



Svalbox.no

Open data and information on Svalbard's geology

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Map

Virtual Outcrops

Projects

e-Learning

About

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Svalbox Map Interface

Click on a feature on the map to open its properties.

- ☒ ESRI
- ☐ NPolar - Bas.
- ☐ NPolar - Sat.
- ☒ Geology
- ☒ Exploration wells
- ☒ Sedimentary logs
- ☒ Seismic
- ☒ Virtual outcrop models

An interactive digital Svalbard geological-geophysical portal

Kim Senger
Associate Professor
Department of Arctic Geology
The University Centre in Svalbard
+47 95291592 / kims@unis.no



Leaflet | Powered by Esri | USGS, NOAA, Norsk Polarinstitutt

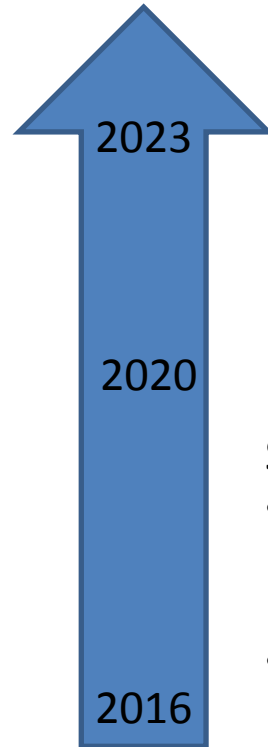


FORCE Lunch & Learn, Wednesday 27th May 2020, online webinar



Webinar overview: what is Svalbox?

- 12:00-12:35:
Presentation of
Svalbox (**Kim Senger**)
- 12:35-12:45:
Demonstration of
Svalbox portal by
video (**Peter Betlem**)
- 12:45-13:00:
Questions & answers
(please use chat)



Svalbox2020 wants to:  **FORCE**

- Be a more widely used tool in both mainland universities and industry
- Be an innovative hub for embracing new technologies and data types in geoscience training & research
- Be a full-time job for (at least) 1 person

Svalbox is:

- An interactive and integrated database used in teaching and research at UNIS in Longyearbyen
- Run by 2 people on the side of teaching and research, started in 2016
- Accessible at www.svalbox.no



Svalbox: key personnel

Kim Senger

- Associate Professor in Structural Geology and Basin Analysis at UNIS
- Background from Bayerngas and EMGS
- Permanent and full-time at UNIS since 2015
- Svalbox project manager
- Geology WP co-leader in ARCEX centre (arcex.no)



Peter Betlem

- PhD student at UNIS, 2019-2023
- Funded by NCCS project, focusing on CO₂-cap rock integrity monitoring
- 25% of position funded by UNIS, with outreach and data management tasks
- Svalbox in-house “coder”, developer and drone pilot



Envisioned project collaborators:



+





Svalbox: workflows and visualisation



INPUT DATA

Virtual outcrop models (VOM)

Other data types (see Figure 8 and table on <http://svalbox.no> for details).

VISUALISATION

SVALBOX.NO
VOMs and selected datasets

ArcGIS

Petrel. All data sets in 3D environment

Virtual outcrop models

- Georeferenced
- Cost effective acquisition and processing
- Shared through SketchFab

UNIS internal Svalbox

- Petrel-based
- All data (except VOMs)
- Access controlled

Online Svalbox

- ArcGIS-based
- VOMs and some data sets
- Freely accessible



Svalbox: workflows and visualisation

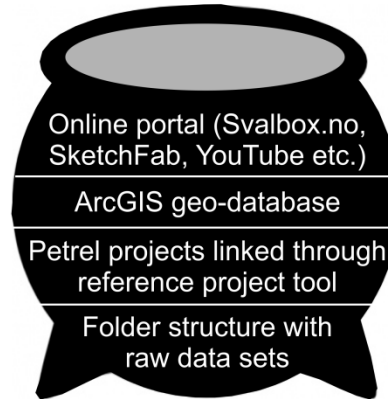


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DATA STORAGE, QC AND MANAGEMENT



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Svalbox: workflows and visualisation



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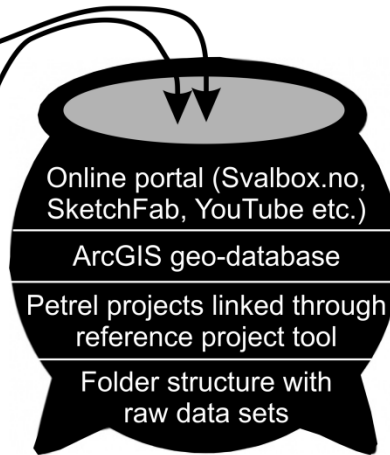
Virtual outcrop models (VOM)

*VOM acquisition and processing
Export for visualisation
Input data archiving*

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*Data loading
Georeferencing maps
Digitizing paper logs
Convert formats
Quality-control
Access rights/confidentiality
Assign to correct Petrel project
Meta-data specification
Continuous data mining
Connect to online repositories*

DATA STORAGE, QC AND MANAGEMENT



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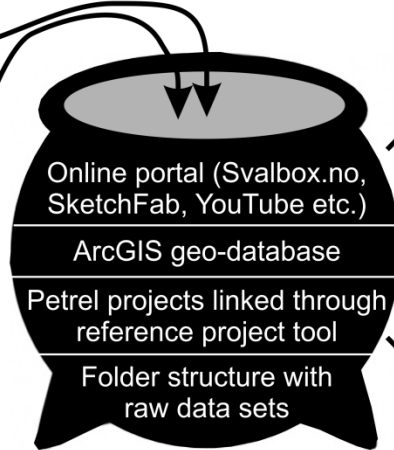
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DATA STORAGE, QC AND MANAGEMENT



*VOM location and 3D pdf
Construct and share VFTs
Share experiences and resources
Update map data automatically from UNIS ArcGIS geo-database*

*Maintain updated geo-database
Link to Petrel and Svalbox.no*

*Maintain data packages based on location, data type and access restrictions
Update projects twice yearly
Optimize workflows and teach*

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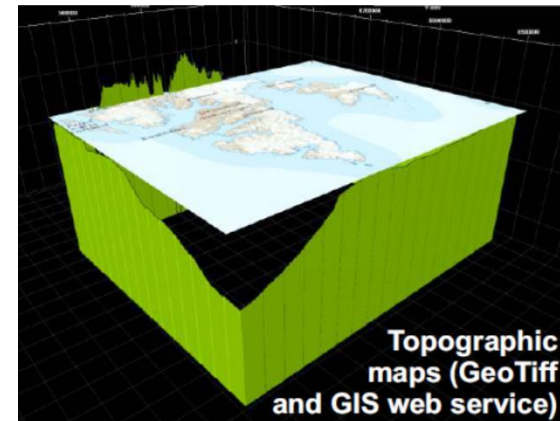
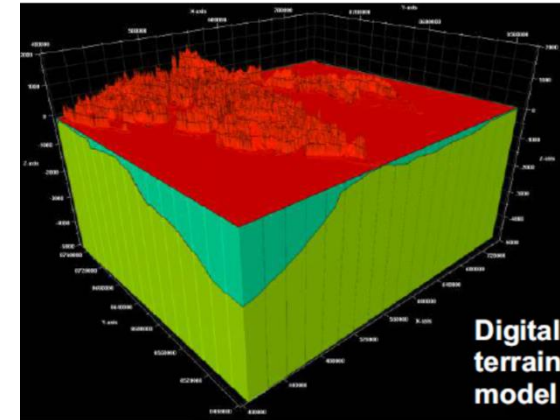
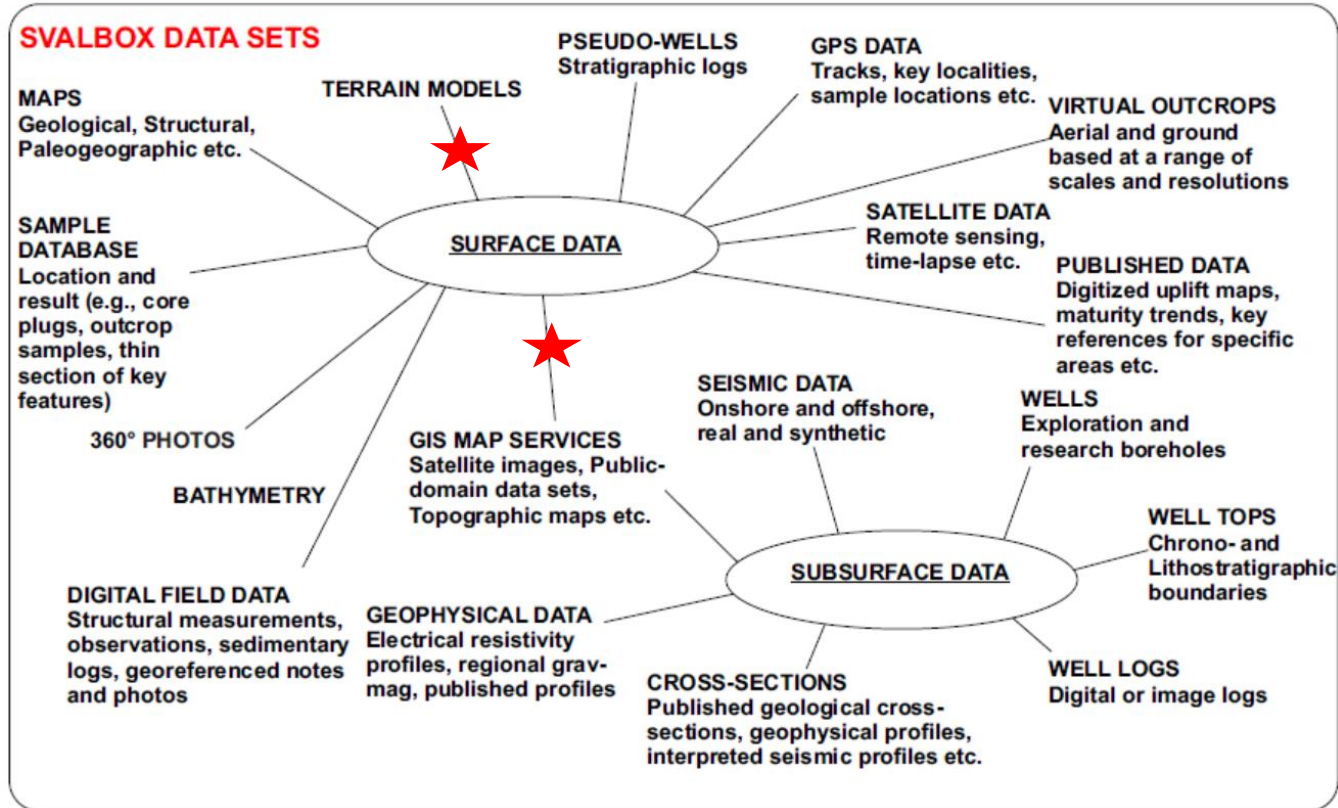
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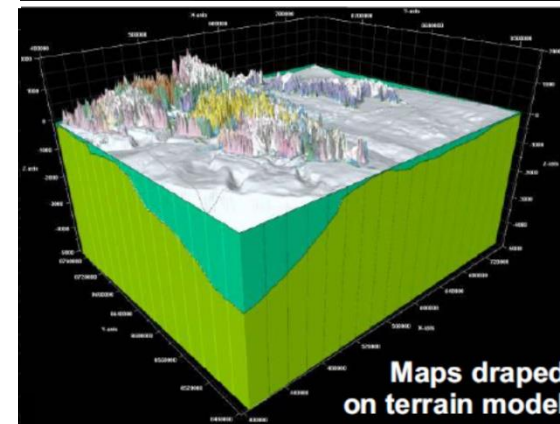
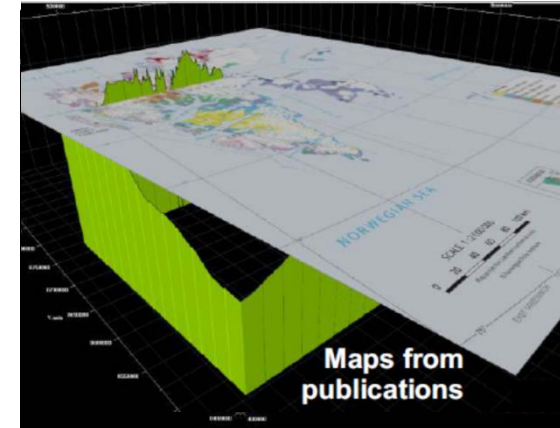
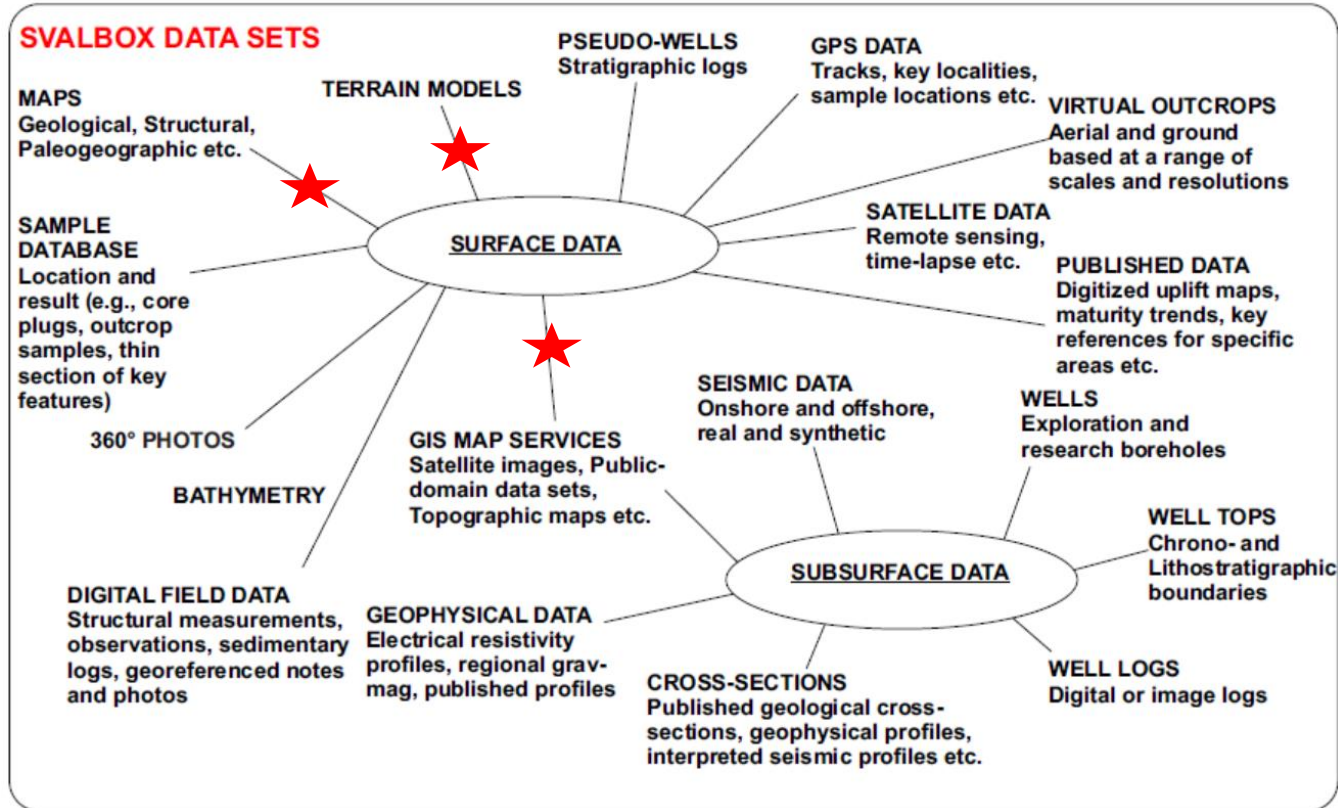


Svalbox: data sets



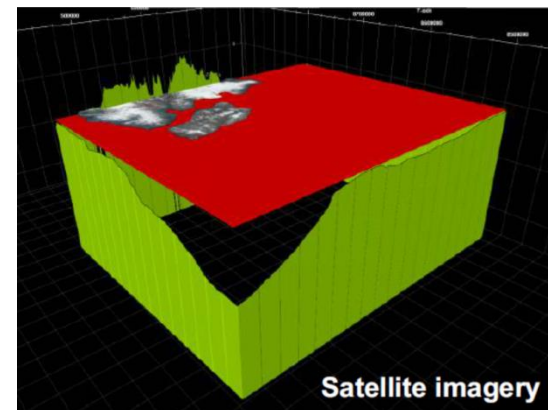
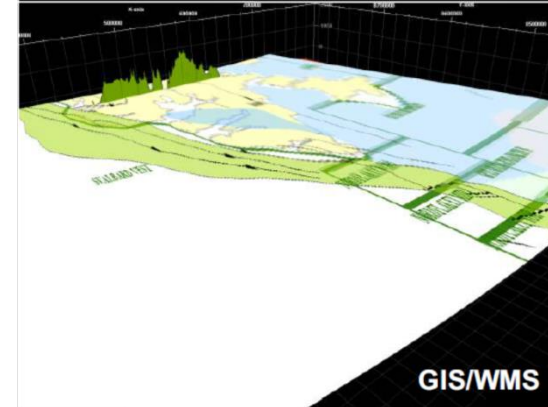
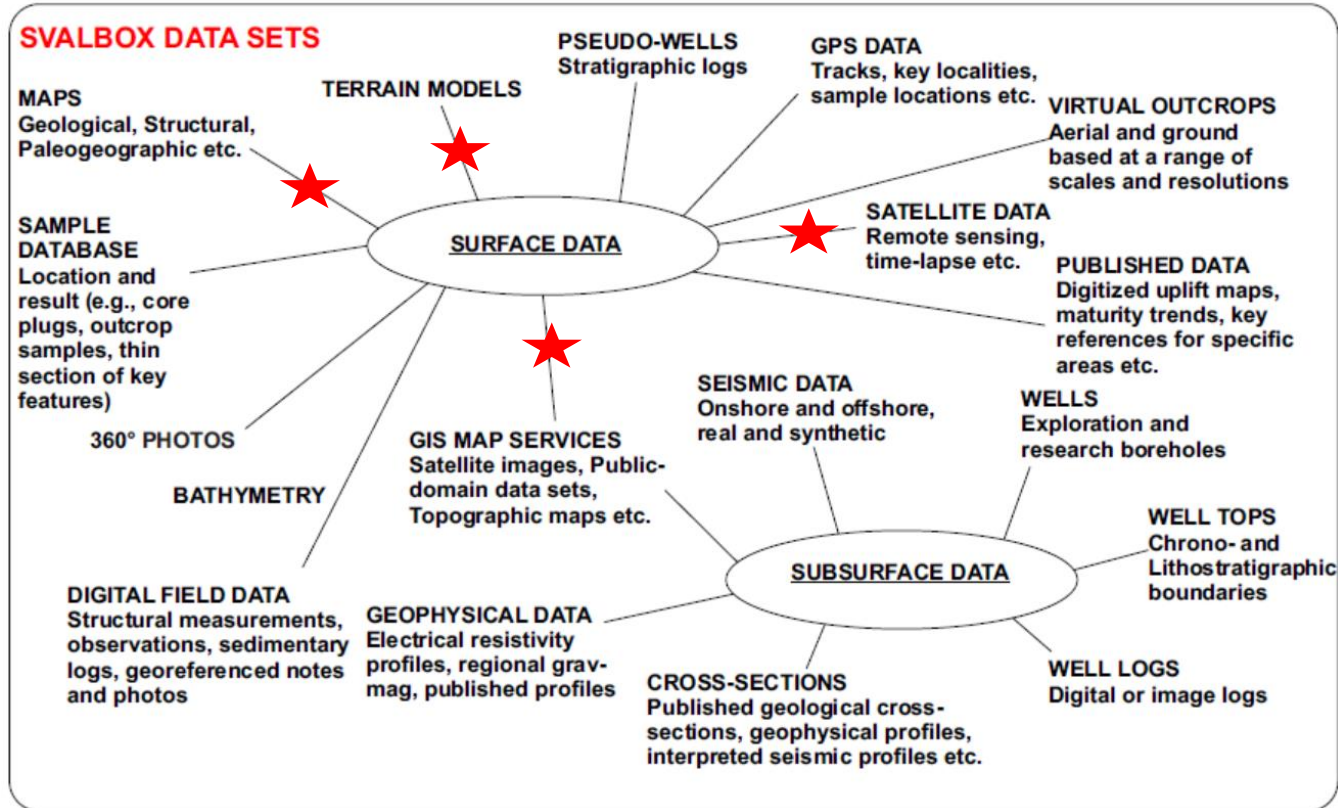


Svalbox: data sets



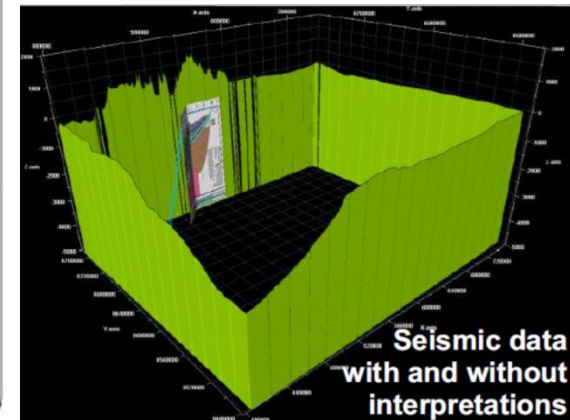
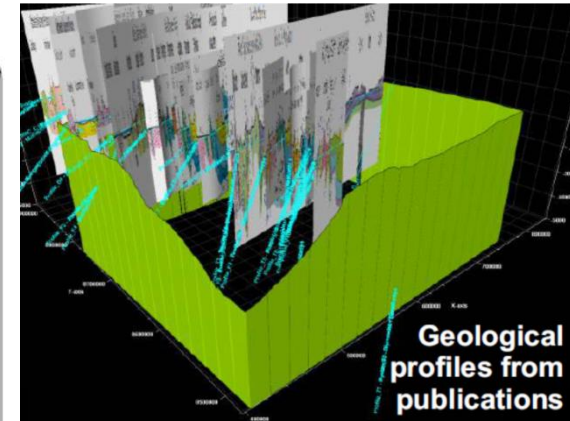
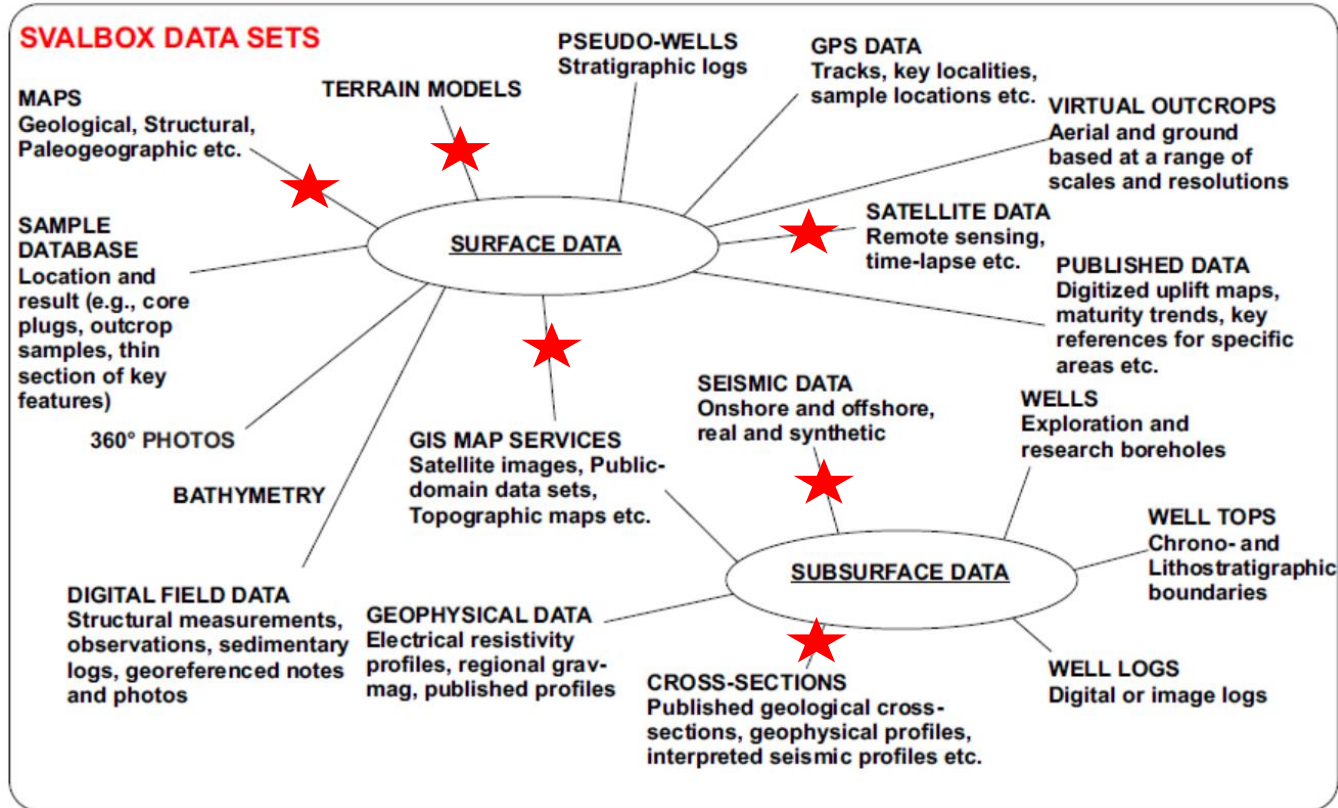


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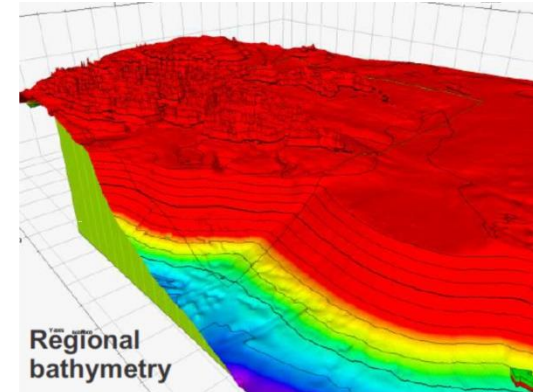
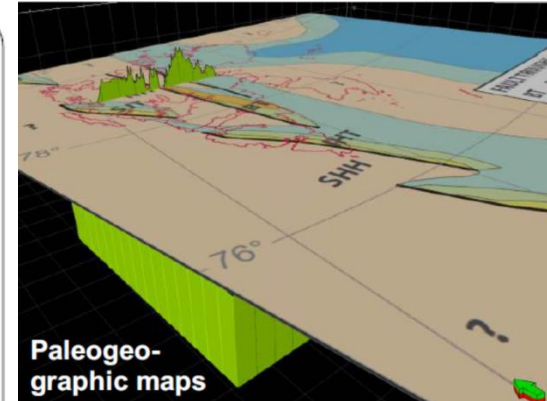
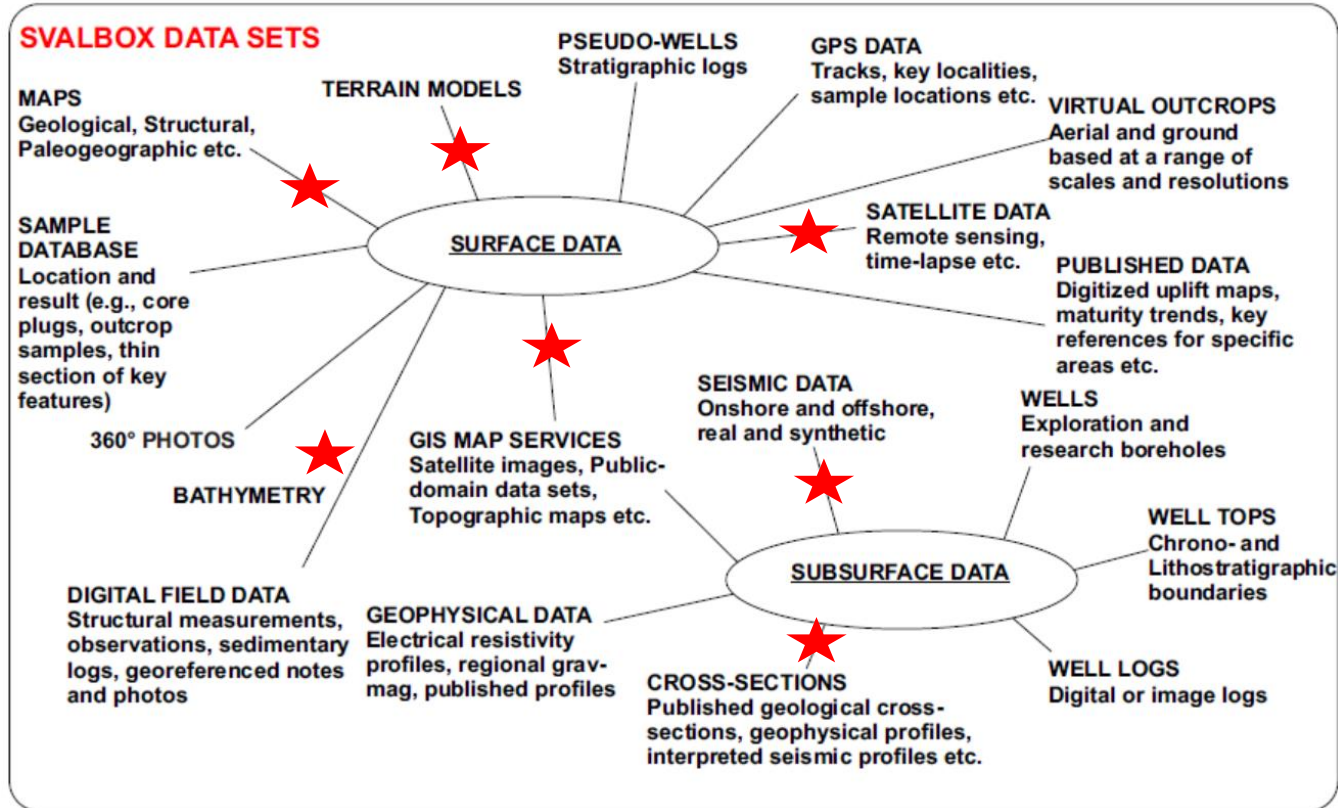


Svalbox: data sets



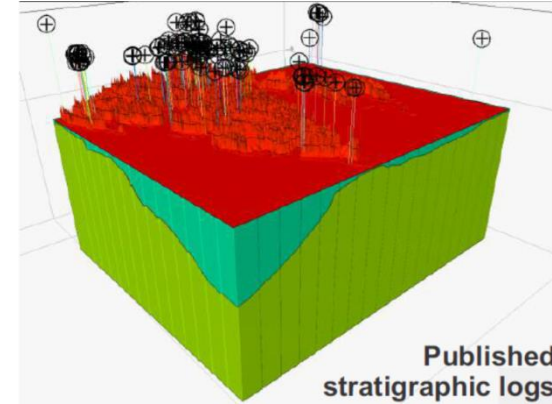
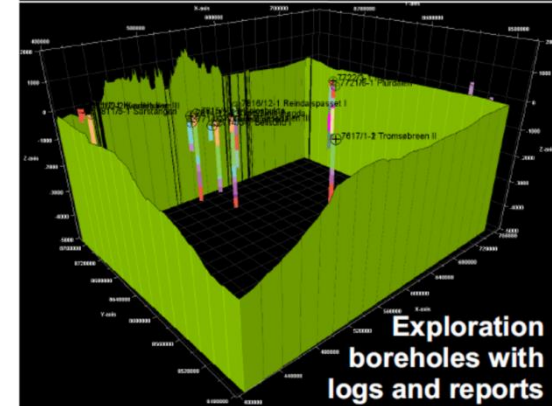
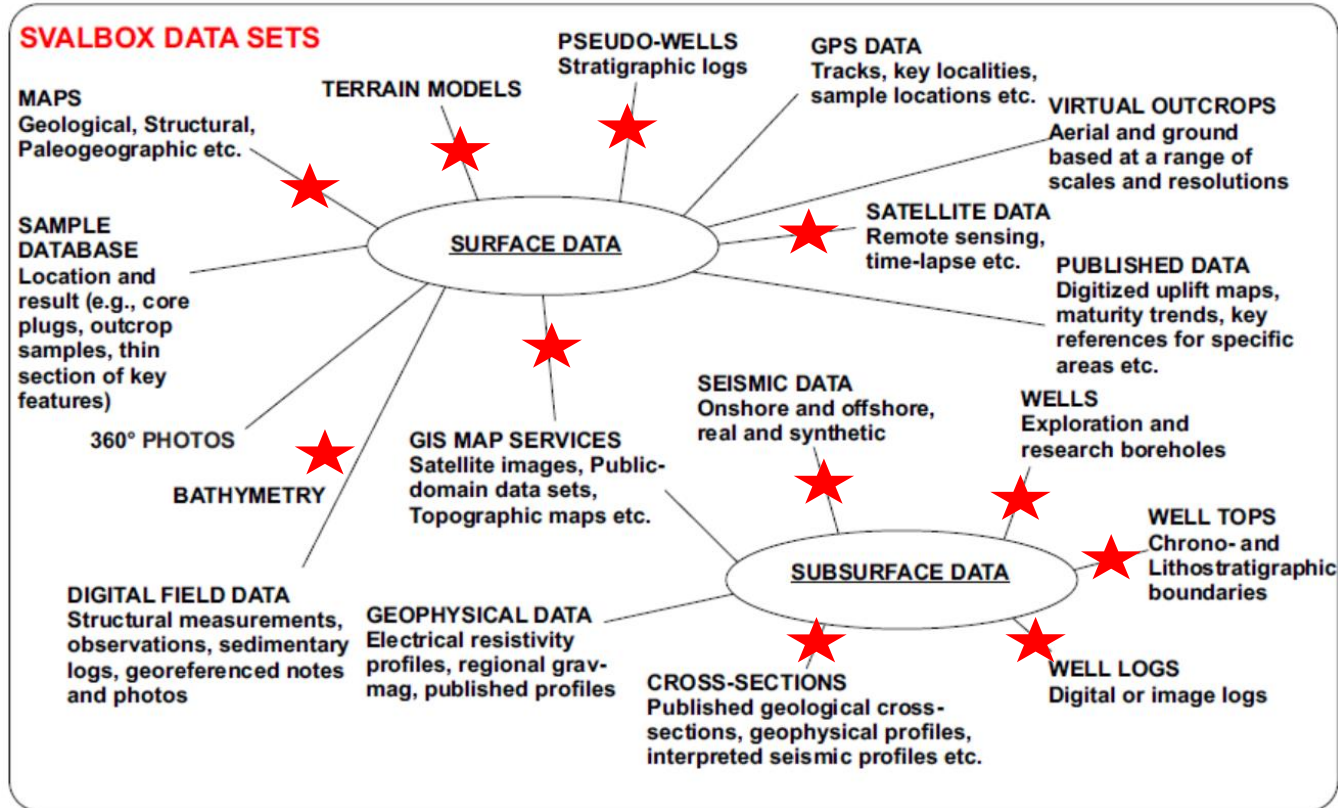


Svalbox: data sets



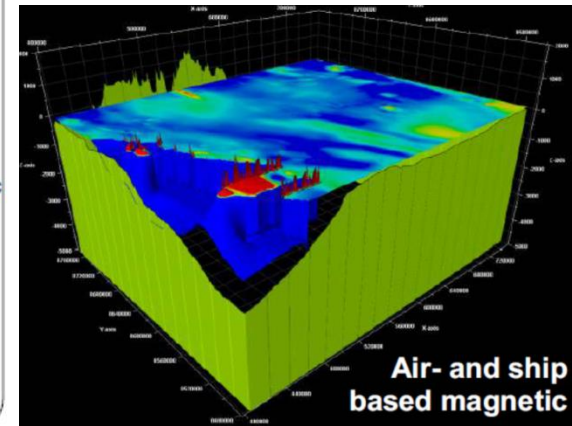
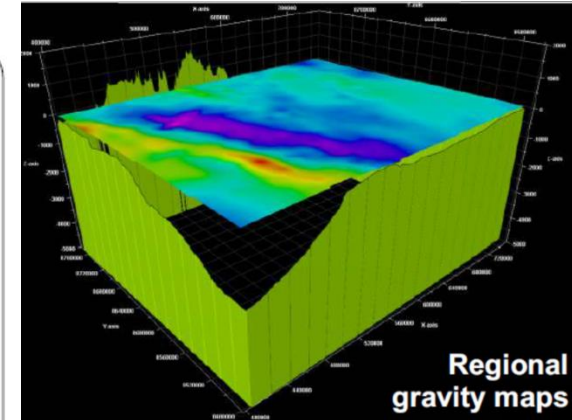
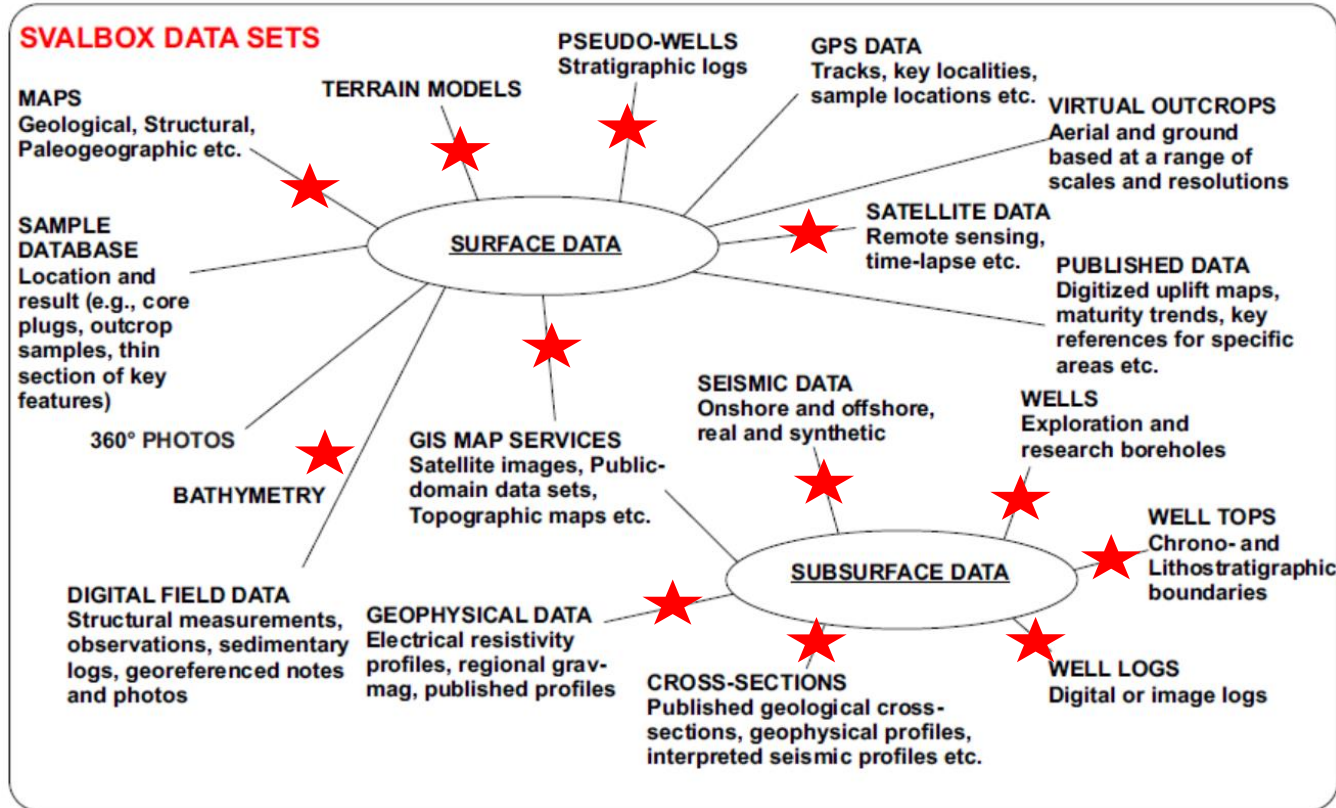


Svalbox: data sets



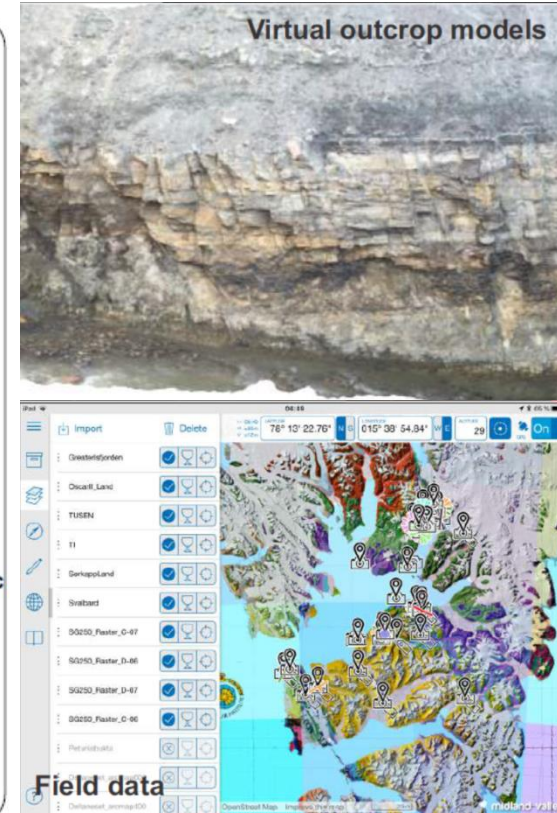
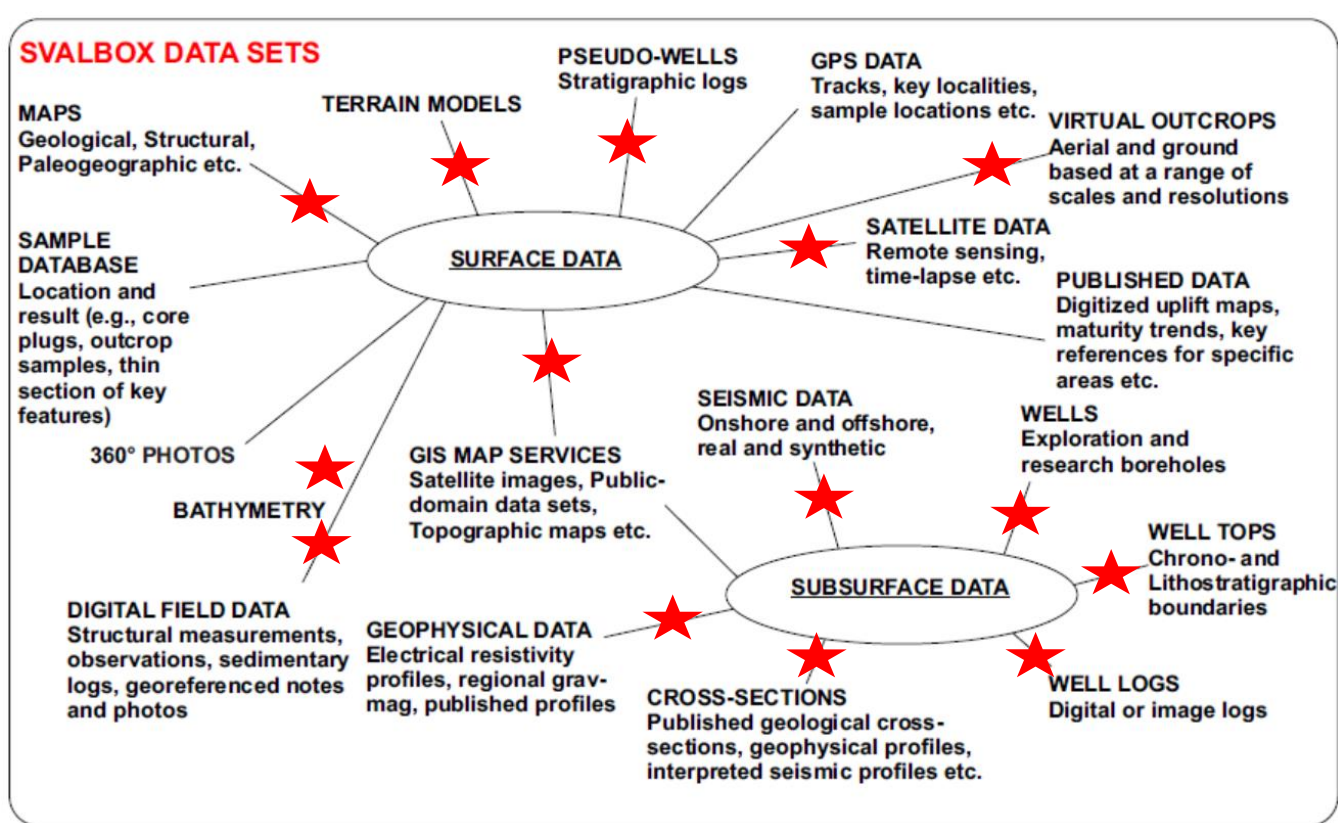


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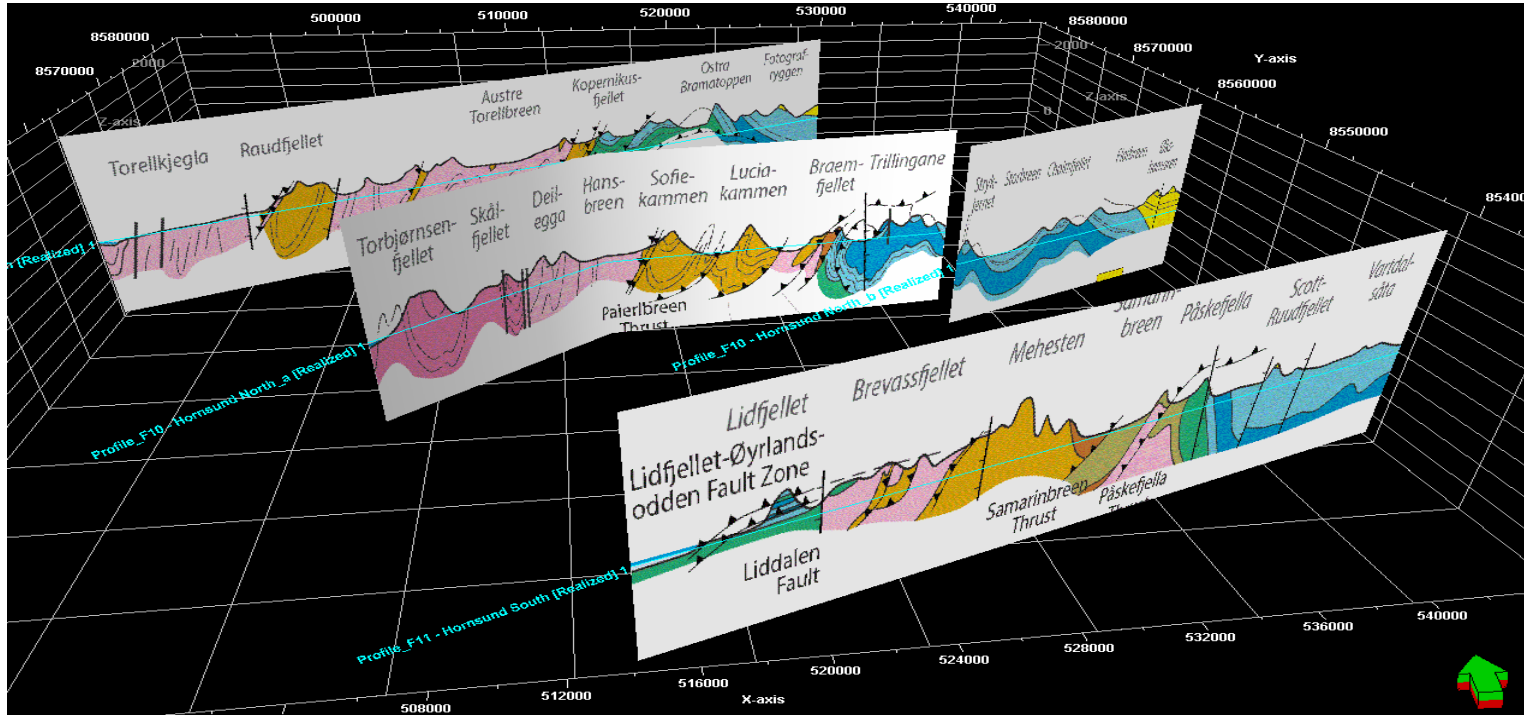


Svalbox: data sets



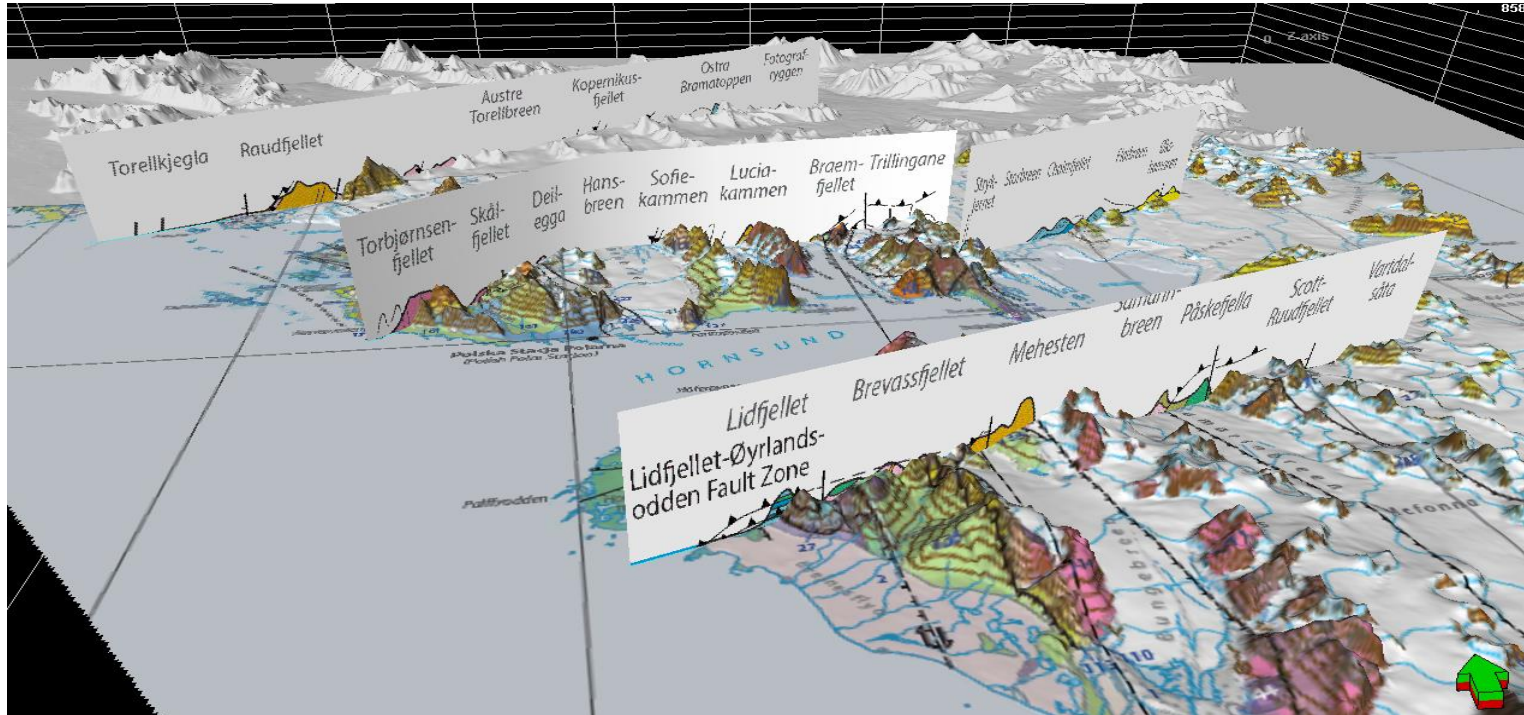


Data examples: published profiles





UNIS

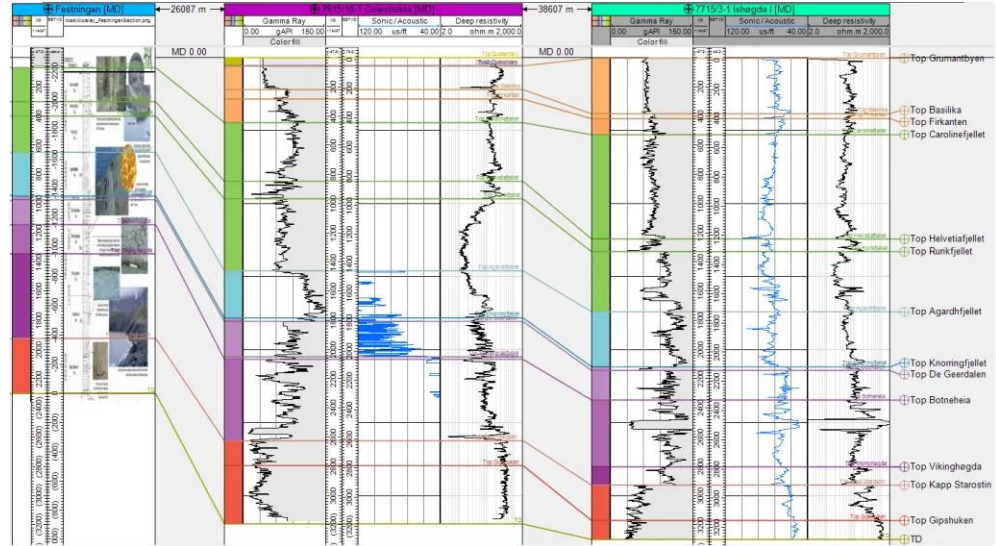




Highlights: new data and integration



The Festningen profile in April 2019, looking westwards. The dominant wall comprises the sandstones of the Cretaceous Helvetiafjellet Formation. Note snowmobiles for scale.



Correlation panel from Festningen to the two deepest petroleum exploration boreholes drilled in Svalbard, at Colesbukta and Ishøgda.

- 18 petroleum exploration boreholes drilled 1961-1994
- Increasing data availability from petroleum exploration from a range of sources including Norsk Polarnavigasjon archive
- Need to synthesize material (Svalbard Rock Vault project)

NORWEGIAN JOURNAL OF GEOLOGY Vol 99 Nr. 3
<https://dx.doi.org/10.17850/njg99-3-1>



Petroleum, coal and research drilling onshore Svalbard: a historical perspective

Kim Senger^{1,2}, Peter Brugmans³, Sten-Andreas Grundvåg^{2,4}, Malte Jochmann^{1,5}, Arvid Nøttvedt⁶, Snorre Olaussen¹, Asbjørn Skotte⁷ & Aleksandra Smyrak-Sikora^{1,8}



Highlights: outreach



Longyearbyen skole Yrkesmesse, 20 Nov 2019



Highlights: virtual reality and VIPs

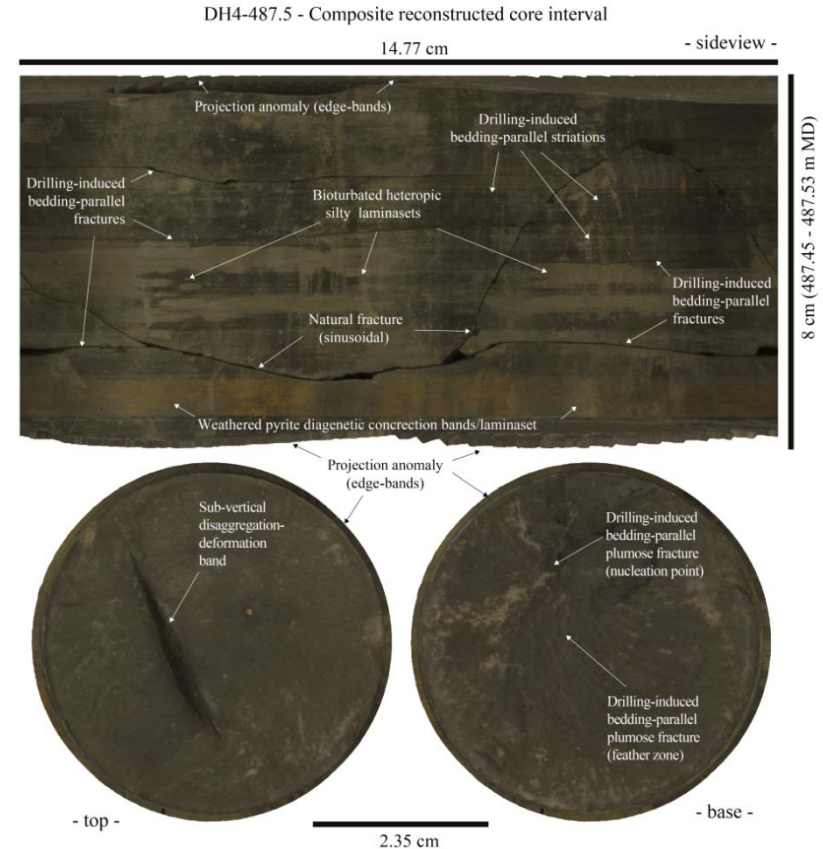
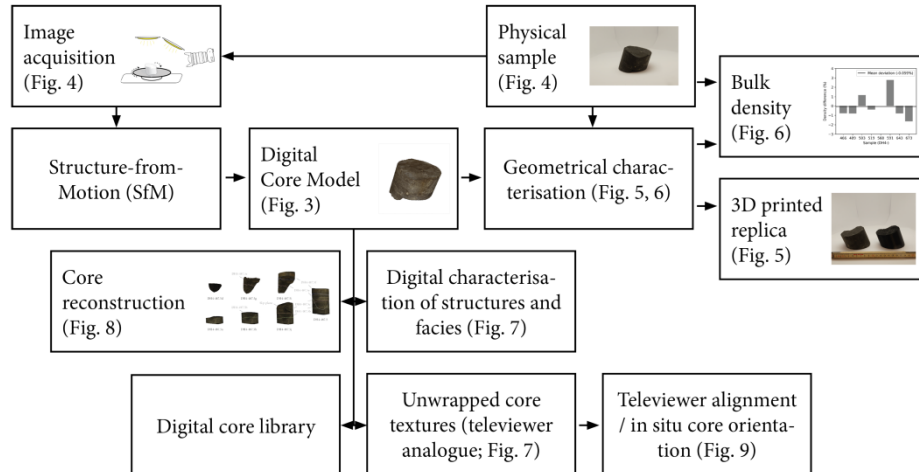
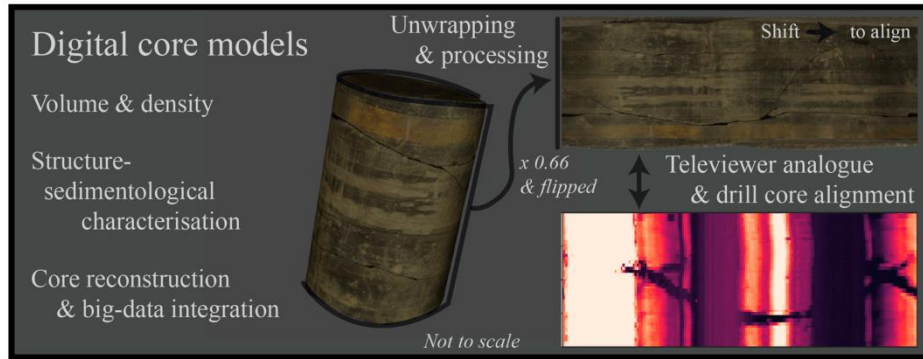


Kim Senger is an associate professor
at The University Centre in Svalbard

Visit of (then) Minister for Education & Research
Iselin Nybø, including demonstration of VR, May 2019



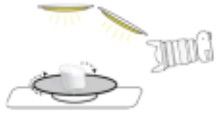
Highlights: digital drill cores





Highlights: digital hand samples

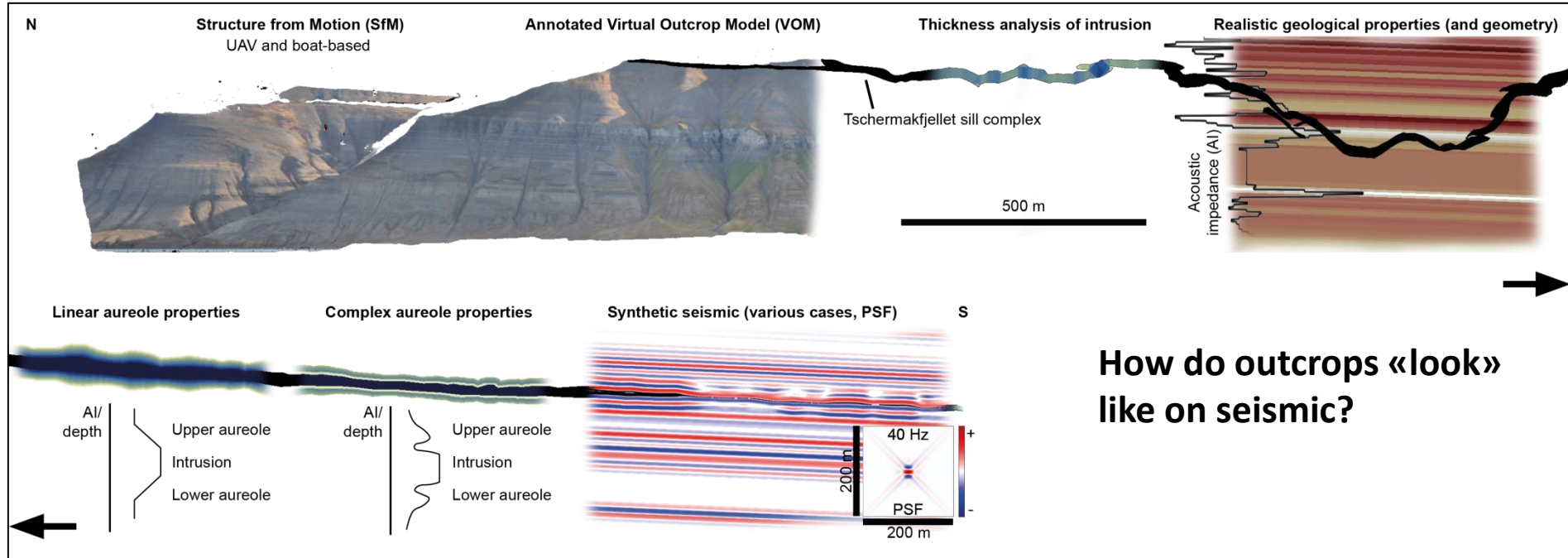
Image
acquisition
(Fig. 4)



<https://sketchfab.com/3d-models/rock-sample-malte-b2cb2ad336dd402eb3dc4222bb03d4bd>



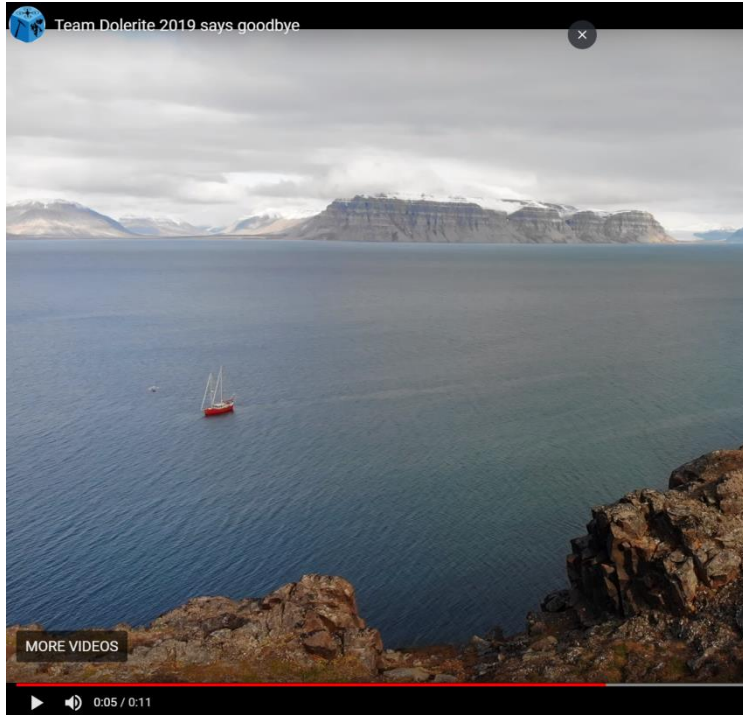
Highlights: seismic modelling





Highlights: VOM data acquisition

First dedicated Svalbox summer data acquisition campaign aboard R/V Clione, August 2019



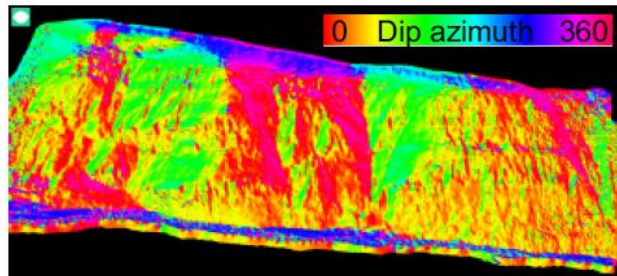
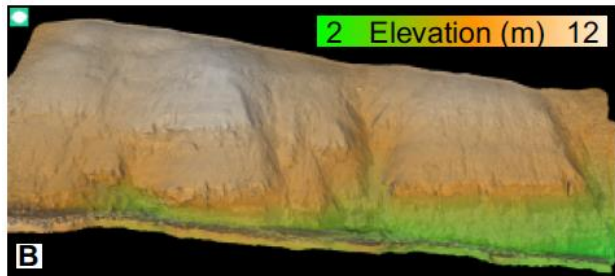
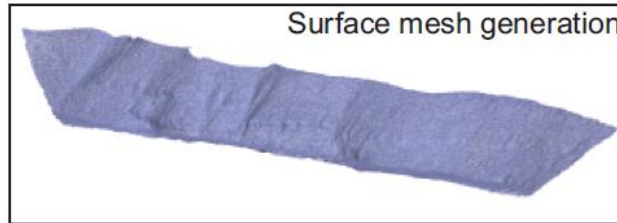
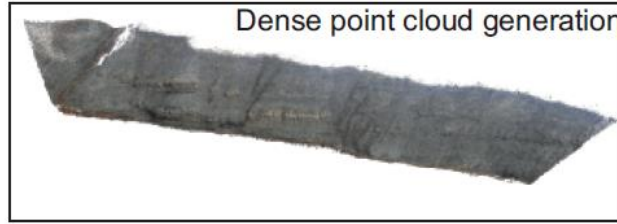
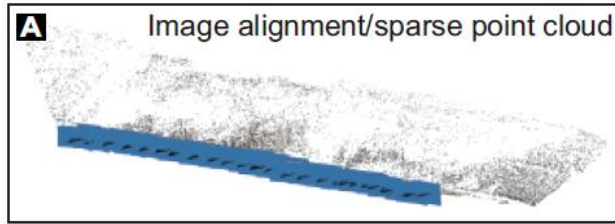
Skansen	
Model information	
Locality	Billefjorden
UTM33x/Longitude	523508.58558208466
UTM33x/Latitude	8717655.36814862
Technical specs	
Date acquired	17.08.2019
Acquired by	Kim Senger
Acquisition method	UAV
Processed by	Kim Senger
# images	93
Average distance (m)	292
Resolution (cm/pix)	8.88
Reference	Kim Senger

<http://www.svalbox.no/portfolio/skansen/>





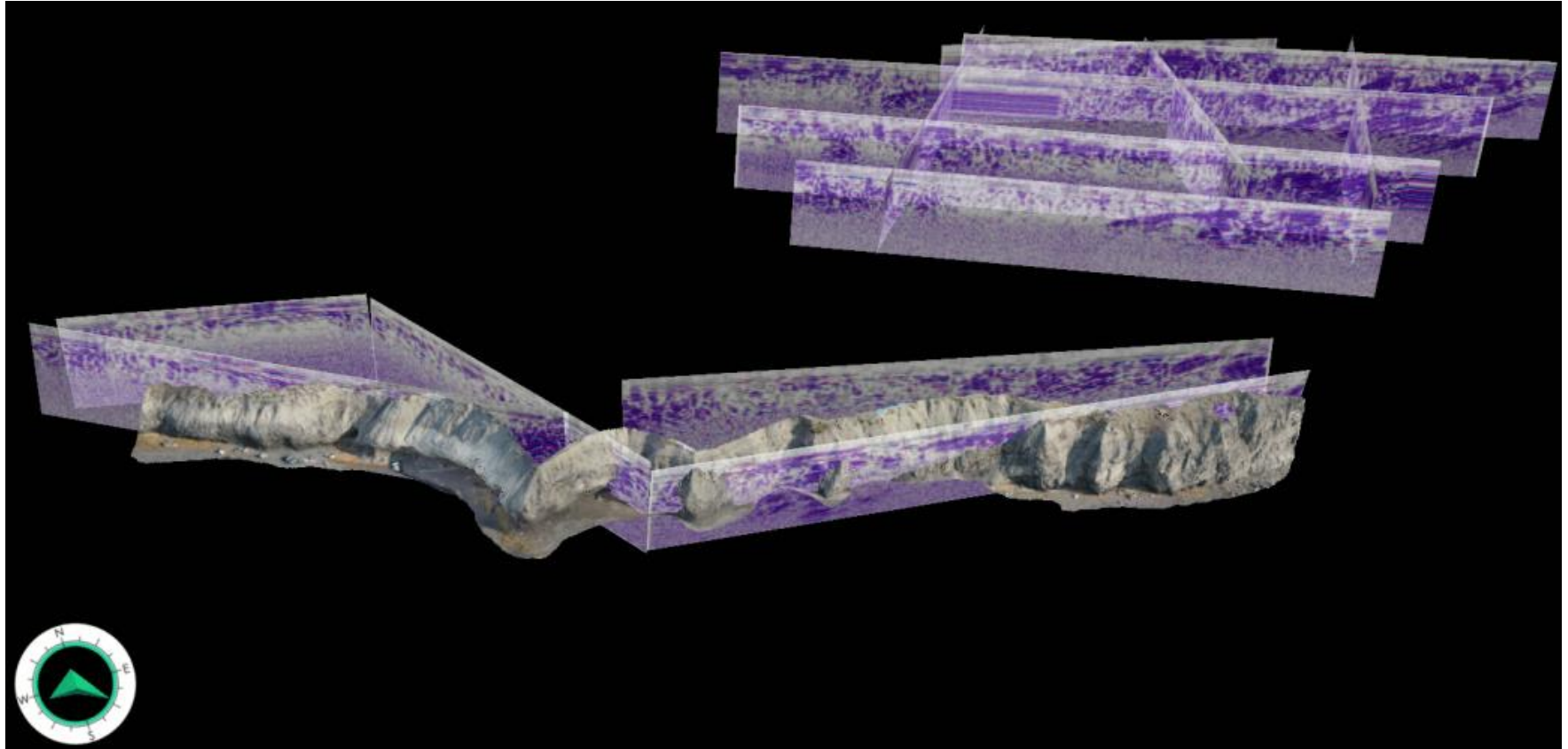
Highlights: VOM data processing



- Batch processing and re-processing
- Playground for testing quantitative and qualitative tools for interpretation of digital outcrops
- Optimizing workflow from (digital) outcrop to geomodel



Highlights: data integration

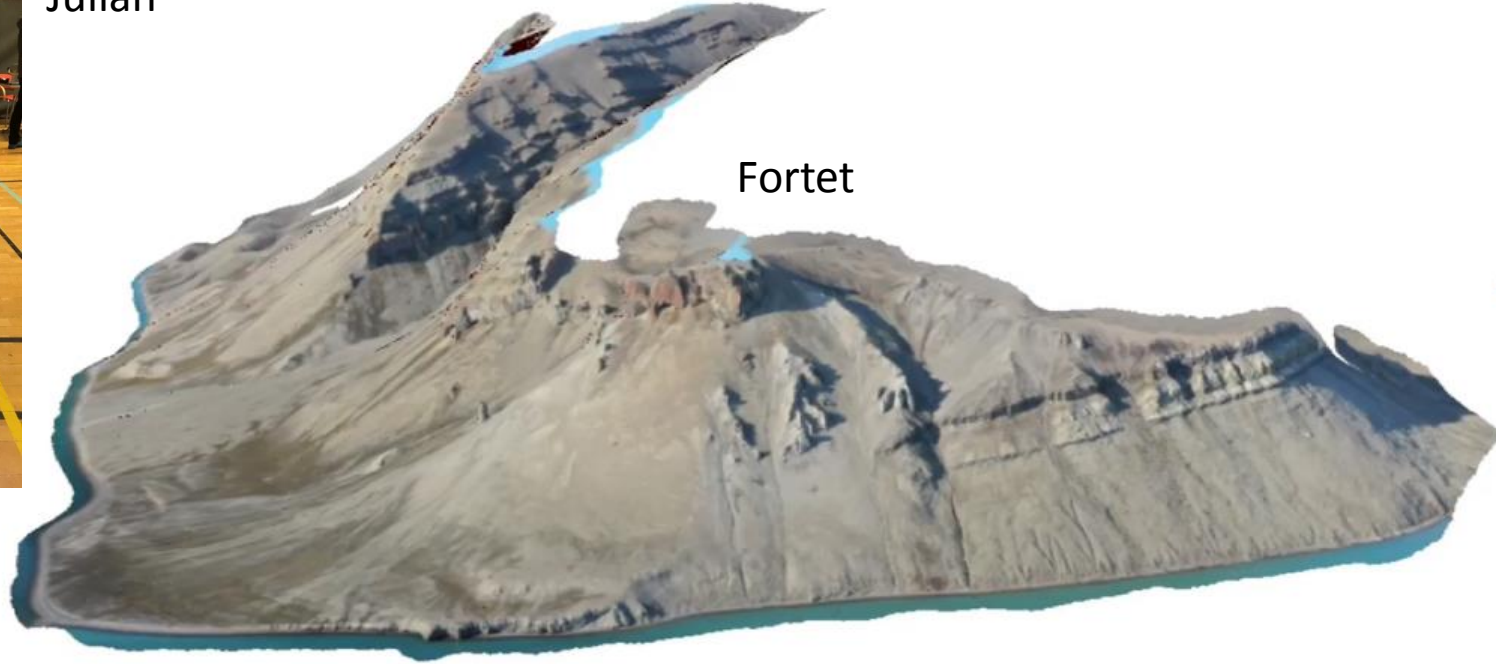




Highlights: data integration



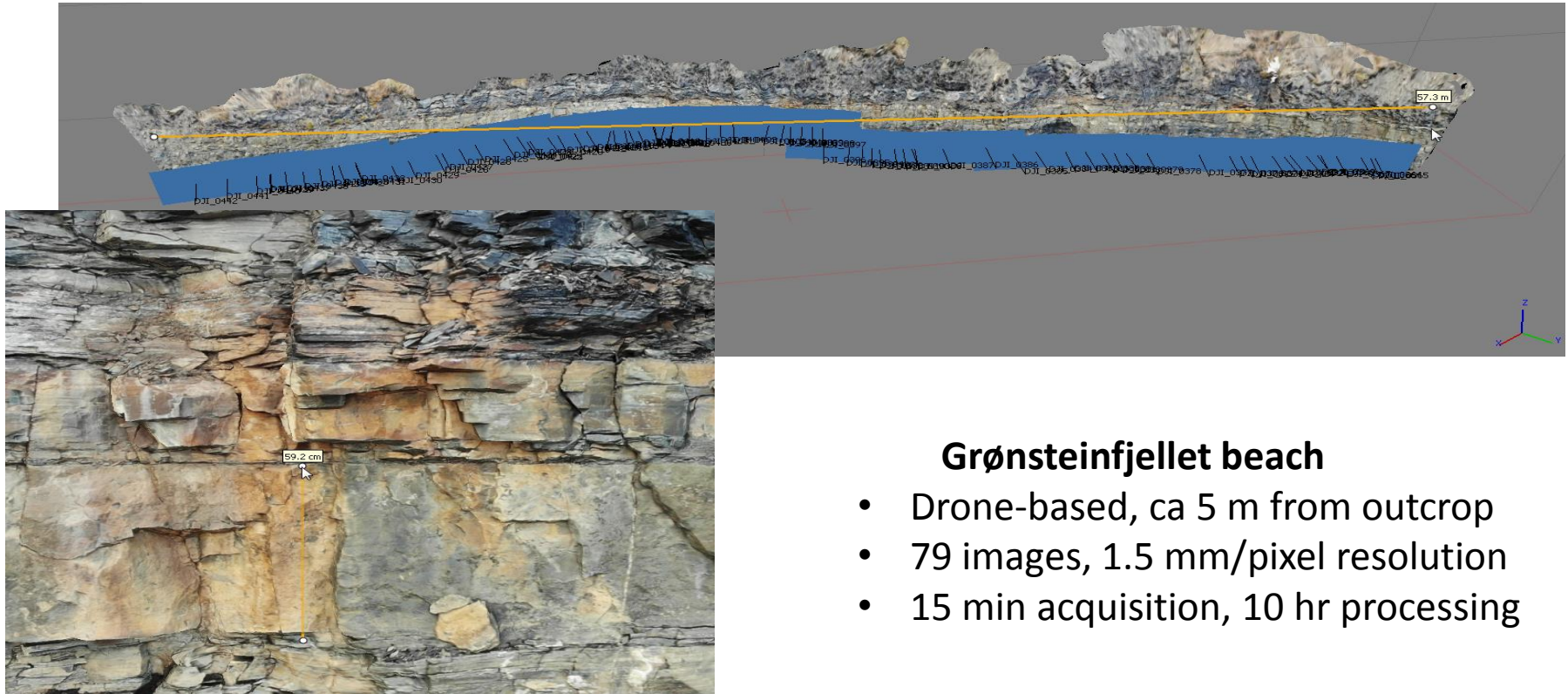
Julian



<https://www.youtube.com/watch?v=Dp2m8o16SoQ>



VOM example: Grønsteinfjellet beach



Grønsteinfjellet beach

- Drone-based, ca 5 m from outcrop
- 79 images, 1.5 mm/pixel resolution
- 15 min acquisition, 10 hr processing



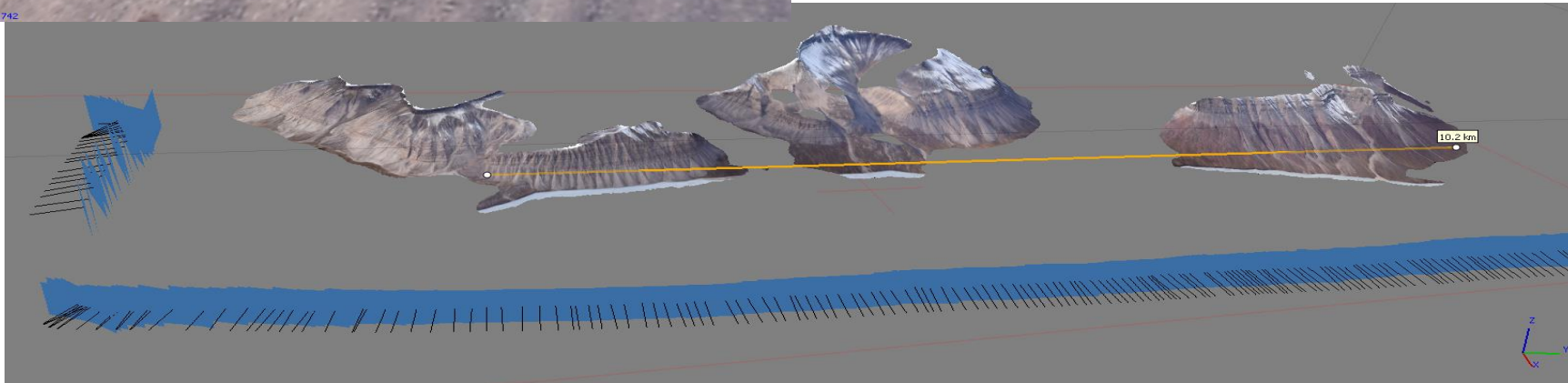
VOM example: Dicksonfjorden



faces: 3,018,223 vertices: 1,517,742

Dicksonfjorden outcrop

- boat-based, ca 3.4 km from outcrop
- 190 images, 25 cm/pixel ground resolution
- 2 hour acquisition, 10 hour processing





VOM coverage overview



Svalbox.no

Open data and information on Svalbard's geology

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[Map](#)

[Longyearbyen CO2 Lab](#)

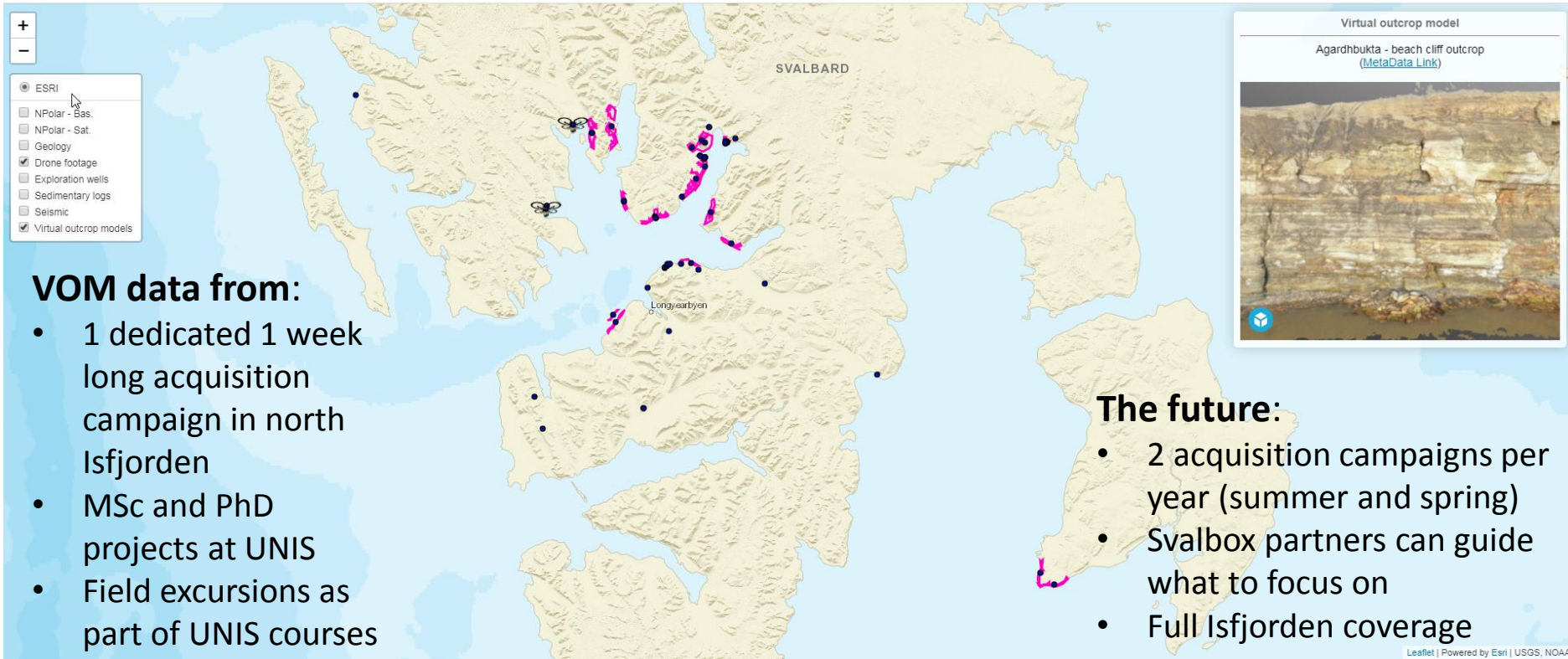
[Virtual models](#)

[Projects](#)

[e-Learning](#)

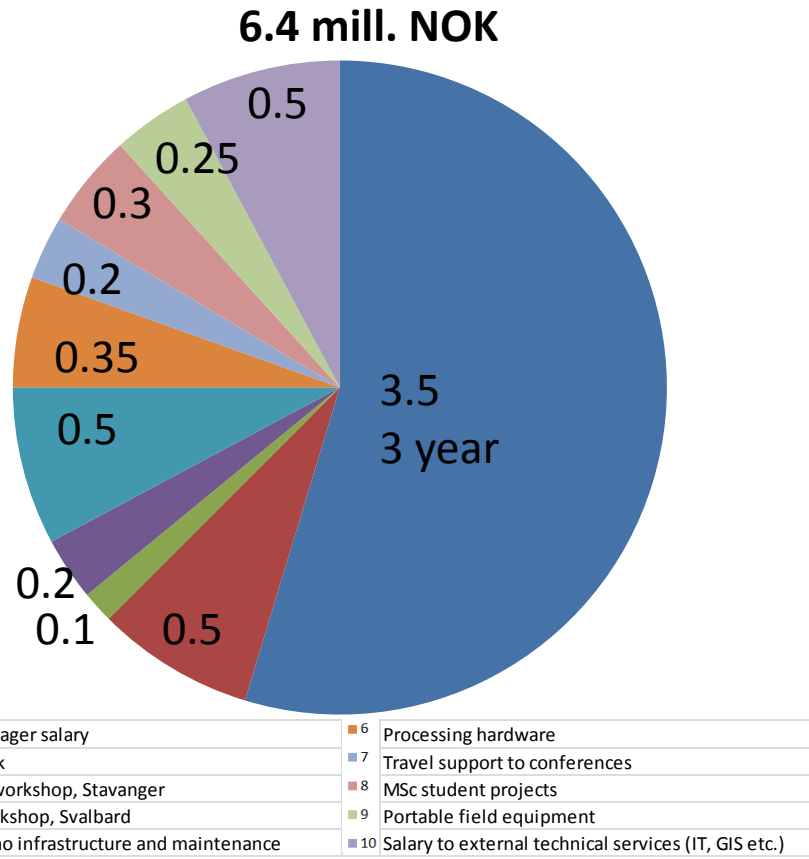
[About](#)

[News](#)





Svalbox2020: Resources and financing



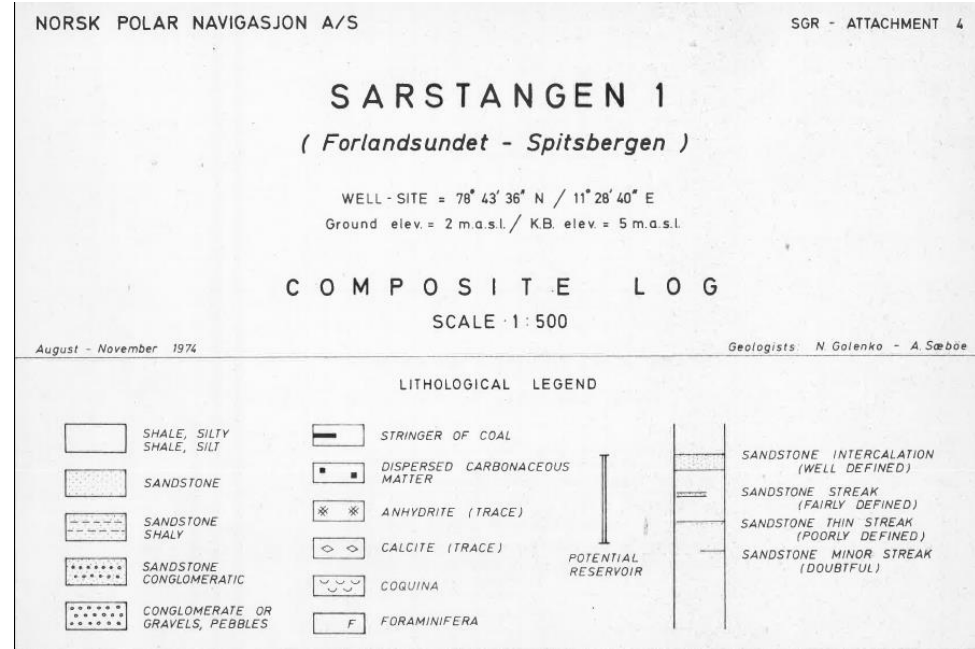
- Financing model through FORCE:
2.15 mNOK/year over 3 years
 - 425 kNOK/per company per year (if 5 companies participate)
- In-kind contributions:
 - Salary to project manager Kim Senger through UNIS
 - Salary to PhD candidate Peter Betlem through UNIS
 - Access to data sets from participating institutions
 - Access to remote field sites for virtual outcrop acquisition through ongoing R&D projects and courses at UNIS
 - Academic software licenses from various companies (Petrel, Move, LIME etc.)
 - Building on 750k NOK funds from UArctic co-op project (2017-2019)
 - Building on ca 100 k NOK ARCEX support for data input



Svalbox2020: Tasks and project organisation

WP1: Data hunting, data integration, data digitization and data management

- **Organise data-based** (published maps, terrain models, geological maps, seismic data, borehole data) and location-specific **Petrel projects**
- **Digitize** all material from Norsk Polar Navigasjon **archive** and other relevant archives (e.g., Barentz-Gruppen archive in Tromsø State Archive, Svein Ytreland's archive in Svalbard Museum)
- **Digitize key publications** from Svalbard and incorporate in Svalbox
- **Systematize the seismic database** onshore and near-shore Svalbard and compile into single Petrel project





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WP2: Data acquisition, processing and interpretation

- Systematic and dedicated **virtual outcrop acquisition** in Svalbard from boat and drone. Partners will have the possibility to provide input to prioritization, see www.svalbox.no/map for an overview of present VOM coverage
- Use of **portable field instruments** (magnetometer, portable XRF, XRD, NIR etc.) to characterize key outcrops and existing drill cores in Longyearbyen
- **Geophysical data acquisition** – onshore gravity-magnetics and MT along seismic profiles and seismic-outcrop correlations through seismic modelling
- **Regional seismic interpretation** including generation of structure-contour maps and thickness maps (MSc projects and term projects)



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- Regional seismic interpretation including generation of structure-contour maps and thickness maps

WP3: Data dissemination, outreach and training

- **Regular updates** of “free-for-all” Svalbox.no website with both new content, new data types (e.g. 360 degree videos, see Svalbox YouTube channel) and project results
- Annual **data package delivery to FORCE** partners in industry-standard Petrel format
- Regular project **newsletter** and popular science articles on geo365.no and other relevant channels
- Development of **virtual field trips** to key thematic localities in Svalbard
- Development of **interactive training material** to be used in the field, in Longyearbyen or in partners' premises



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- Regional seismic interpretation including generation of structure-contour maps and thickness maps

WP4: Project management

- Organisation of **project meetings**, including Svalbox kick-off meeting in Stavanger and Svalbox **field workshop** based in Pyramiden with an excursion to the Billefjorden Trough
- Establishment of a **steering committee** with representatives from industry and academia
- Judicial considerations on **data access** rights and organization of project deliveries accordingly



Svalbox and Covid19 – challenges and opportunities

Geoforskning.no - Studenter

Digital feltundervisning

Opprettet 08.05.2020

I disse dager nyter geologistudentene ved UNIS godt av tilbudet om virtuelle blottninger, feltvideoer og annet datamateriale til bruk hjemmefra.



Stilbilde fra video fra kurset AG222 (UNIS)

Kim Senger, førsteamanuensis i strukturgeologi og bassenganalyse, og kolleger gir oss en oppdatering på hvordan Department of Arctic Geology ved Universitetssenteret på Svalbard (UNIS) gjennomfører "feltundervisning" i en periode der både underviser og studenter sitter spredt rundt omkring i verden:

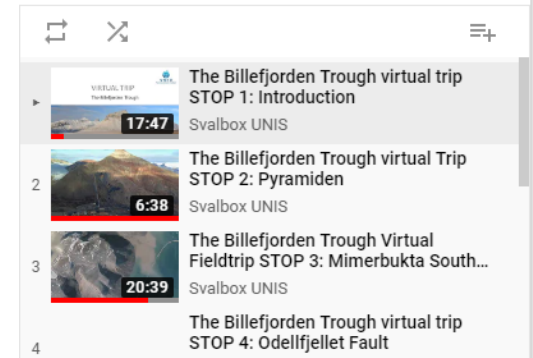
Mid-March 2020. The world crumbles under the Covid-19 pandemic and associated restrictions. All of us are affected - some more, some less. Universities in Norway turn to digital teaching almost overnight, and many exchange students worldwide are asked to return to their home countries.

<https://geoforskning.no/studenter/2270-digital-feltundervisning>

- Since mid-March, we run a BSc course at UNIS fully digitally
- A highlight was a virtual excursion to the Billefjorden Trough – possible also because of Svalbox
- We plan to use the experience from this to generate thematic virtual field trips to Festningen and more



<https://www.youtube.com/watch?v=BOLIGOxqQKg&t=949s>





Summary and way forward

- Svalbox is a fully operational and vibrant data portal
- We see increased usage internally at UNIS and partners in education, outreach and research
- We require longer-term financing and a dedicated technician/data manager to take Svalbox to a higher level



Svalbox: bringing Svalbard geology to you – wherever you may be!



Svalbox.no

Open data and information on Svalbard's geology

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Introduction video to Svalbox online portal (7 min, by Peter Betlem)

Svalbox Map Interface

Click on a feature on the map to open its properties.

- ☒ ESRI
- ☐ NPolar - Bas.
- ☐ NPolar - Sat.
- ☒ Geology
- ☒ Exploration wells
- ☒ Sedimentary logs
- ☒ Seismic
- ☒ Virtual outcrop models

An interactive digital Svalbard geological-geophysical portal

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UNIS

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FORCE Lunch & Learn, Wednesday 27th May 2020, online webinar