



Sentinel-1 analysis ready data layers for B2B and B2G users

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Outline

1. KZ introduction
2. Our experience with ESTHub so far
3. How to make ESTHub even better
4. Problem with Sentinel-1
5. Our API and WMS/WCS services vision

KappaZeta

- EO services company.
- Established in 2015 (economically active since 2017).
- Spin-off of Tartu Observatory, University of Tartu.
- In ESA BIC Estonia 2018-2019.



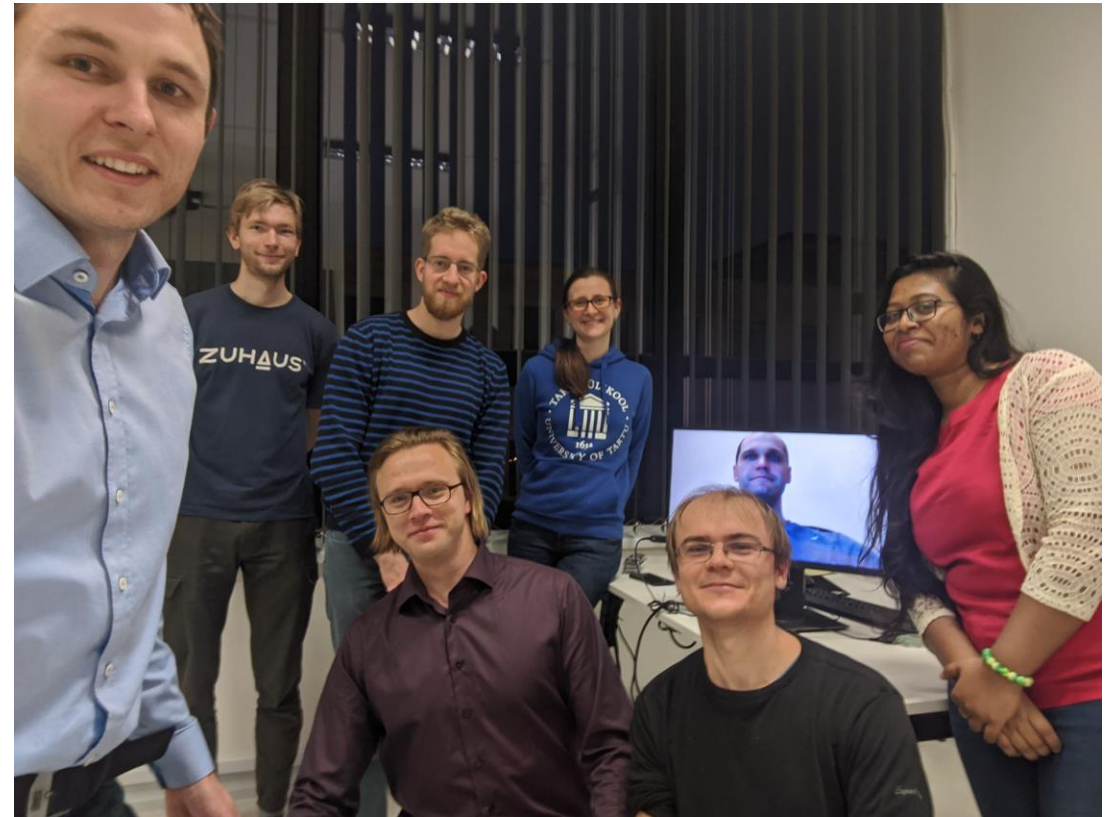
TARTU OBSERVATOORIUM
eesti kosmosekeskus



KAPPAZETA

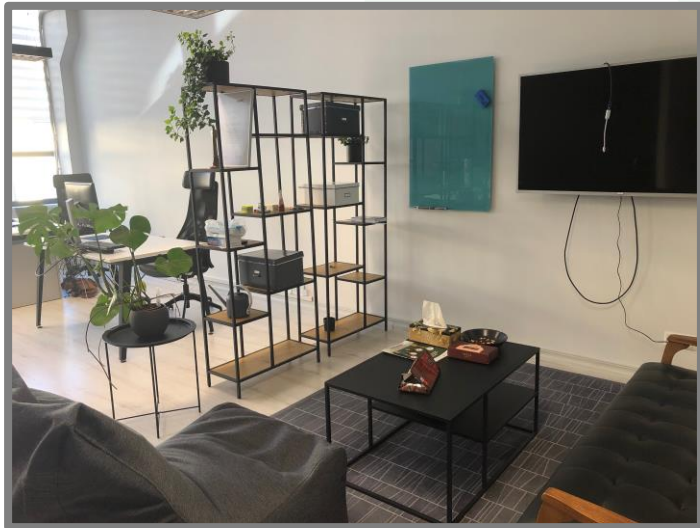
KappaZeta

- SAR and deep learning technology.
- Applications in agriculture sector.
- Analysis ready S1 data layers for other EO and ICT companies



KappaZeta today

- Team of 12 people and growing.
- Offices in Tartu (Aparaaditehas) and Kuressaare.



Our experiences with ESTHub so far

- Used for Sentinel-2 time series generation about whole Estonia (2018-2019) in the RITA crop classification methodology project.
- ESTHub and Calvalus are very powerful – if you know how to use it right.
- Calvalus customer support was fast and to the point – thank you Martin Böttcher!

Our experiences with ESTHub so far

- Sentinel-2 WMS is up – great news!
Crucial in making Sentinel-2 available beyond the EO community.
- For most users S2 zip files from ESA (or ESTHub) are too complex – want 1-click integration into my GIS!
- ESTHub Sentinel-2 WMS NDVI colour schema is eye-pleasing and easy to read. 😊

How to make ESTHub even better?

- Keep an eye on Copernicus DIASes – try to make/keep ESTHub compatible with them.
- How to make even more Copernicus data layers accessible with 1-click beyond the Sentinel-2 WMS?

How to make ESTHub even better?

- ESTHub advantage is loads of local Estonian geospatial data, that international platforms lack.
- Be cautious with too strict policies to commercial EO companies – the business is still very small, support and cooperation needed.
- KappaZeta is open and sharing our results too! :-)
Fresh article published <https://www.mdpi.com/2072-4292/12/22/3784>

Sentinel-1 analysis ready data layers for B2B and B2G users

KappaZeta vision

Problem

- Sentinel-1 is a beautiful data factory.
- But its data is still under-utilized.
- Too complex
 - entrance barrier too high for majority of users.
- As a consequence they cannot feel the benefits.



Problem

- Primary users of S1 data till today:
(1) university research groups and (2) special EO companies (like KZ).
- ICT- and GIS-companies?
- Various government institutions?
- GIS-community ~10x larger than EO-community.
- The turnover of ICT companies in Europe ~1000x larger than the one of EO companies (1B € vs 1000B €).
- *GIS companies are a clearly addressable subset of the ICT sector!*

Vision

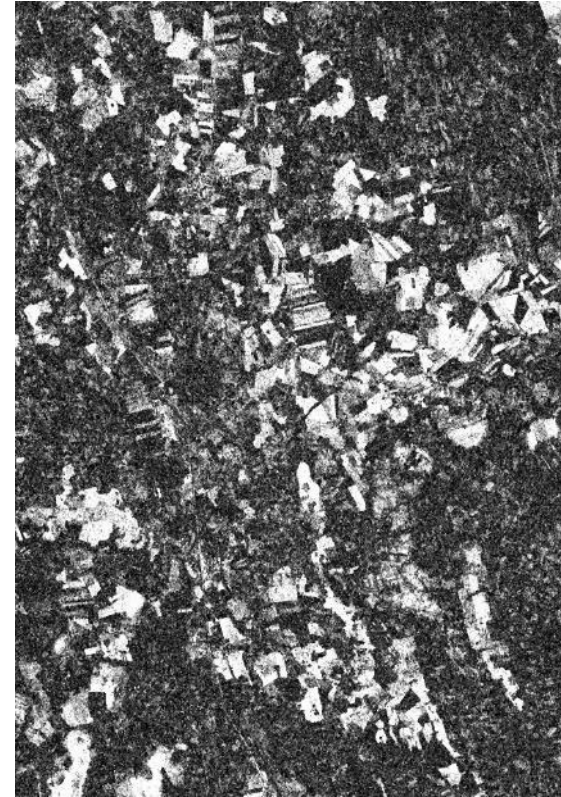
- Making Sentinel-1 SAR analyses-ready, well calibrated data layers very easy to use
 - 1 click integration and use.
- Machine readable via APIs and visual use for humans.
- *„Making space a valuable asset for everyone!“*

List of Sentinel-1 services proposed

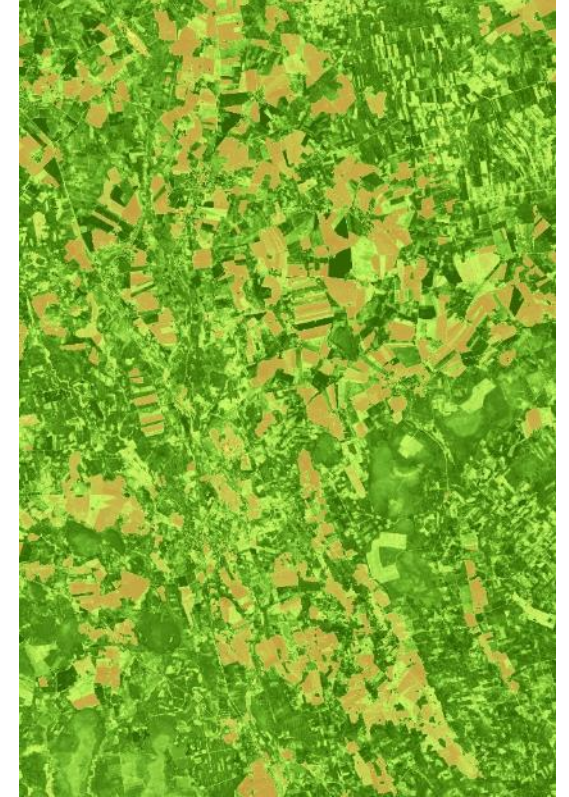
1. **Time series of parcel level aggregated statistics** of VH and VV backscatter, VH/VV backscatter ratio, VH and VV 6-day repeat pass coherence (parcel mean, median, standard deviation).
2. Calibrated high resolution **VH and VV coherence raster layers**.
3. Calibrated high resolution **VH and VV backscatter (sigma0)** and **VH/VV ratio raster layers**.
4. Multi-polarisation **backscatter image for visual use as a WMS/WCS service**. *Early prototype available at <http://18.195.149.198/mapserver/?VERSION=1.1.1>*
5. **AI modelled pseudo S2 natural colours image** from S1 and S2 time series.
6. AI modelled **pseudo NDVI** from S1 and S2 time series.

Coherence & sigma0 raster service

- Machine readable API.
- Payment by subscription, number of queries?
- Exact, well calibrated and noise corrected rasters for quantitative analysis.
- Could be used as visualisation layers via WMS/WCS service.



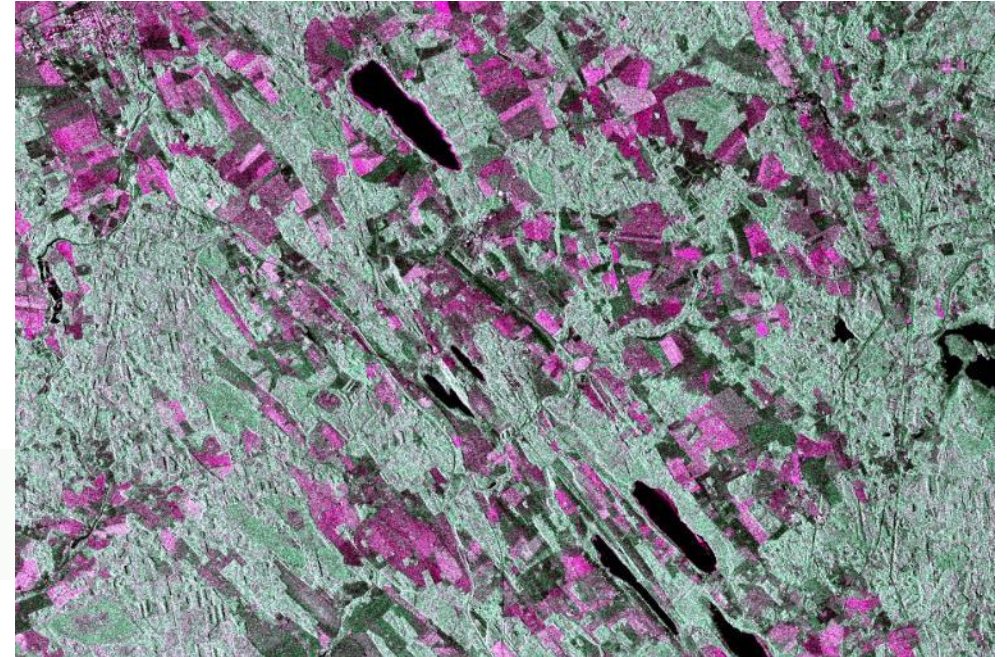
SI coh



S2 NDVI

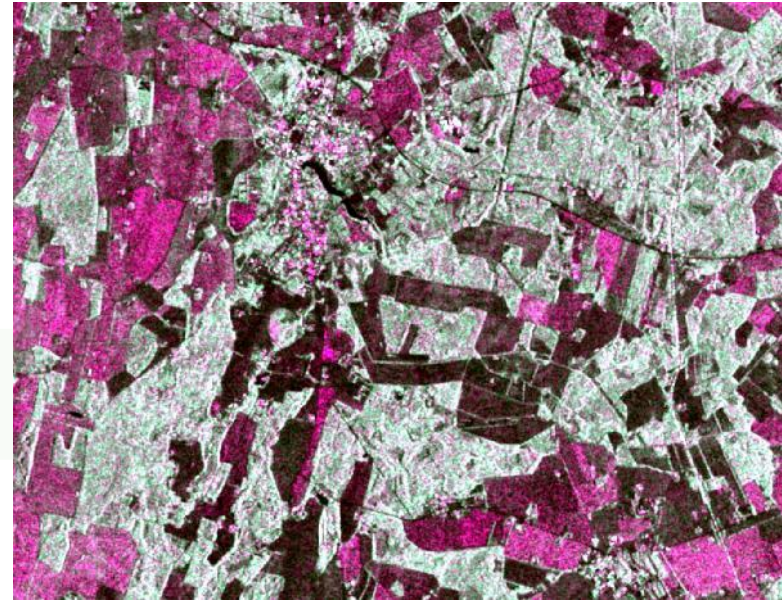
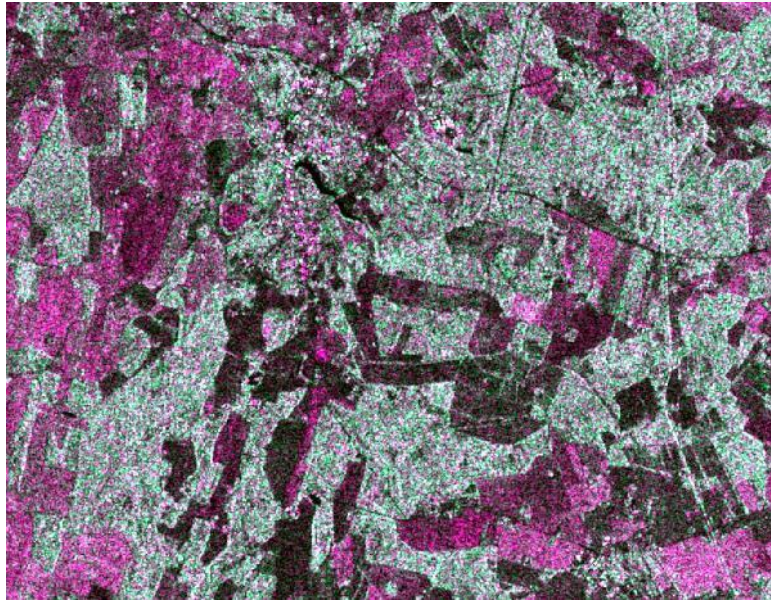
S1 simple visual WMS/WCS (1)

- The most up to date and frequent satellite image.
- For visual use, human interpretation.
- Provided as WMS/WCS service.
- Payment by
 - (a) fixed fee monthly subscription or
 - (b) number of queries/amount of data processed.



S1 simple visual WMS/WCS (2)

- State of the art noise removal.
- Preserving the spatial resolution as much as possible.



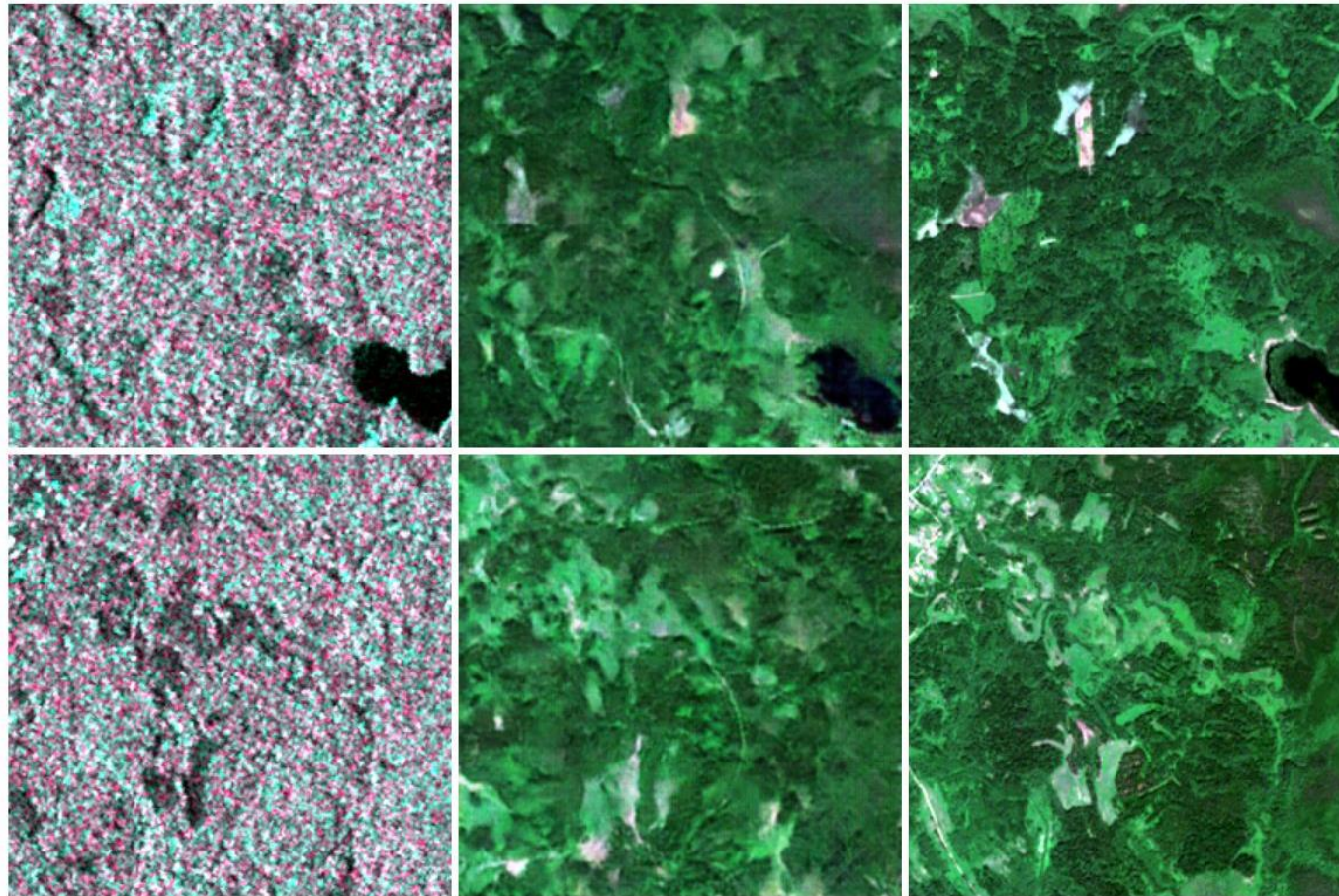
Sentinel-1 image as pseudo Sentinel-2

S1 input

Synthetic pseudo S2

* experimental results from
KZ, Heido Trofimov

S2 reference



We are working to make it happen.

If you have good suggestions – let us know! :-)

Aitäh!

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Heritage

- Sentinel-1 and Sentinel-2 processing chain for an operational CAP controls service.
- <https://demodev.kappazeta.ee/demo/>
- How to processes S1 and S2 imagery time series in large scale near real time.
- 60 + 234 + 304 kEUR government money saved (2018 + 2019 + 2020) by reductio of false payments.