

Uumo-project

Continous monitoring and drone-based mapping

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Vipuvoimaa
EU:lta
2014–2020



UUMO - New Innovative Methods for Groundwater Quality Monitoring - Project

- The project is split into three parts:
 - Continuous online measuring (YSI)
 - Drone- based mapping and spectral imaging
 - Passive sampling
- How new methods can be used to better measure and monitor groundwater quality and things that correlate with it
 - The aim is to:
 - Improve the safety of waterworks by reducing the time it takes to react to problems concerning groundwater and to aid sampling with monitoring data
 - Research new ways to monitor the environment
- Project runtime 1.1.2018 – 31.8.2020
 - Project Manager – Riina Tuominen
 - Research Engineer – Aki Mykkänen
 - Lecturer Marjatta Lehesvaara (Passive sampling)
 - RDI Specialist Esa Hannus (Drone- base mapping)



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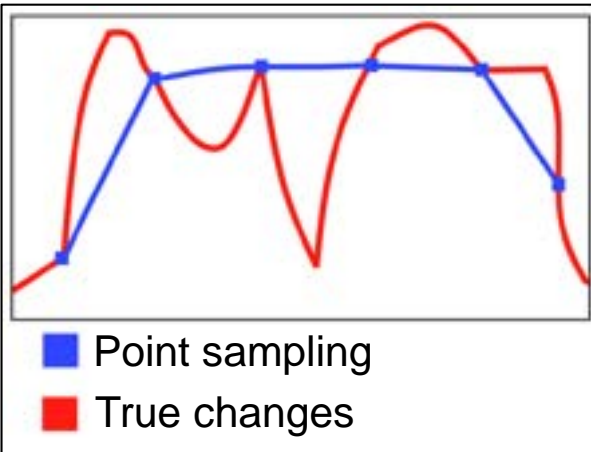


Continuous monitoring

- Done with YSI- water quality sondes
 - YSI EXO- series (Groundwater)
 - YSI 6920V2-2 (surface waters)
 - YSI 6820V2-2



Photo: Niina Laurila



Online groundwater monitoring station



- YSI EXO 1- water quality sonde with Keller ARC-1 data transmitter
 - Can be installed to a examination well of 50 mm diameter or larger
- Parameters
 - Groundwater depth
 - Temperature (air and groundwater)
 - Conductivity
 - pH
 - Dissolved oxygen
 - Turbidity
- 24 measurements per day, transmission every 12 hours
 - Data transmission via mobile network to a cloud database
- The system is entirely battery powered



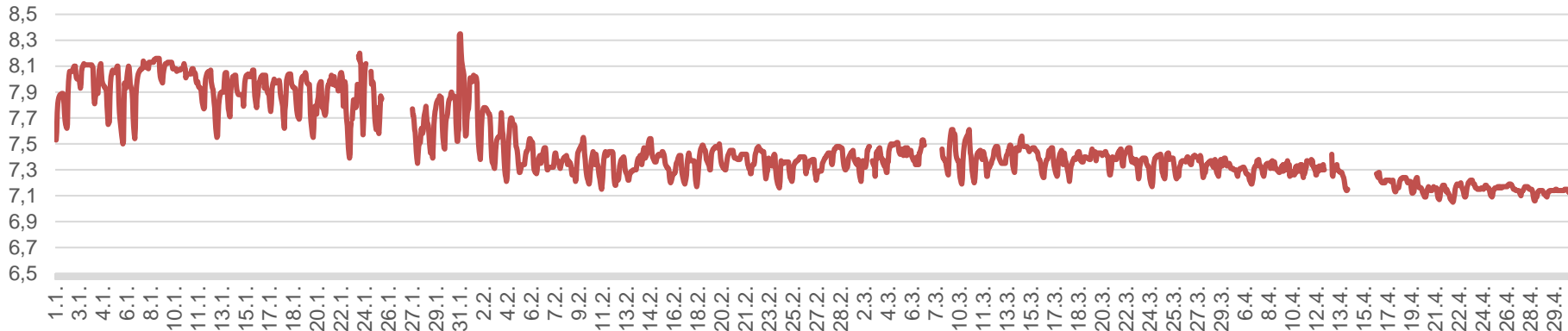
Station housing



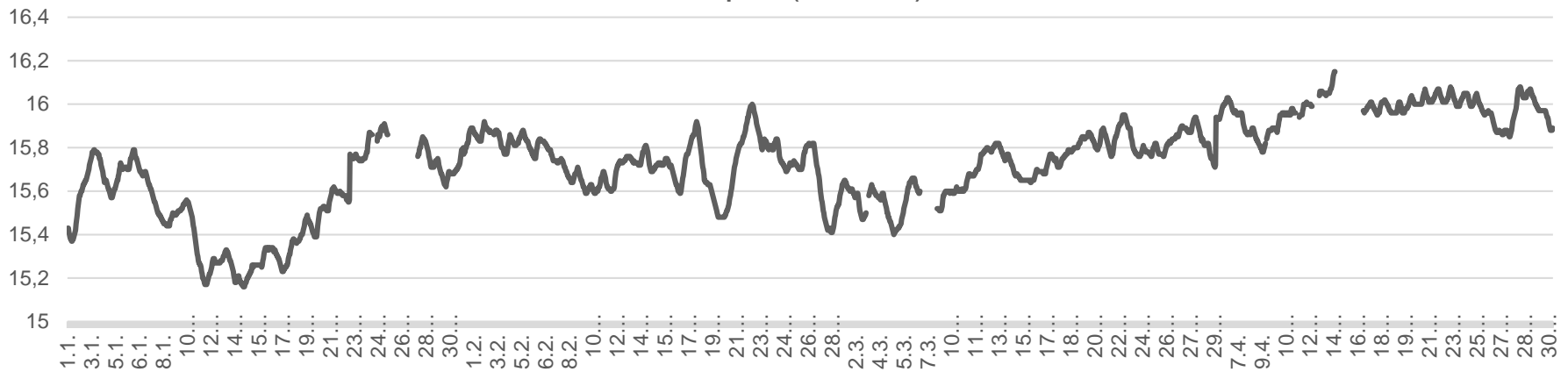
EXO and ProDSS

Result examples from Mikkeli groundwater january-april 2019

Groundwater temperature (°C)

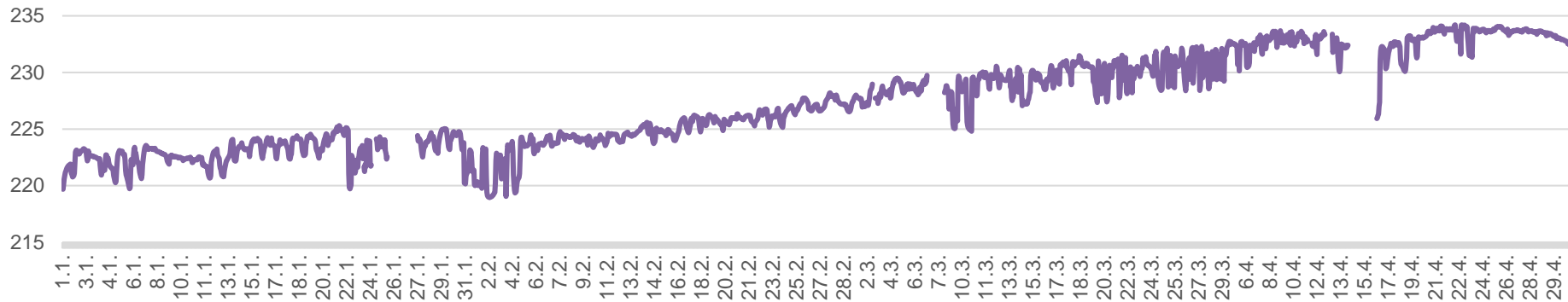


Depth (metres)

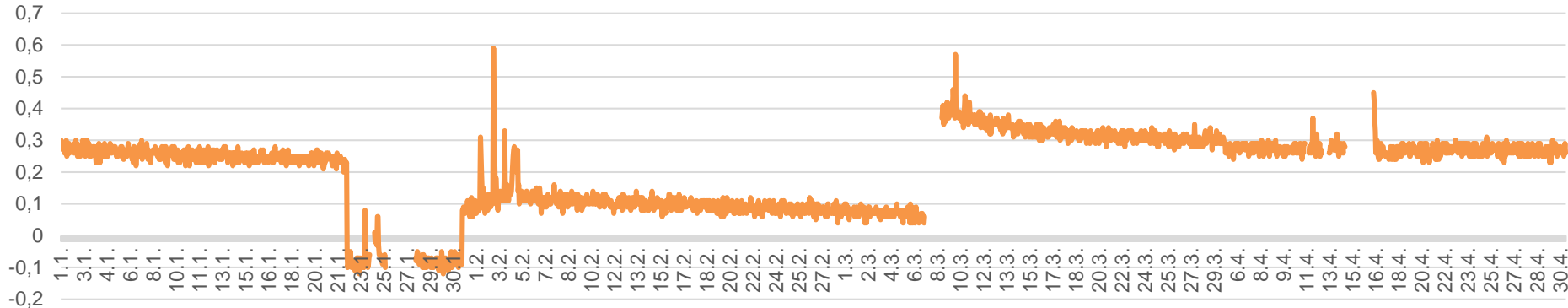


Result examples from Mikkeli groundwater january-april 2019

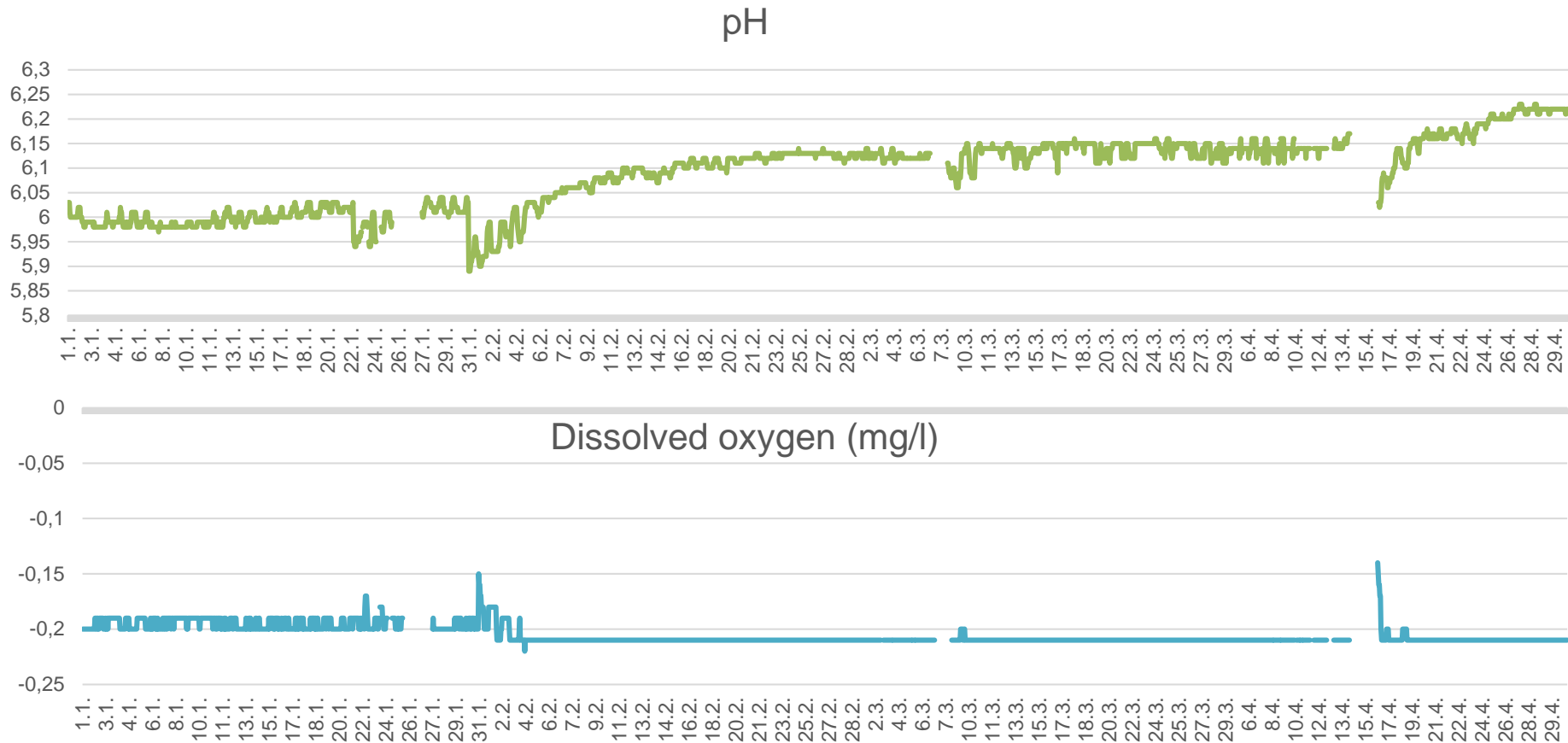
Conductivity ($\mu\text{S}/\text{cm}$)



Turbidity (FNU)



Result examples from Mikkeli groundwater january-april 2019



Drone-based mapping



- How drones be used to better survey and map the environment in groundwater sites
- Phantom 4 -drone with two Mapir- spectral imaging cameras
 - The various spectra can be used for example to determine the amount and quality (health) of vegetation, moisture and soil cover, etc.
 - The drone can also be used to create 3D models and orthophotographs (Pix4D)
 - These results are dimensionally accurate (via GPS)
- Advantages of drone based mapping compared to satellite or plane based
 - Costs are much lower
 - The surveys can be done wherever and whenever needed
 - The image resolution stays better due to a lower flying altitude (50-100 m)
- More info from our drone operator Specialist Esa Hannus



DJI Phantom 4-
consumer drone



Mapir spectral imaging cameras.
OCN (Orange+Cyan+Near-infrared)
&
NGB (Near-infrared+Green+Blue)



Unedited raw spectral images



Perinteinen kamera



Perinteinen kamera



OCN

(Orange+Cyan+NIR)



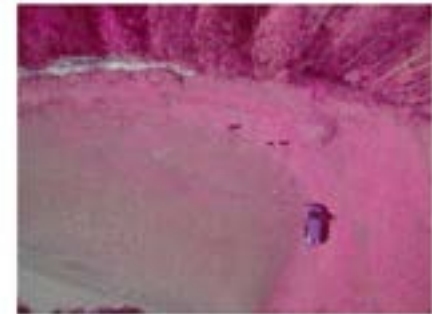
NGB

(NIR+Green+Blue)



OCN

(Orange+Cyan+NIR)



NGB

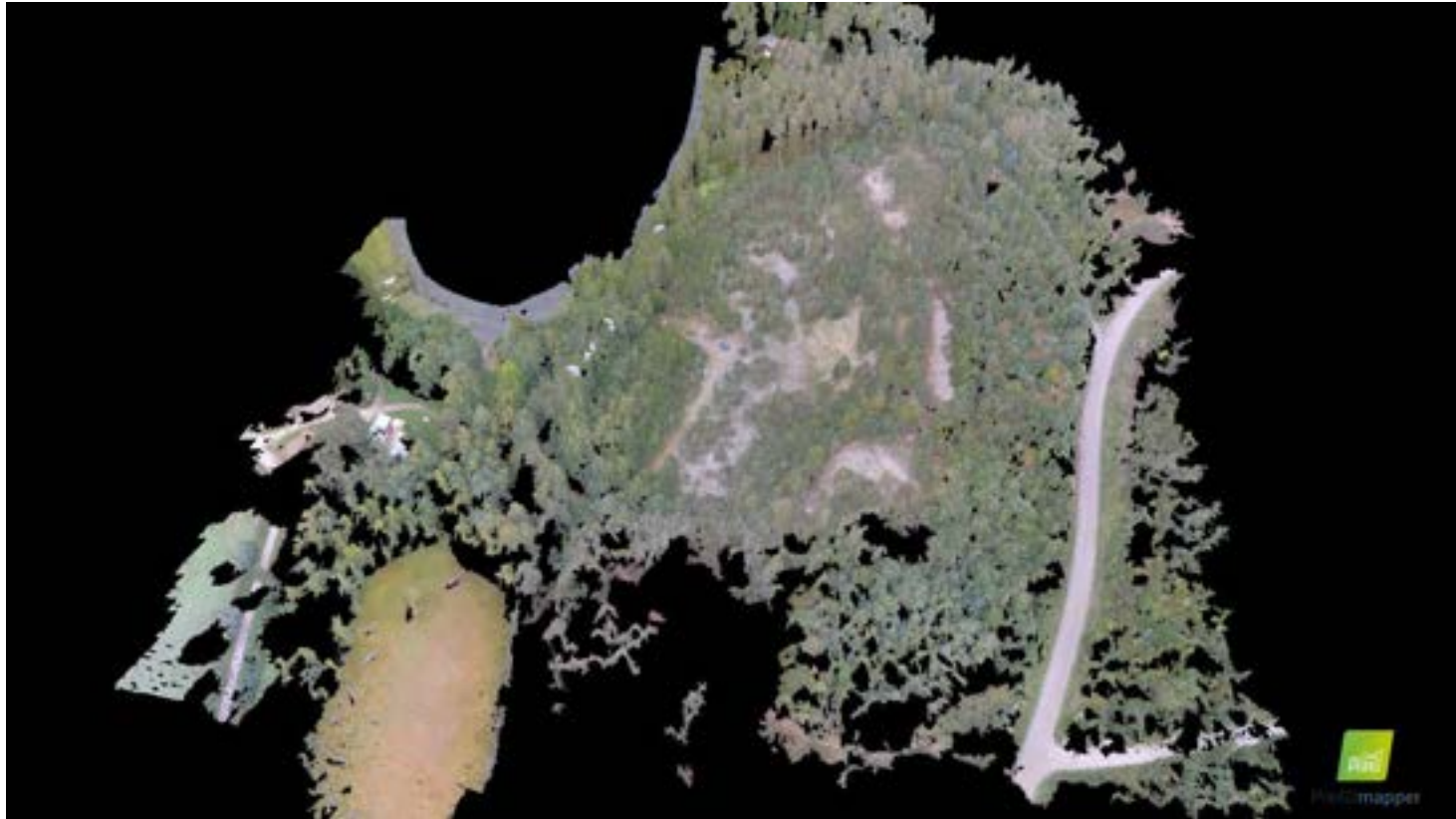
(NIR+Green+Blue)





Orthophotograph
made by drone,
altitude 50 metres

Point cloud model from Rantasalmi





Tunne huominen - All for the future.