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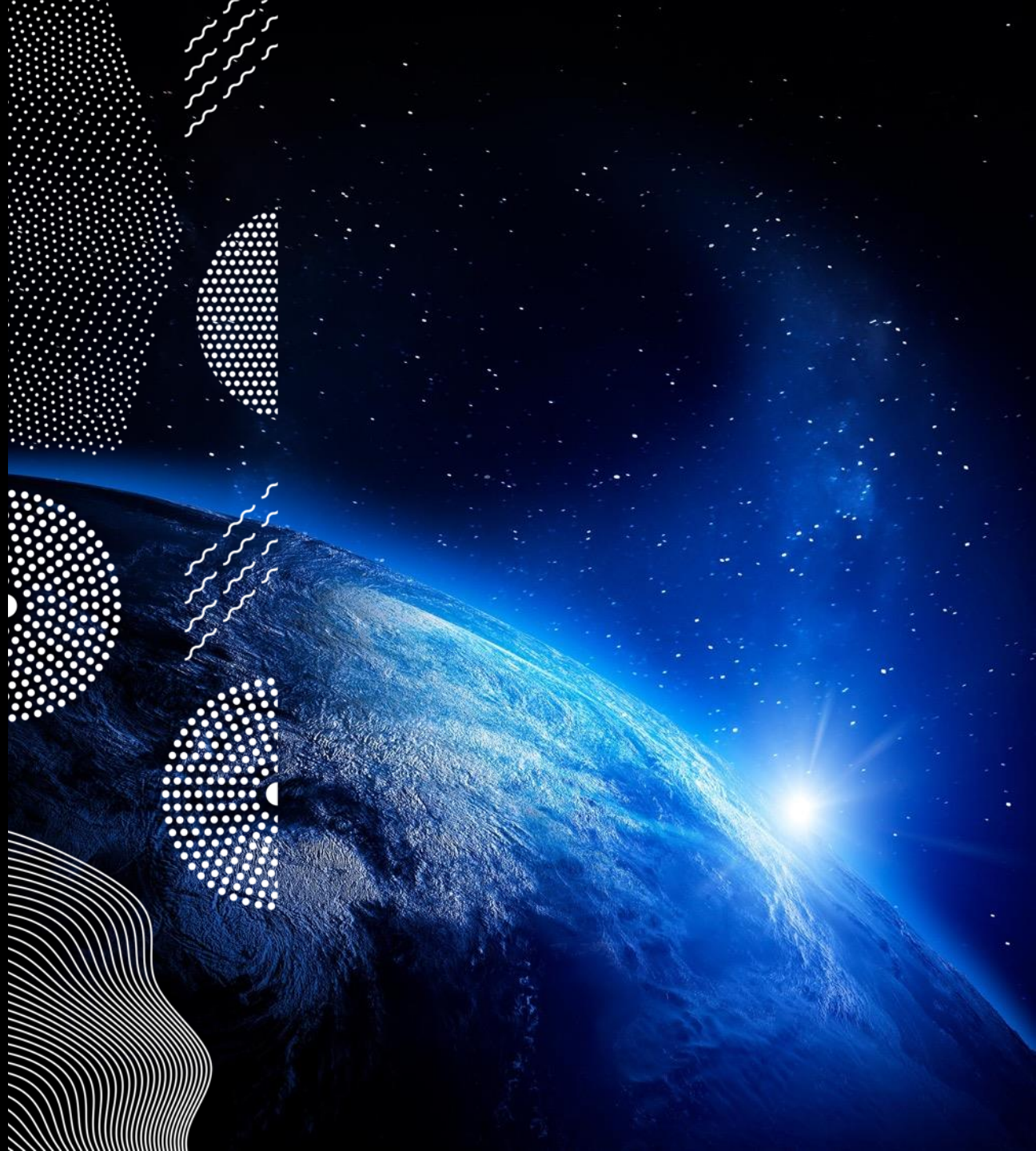
Drones in arctic ITS & cryospheric research



6.6.2022

Kari Mäenpää

Basic info

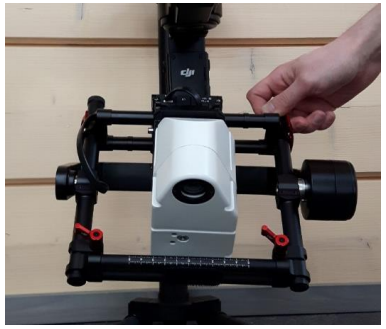
Finnish meteorological institute(FMI):

- Arctic Space Centre
- Intelligent traffic and interactive road weather services
- Atmospheric research
- Cryospere research

Drones used in this research

- DJI mavic pro (Quadcopter)
  - Small and foldable
  - Used for taking pictures.

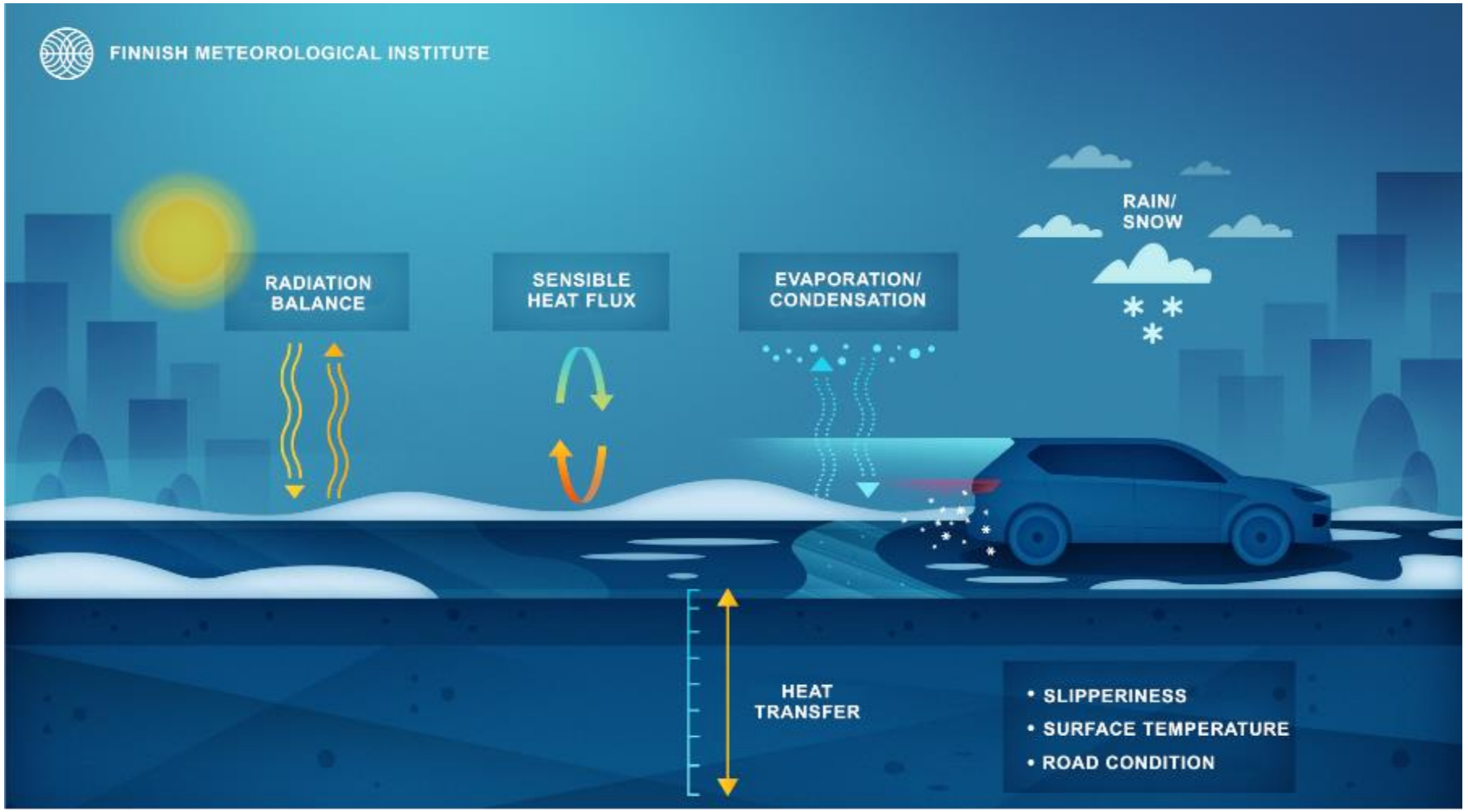
- DJI Matrice 600 (Hexacopter)
  - With added 600 Pro properties
    - 3 GPSs and IMUs for improved flight safety
  - 2 gimbals:
    - Ronin MX.
      - Larger cameras/instruments ~4kg carry capability.
    - DJI X5 camera/gimbal.
      - For accurate photography



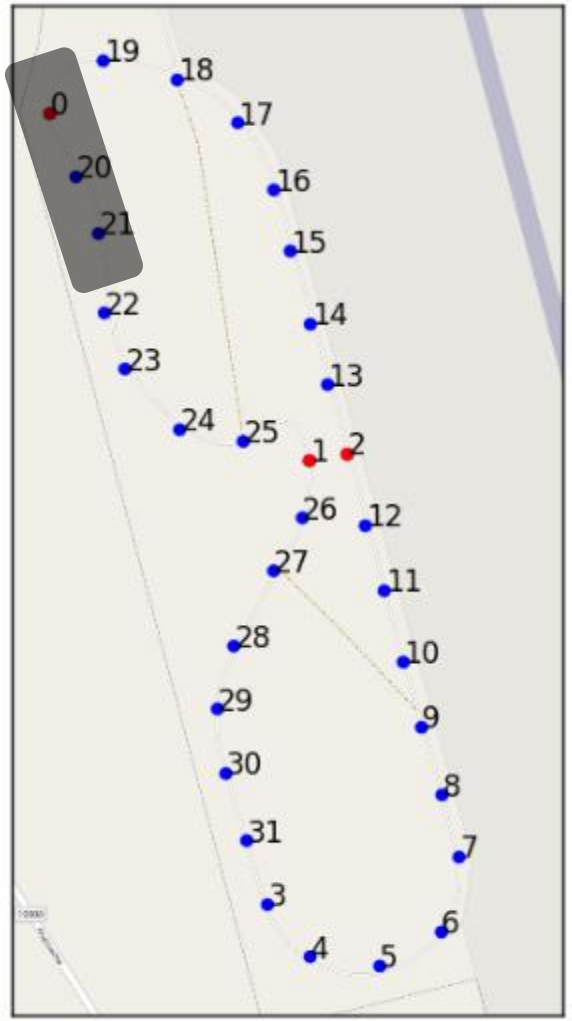
RGB camera

Vehicle pedestrian recognition

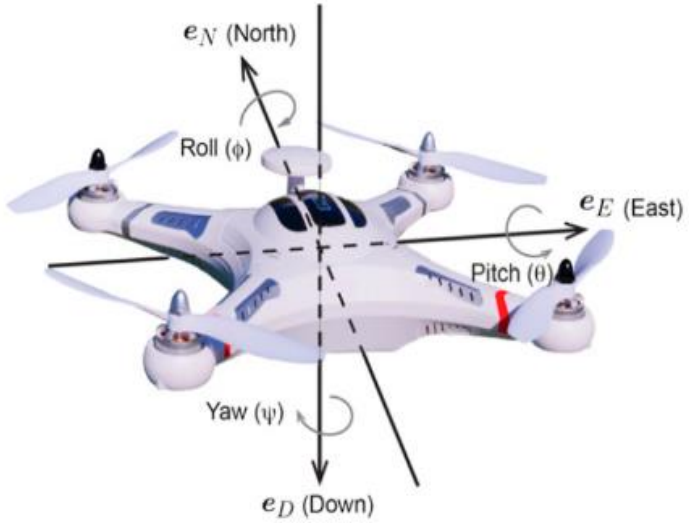
Road weather model



Forecast points

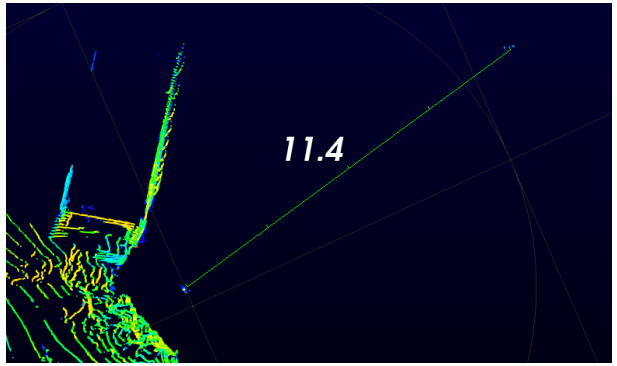


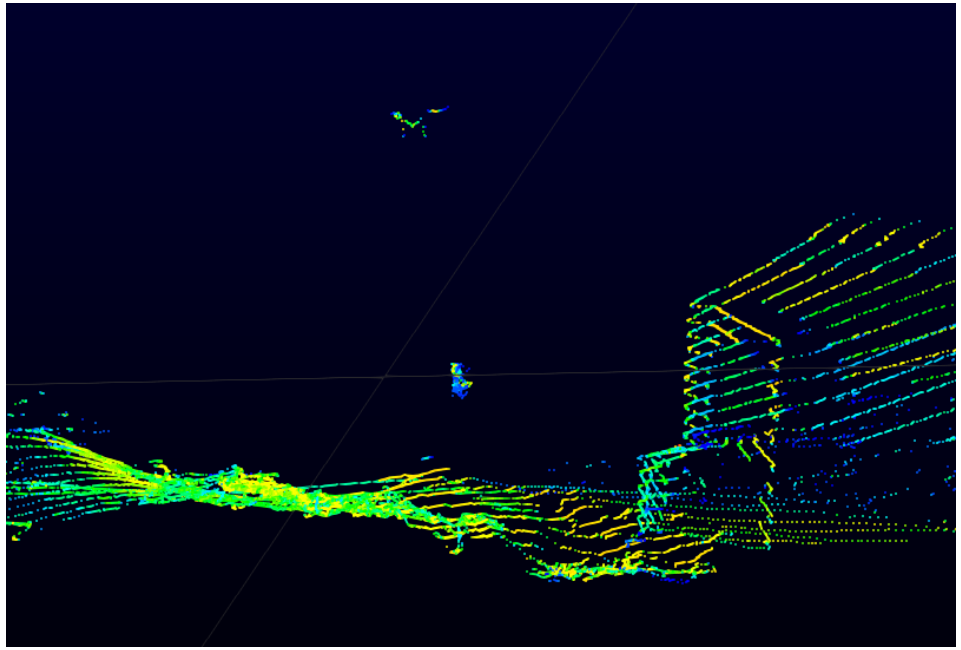
Wind speed



	Weather station		UAV 10 min calculated values	
Flight number	Wind direction 10 min avg.	Average wind speed 10 min (m/s)	Wind direction	Average wind speed (m/s)
1	274	3	230	5,5
2	280	4,4	266	6,28
3	309	4	324	3,74
4	229	2,9	183	4,6
5	237	2,6	243	5,13

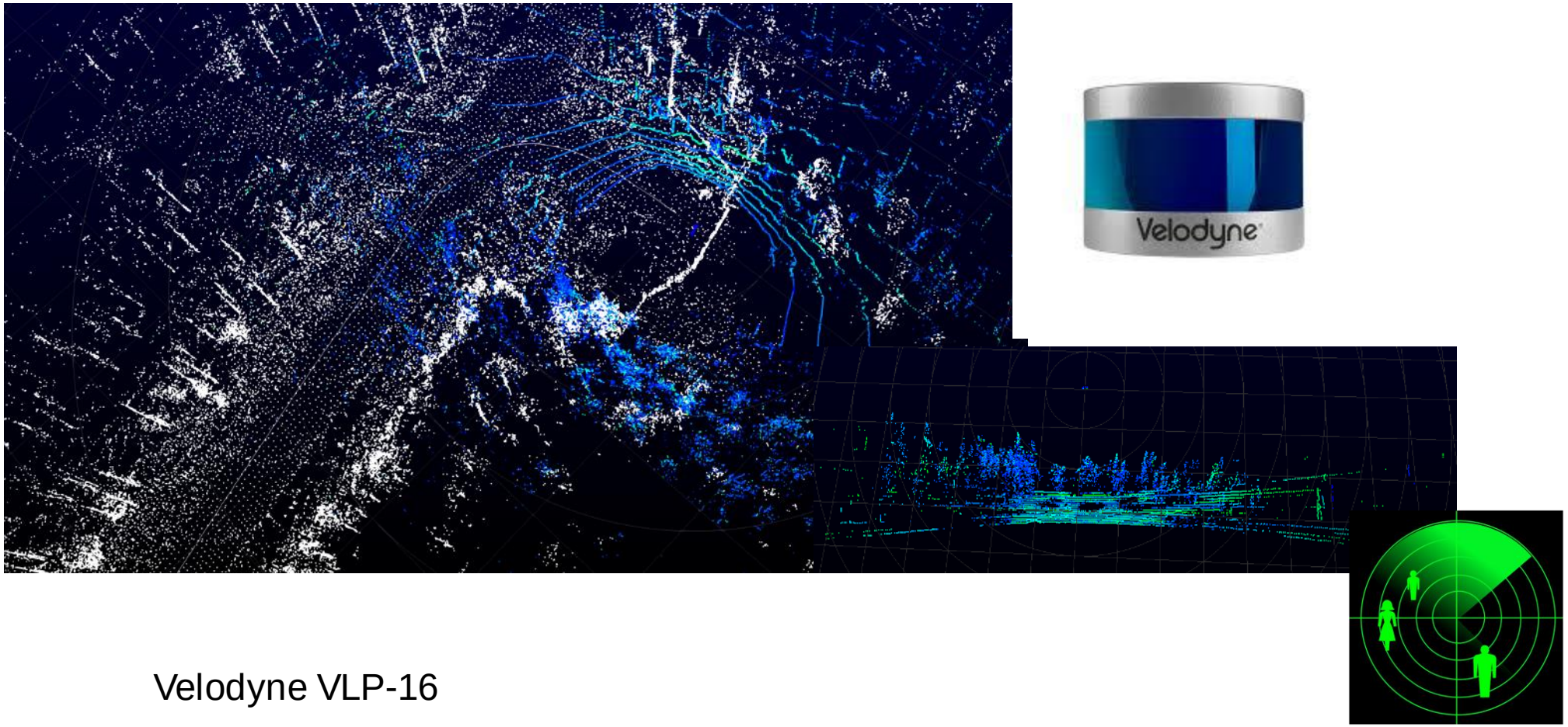
Wind speed continues





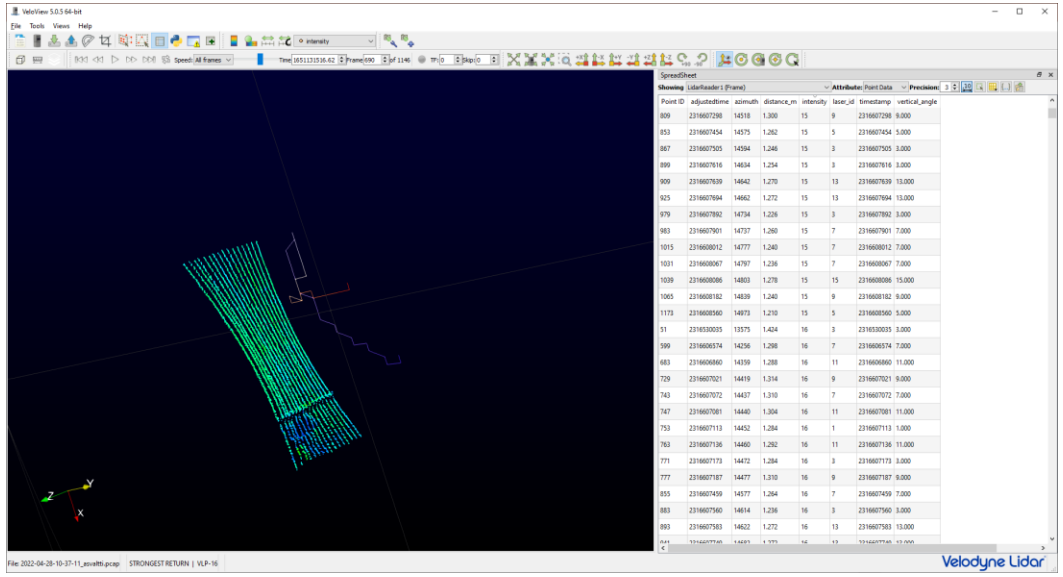
	Observation	Drone wind(airdata)	Wind from Lidar
1	4 m/s 10min avg	3,7 m/s	3,1 m/s
2	4 m/s 10min avg	3,2 m/s	1,5 m/s
3	7,1 m/s (10min max wind)	6,9 m/s	6,8 m/s

Lidar



Velodyne VLP-16

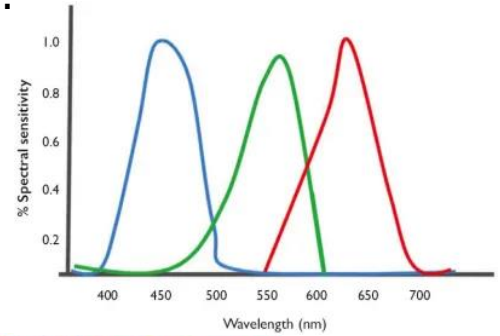
Asphalt recognition with Lidar

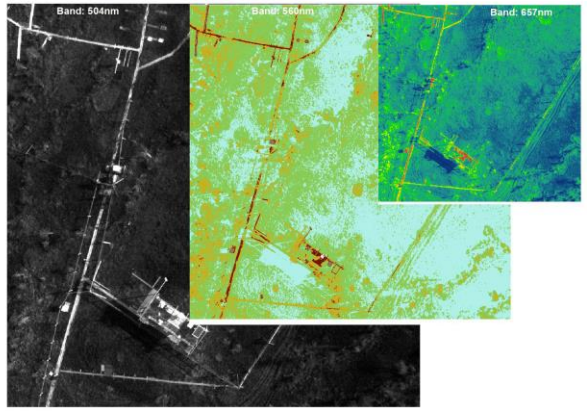


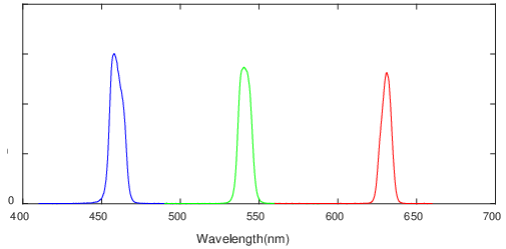
- Asphalt/snow/ice condition recorded.
- Intensity

Hyperspectral camera

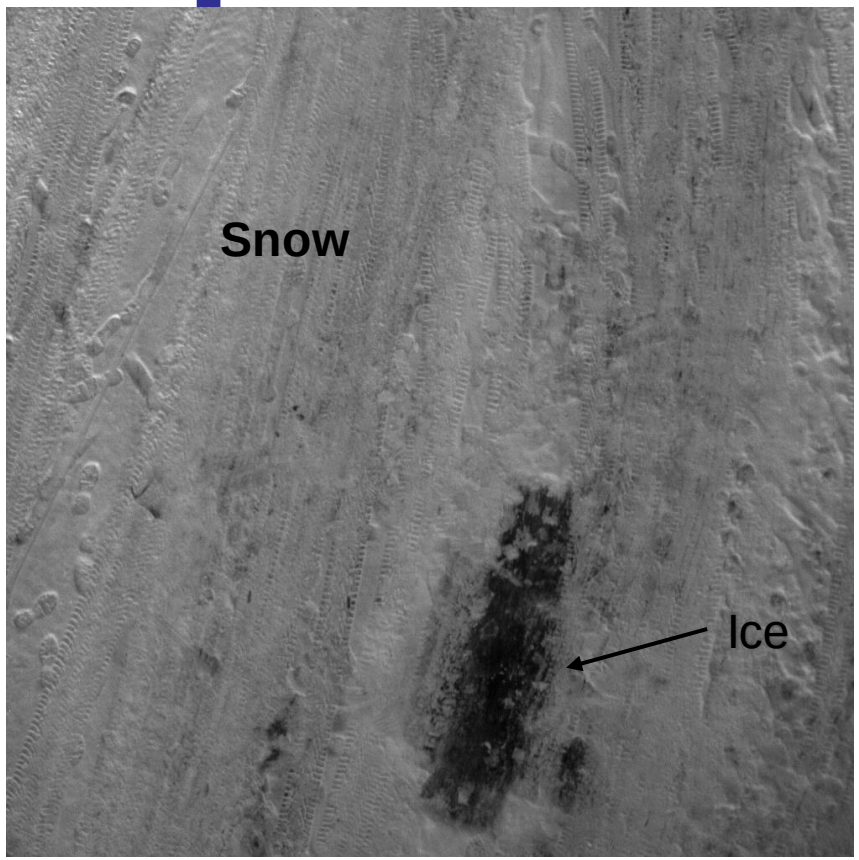
Red 610, Green 560, Blue 450
Area 500-900 nm.

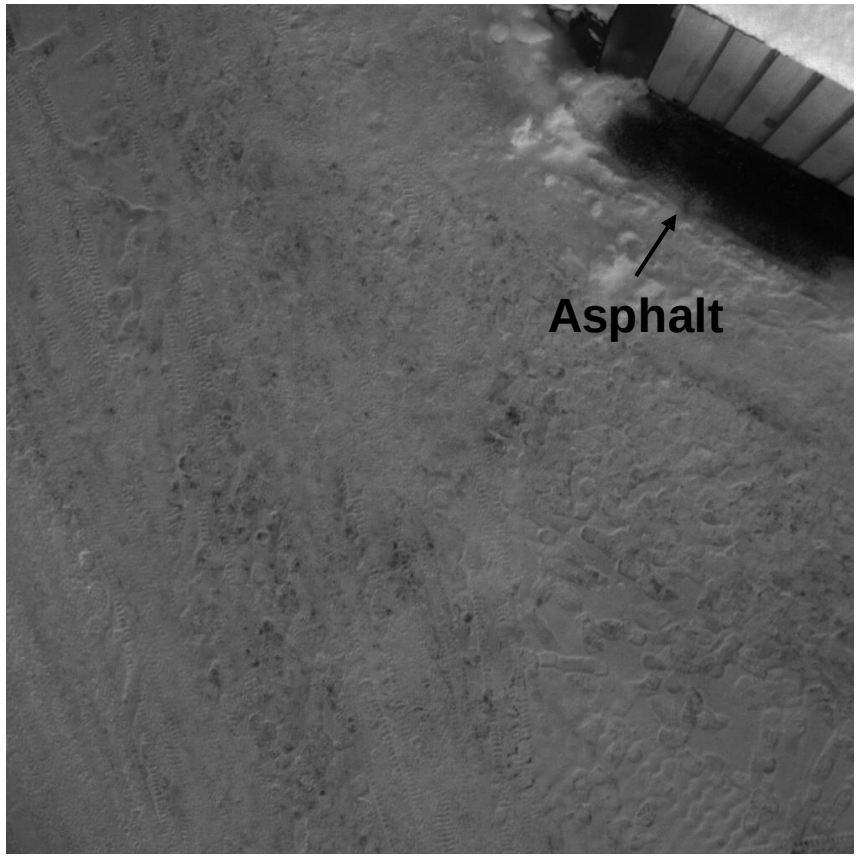






Asphalt recognition with hyperspectral camera





Cryosphere scenario

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- **Forest area (ICOS-tower)**
- Problem with Rikola exposure values due lightning differences between the ground floor and forest top
  - → Correction is needed

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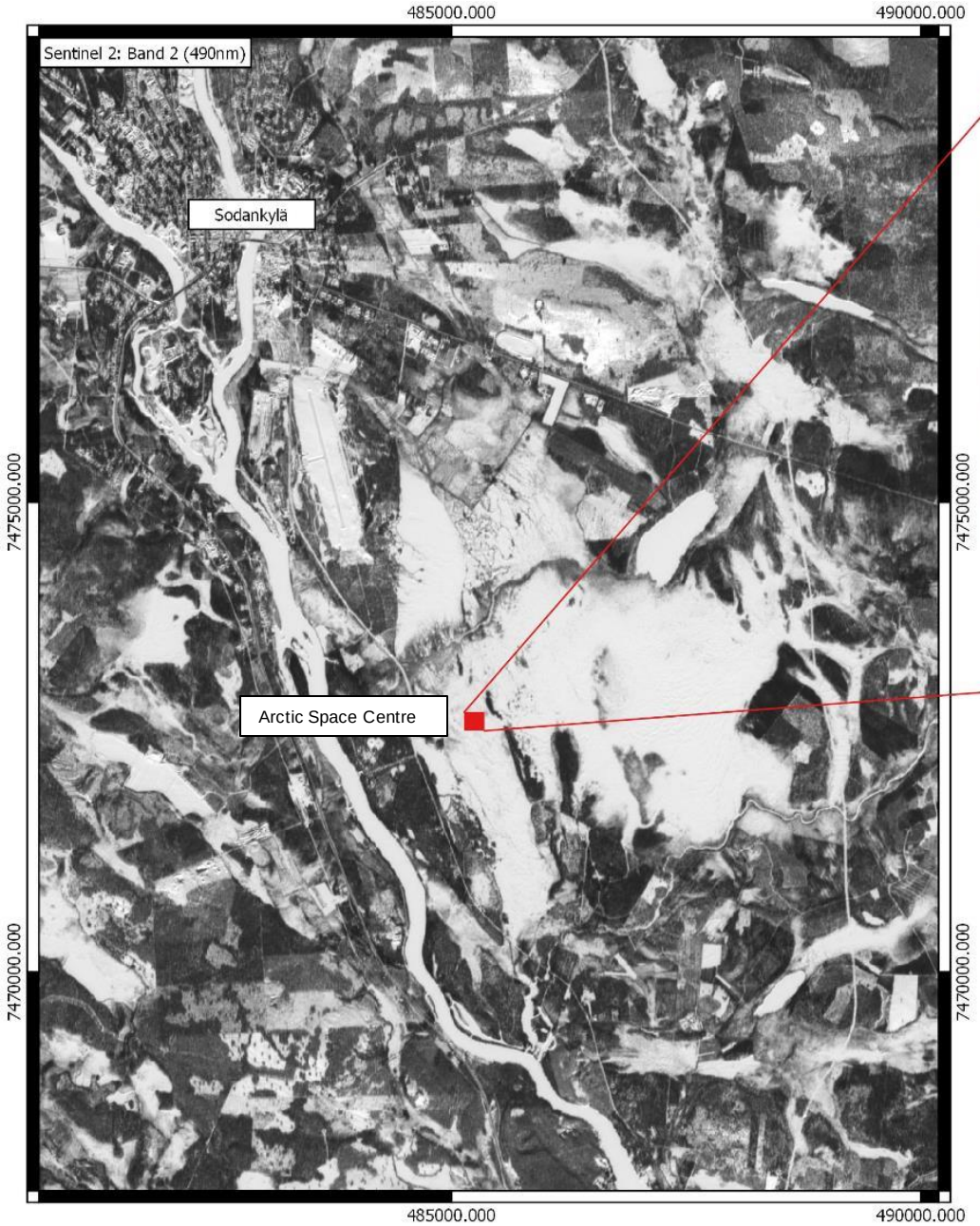

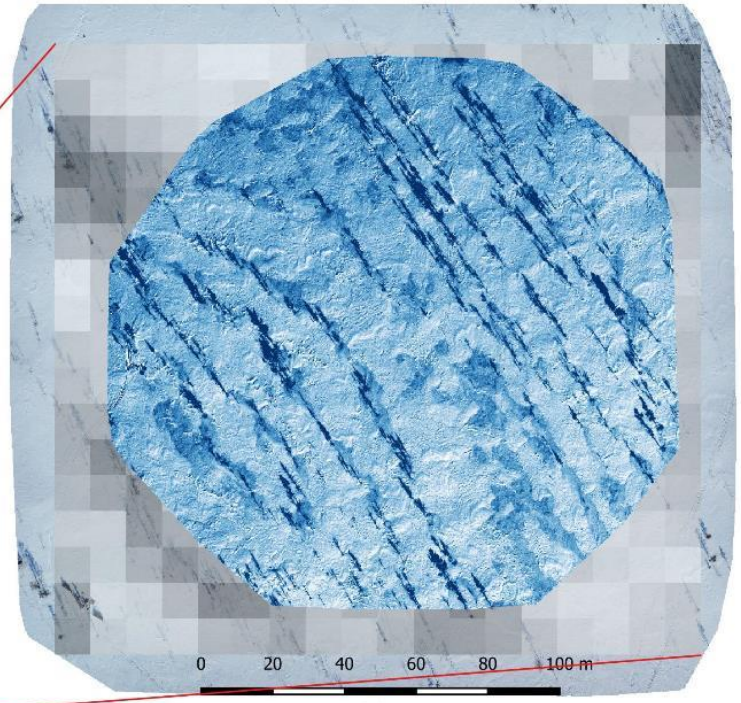

Rikola Hyperspectral Mosaic
Resolution: 6.5cm
Sentinel 2: Band 2 (490nm)
Resolution: 10m
Drone orthomosaic

©Map: Aleksi Rimali
Ilmatieteen laitos 24.4.2020
Data: European Space Agency - ESA Sentinel 2
MSI sensor: 21.3.2020

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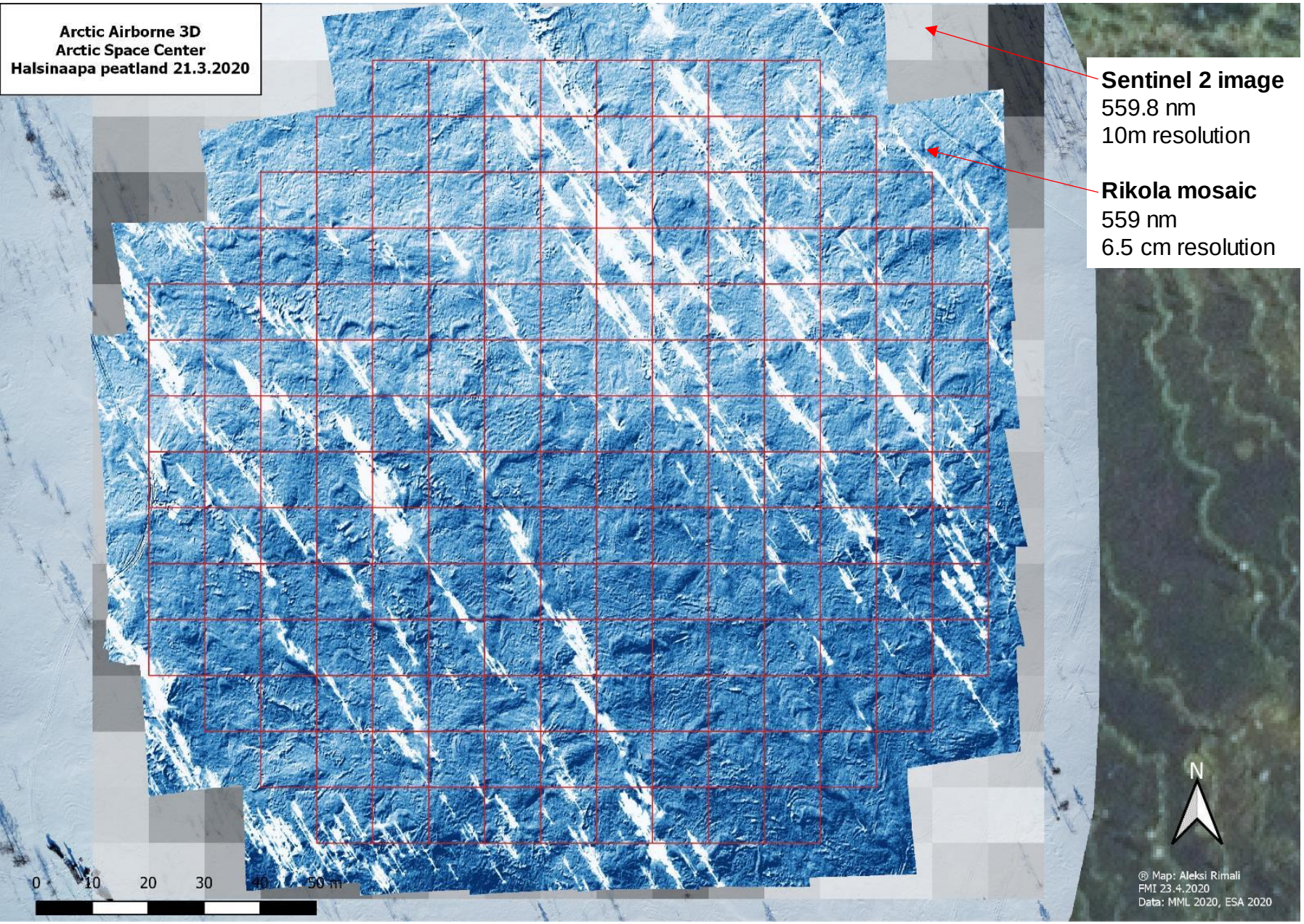
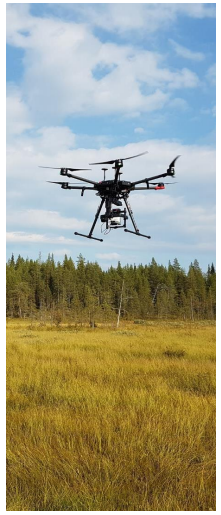
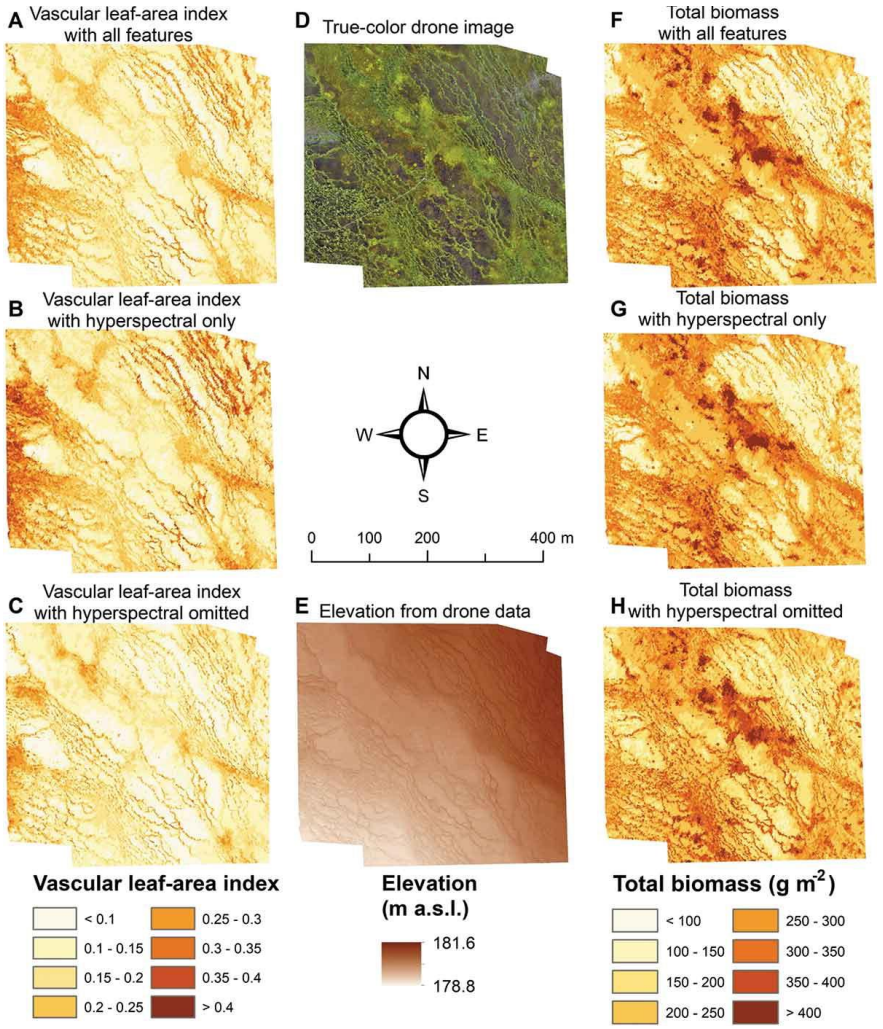


Summer measurement

- Peatland leaf-area index and biomass estimation with ultra-high resolution remote sensing
- GIScience & Remote Sensing
  - Volume 57, 2020 - Issue 7





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Kiitos

6.6.2022 **Nimi**