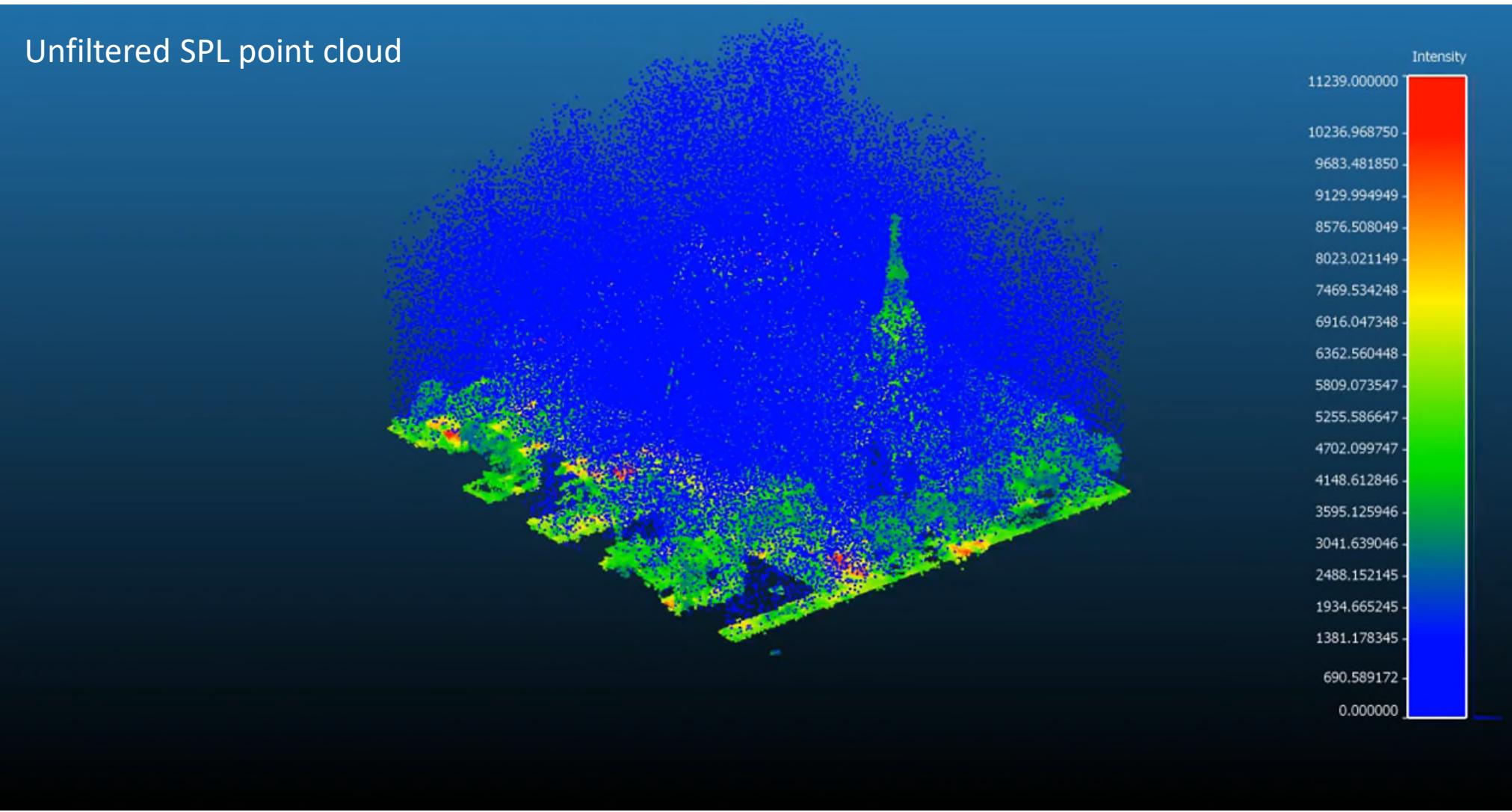
3 sites:

- City center (vie_center.laz, 6.5M points)
- Museums (vie_museum.laz, 7.5M points)
- Theater (vie_theater.laz, 7.5M points)

Data set 1: ALS Vienna

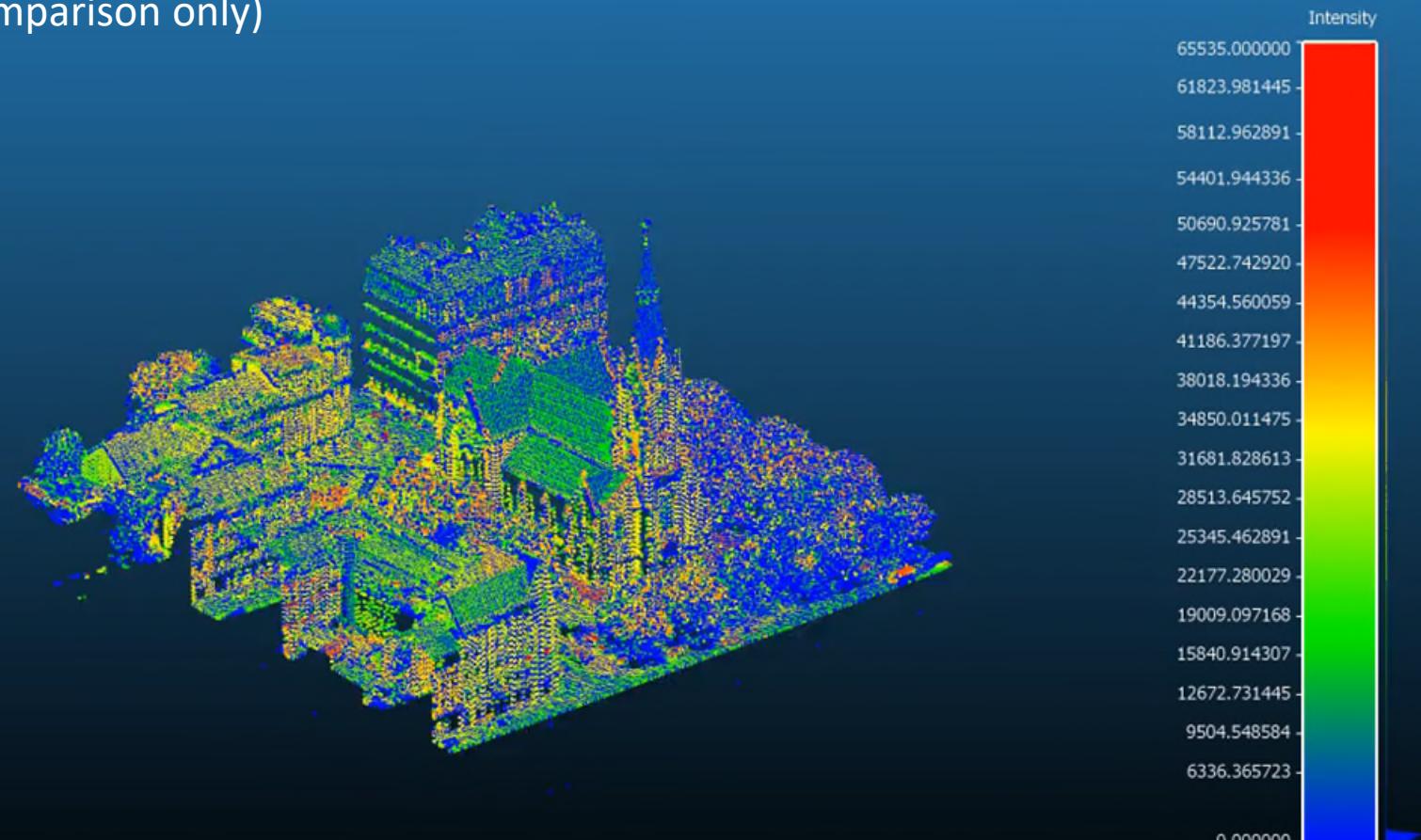


Data set 2: ALS Vienna (Single Photon LiDAR)

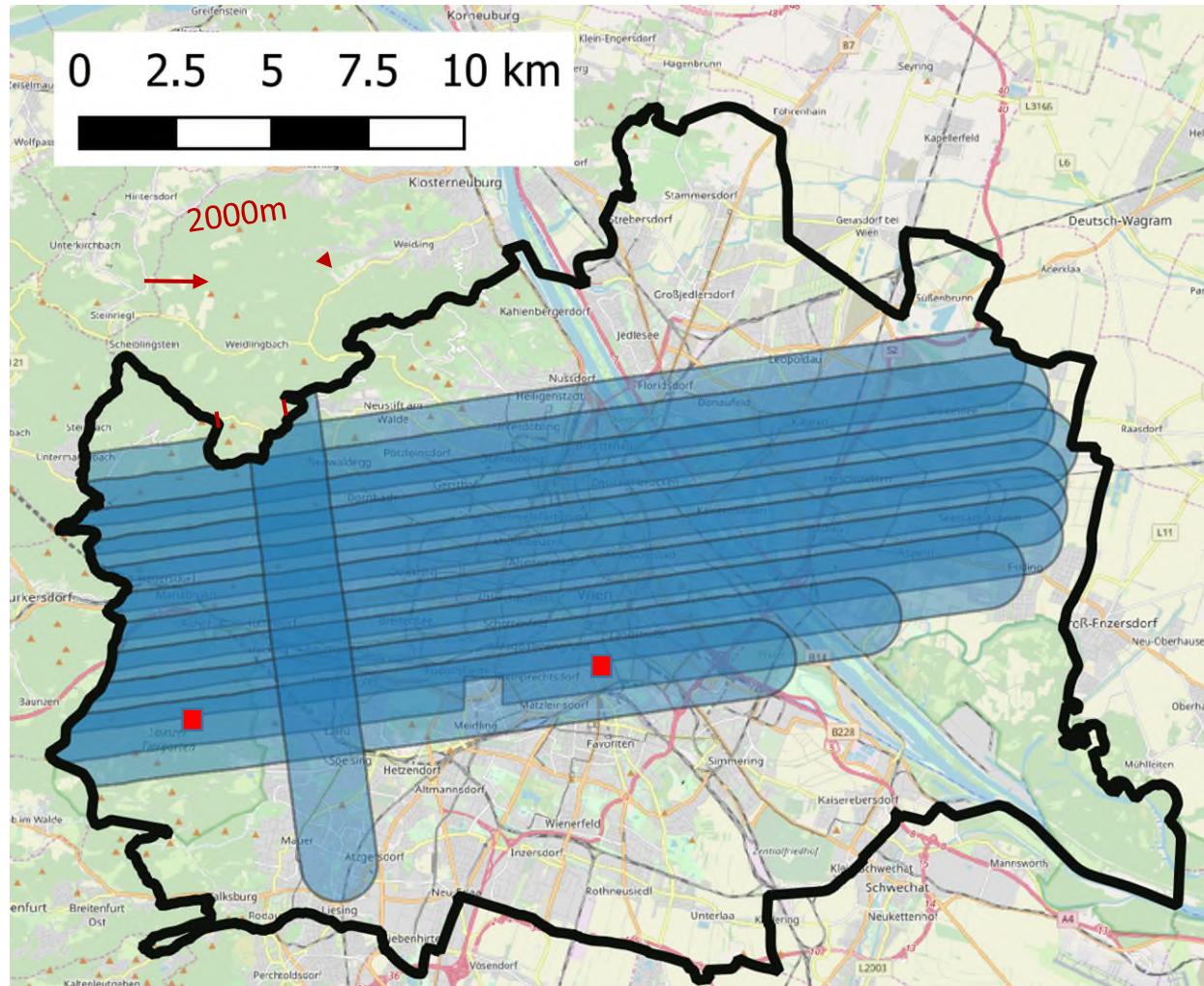


Data set 2: ALS Vienna (Single Photon LiDAR)

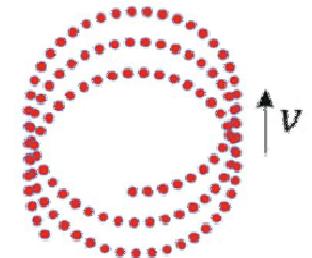
FWF point cloud (for comparison only)



Data set 2: ALS Vienna (Single Photon LiDAR)



Flight mission parameters	
Flight date	29.07.2018
Scan rate	5 MHz
Flying altitude	4000m
Swath width	2000m
Scan pattern	circular (Palmer)
Field-of-View	30°
Overlap	>50%
Nom. pt. density	20 Pkt/m ²
Nr. of strips	10



Data owner: City of Vienna (MA41)
Laser scanner: Leica SPL100
Data acquisition: COWI

Data set 2: ALS Vienna (SPL)



Data set 3: Multi-temporal ALS (mining site)



Rybnik/Poland, 2011

Data set 3: Multi-temporal ALS (mining site)



Rybnik/Poland, 2022

Data set 3: Multi-temporal ALS (mining site)

	2011	2019	2021	2022
Date	2011-07-16	2019-04-04	2021-03-26	2022-03-22
Scanner	<i>RIEGL LMS-Q680i</i>	<i>RIEGL LMS-Q680i</i>	<i>RIEGL VQ-780 II</i>	<i>RIEGL VQ-780 II</i>
Flying altitude	850 m	---	---	---
Point density	~15 Pts/m ²	~20 pts/m ²	~20 pts/m ²	~20 pts/m ²
Attributes	RGB, class, intensity	class, intensity	class (ground/off-terrain), intensity	RGB, class, intensity
Horiz. Ref. System	EPSG:2180	EPSG:2180	EPSG:2180	EPSG:2180
Vert. Ref. System	EVRF2007	EVRF2007	EVRF2007	EVRF2007

Data set 3: Multi-temporal ALS (mining site)

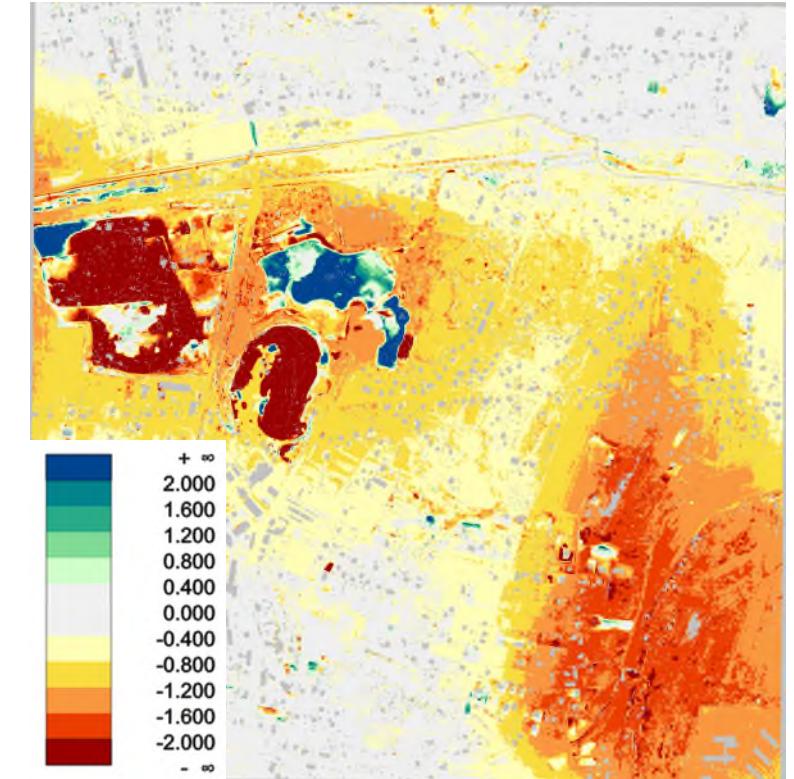
DTM 2011



DTM 2022

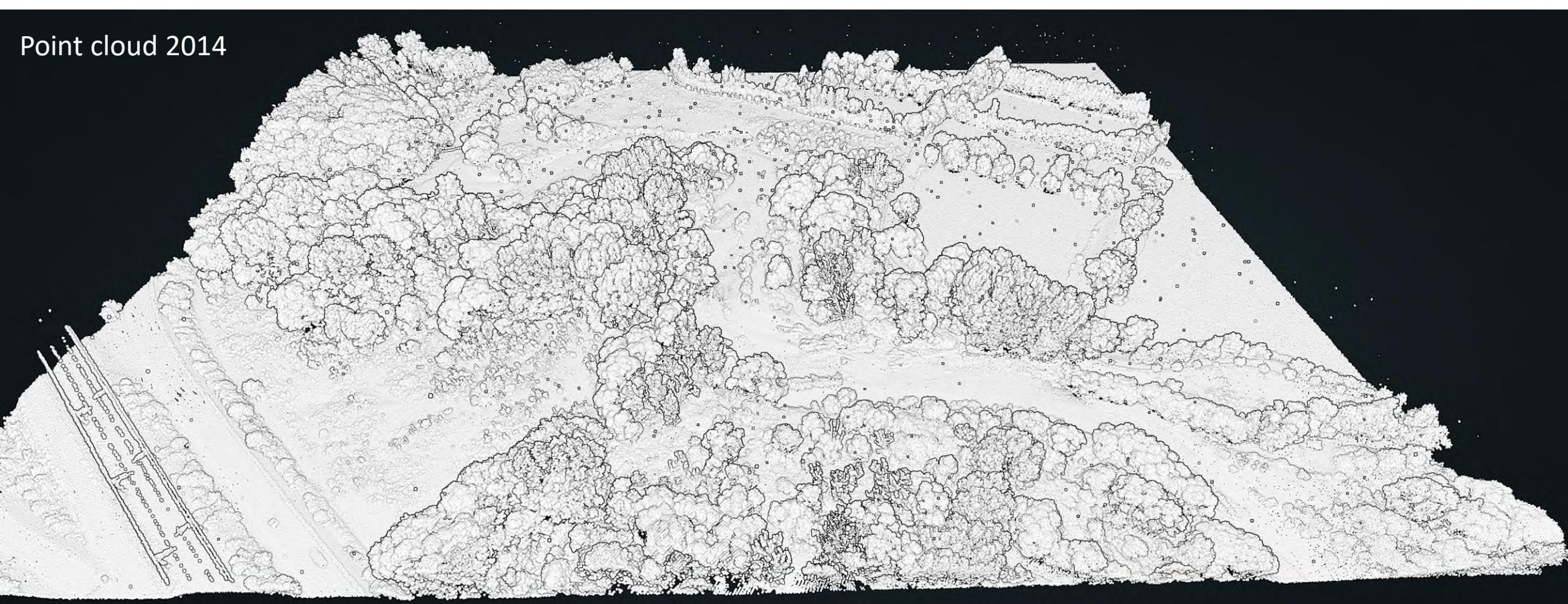


DEM of Differences



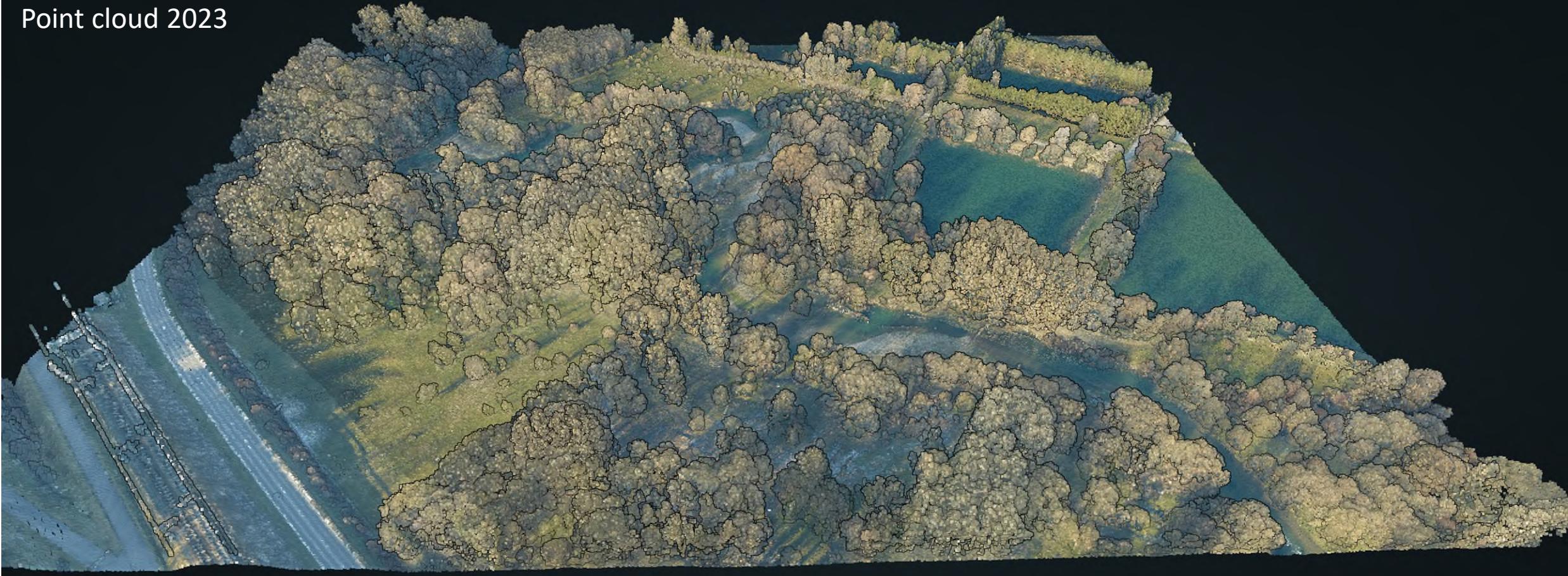
Data set 4: Laser Bathymetry , Pielach River

Point cloud 2014

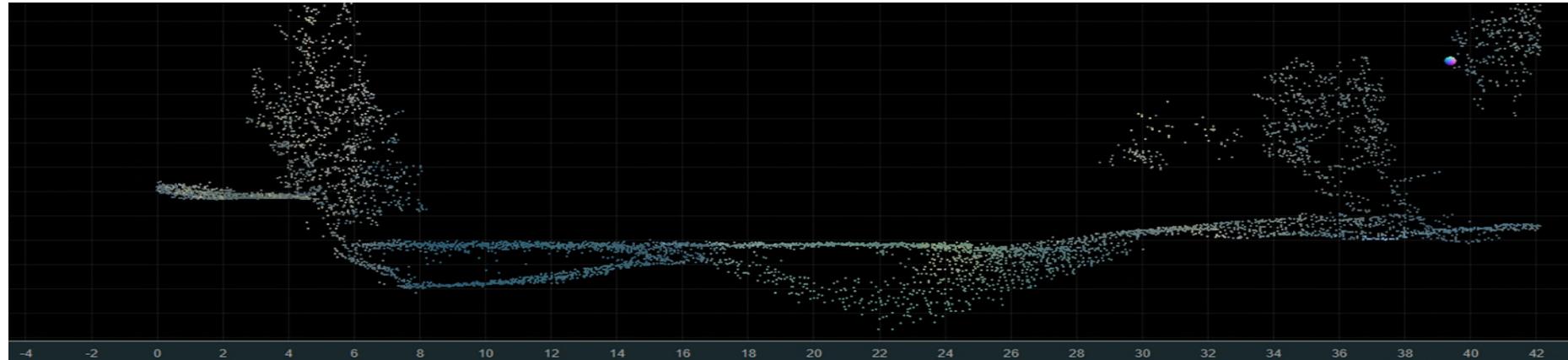


Data set 4: Laser Bathymetry , Pielach River

Point cloud 2023



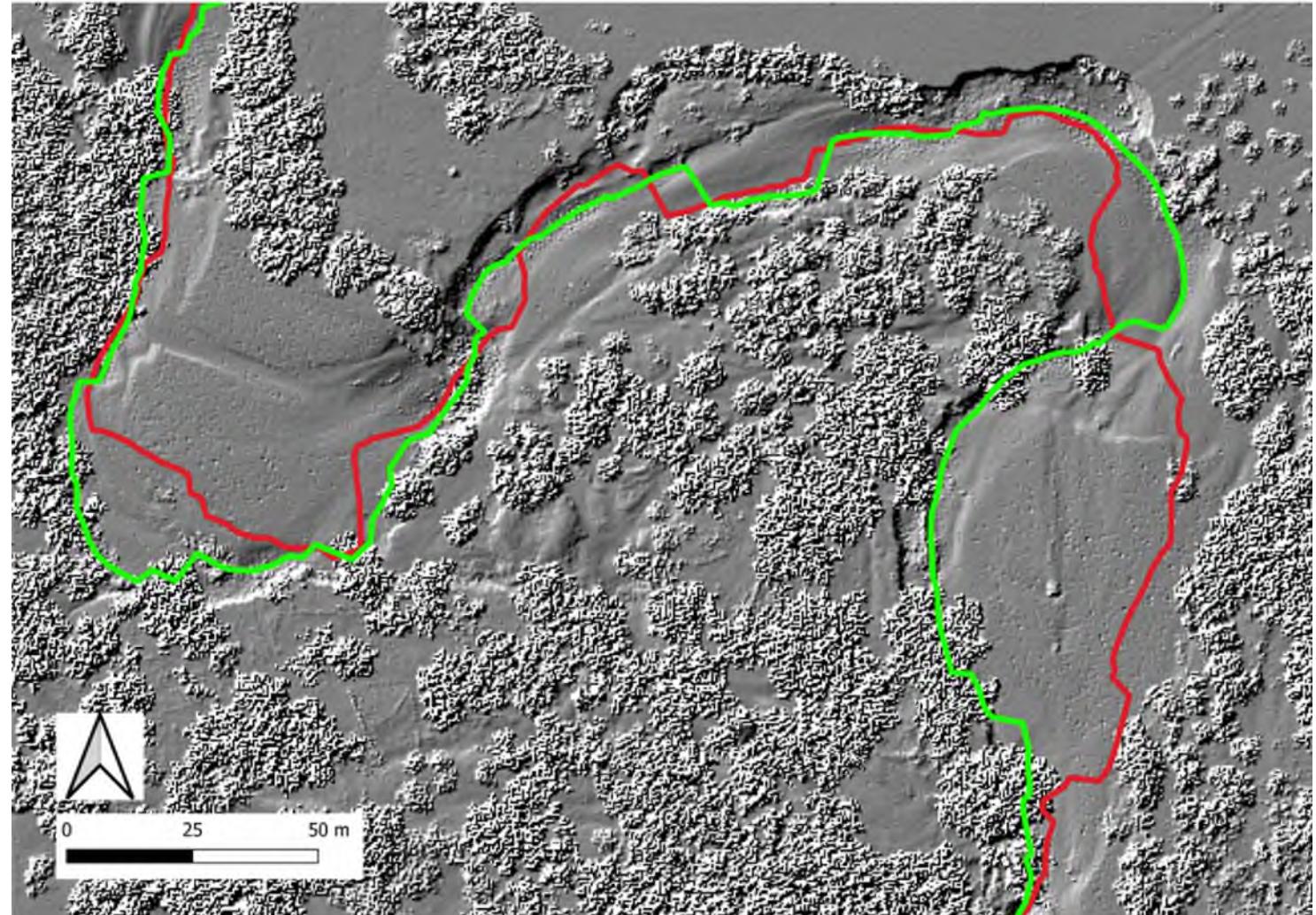
Data set 4: Laser Bathymetry , Pielach River



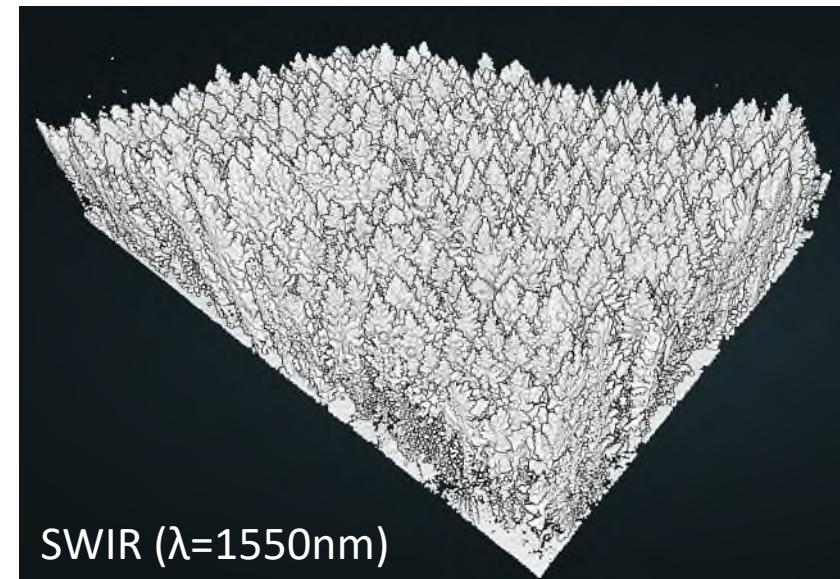
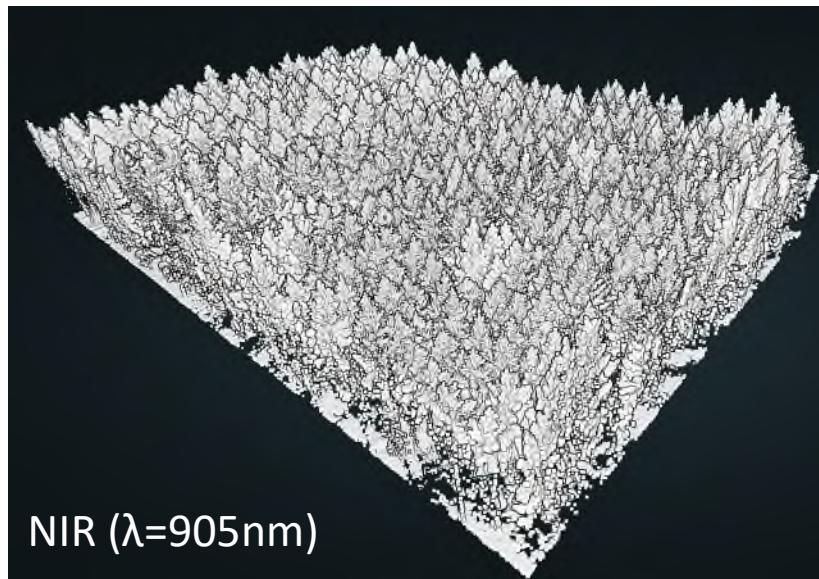
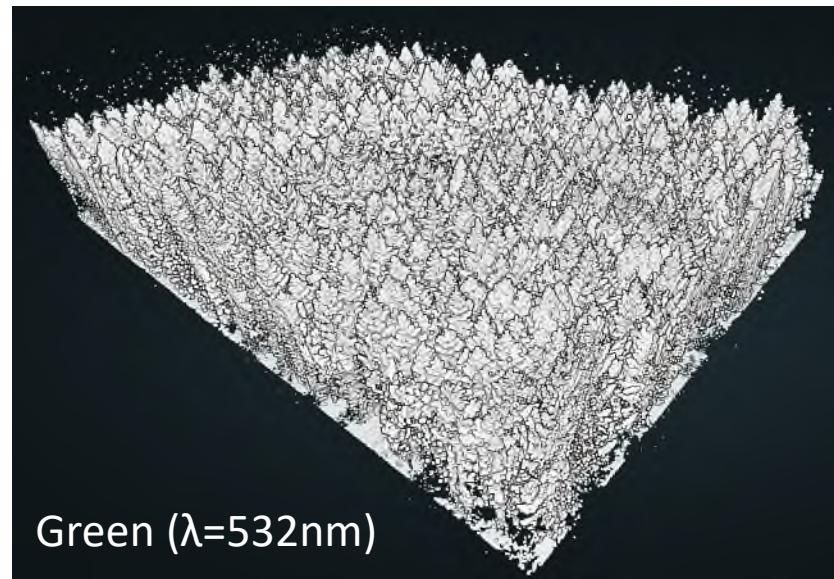
	2014	2023
Scanner	<i>RIEGL VQ-880-G</i>	<i>RIEGL VQ-880-G</i>
Point density	28 pts/m ²	32 pts/m ²
Flying altitude	~700m a.g.l.	~700m a.g.l.
Reference system	ETRS89/UTM33	ETRS89/UTM33
Attributes	intensity, reflectance, deviation	RGB, intensity, reflectance, deviation

Data set 4: Laser Bathymetry , Pielach River

- Hill shading from 2014
- Green: Thalweg 2014
- Red: Thalweg 2023

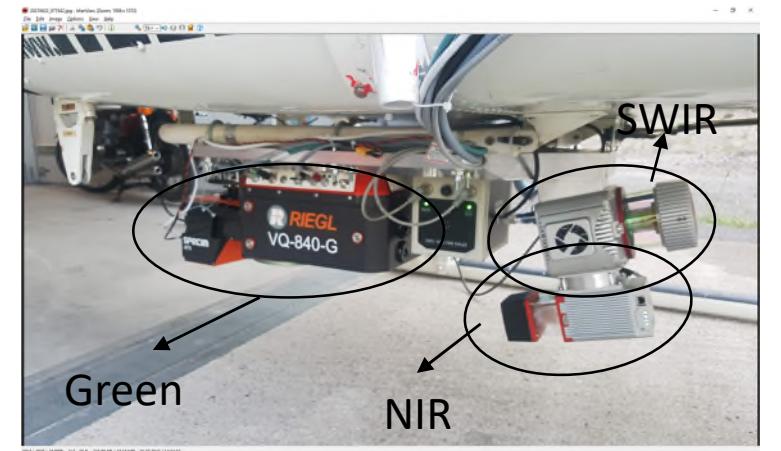


Data set 5: Multi-spectral UAV-LiDAR

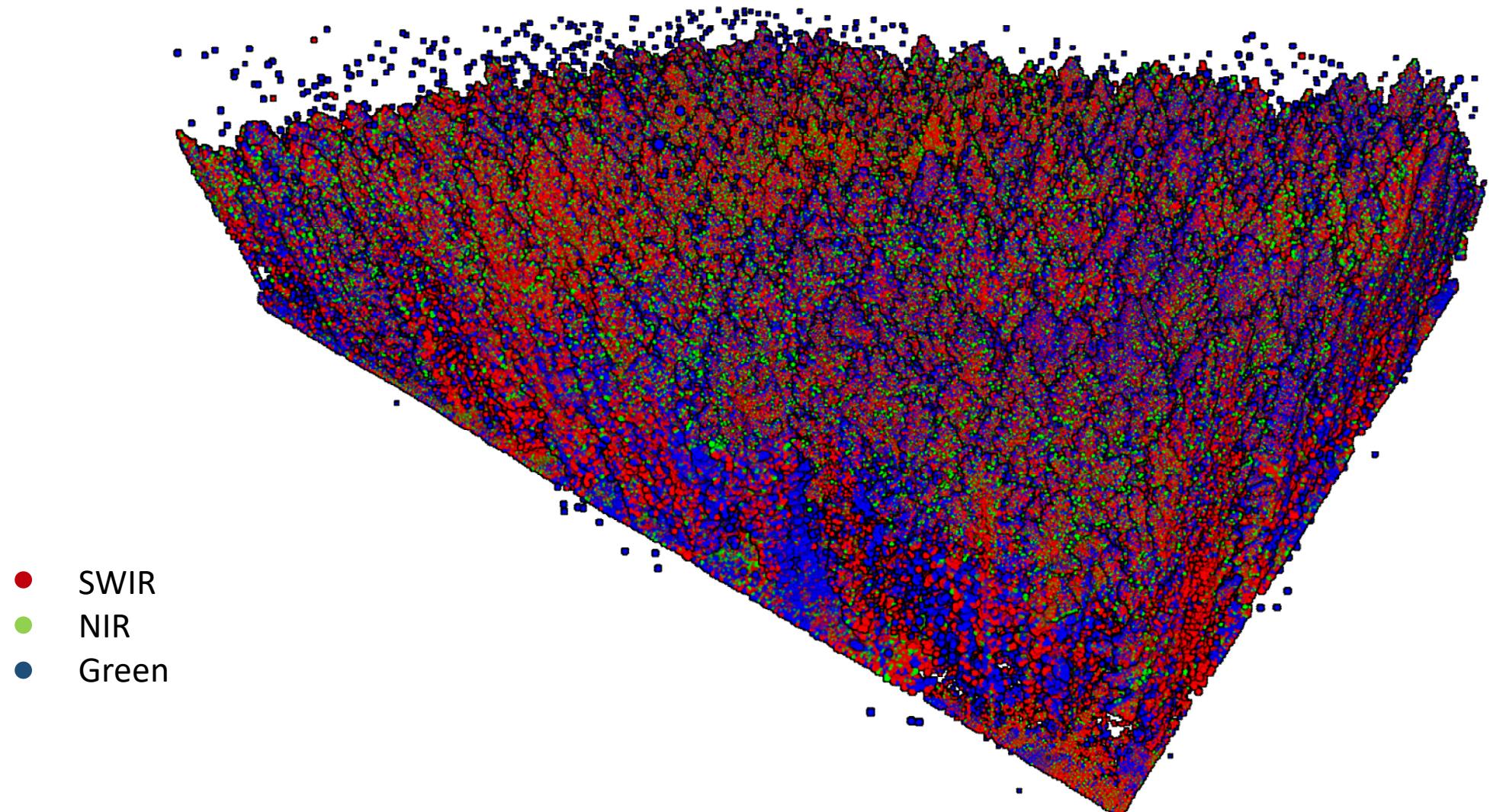


Channel	Scanner	Point density
Green	<i>RIEGL</i> VQ-840-G	475 pts/m ²
NIR	<i>RIEGL</i> miniVUX-3UAV	215 pts/m ²
SWIR	<i>RIEGL</i> VUX-1HA	830 pts/m ²

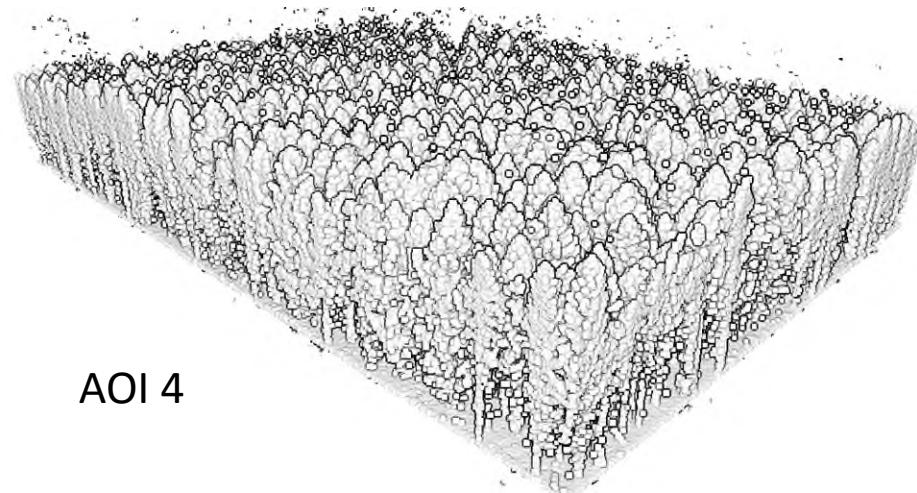
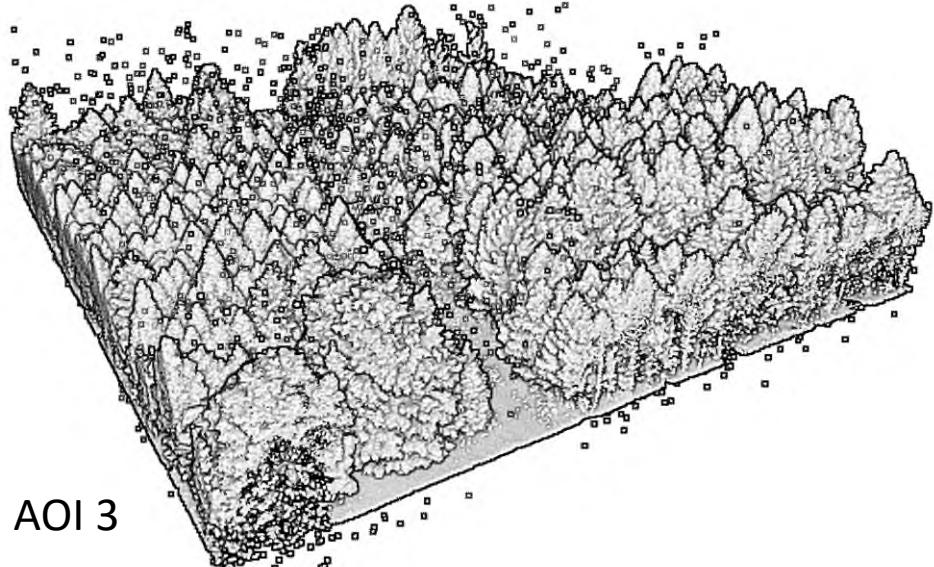
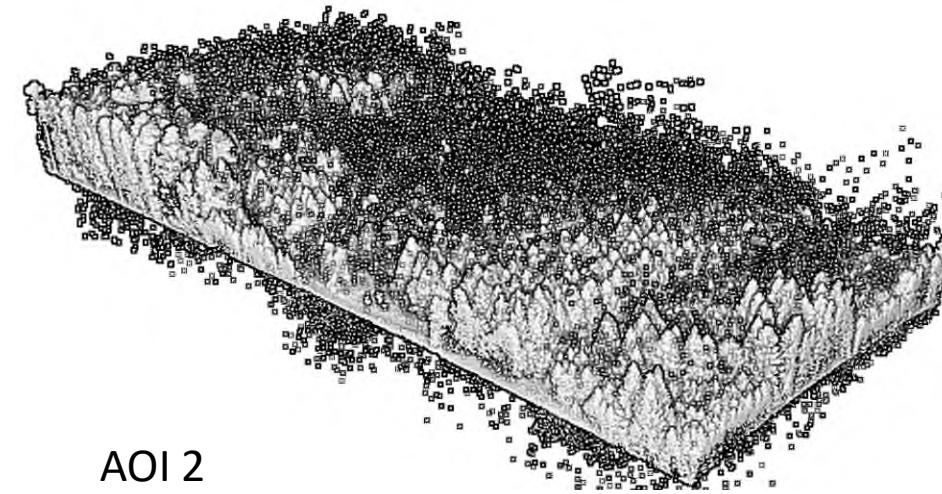
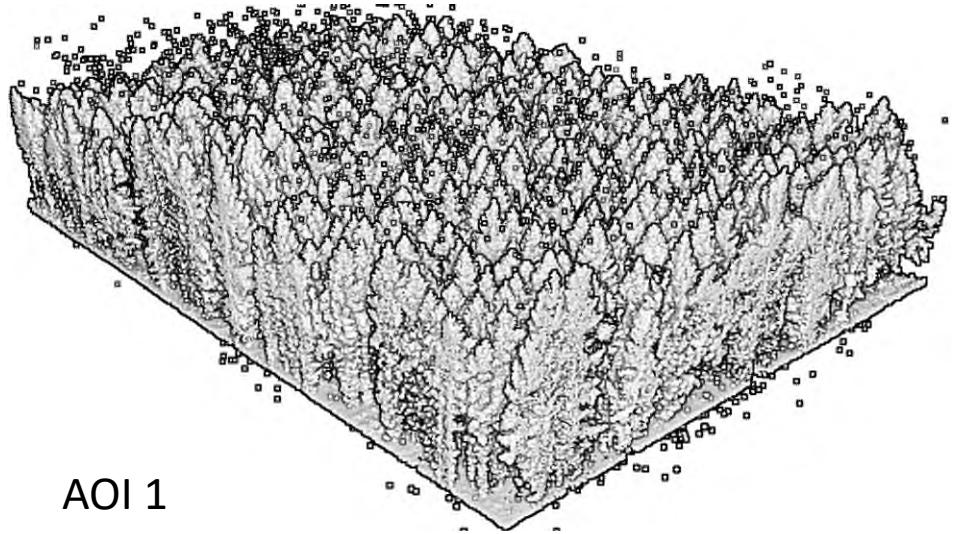
Flying altitude: ~100m a.g.l., Reference System: ETRS89/UTM33, Data provider: FIG



Data set 5: Multi-spectral UAV-LiDAR



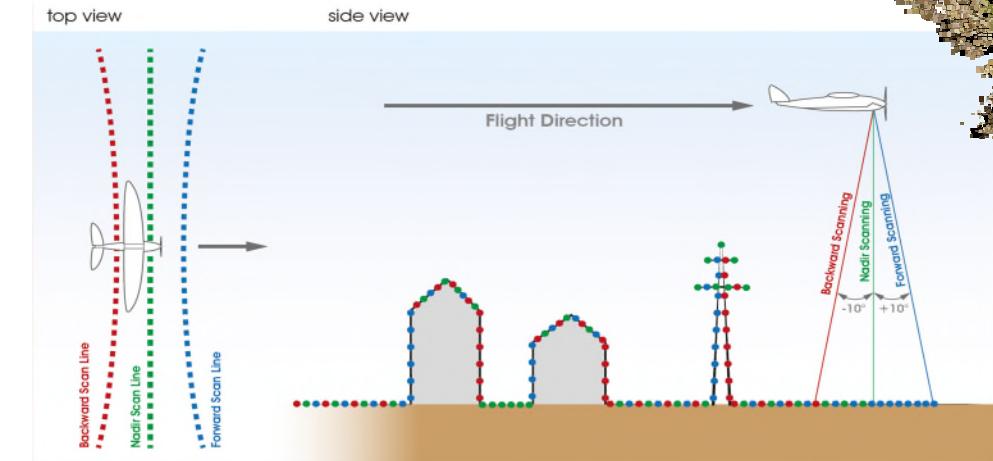
Data set 5: Multi-spectral UAV-LiDAR



Data set 6: Multi-view UAV-LiDAR

Rohrach, Vorarlberg, Western Austria
Forestry conservation area

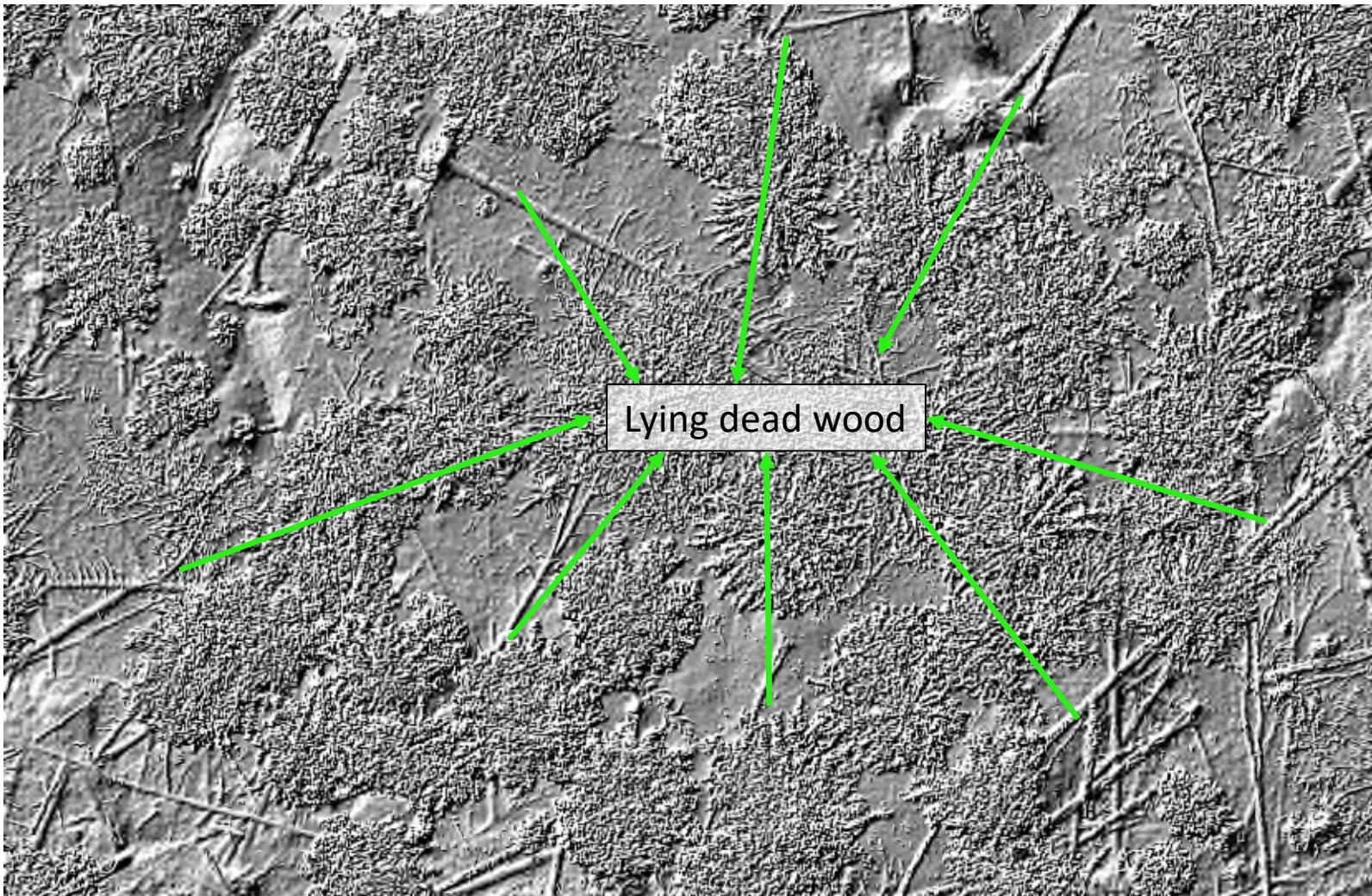
Scanner: VUX-120
Flying altitude: ~50m a.g.l.
Point density: ~4000 pts/m²
Point count: 31 Mio Pts
AOI area: 85 x 55 m²



This Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857612.



Data set 6: Multi-view UAV-LiDAR



This Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857612.



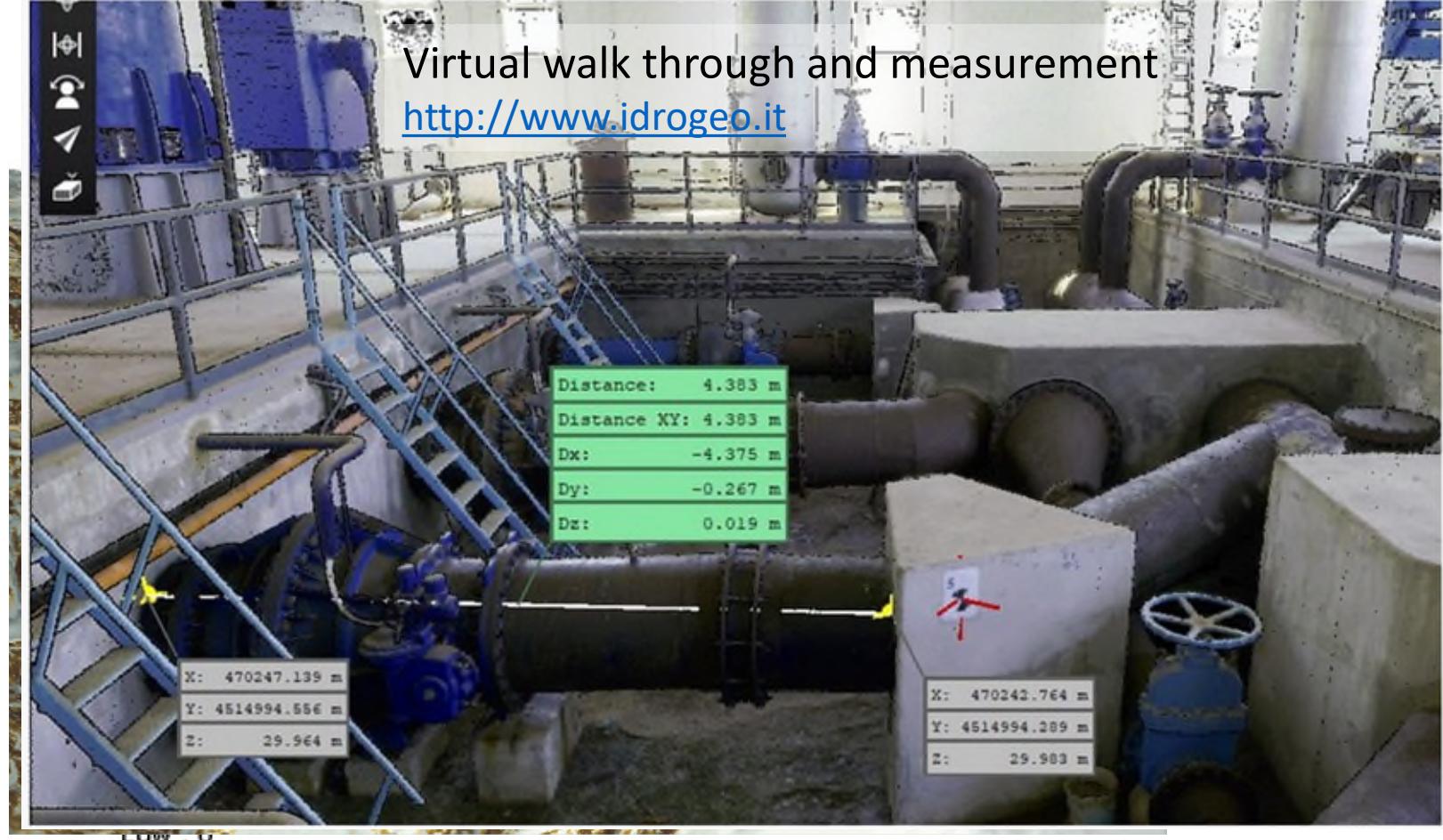


Break 15-20'

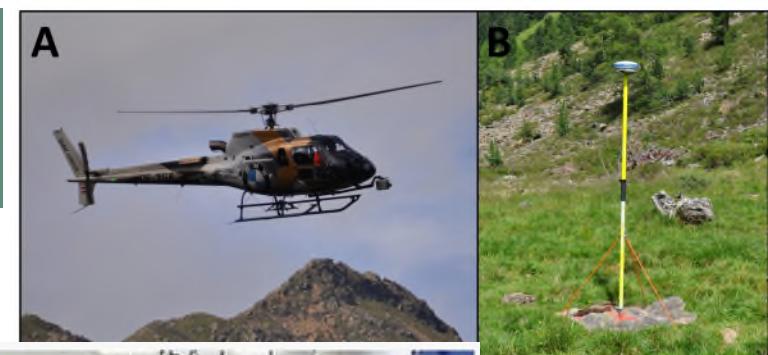
Aims & Challenges

- Point Clouds Today

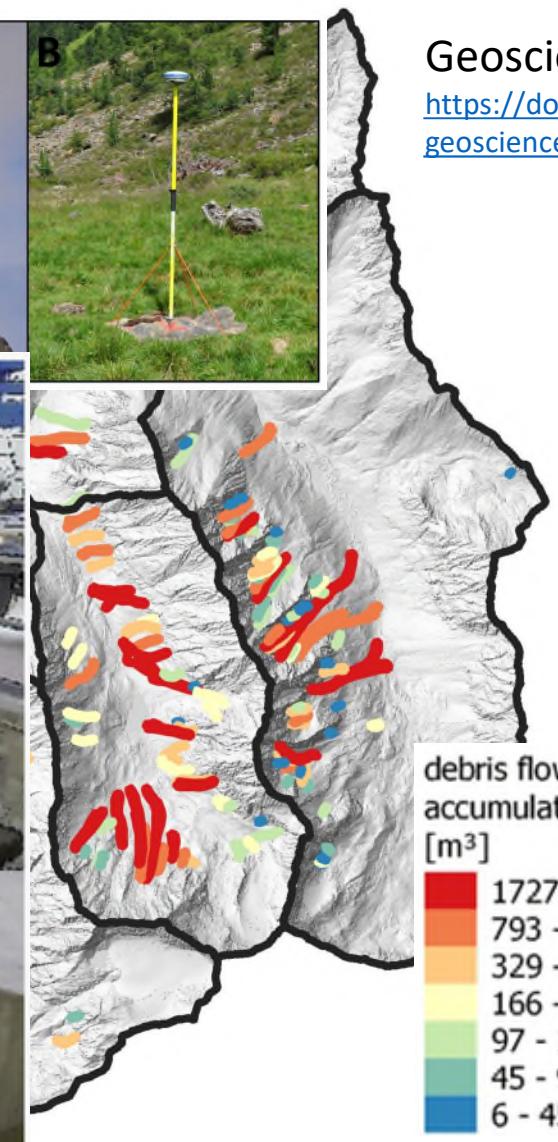
GEO Department, TU Wien, Modelling Challenges



Virtual walk through and measurement
<http://www.idrogeo.it>



Geosciences:
<https://doi.org/10.3390/geosciences13040100>



debris flow
accumulation volumes
[m³]

1727 - 40907
793 - 1727
329 - 793
166 - 329
97 - 166
45 - 97
6 - 45

Aims & Challenges

- Point Clouds Today
- **Existing problems !**
- Exploitation beyond State of Art
- Develop 1 idea
- Demonstrate it: technical | creative
by coding and/or creative means
Convince the jury

Data volume
Data screening
Quick results
Training data
Non-expert interaction
Robust results
Efficient processing
Reliable processing
Processing control
Degree of automation
Automated quality control
Lack of standards

...

Aims & Challenges

- Point Clouds Today
- Existing problems !
- Exploitation beyond State of Art
- Develop 1 idea
- Demonstrate it: technical | creative by coding and/or creative means
Convince the jury

- participatory planning
- holistic monitoring
- multi-modal navigation
- immersive discussion in 3D space
- assisted living
- sustainable resource management
- farm automation

Aims & Challenges

- Point Clouds Today
- Existing problems !
- Exploitation beyond State of Art
- Develop **1** idea
- Demonstrate it: technical | creative
by coding and/or creative means
- Convince the jury

Group forming

Technical Challenge



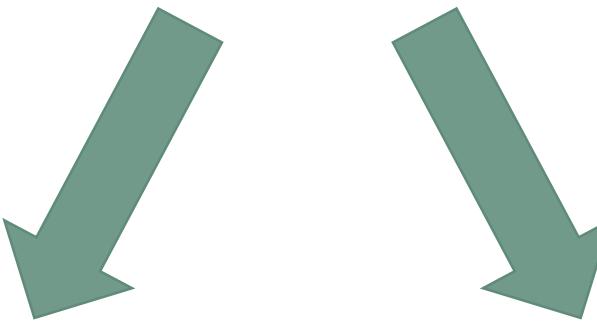
Creative Challenge



Technical Collaboration

Group forming

Separate technical and creative focus



Technical Challenge

Creative Challenge

Group forming

- Group A

Name:
Room :

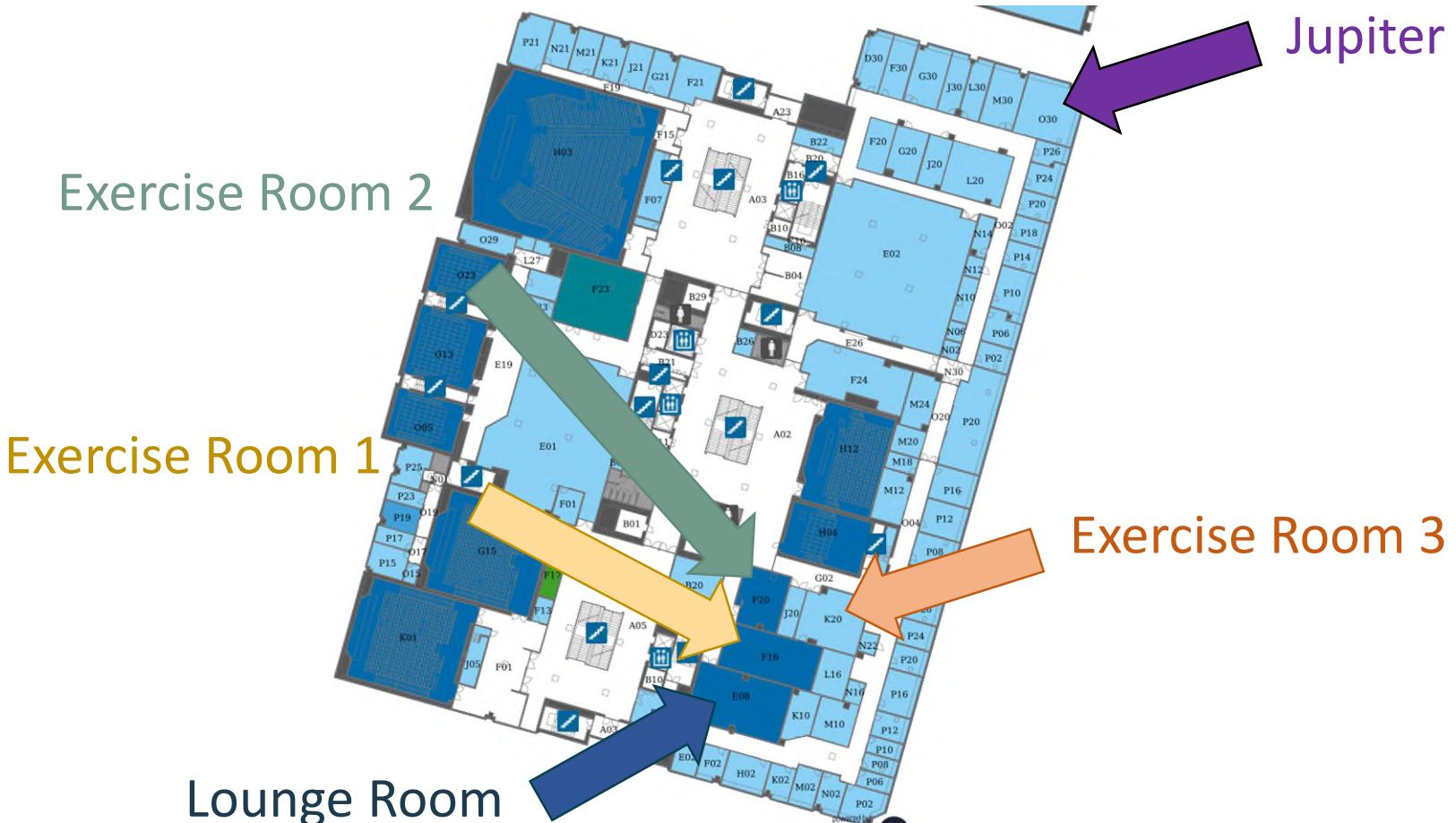
- Group B

Name:
Room :

- Group C

Name: *The PointClouders*
Room : Exercise Room 3

Rooms

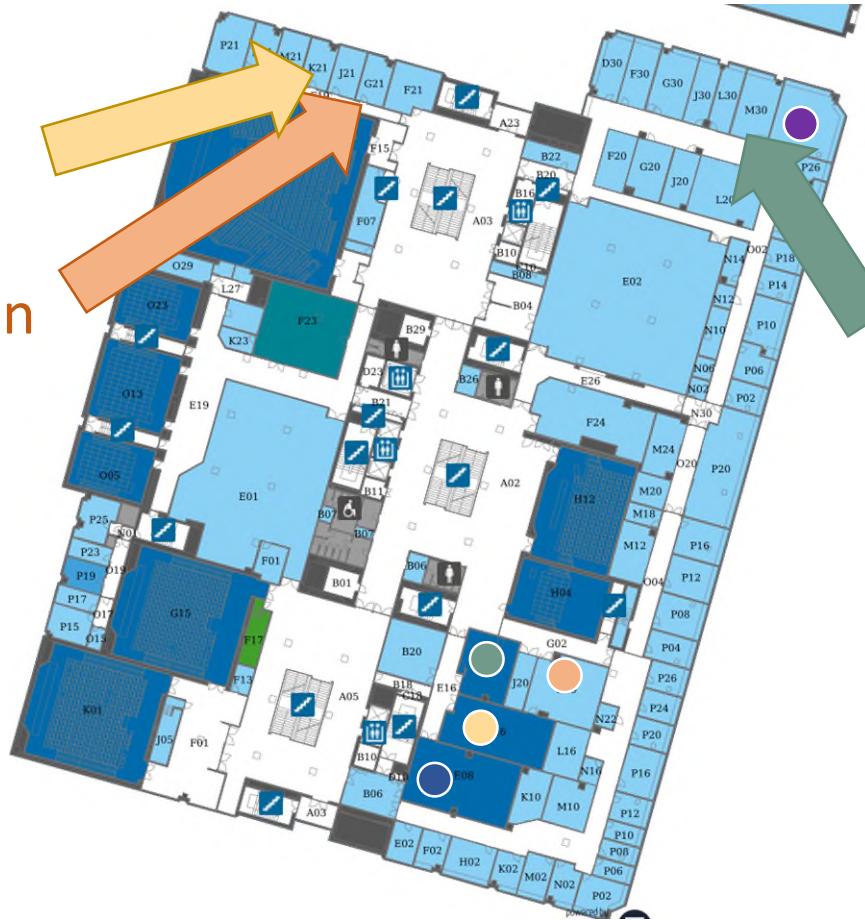


Rooms - Mentor

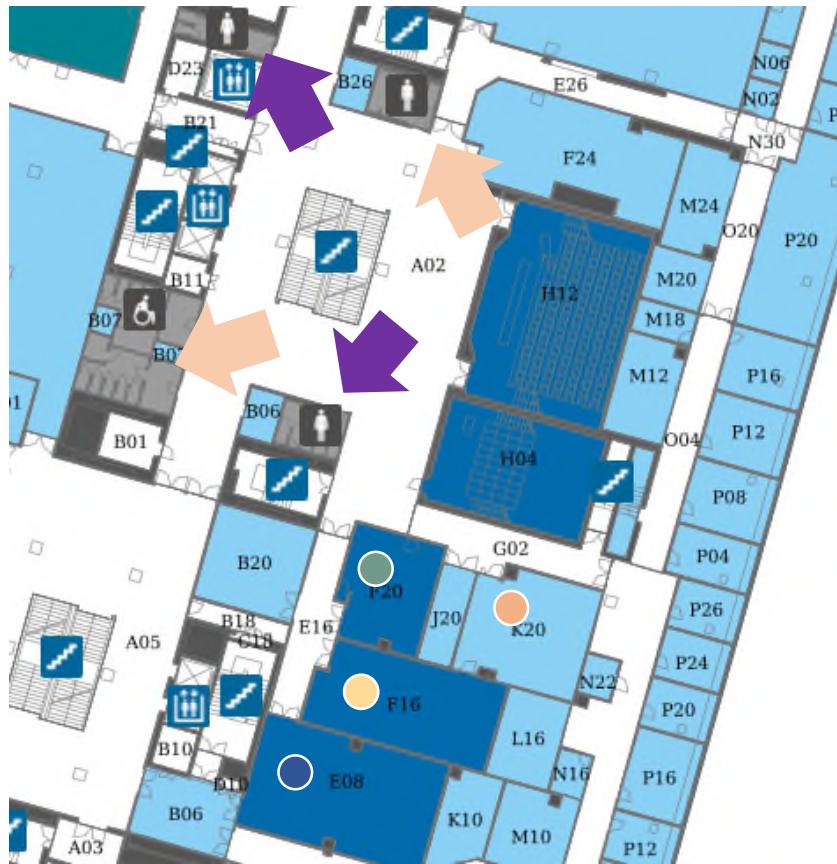
Benjamin Wild

Taskin Özkan

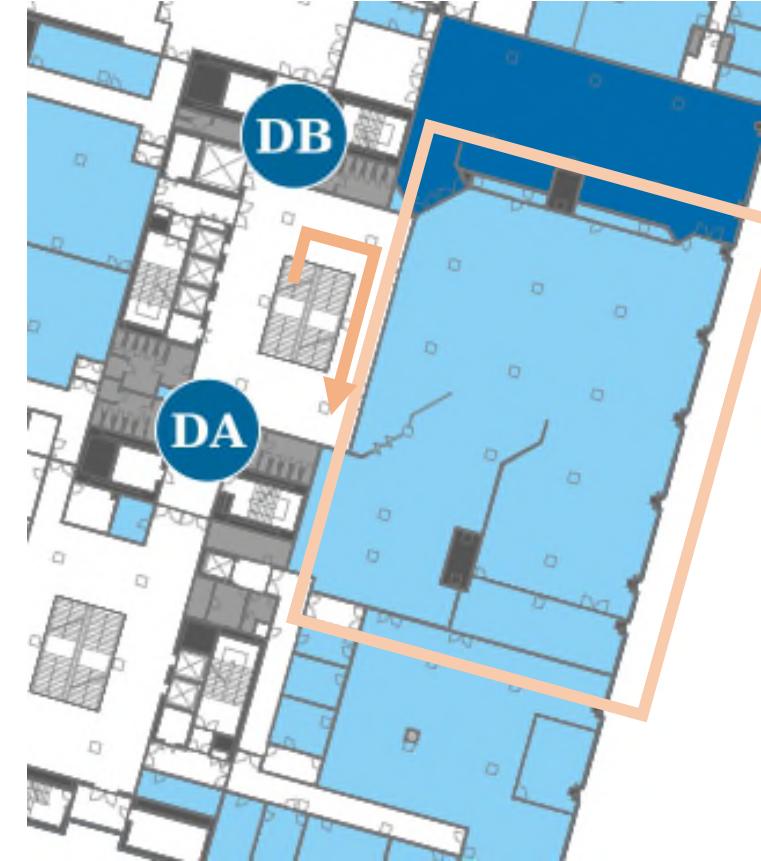
Wilfried Karel



Rooms



- 2nd floor
Toilets in the hallway – one key per group



- 1st floor
Mensa



Let's get Started!