

# DIGITAL MAPPING TECHNIQUES 2025

The following was presented at DMT'25  
May 18 - 21, 2025

The contents of this document are provisional

See Presentations and Proceedings  
from the DMT Meetings (1997-2025)  
<http://ngmdb.usgs.gov/info/dmt/>





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# Field data application and UAV

**Etienne Girard, Gabriel Huot Vézina**

A new open source application for collecting data in the field  
and a brief overview of using drone in different application

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# Things to consider during development

- **Esri** license change: Floating / Computer = 400K / 2.5 millions
- More **Qgis** user: scripting / mapping
- **FAIR**: Model and common science language and sharing unique ID
- **AI** : data / maps
- Cartography: **Human** readable / **machine** readable
- New acquisition tools: **data** acquire / **science** behind

[FAIR](#) : Findable, Accessible, Interoperable, Reusable



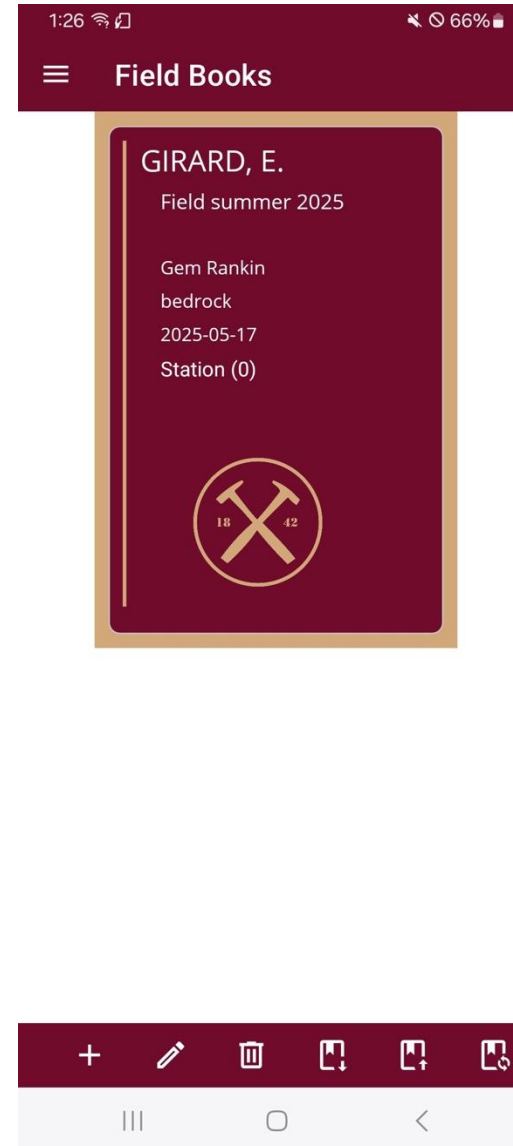
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# Talk: two examples

- GSC Field Application
  - New environment of development
  - New background data
  - Customize environment
  - Customize dictionary... be careful...
  - Open source
- UAV in the field in development
  - Totally different usage
  - Future usage



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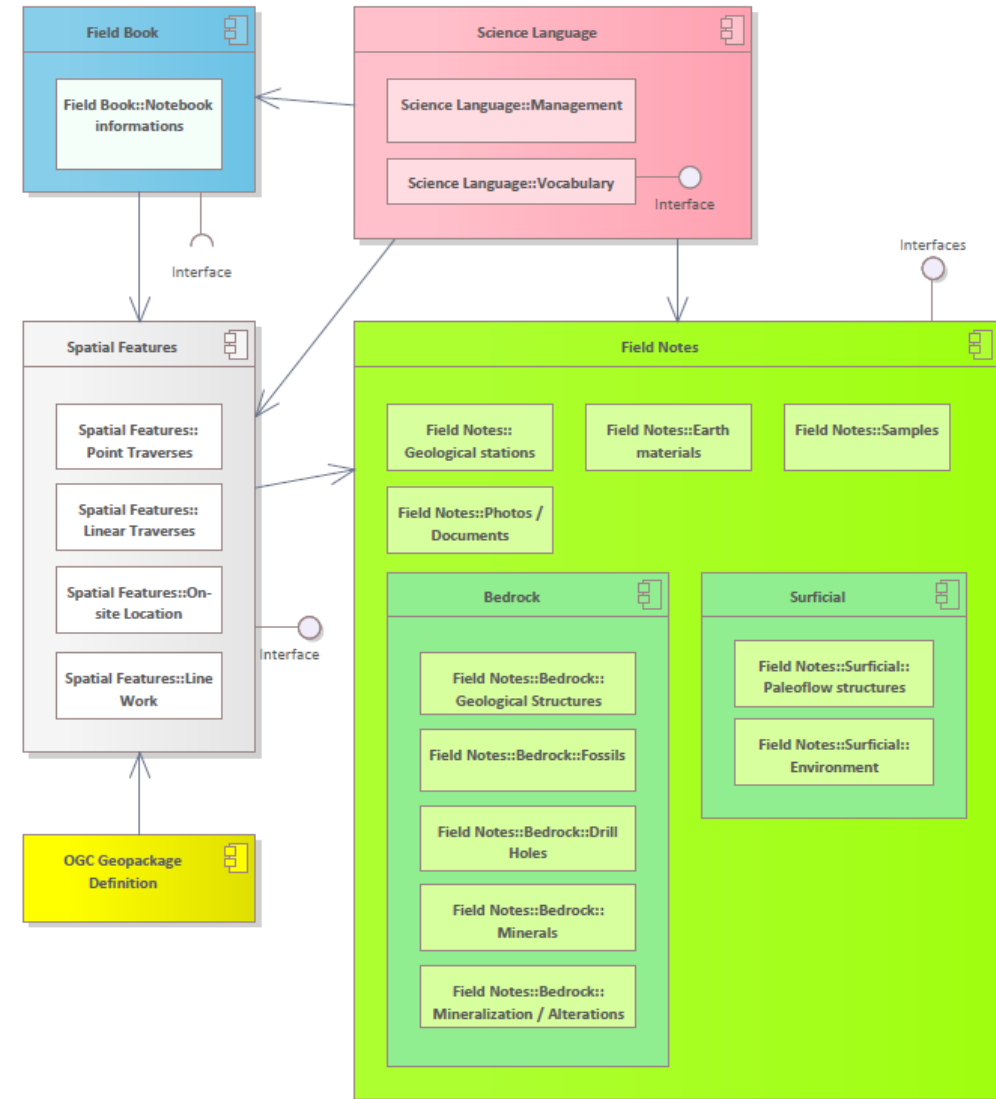
# Field App: New environment of development

- [.Net Maui](#): development for 3 different platforms:  
Windows, Android and IOS (will be)
- [Mapsui](#) instead of ESRI map object
- [OGC Geopackage](#) database

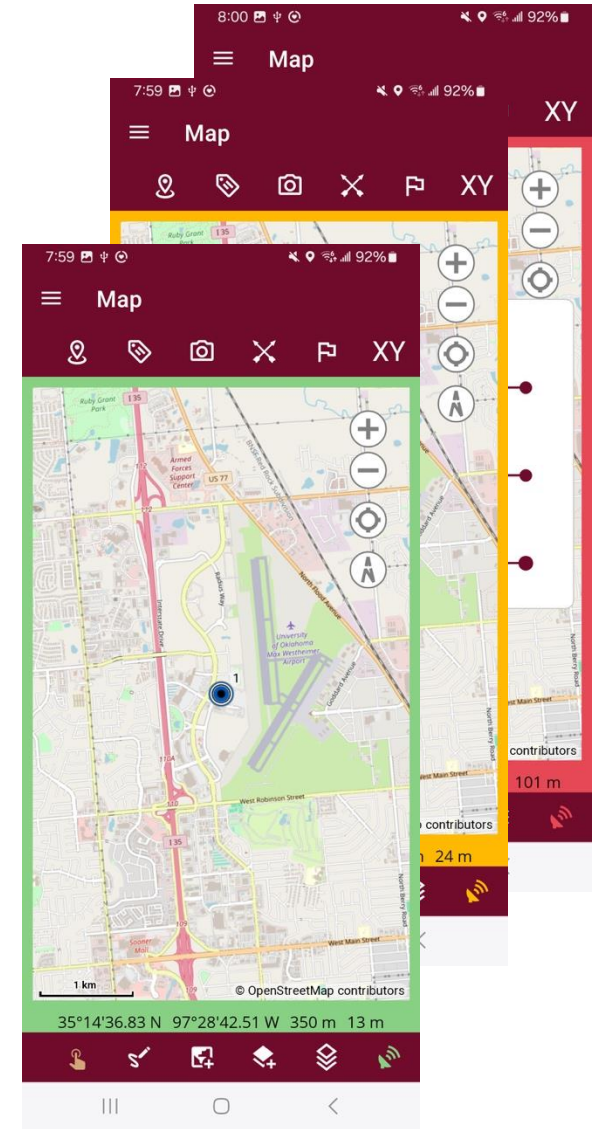
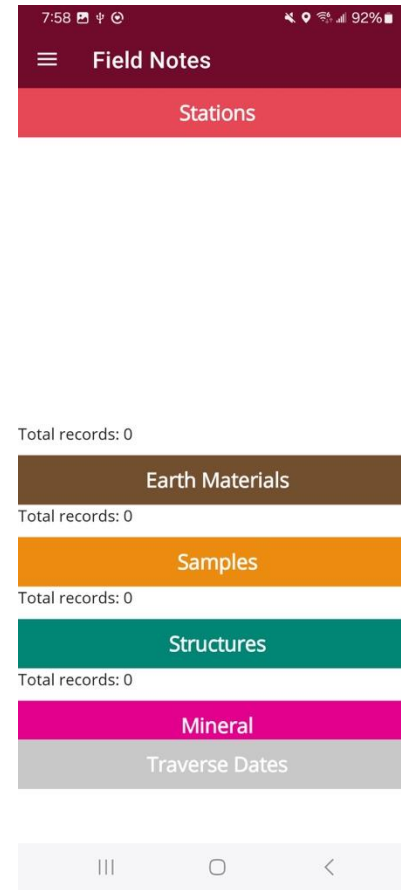
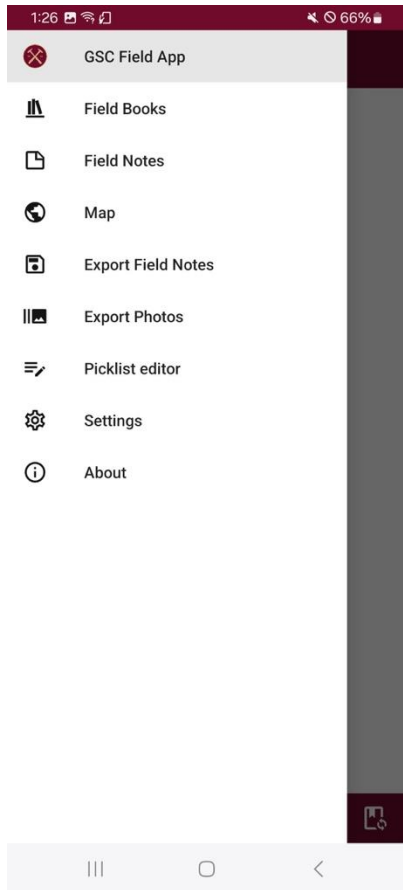


# Field App: Data model

- **Field Book:** project metadata
- **Spatial Features:** new line work
- **Field Notes:** New drill holes... more to come for instrument
- **Science language:** easier to manage
- **Database format:** Geopackage



# Field App: Interface





# Field App: Interface

8:49 100%

← Station

25SAC0002

**Type**  
Observation  
visited outcrop

Source  
ground observation

**Outcrop**  
Size  
10

Quality  
good

good X

Save

III O <

8:49 100%

← Earth Material

25SAC0002A

**Lithology - Setting and composition**

Group and type  
Type  
metamorphic - gneiss

Detail  
augen gneiss X

augen gneiss

Qualifier  
dunitic

dunitic X

Save

III O <

8:50 100%

← Structure

25SAC0002A01

**Type**  
Class and type  
planar - fault plane

Detail  
normal

**Measurements**  
Format  
right-hand rule

Azimuth  
12

Dip/Plunge  
45

Depth  
0

Method

Save

III O <

8:51 100%

← Photo

25SAC0002P001

**Description**

Category  
sample site

sample site X

Caption  
strange place to took a sample

Load Previous Caption

Scale Direction  
Select ...

Save

III O <





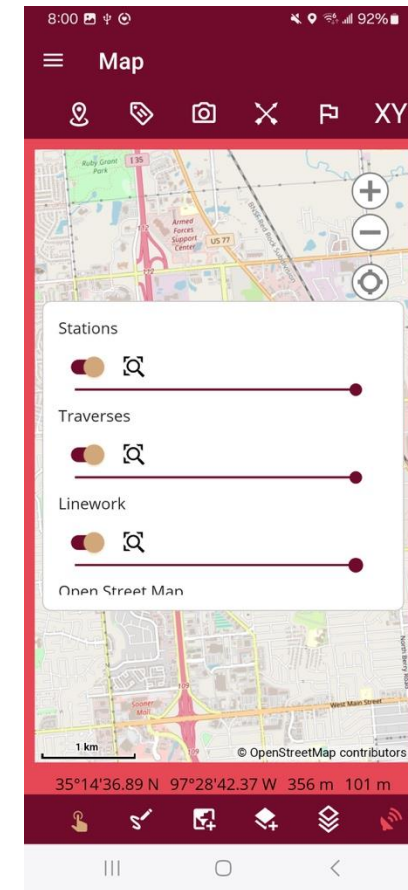
# Field App: New background data

- WMS in a buffer (Street map by default)
  - Zoom to the location before you go in the field
- Mbtile
  - For raster easy to create in Qgis
- Geopackage
  - For vector where you want to query something

## use SLYR

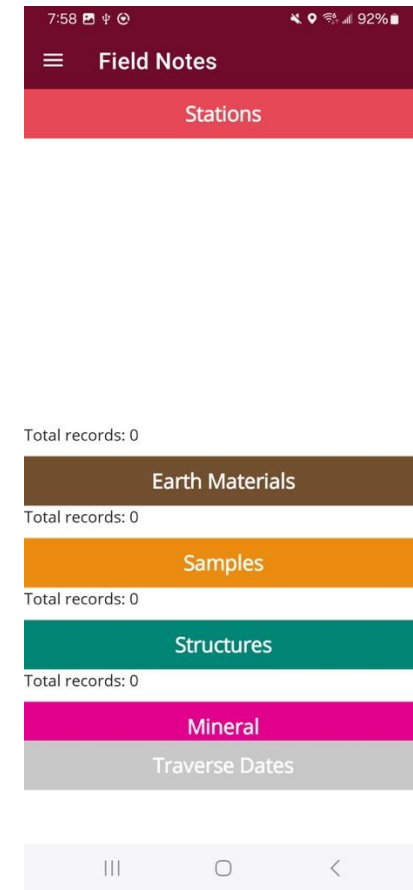
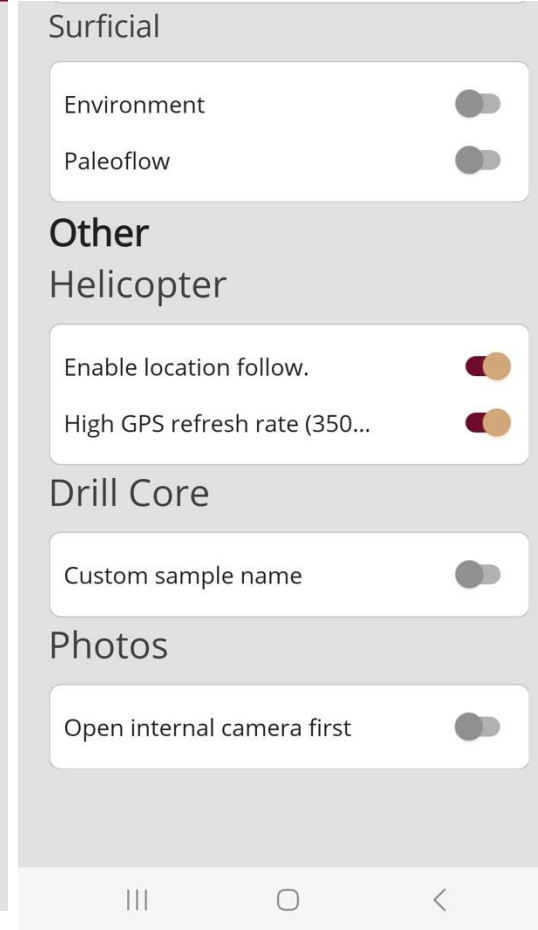
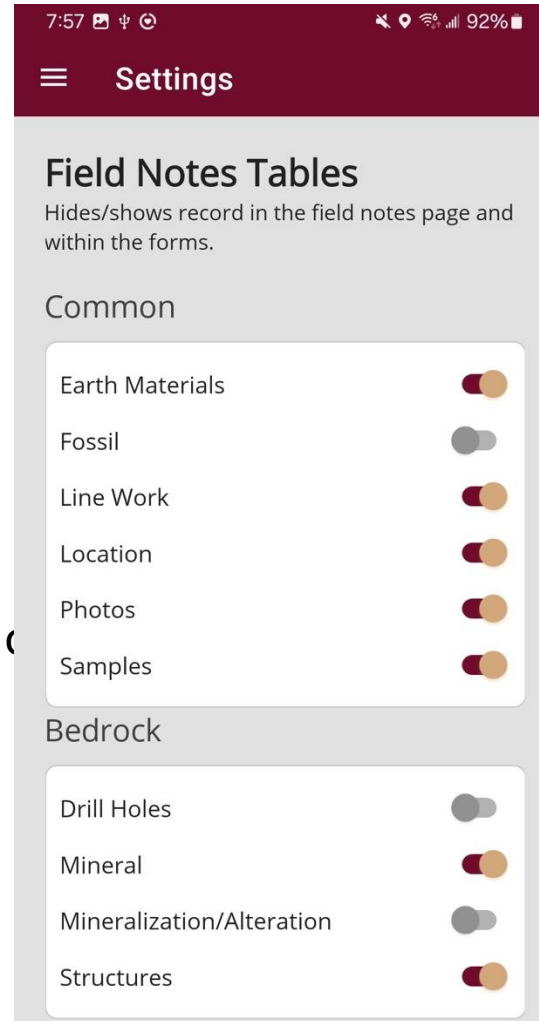
- Extension in Qgis to transfer style or stylex / aprx or mxd / data in compatible format for Qgis... a very interesting way to propose another format for publishing data. Note: there are 2 versions of Slyn: one free and one paid (paid version is better and not really expensive)

Must be in WGS 84 (EPSG: 4326) or WGS 84 / Pseudo-Mercator (EPSG: 3857). Any other spatial reference system (SRS) set within the geopackage will be projected to EPSG:3857 upon loading in the map page



# Field App: Selectable environment

- turn on/off certain tables of data collection
- Option for helicopter due to have to increase refresh speed took more batteries power
- Option to use custom, normally it's automatic merging year / geol code / sequential number 25RAT\_E001
- Option to use internal camera instead of external camera



# Field App: Customize dictionary

- Edit terms use in the picklist.
  - Table name
  - Use
  - Reader
  - Simple
  - Default value

1:28 65%

Picklists

Notes Table

+

Location

Field

↕

Elevation Method

Parent term

↑

Select ...

Terms

NA	<input type="checkbox"/>
GPS	<input checked="" type="checkbox"/>
Handheld GPS	<input checked="" type="checkbox"/>
altimeter	<input type="checkbox"/>
50k Map	<input type="checkbox"/>
250K map	<input type="checkbox"/>
total station	<input type="checkbox"/>
DCDC	<input type="checkbox"/>

Save

1:29 65%

Picklists

Notes Table

+

Earth Materials

Field

↕

Lithology Description

Parent term

↑

metahypabyssal - porphyry

Terms

augite porphyry	<input checked="" type="checkbox"/>
feldspar porphyry	<input checked="" type="checkbox"/>
feldspar-quartz porphyry	<input checked="" type="checkbox"/>
felsic porphyry	<input checked="" type="checkbox"/>
hornblende porphyry	<input checked="" type="checkbox"/>
intermediate porphyry	<input checked="" type="checkbox"/>
mafic porphyry	<input checked="" type="checkbox"/>
metagabbro	<input type="checkbox"/>

Save



# Field App: About

- Update software
- Hyperlink to documentation

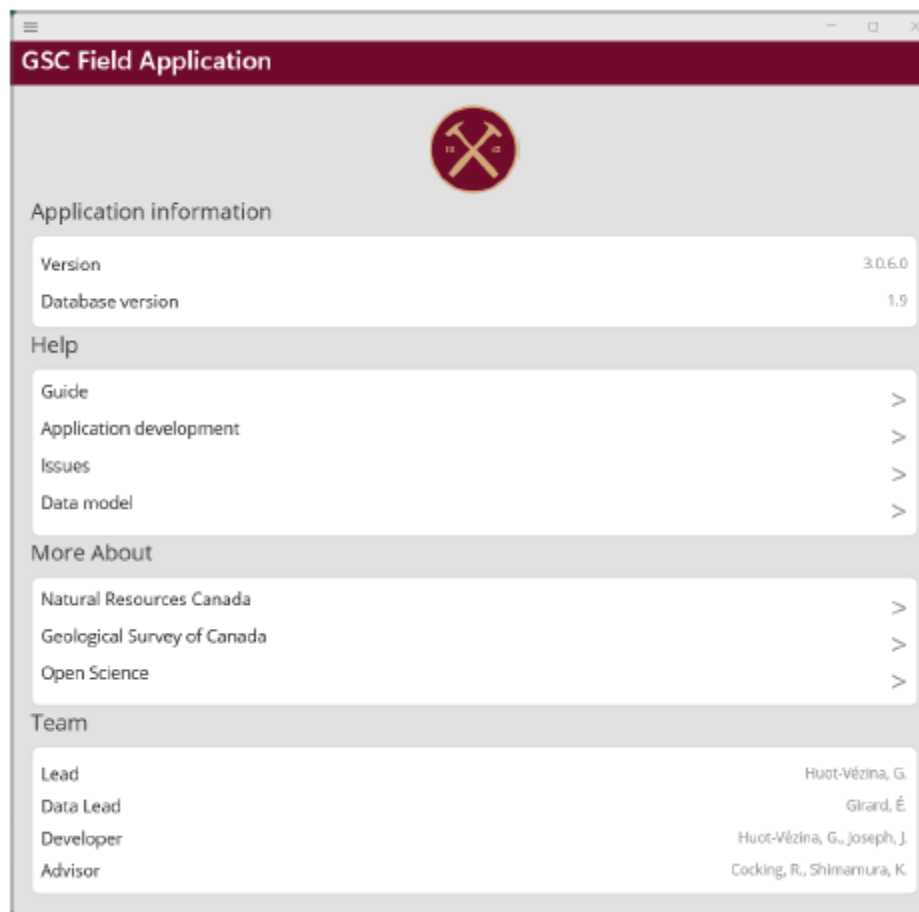
## Team

Gabriel Huot Vézina

Étienne Girard

Jamel Joseph

Rob Cocking



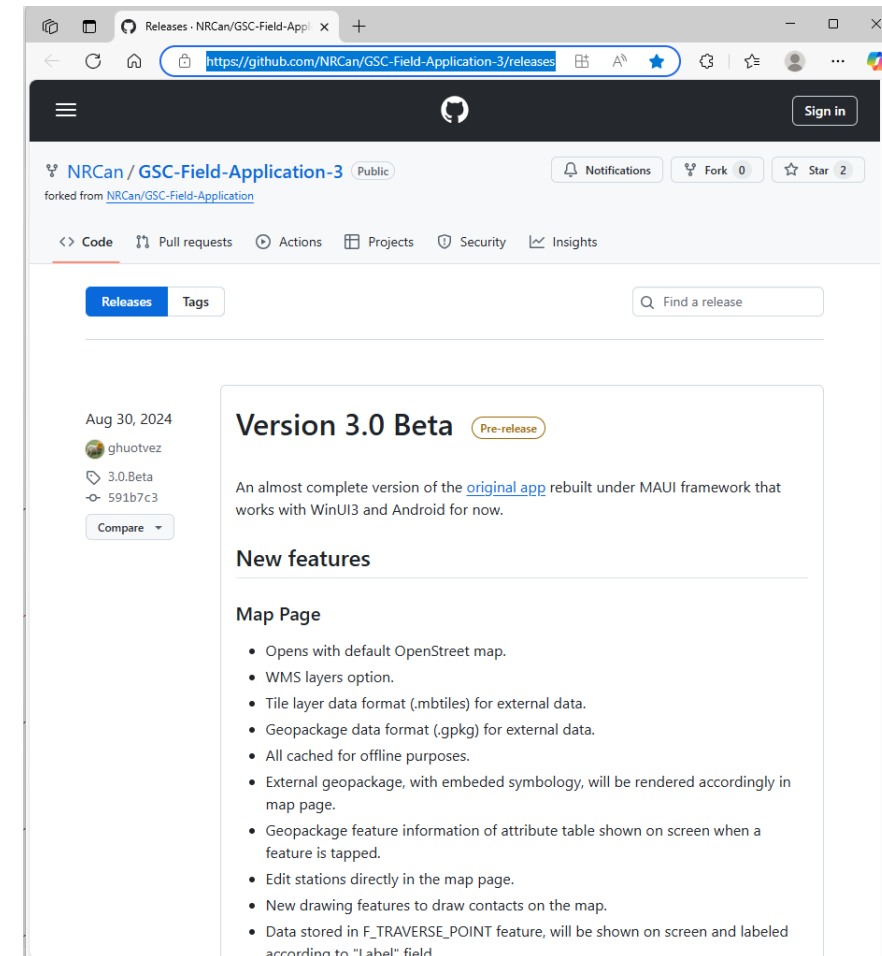
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# Field App: Open source

- [Releases · NRCan/GSC-Field-Application-3](https://github.com/NRCan/GSC-Field-Application-3/releases)



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# UAV in the field

- DJI Matrice 350 rtk
    - Camera RGB P1 42 mp
    - Lidar
    - Thermal camera - H20
  - DJI Mavic 3T
    - Camera RGB 20 mp
    - Thermal camera
  - BIG CHALLENGE - Travel
    - Batteries over 120 Kwh
    - cost \$1 000 and 1 month
- Photogrammetry / 2.5 D
  - Lidar
  - Thermal sensor
  - Water sampling
  - Magnetometer



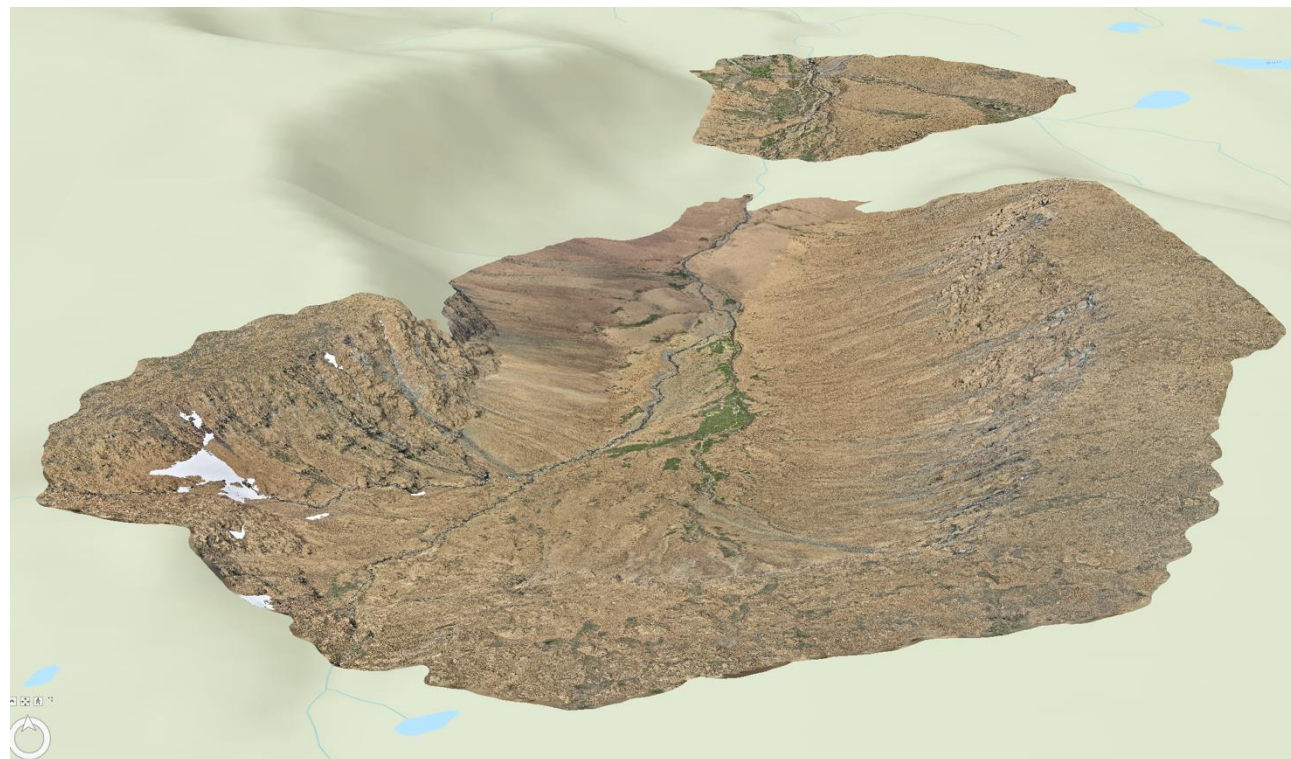
# UAV: Photogrammetry / 2.5 D

Gros-Morne, Newfoundland

- 3200 images
- 5280 x 3956 pixels
- To do
  - 9000 images

## Challenge

- Weather
- landform



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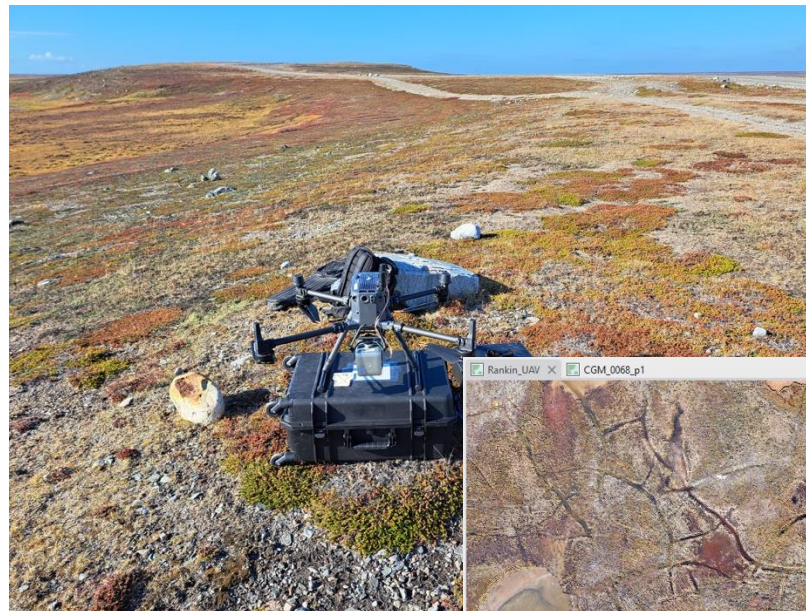
# UAV: Lidar

Rankin Inlet, Nunavut  
Arviat, Nunavut

For Ice wedge in permafrost

## Challenge

- Weather
- Type of lidar...
- Processing the data



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# UAV: Thermal sensor

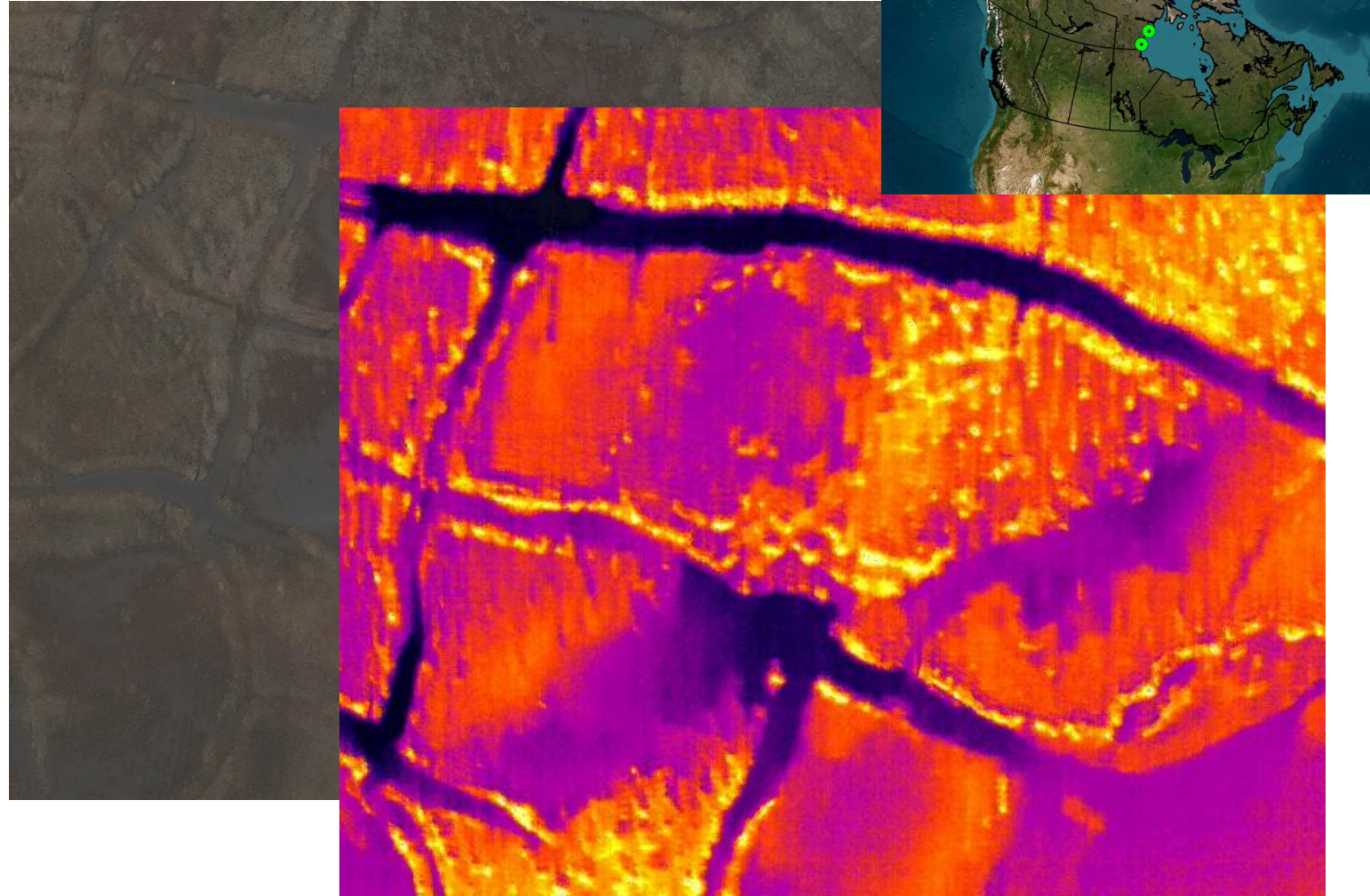
Rankin Inlet, Nunavut  
Arviat, Nunavut

For Ice wedge in  
permafrost

Resurgence of  
groundwater in a river

## Challenge

- Weather
- Time of the day
- Season



# UAV: Water sampling

Rankin Inlet, Nunavut

Arviat, Nunavut

Lake geochemical

## Challenge

- Weather
- Time of the day
- Season

[Using UAVs to collect filtered water samples for mineral exploration:  
Will it take off? - ScienceDirect](#)



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# UAV: Magnetometer

Six Nations of the Grand River, Ontario

DRONEmag UAV Magnetometer with GSMP-35U **Ultra Light-Weight Potassium Magnetometer** (0.2 pT sensitivity)

## Challenge

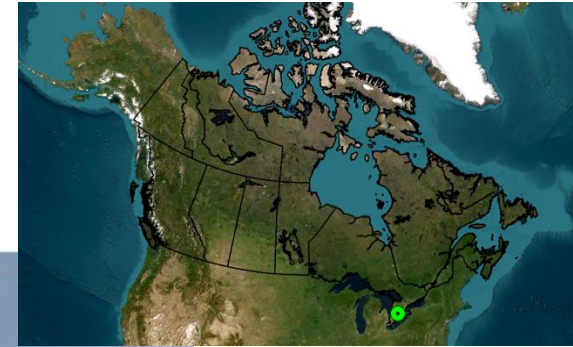
Integrate all parts under the drone

Settings

Data

Permit

Number of flight



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# UAV: Magnetometer in the field

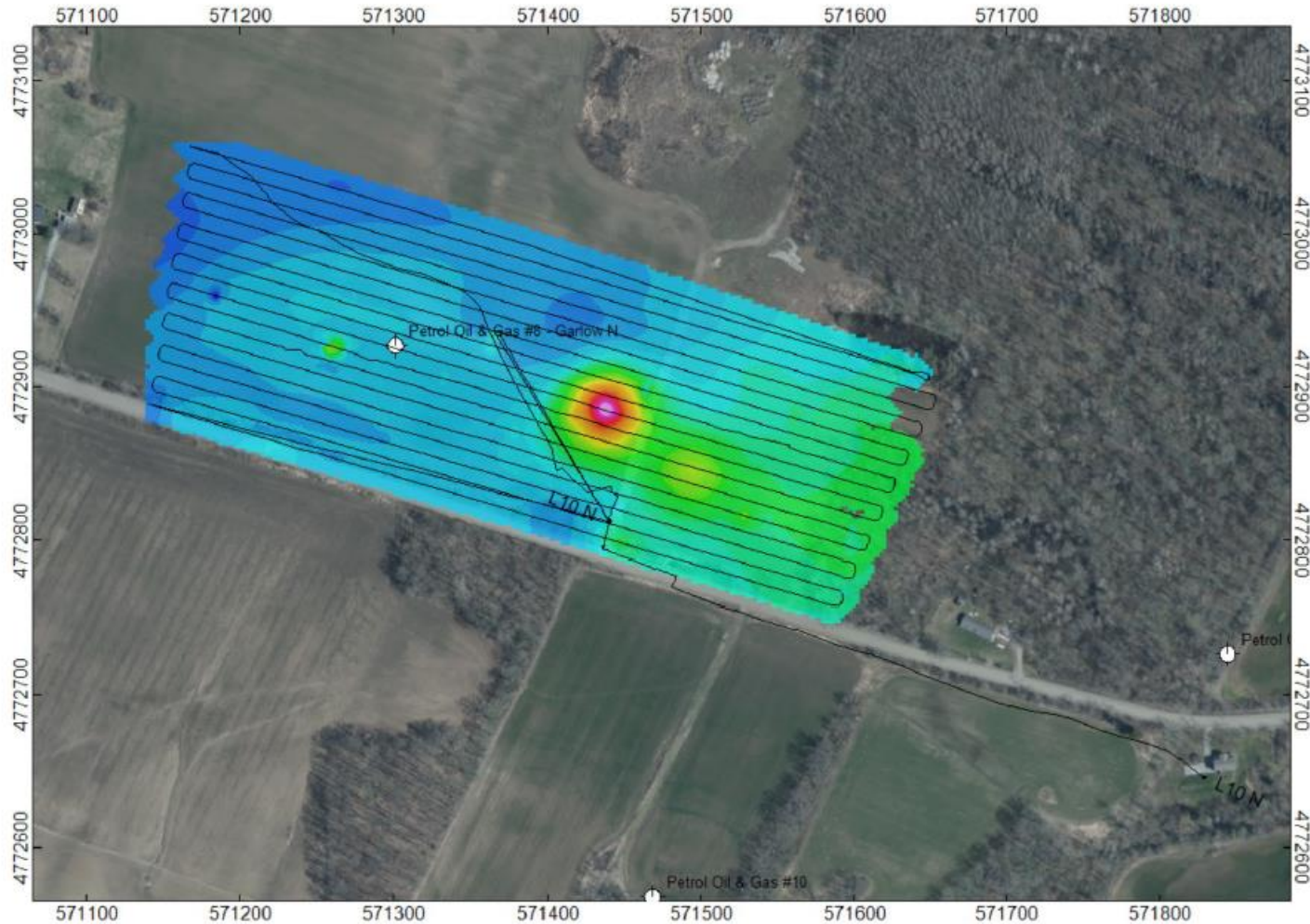


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# UAV: Magnetometer in the field



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# Next step for UAV

- UAV Pegasus: 3 hours flight / 10 kg / small batteries + gaz
- Integration of different sensor: Balko
  - New hyperspectral sensor
  - Lidar
  - Very high resolution camera 102 megapixels
  - New capability for planning
  - BLOS
- Bigger price





# Conclusion

AI give us opportunities to increase:

- Management of our data

- Standardisation of data model

- Works on scientific language

Challenge us to preserve cartography

New technology in UAV change the scale of studies

New technology give us new opportunities to learn

Where we go. Will see ;-)



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