



# CONTRIBUTION OF SATELLITE DATA ON WATER INFRASTRUCTURE MANAGEMENT

Nationwide, Operational Sentinel-1 Based Monitoring System for Water Facilities

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PROPRIETARY INFORMATION

#### Agenda

L3HARRIS



**Companies & Introduction** 

Use Case : Nationwide water infrastructure monitoring

**Conclusion and Discussion** 



#### L3Harris Geospatial Solutions Overview







#### More Pieces of the Puzzle

ENVI SARscape is taking the data from hard-to-interpret numbers and turning it into to meaningful, contextual information.

#### SAR Data Products

SARscape generates products and offers the option to integrate this information with other geospatial products.

#### Sentinel-1 Support

SARscape supports the Sentinel-1 products and allows access and download of Level 0 RAW, Level 1 SLC, and Level 1 GRD (SM, IW, EW) and many other very unique capabilities.



## Introduction



#### The use of Sentinel-1 SAR data for monitoring strategic water facilities

Sentinel-1 SAR data could support the implementation of operational monitoring systems thanks to its wide coverage and frequent revisiting time. InSAR applications allow retrieving small displacements and the temporal evolution of the deformation rates over sensitive infrastructures.





# **Study Area**



Continuous monitoring of a country's ageing water management infrastructure has become an increasingly critical issue in recent years. Due to the remote location of the water facilities and the data updates required on a regular basis, it soon became clear that InSAR processing, focusing on the facilities and their immediate surroundings, could offer a more relevant and time-effective solution than InSAR processing of the whole county.



#### **Methods**





**Methods** 

Sarmap

 $\phi_{Int} = \phi_{Topography} + \phi_{Change} + \phi_{Movement} + \phi_{Atmosphere}$ 



Sensitive to deformation up to **2 mm/year** 

- Persistent Scatterers (PS)
- Small Baseline Subset (SBAS)

PS	SBAS
Independent, incorrelated motions	At best spatially correlated motions
Pixelwise continuous time series	Possibility of handling time seriers with temporal holes
Time interval between two acquisitions limited by displacement rate	Time interval between two acquisitions limited by temporal decorrelation
Very accurate on PS	Slightly less accurate
Linear displacements favoured	Larger variety of parametric models possible. Non-parametric modeling possible

#### **Examples of the monitored sites**





#### **Examples of the monitored sites**





**B**2

50

Desc

100 m

#### **Examples of the monitored sites**





#### **Installation of Corner Reflectors**





#### **Installation of Corner Reflectors**





## **Deformation measurements**



Vertical deformation [mm/yr]



## **General Scheme of the data processing**





### **General Scheme of the data processing**





#### **Interactive interface**









#### Article

#### Nationwide, Operational Sentinel-1 Based InSAR Monitoring System in the Cloud for Strategic Water Facilities in Hungary

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**Abstract:** The intensive development of both interferometric technology and sensors in recent years allows Interferometric Synthetic Aperture Radar (InSAR)-based applications to be accessible to a growing number of users. InSAR-based services now cover entire countries and soon even the whole of Europe. These InSAR systems require massive amounts of computer processing power and

#### L3HARRIS Critical Infrastructure: Drinking Water & Wastewater





## **Pipeline monitoring**

🔘 ENVI



## **Conclusion and Discussion**



- Design of an automatic monitoring system
- Installation of CRs where necessary
- Frequent updates with all the new incoming images
- Near-real time processing capability

Capabilities and Solutions



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