



**A Premium Geospatial Industry Conference**

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# Large-Scale Ground Deformation Infrastructure Risk Analytics with SAR Satellite Data



# LiveEO

- New Space Startup  
founded in 2018
- 70+ Employees
- Based in Berlin, Germany,  
US Office in New York City

Data Provider (selection)



Integration Partner (selection)



Partner



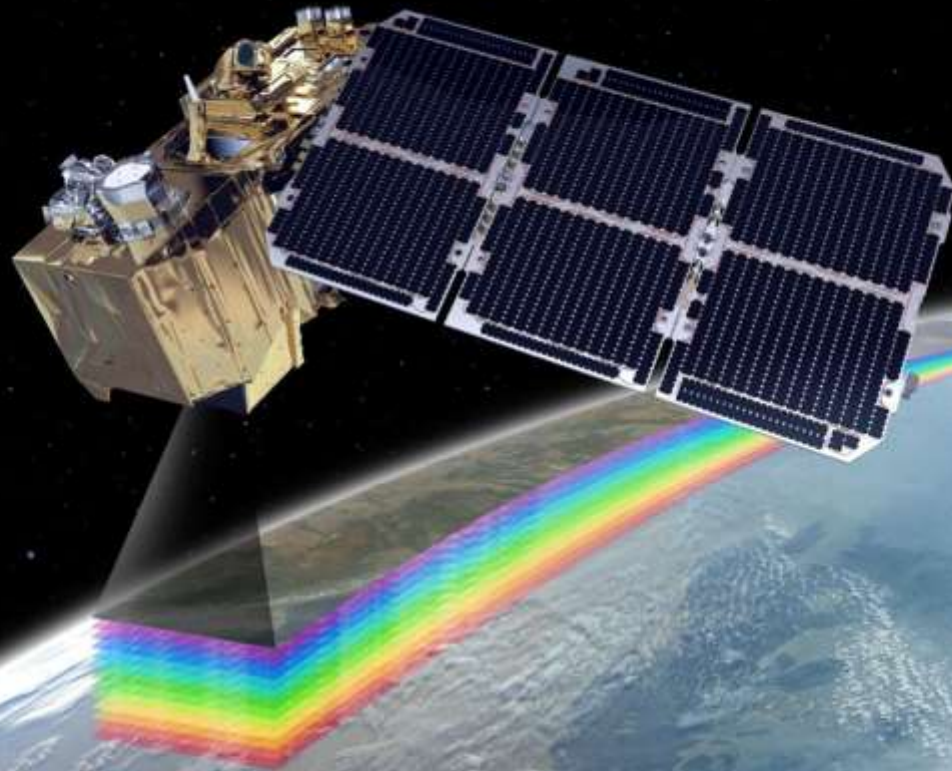
2020 Winner of



**We Keep Infrastructure  
Operational.  
Globally.**



**Monitor  
infrastructure  
from space.**



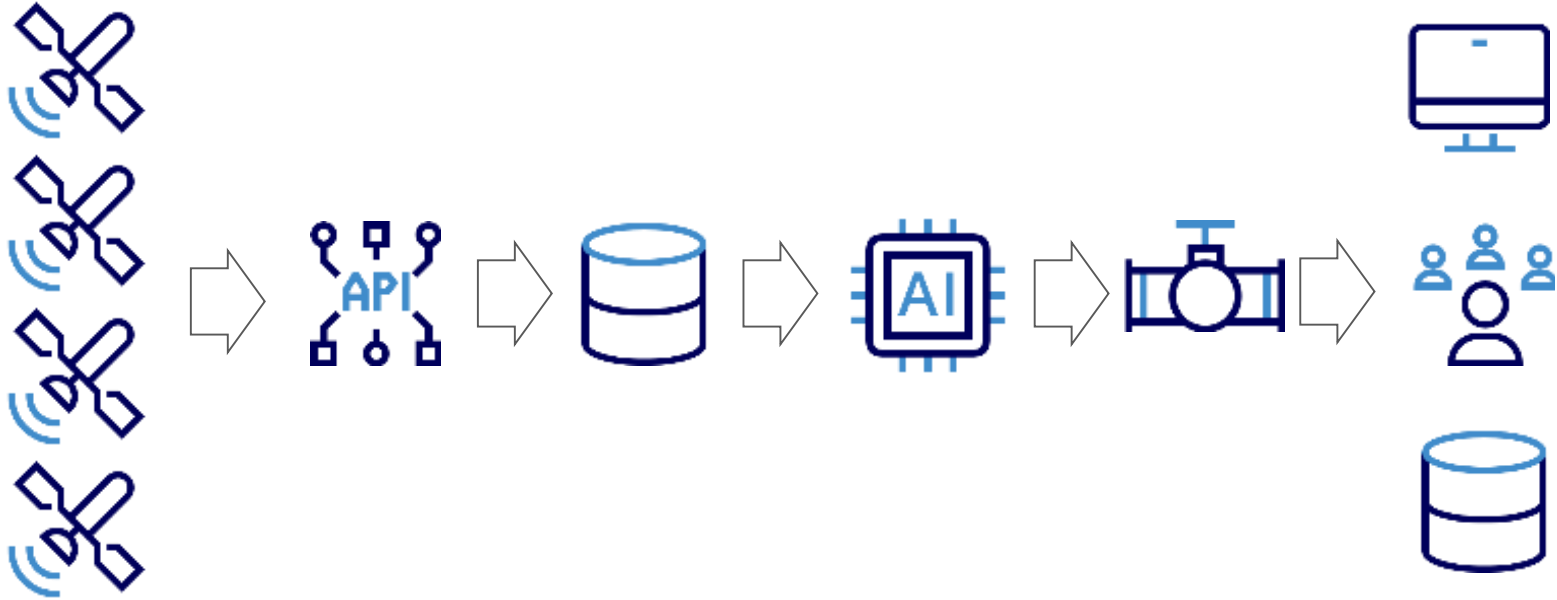
# Raw Data



# Customer



# Satellite Data E2E



# Satellite Data E2E





# Infrastructure Monitoring From Space

Ground Deformation Monitoring



Vegetation Monitoring



3rd Party Monitoring



# Infrastructure Monitoring From Space

Ground Deformation Monitoring



Vegetation Monitoring



3rd Party Monitoring



Underground steel gas pipeline



Stressed wall of the underground steel gas pipeline



# Problem

Sudden ground deformation events can be detected with optical sensors.

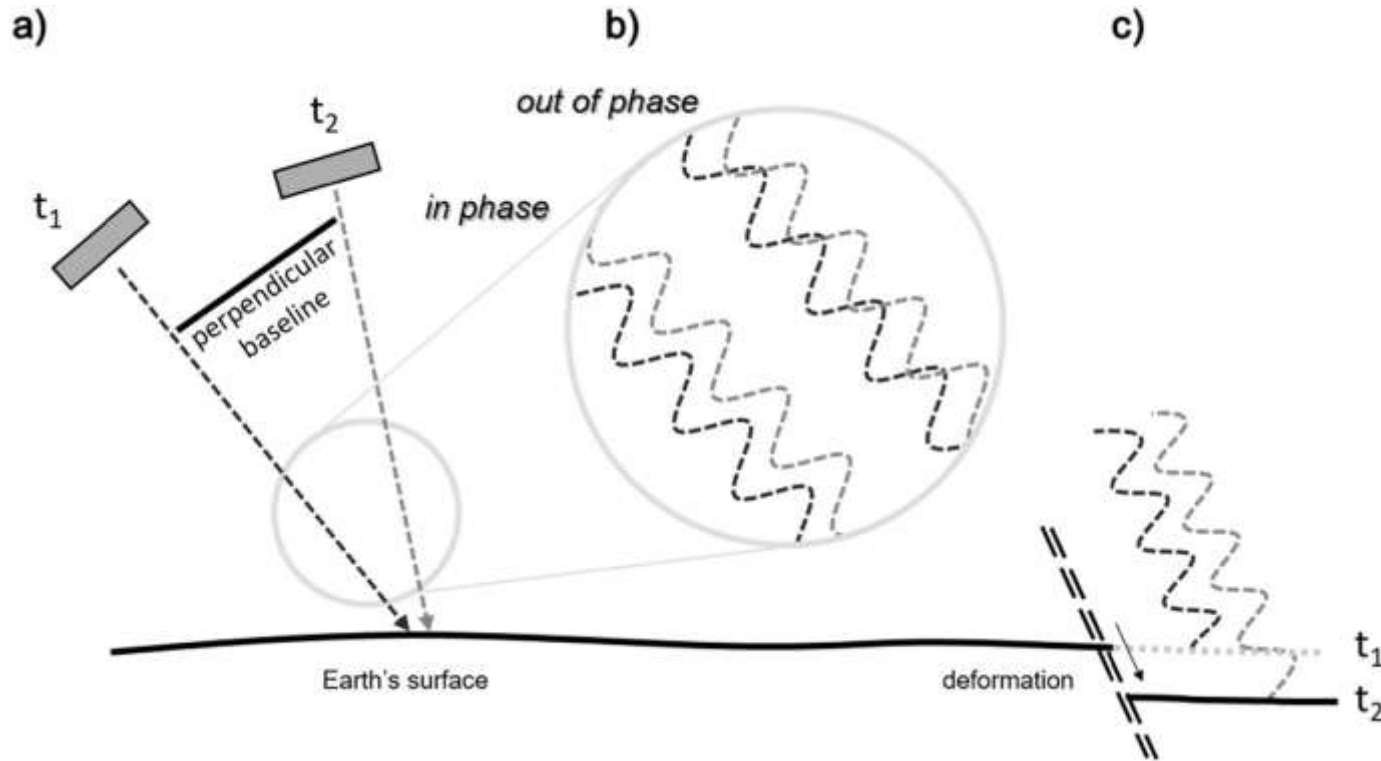
While **slow** but **consistent ground movements** are not visible to a human eye and remain to be **latent threats** for large infrastructure facilities.

# Reasons

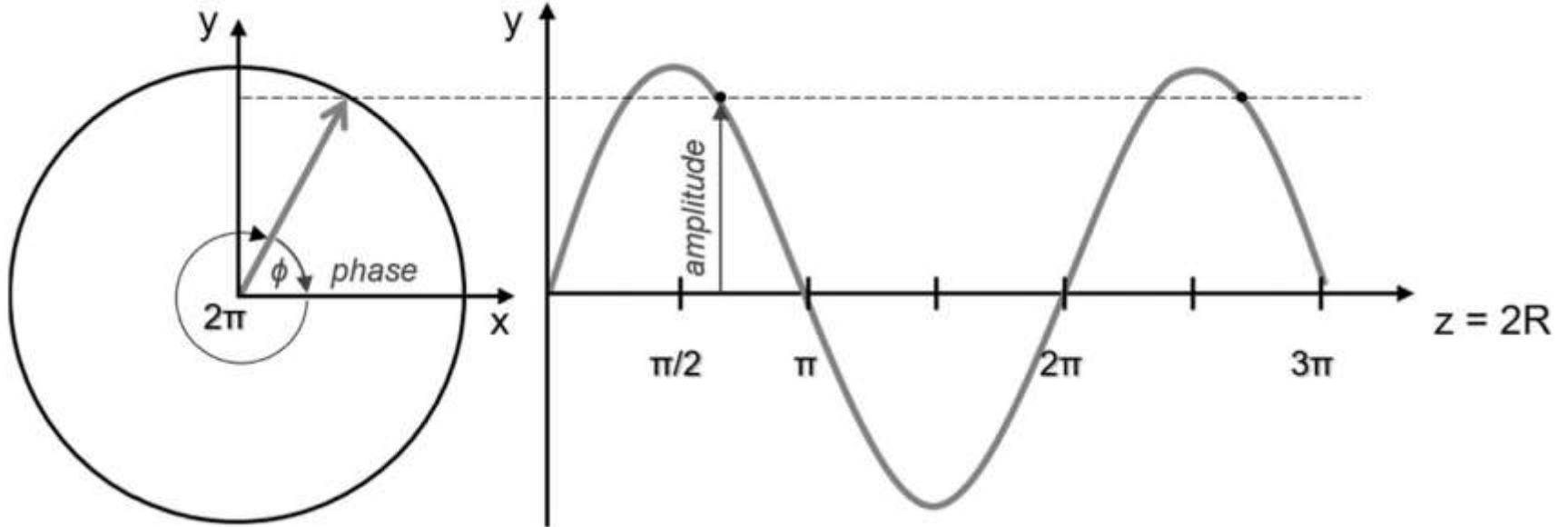
- Geological characteristics
- Historic or active mines  
(underground & open pit mines)
- Soil erosion from changing weather patterns



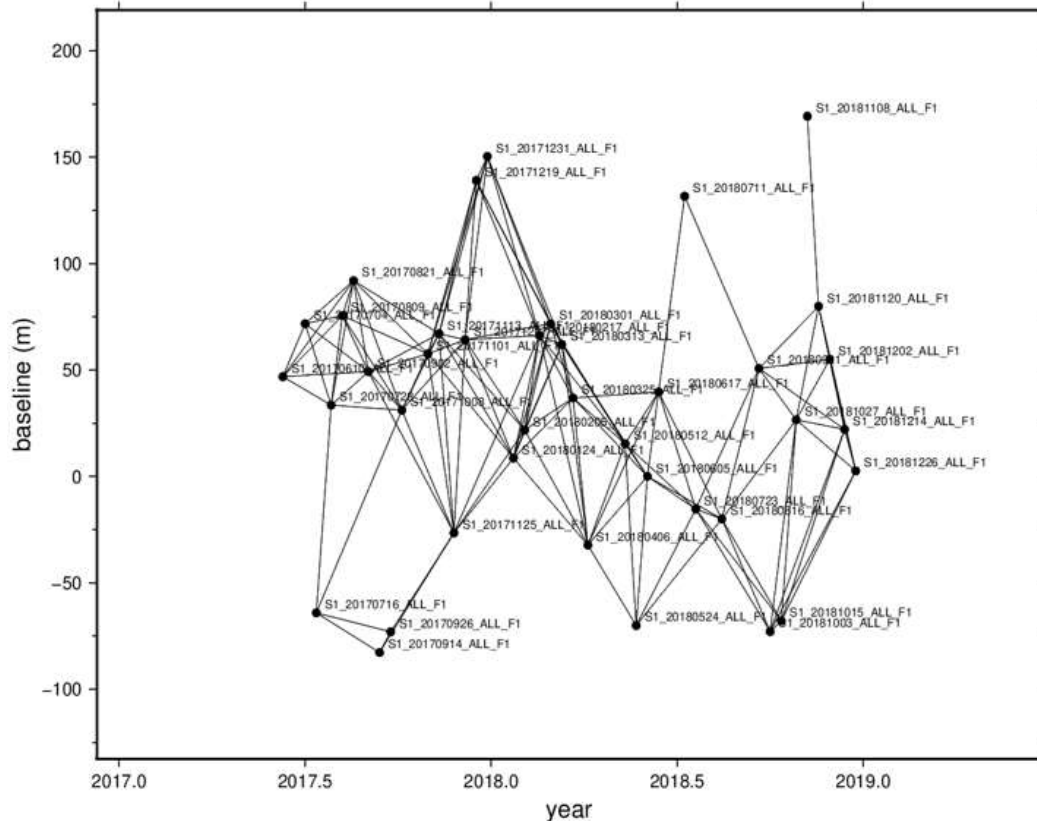
# Ground Deformation - Technical Introduction



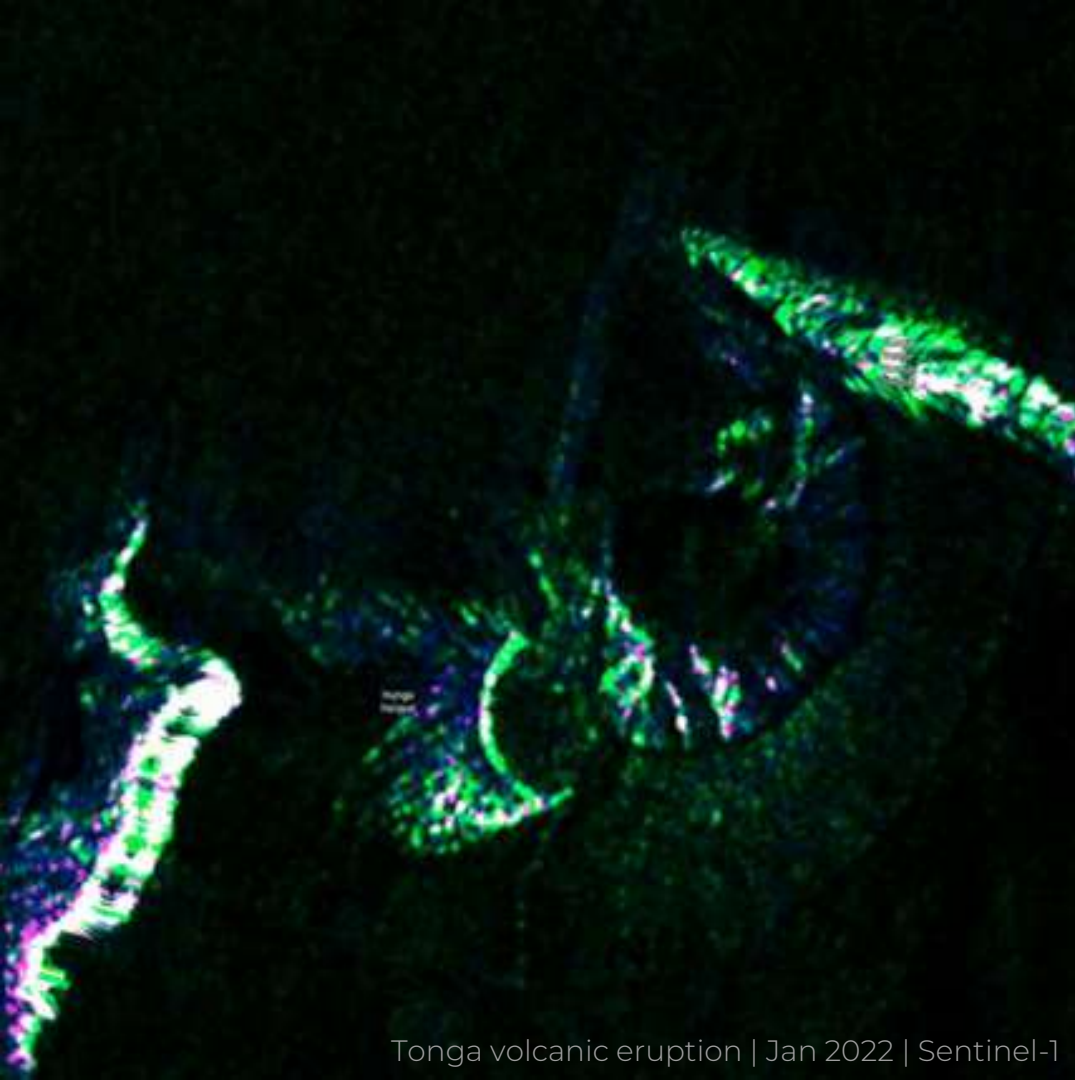
# Ground Deformation - Technical Introduction



# Ground Deformation - Technical Introduction



Schematic representation of the data network for phase processing with the SBAS method.  
Y-axis: perpendicular baseline;  
X-axis: temporal baseline;  
points: relative orbit positions at acquisition time;  
lines: calculated interferograms | LiveEO



# Spatial Resolution

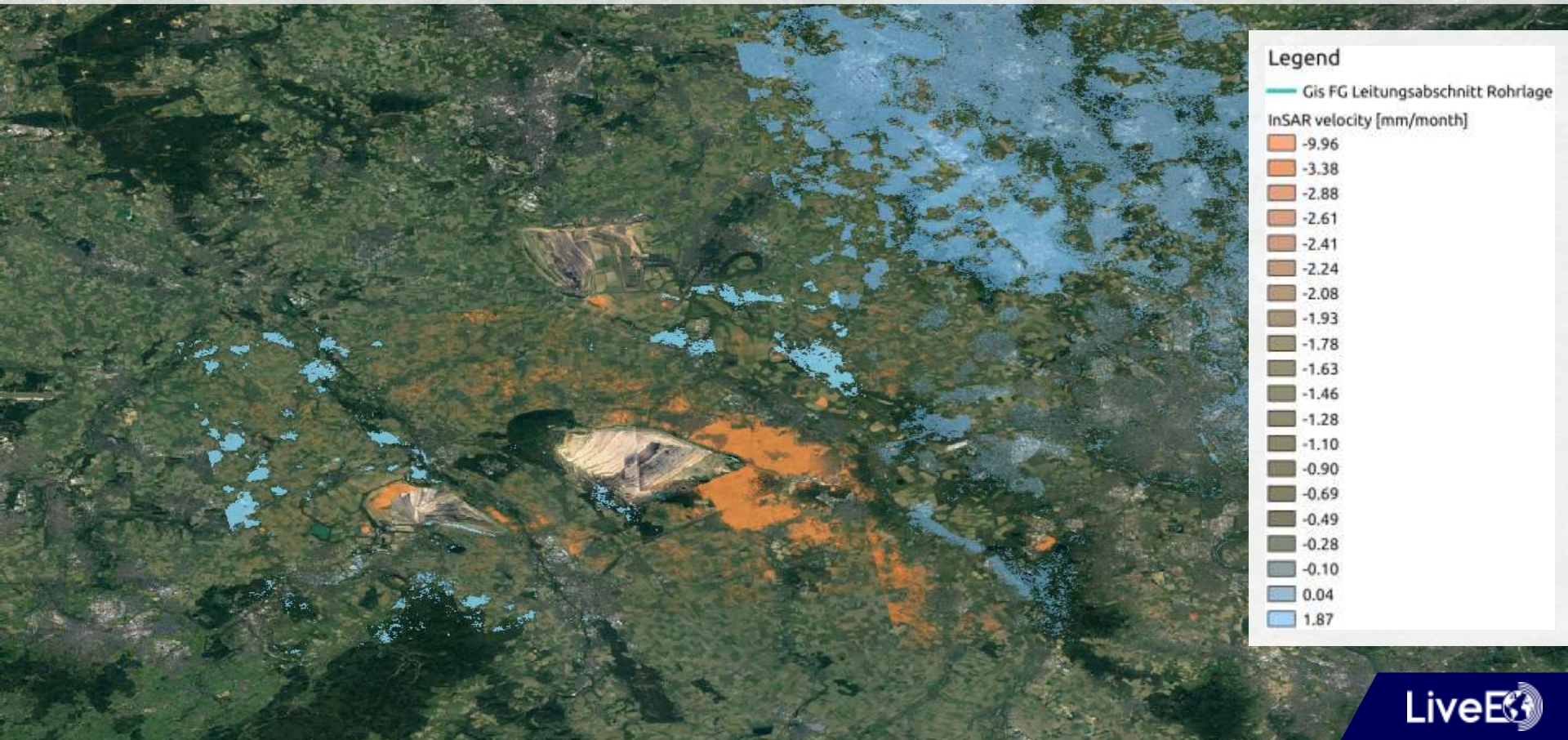


**Sentinel-1**

20 m



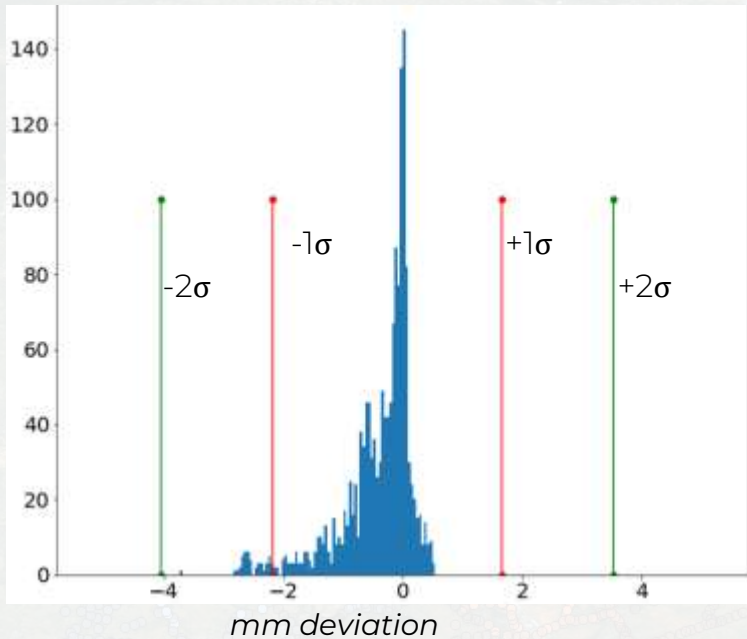
# Accuracy - Vertical



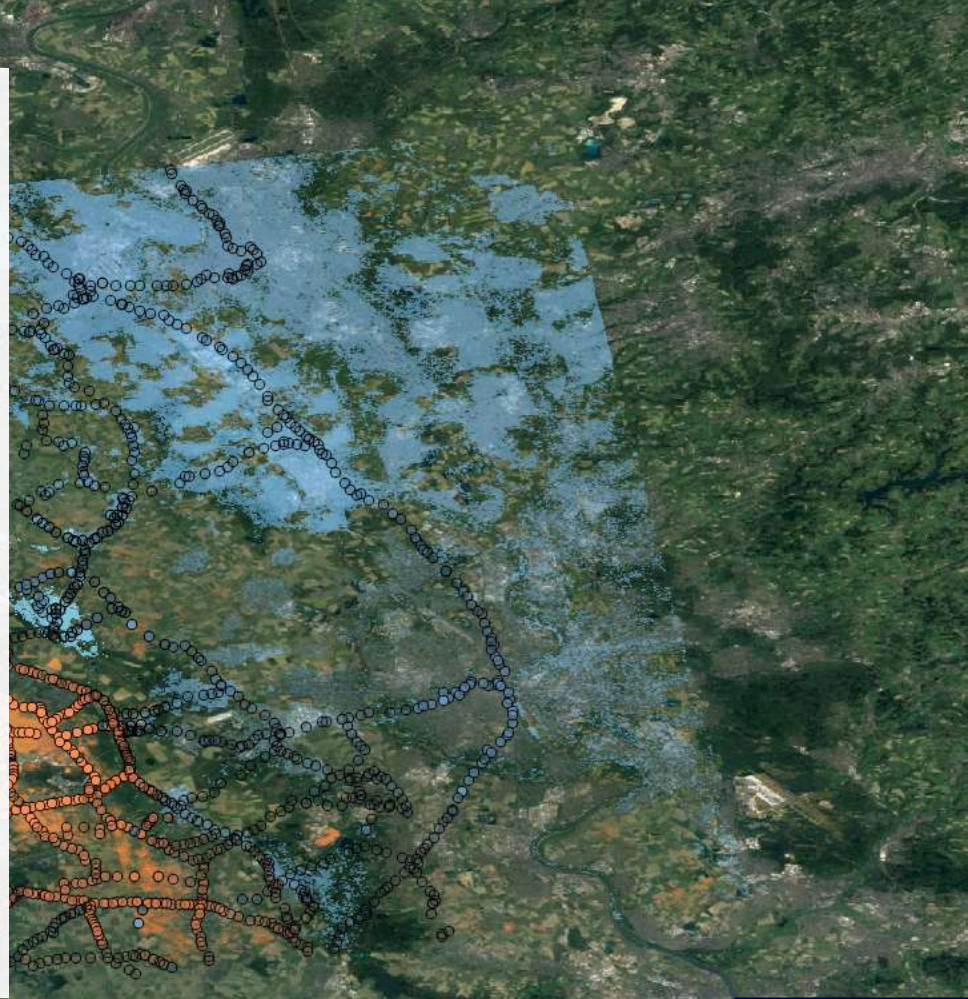
# Accuracy - Vertical



## Difference in rates between levelling & InSAR



Mean value: -0.27 mm deviation  
Stdev: 1.93 mm deviation





# Frequency

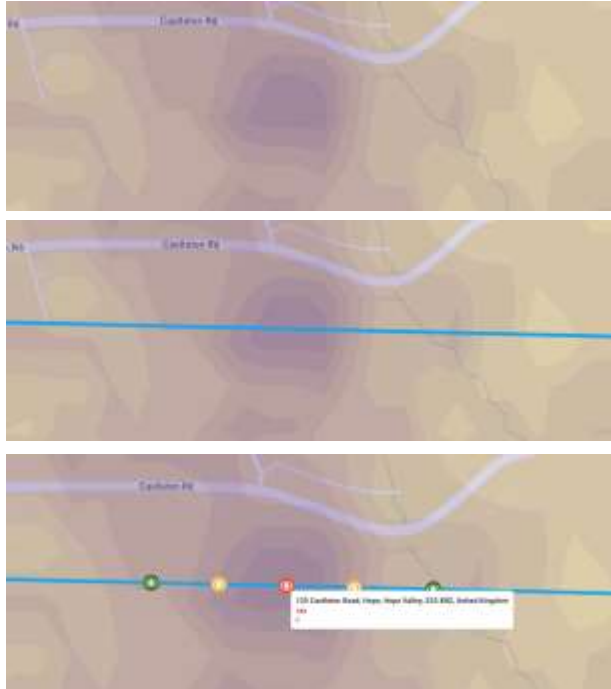


## Sentinel-1

~6 days

# Ground Deformation Workflow

Get an overview



Automate and prioritize risk assessments

PRIORITY	TASK TYPE	DUE DATE
Low	Inspection	Mar 17 2022
Medium	Inspection	Mar 17 2022
High	Inspection	Mar 17 2022
Medium	Inspection	Mar 17 2022
Low	Inspection	Mar 17 2022

125 Clacton Road, Hope, Hope Valley, S23 8EG, United Kingdom

Increase operational excellence



# Demo



Search

Draw task selection area

Measure Distance



Search

Draw task selection area

Measure Distance

Castleton Rd

How Ln



mapbox

300 m

© Mapbox © OpenStreetMap Improve this map



Search

Draw task selection area

Measure Distance



Mean ground deformation contour



ID: 12.00  
displacement\_max\_mm: -16.00  
displacement\_min\_mm: -18.00

Castleton Rd

How Ln



mapbox

300 m

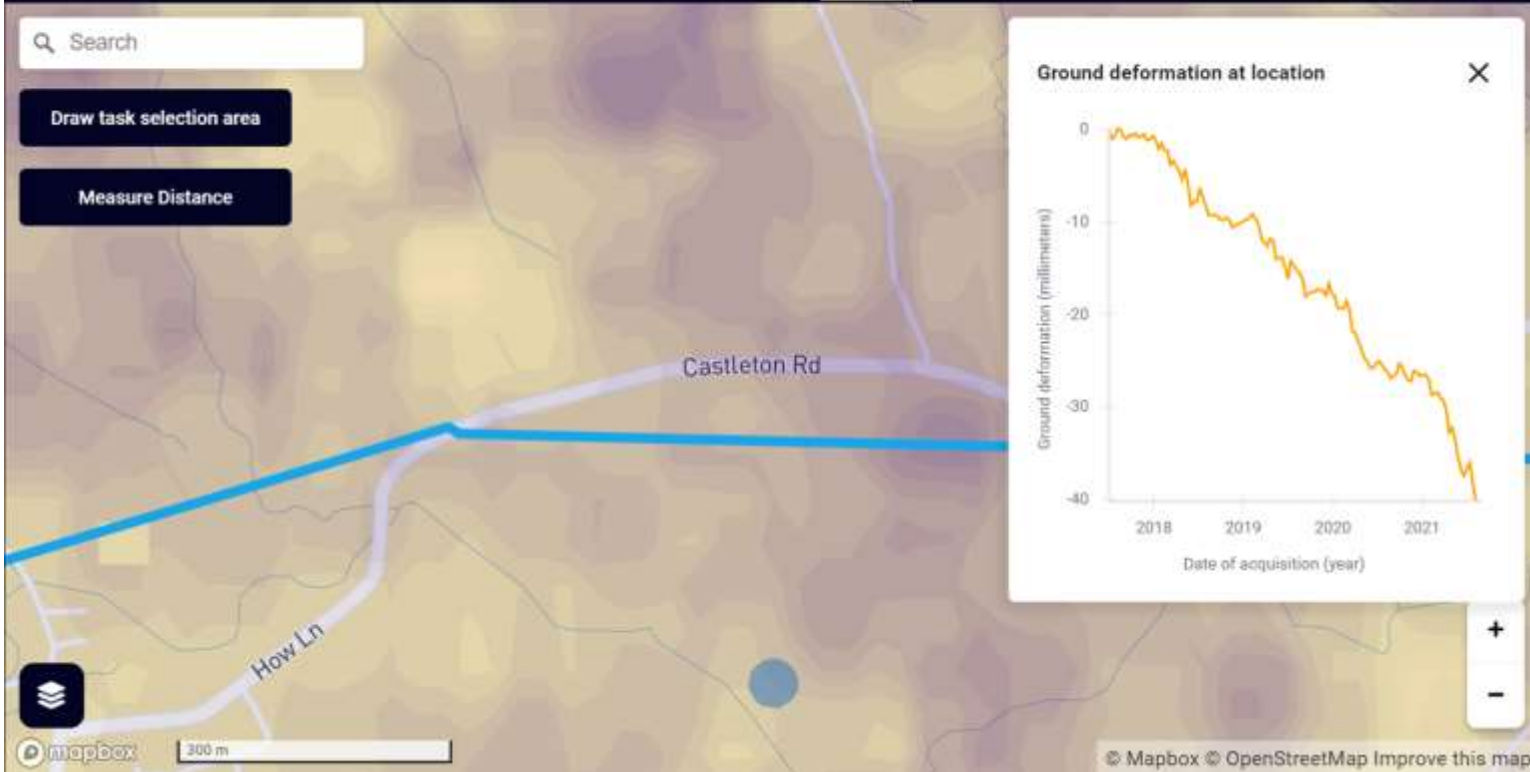


© Mapbox © OpenStreetMap Improve this map

Search

Draw task selection area

Measure Distance



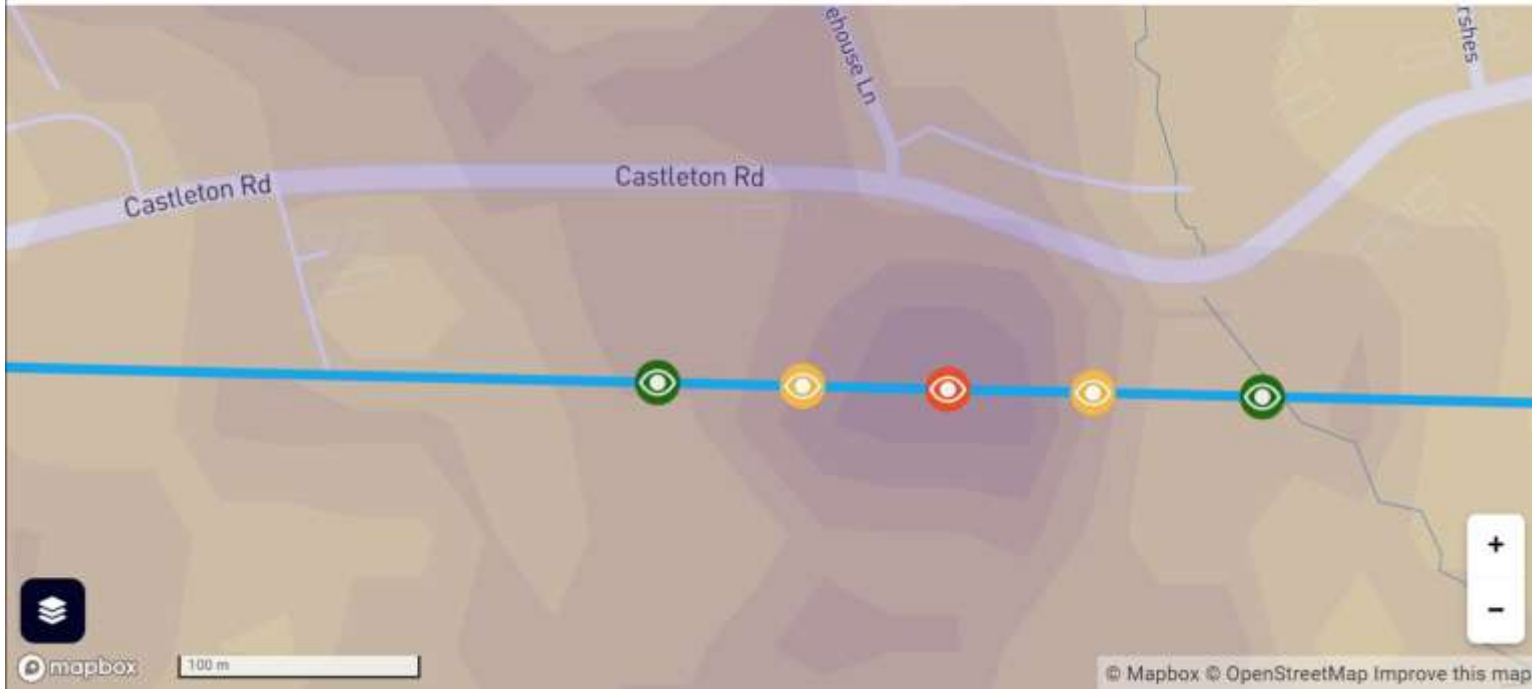
Total tasks: 5

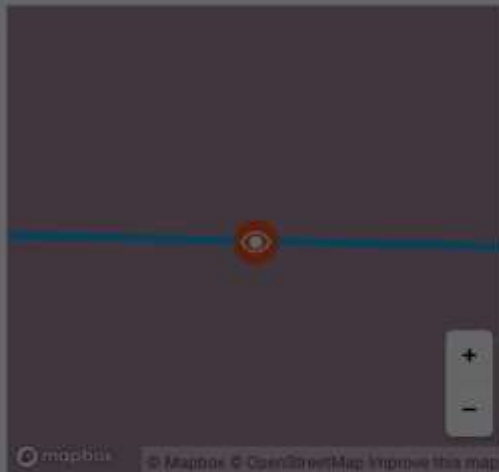
Filters

Schedule tasks

Search for users to assign task

X





125 Castleton Road, Hope, Hope Valley, S33 8RZ, United Kingdom

Next action: May 18 2022 - May 18 2022

Add property owner

Show on map

125 Castleton Road, Hope, Hope Valley,  
S33 8RZ, United Kingdom

**What is the date of inspection?**

12-May-2022 - 12-May-2022

**What is the time of inspection?**

2Hours 0Mins

**What is the type of inspected facility?**

Pipeline

**Are there visible anomalies?**

Yes

**What is the type of the identified anomalies?**

Wrinkling and buckling of the wall of  
the DN400 steel gas pipeline.

**What is the nature of the identified anomalies?**

Stress on the pipeline due to ground  
displacement.

**Take a photo of relevant areas**

1 image(s) uploaded

Photo



Complete protocol

Plan protocol

Delete

Edit

Protocol count: 3

Free

Max

Integrity assessment

Detailed assessment of the facility condition and threats.

4 May 2022

Inspection

125 Castleton Road, Hope, Hope Valley, S33 8RZ, United Kingdom

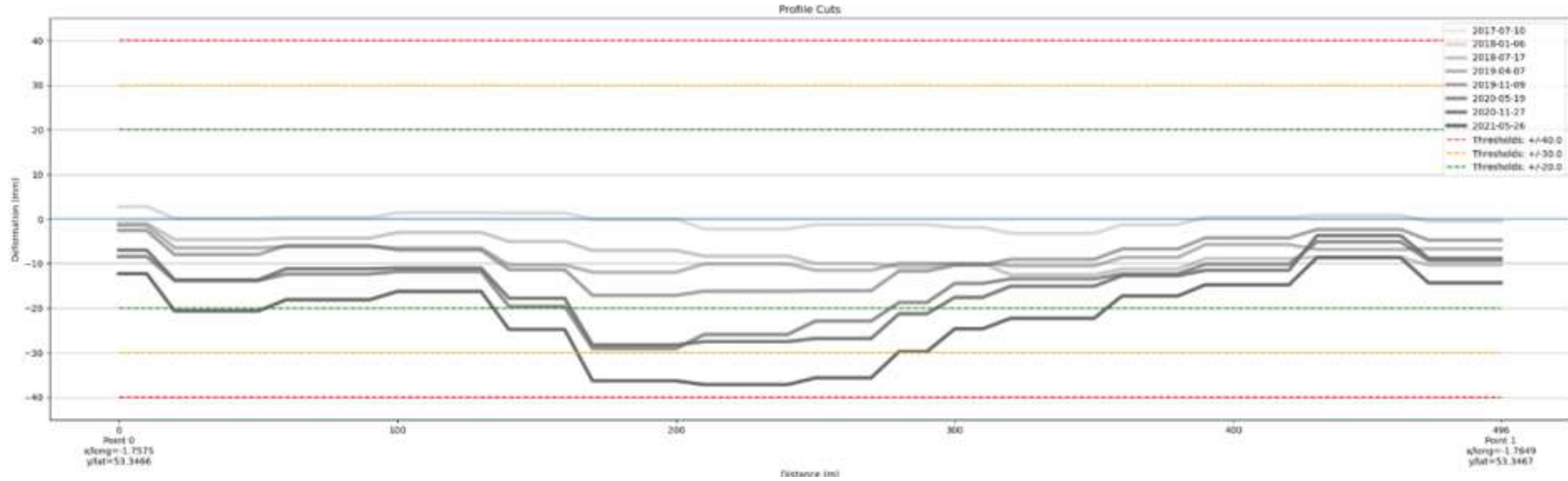
4 May 2022

Inspection

General assessment of the facility condition and check for threats.

4 May 2022

# Demo



Vertical Ground Deformation Total for  
all profile cuts

# Additional Outputs

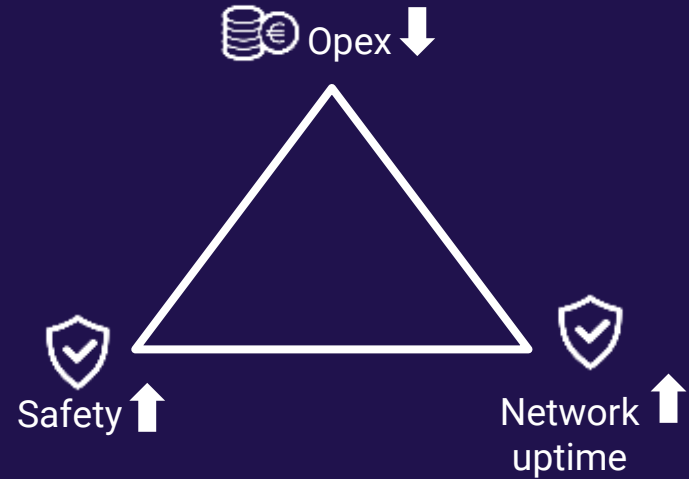
- CSV Reports
- Risk Reports
- GeoJSON
- Feed into ArcGIS / QGIS



# Impact

Save on Opex and increase network reliability & safety by:

1. Automating **risk assessment** & task prioritization.
2. Moving from cycle based to **condition based** maintenance.
3. **Digitizing** Field Force



**Sven Przywarra**

Founder & Co-CEO

[sven@live-eo.com](mailto:sven@live-eo.com)

[live-eo.com](https://live-eo.com)

**Book a meeting  
with us to  
discuss your  
specific use case**