

# Ground & infrastructure monitoring from space

BY

 detektia

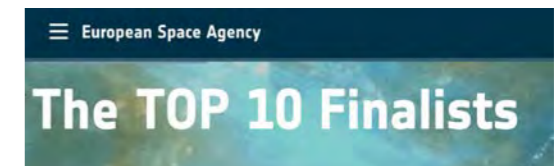
# About us



business  
incubation  
centre  
Madrid Region



- 2019 Spin-off of the **Civil Engineering School of Universidad Politécnica de Madrid (Spain)**
- 2020 Participating in European **EIT Climate-KIC, PARSEC, STARTUP<sup>3</sup> & Space Endeavours** acceleration programs
- 2020 Winners of **Sacyr Innovation iChallenges**
- 2020 Incubated by the **Agencia Espacial Europea (ESA)**
- 2020 **Top10** of the **ESA Startup Competition**
- 2021 **Top20** of the **Global Infrastructure Hub Challenge**



# Team



**MSc. Candela Sancho, CEO.** Expert in DInSAR, geophysical processes and subsidence analysis.



**Prof. Dr. Rubén Martínez.** More than 35 years of expertise in the civil engineering industry and applied research.



**Dr. Alfredo Fernández.** Expert in remote sensing, artificial intelligence and interactive app development.



**MSc. Jaime Fernandez.** Software developer, with expertise in deep learning and data processing.



**Dr. Adrián García.** Expert in new space technologies & DInSAR (algorithms, processing & software).



**MSc. Carlos G. Lanchares.** GIS expert and new use cases developer



**Prof. Dr. Miguel Marchamalo.** 20 years of expertise in geomatic engineering applied to the water and environmental sectors.



## Next additions:



**Software developer, hiring Q2- 2021**

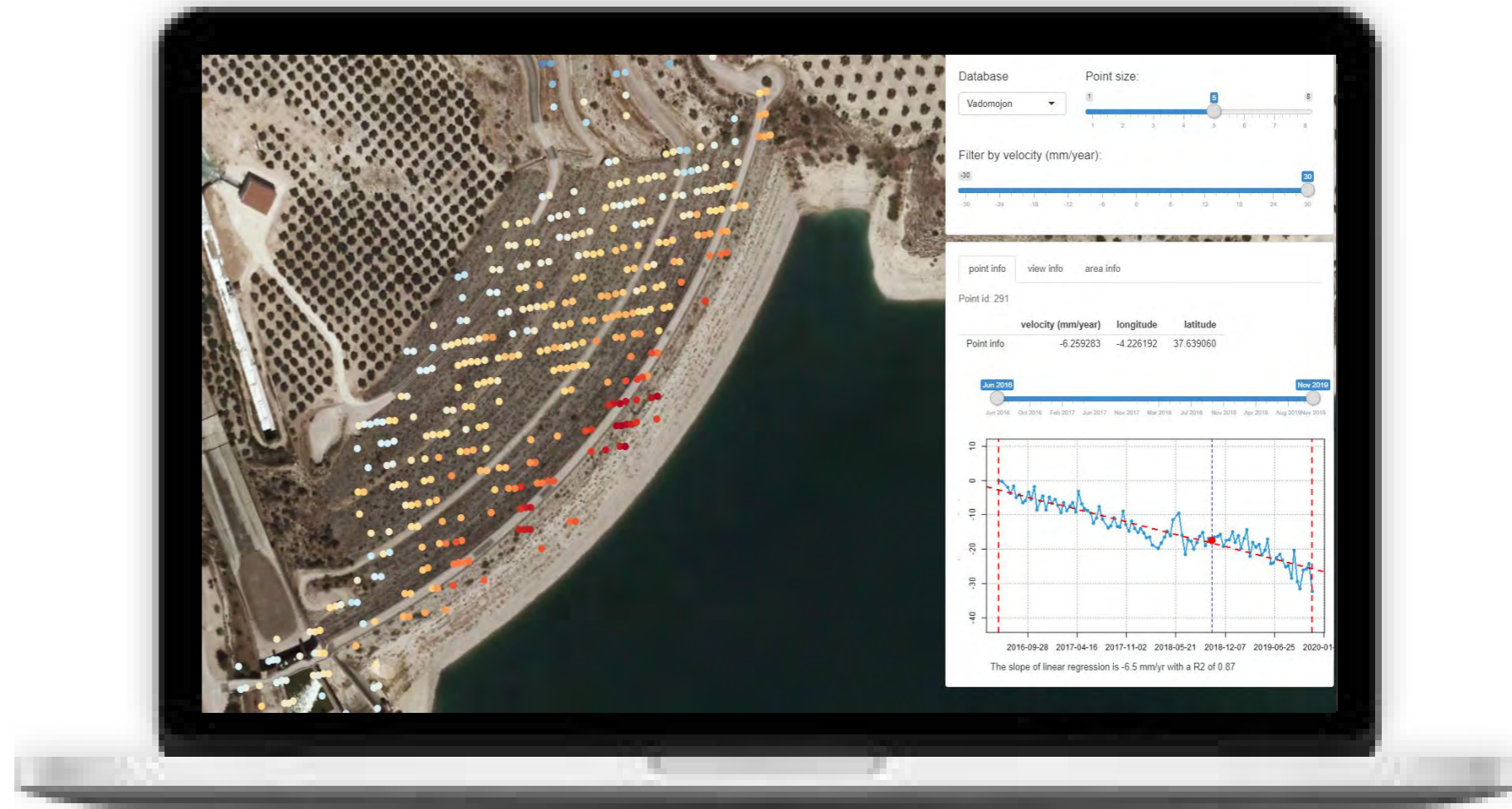


**SDR, hiring Q3-2021**

# What do we do?

We apply satellite DINSAR technology to detect deformation in ground & infrastructures with millimeter accuracy.

We have developed EyeRADAR, a solution for the civil engineering & groundwater sector.

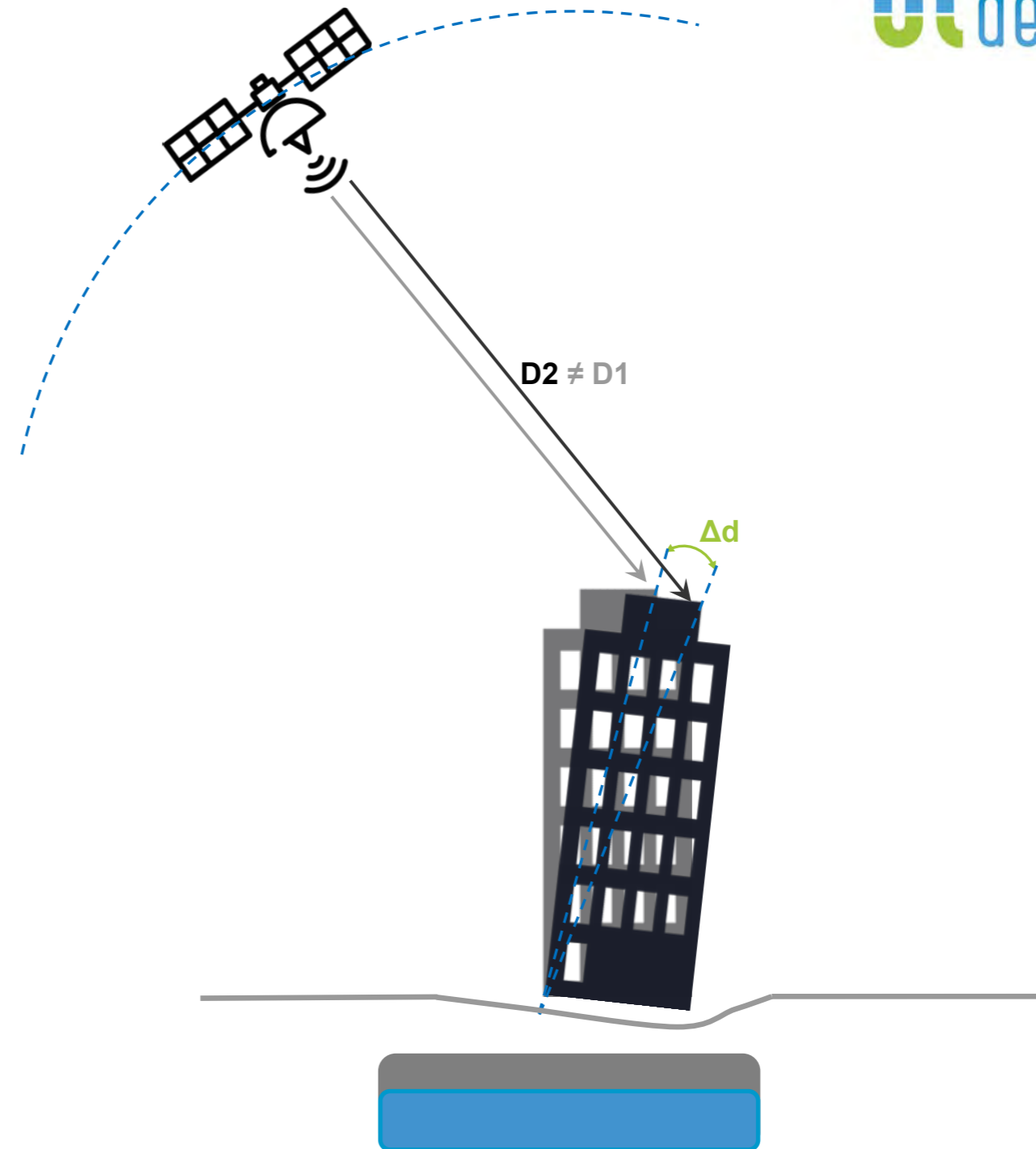
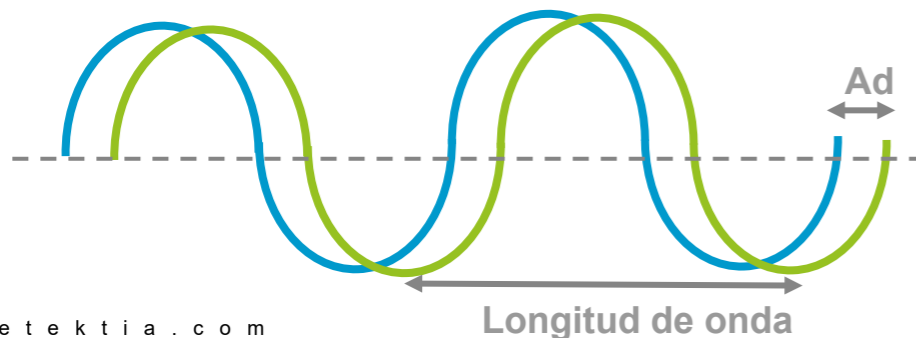


## EyeRADAR

# What is DInSAR?

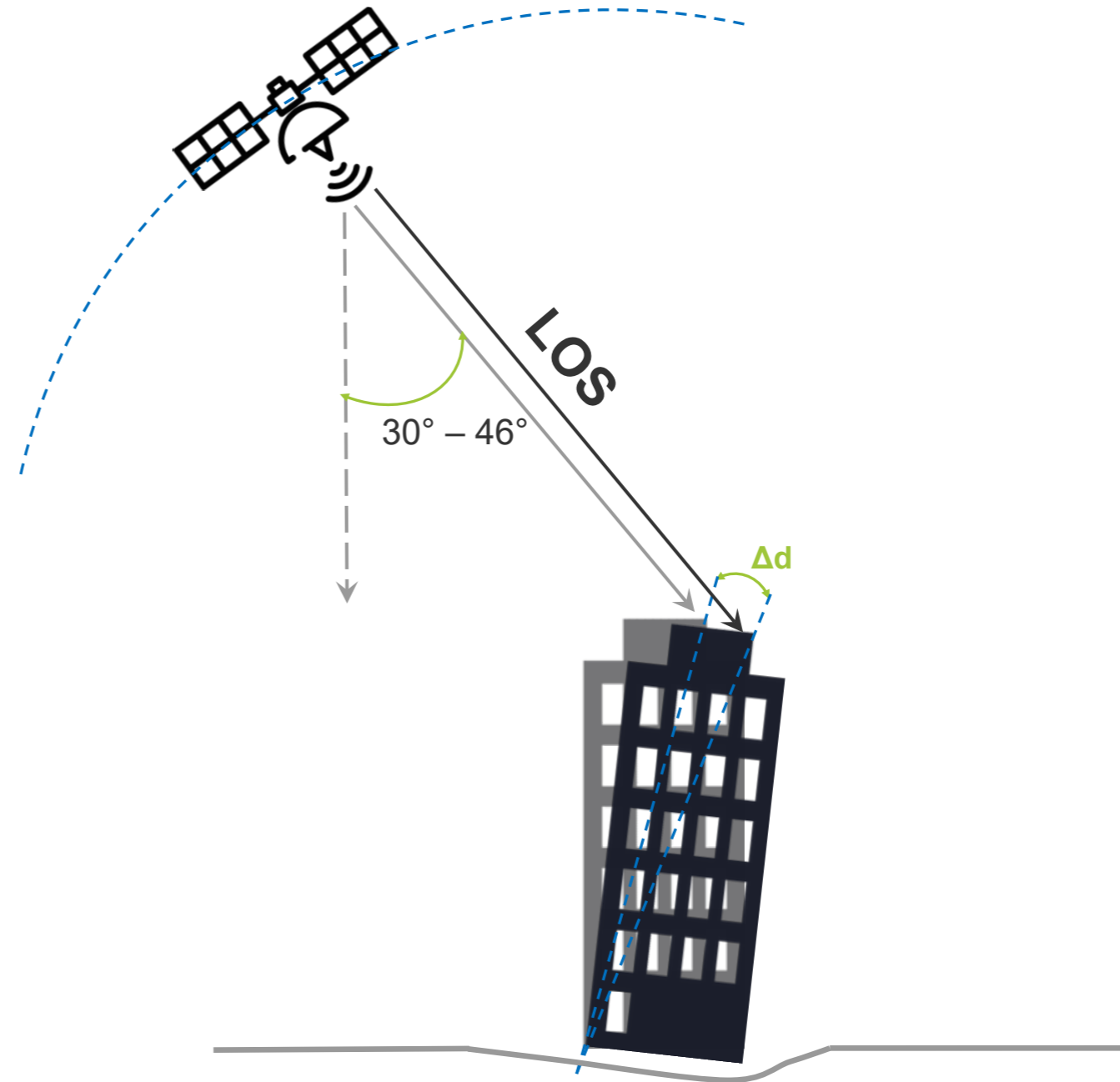
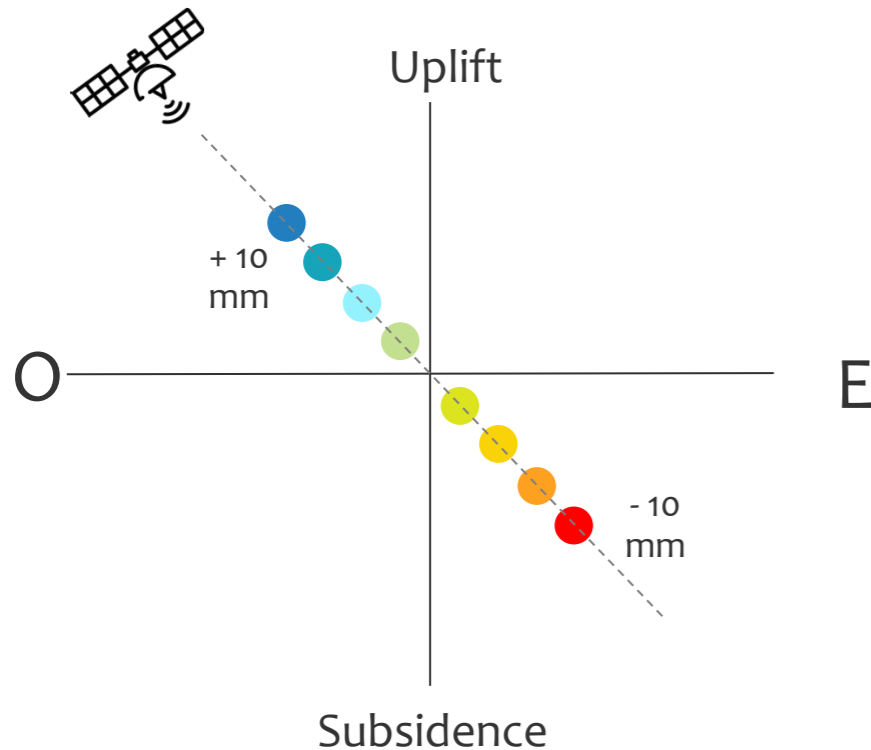
DInSAR means Differential Interferometric Synthetic Aperture RADAR:

- SAR is an active sensor
- Not affected by clouds
- Works in microwave spectrum
- Measures the phase differences of two waves emitted at different



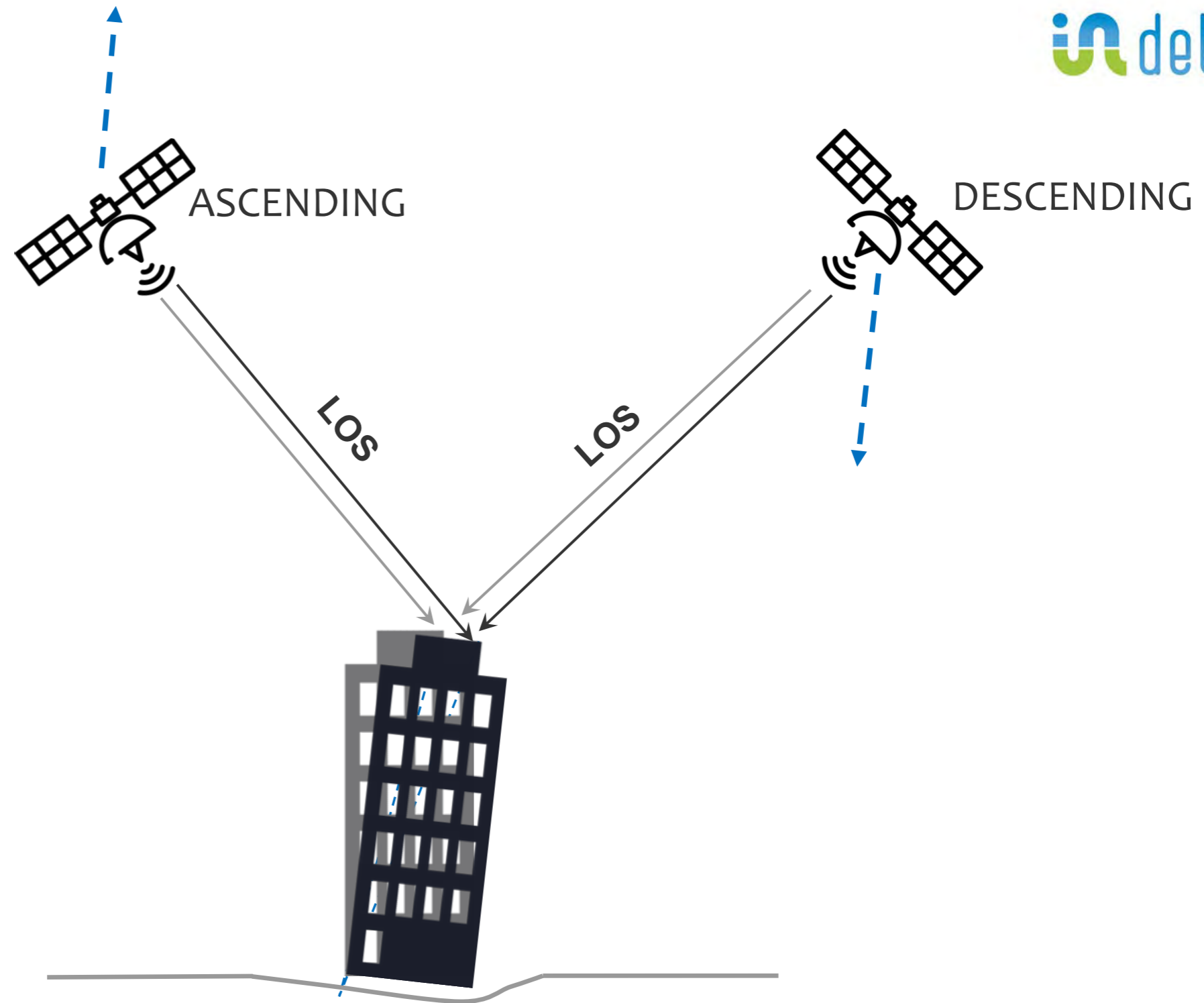
# In which direction do we measure movements?

DInSAR measure movements in the direction of *line of sight* (LOS); it is the line connecting the point in surface with the satellite

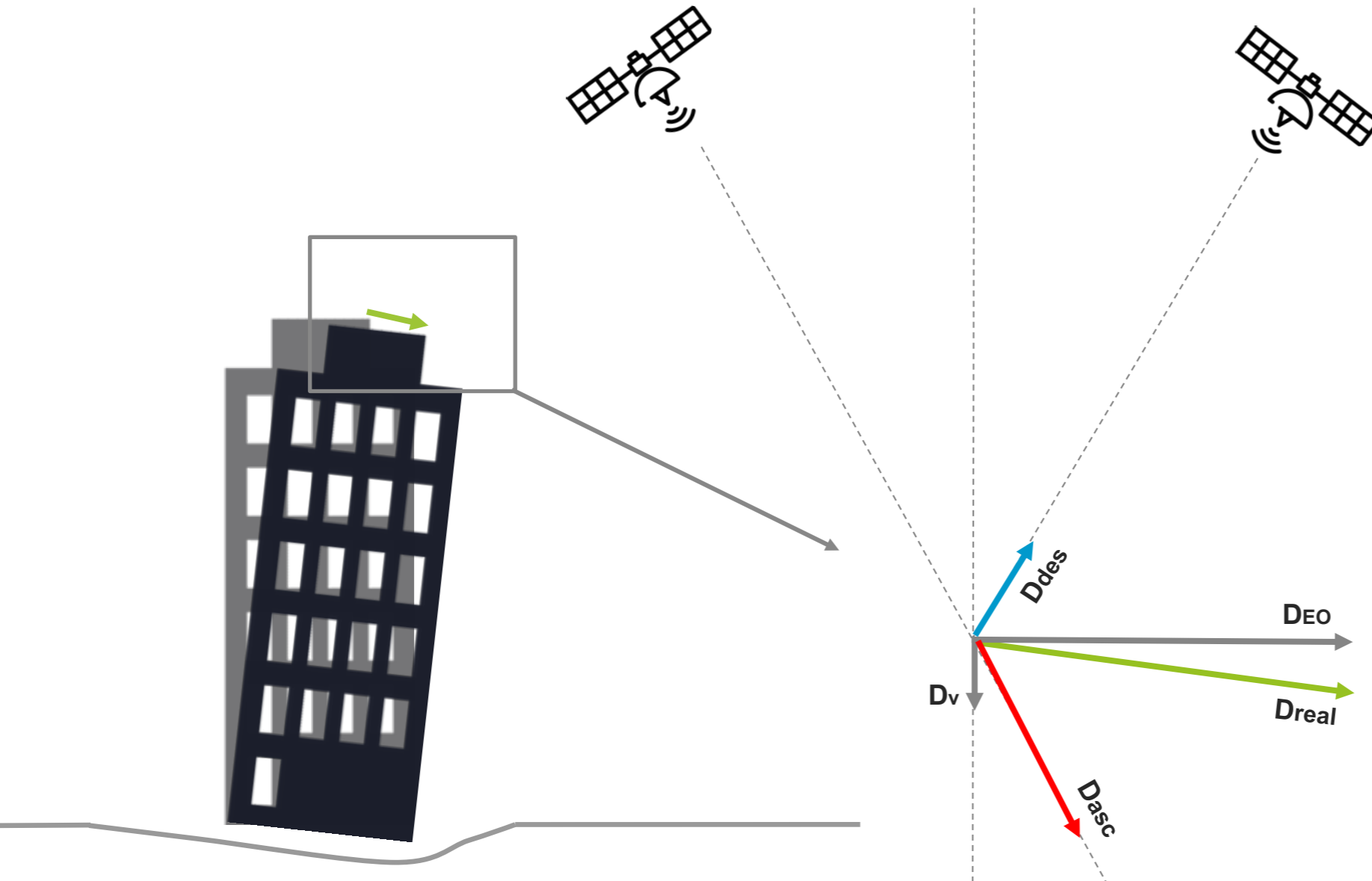


# Acquisition geometrías

Any point in the planet is observed under two different views: ASCENDING y DESCENDING



# Movement decomposition

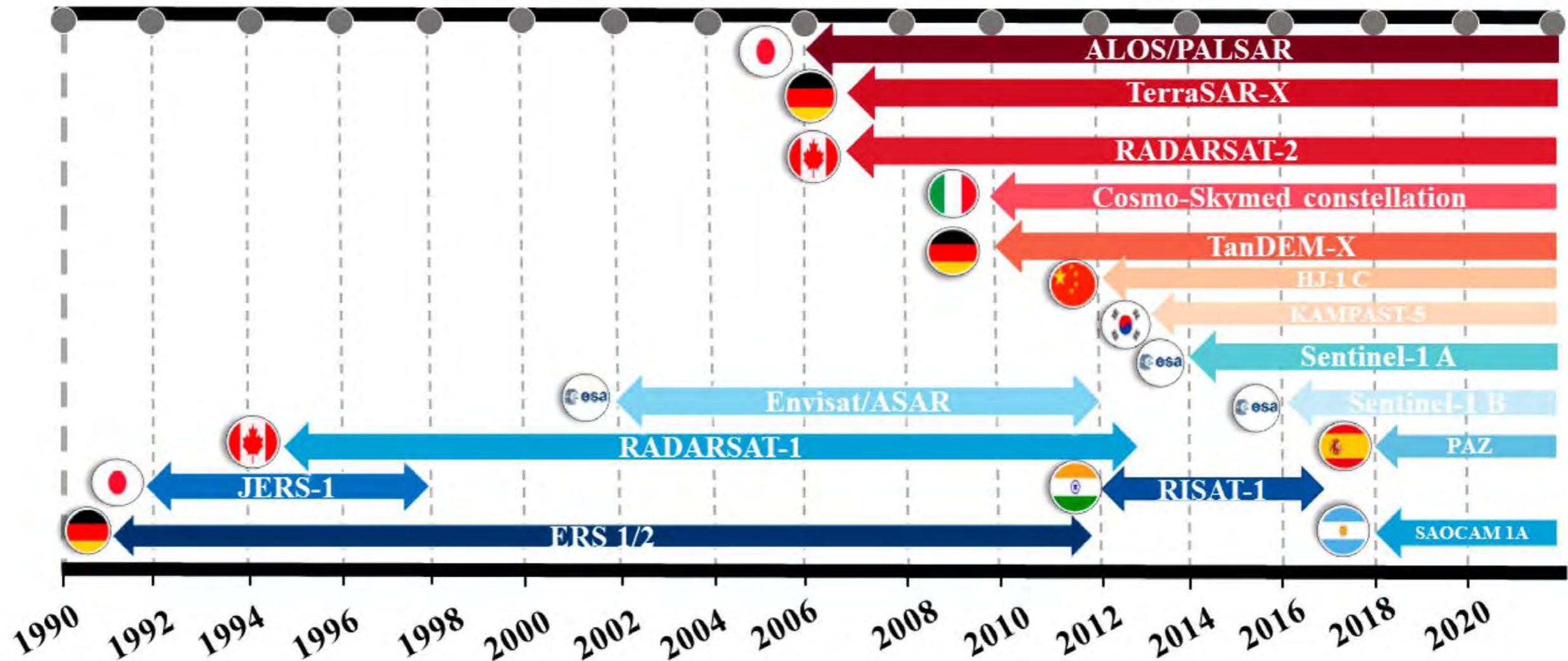


Combination of LOS movements in both vies allows for decomposition of movements in vertical plane (uplift/sunsidence) and East-West plane.

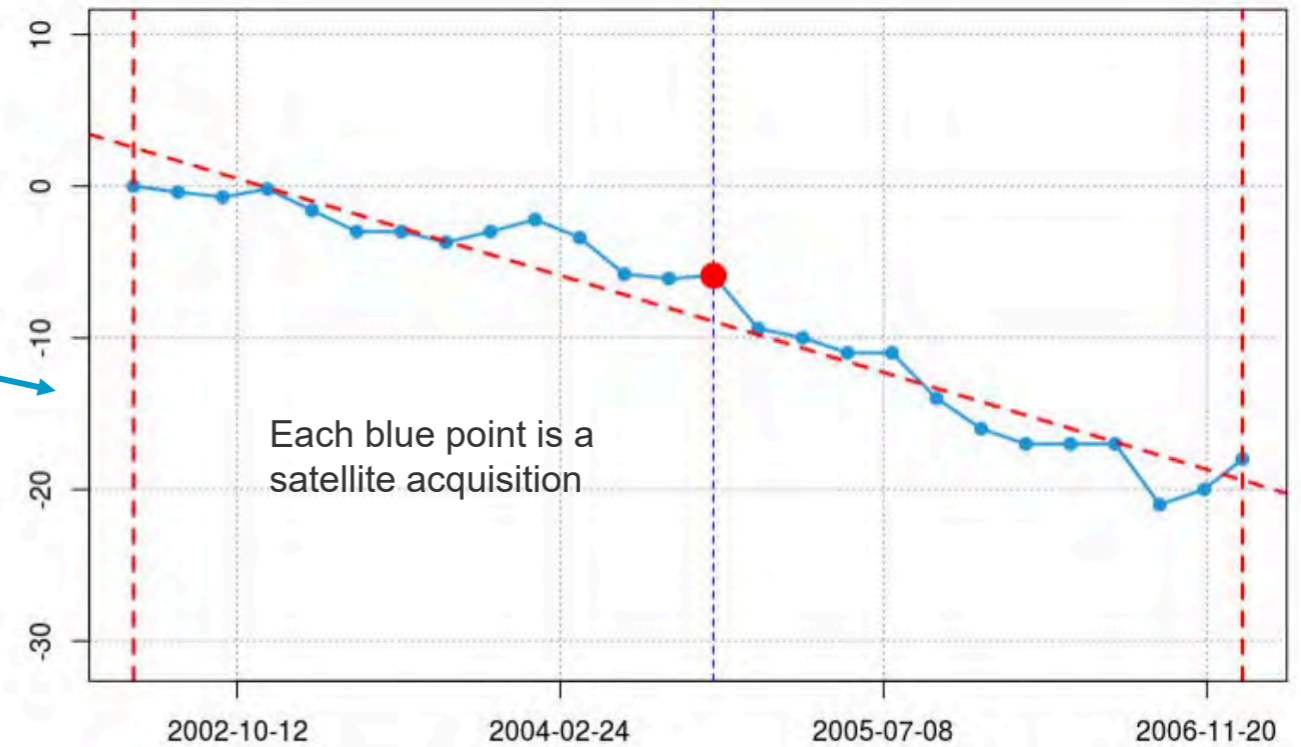


# Historical Analysis

The first SAR satellites were launched in 1990 and data is stored since then

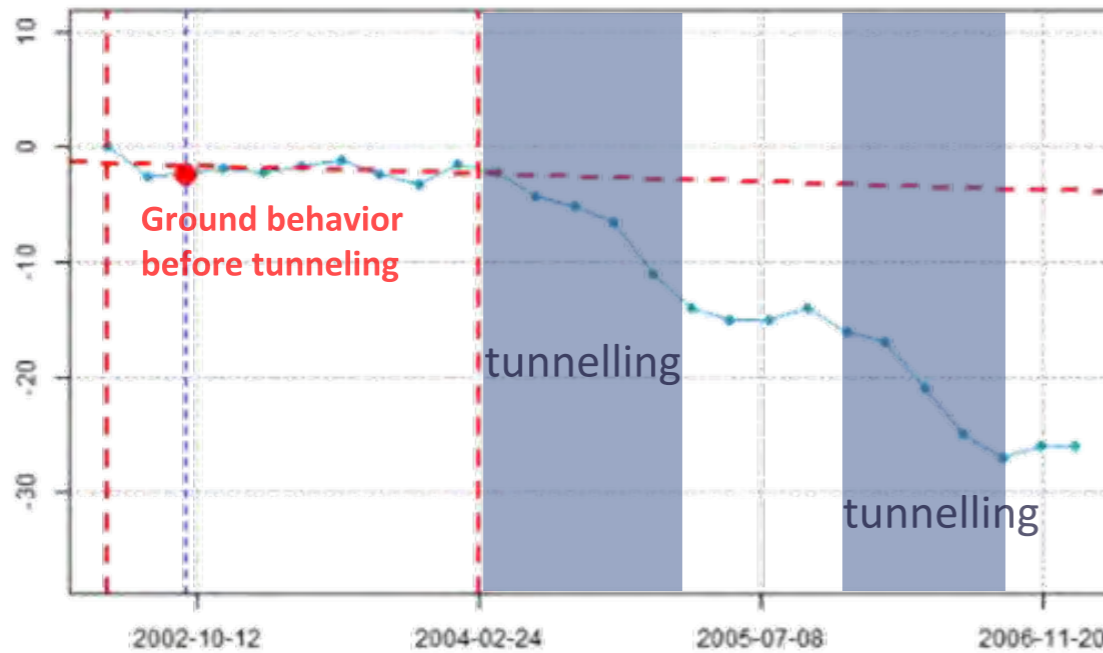


# Improving accuracy

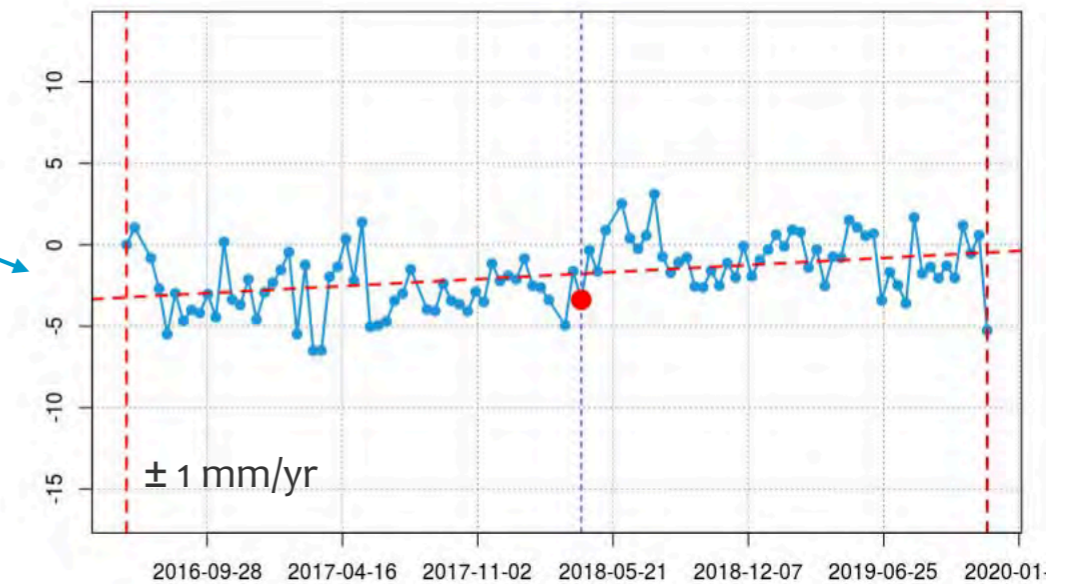
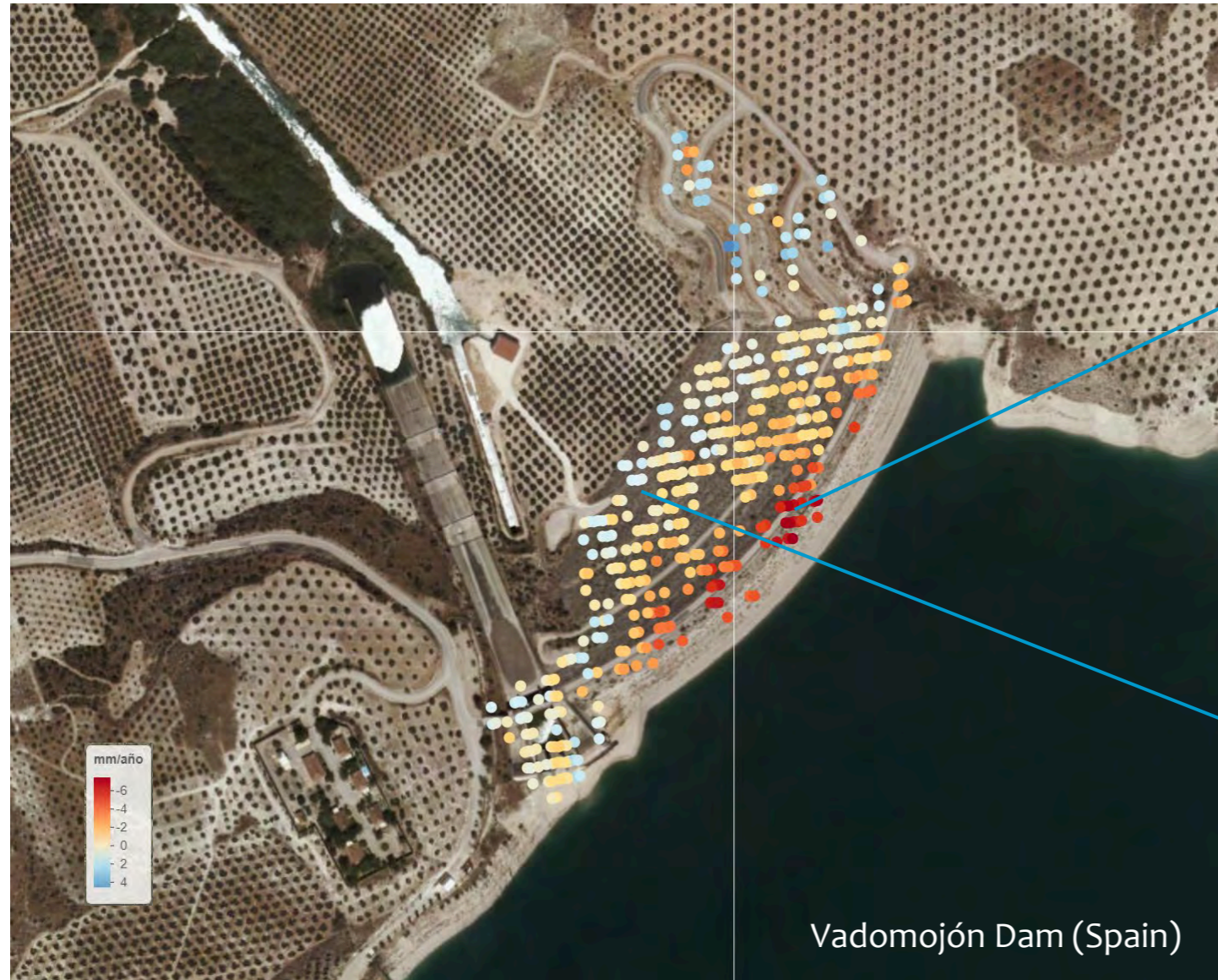


DInSAR works with data series reducing atmospheric signal noise and improving accuracy. (Minimum: 15-20 images), creating a dense network of points (“virtual sensors”) in ground & infrastructures. Seasonal changes are well shown within the temporal series.

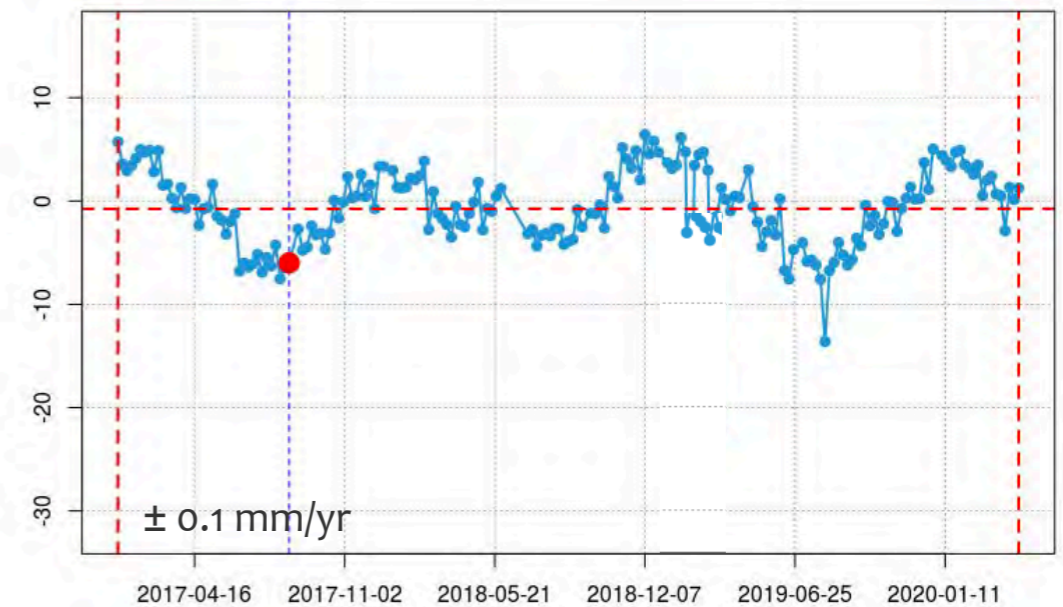
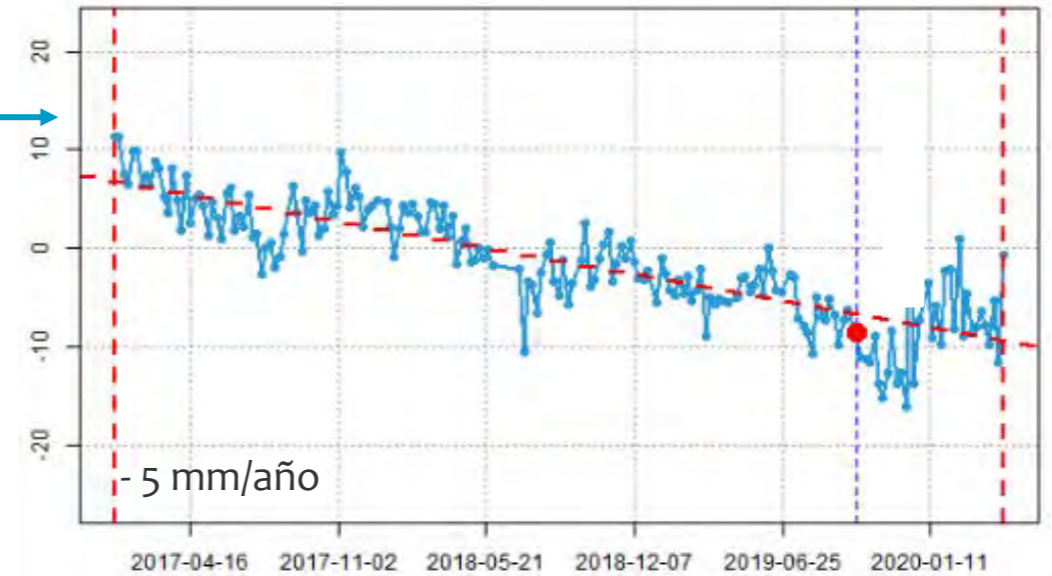
# Example: Tunnelling M30 (Madrid)



# Example: earthfilled dam



# Example: concrete dam

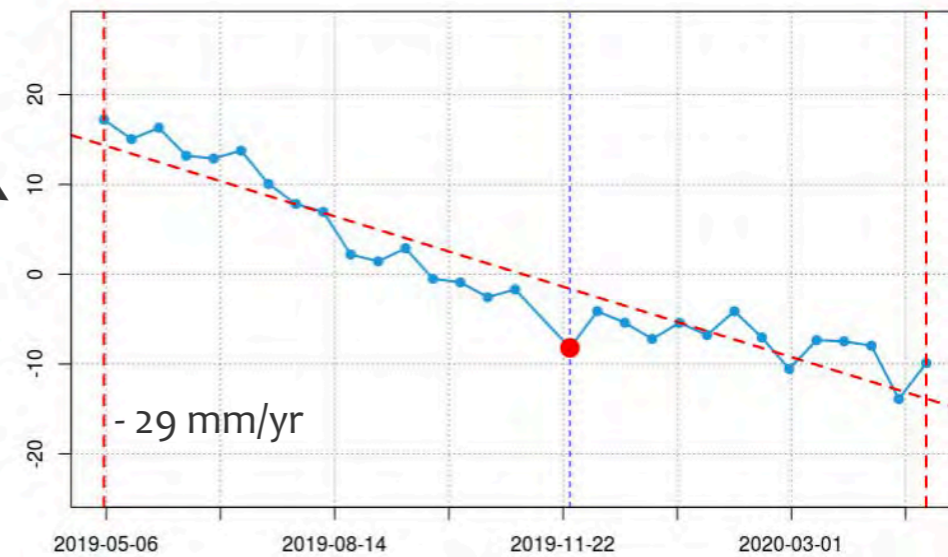
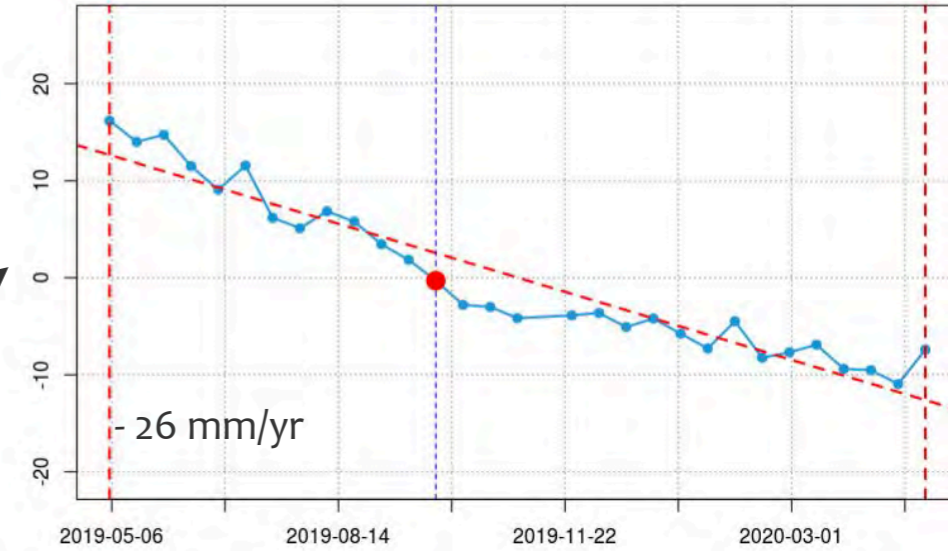
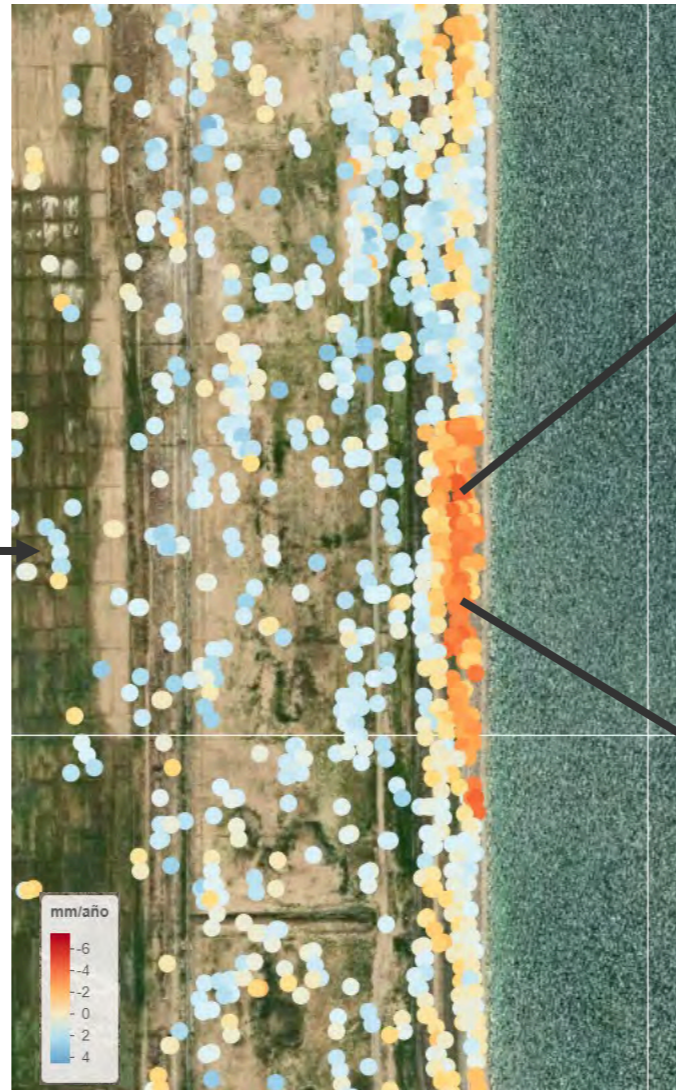
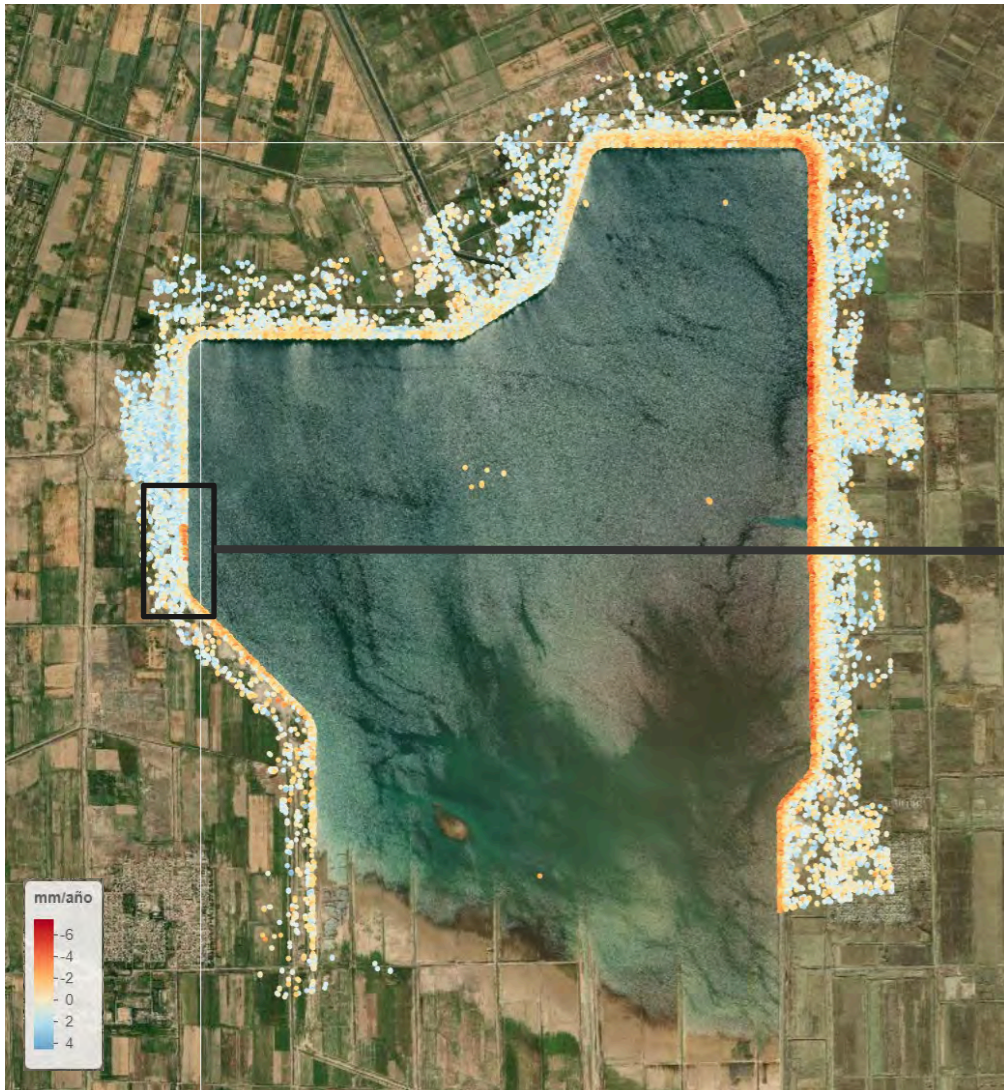


# Example: Sardoba dam (Uzbekistan) – Dam failure

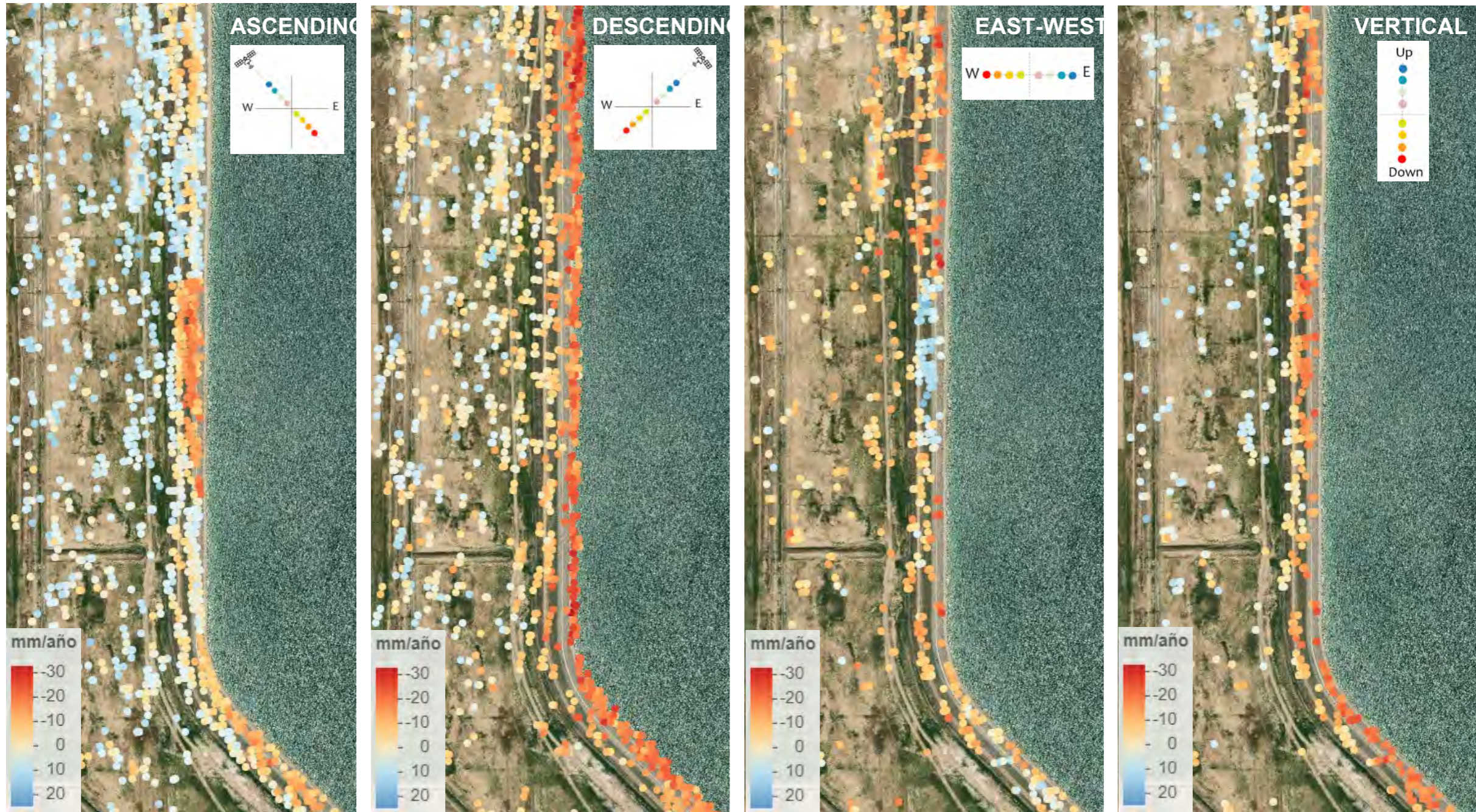
1<sup>st</sup> May 2020, part of the dam wall collapsed in Sardoba (Uzbekistán), causing enormous floods and 70.000 evacuated people.



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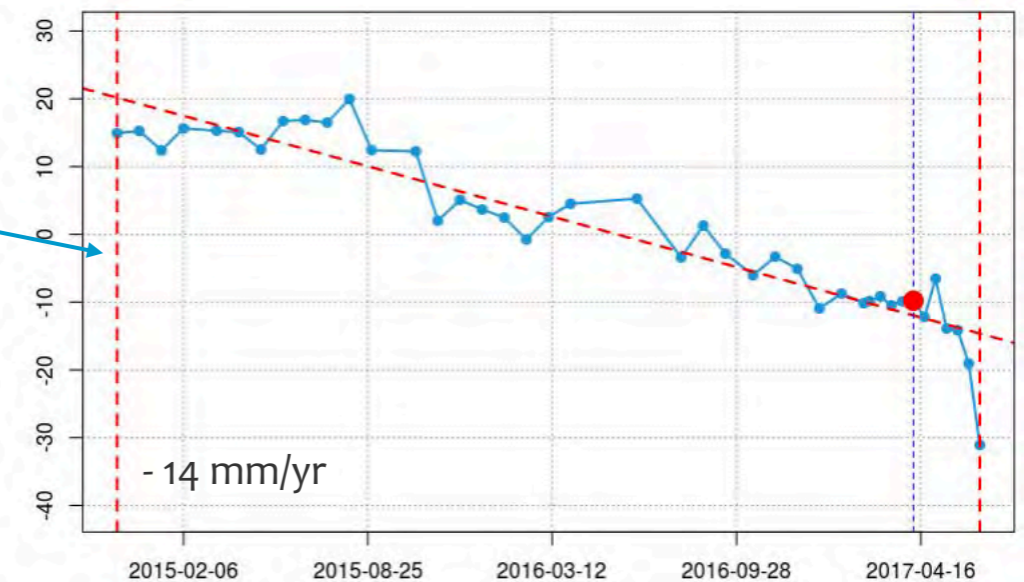
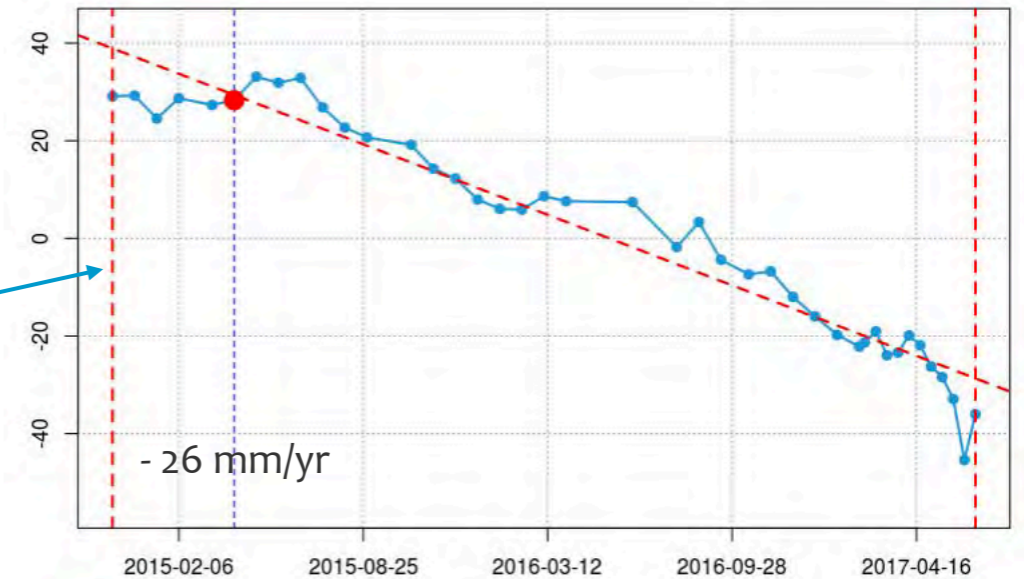
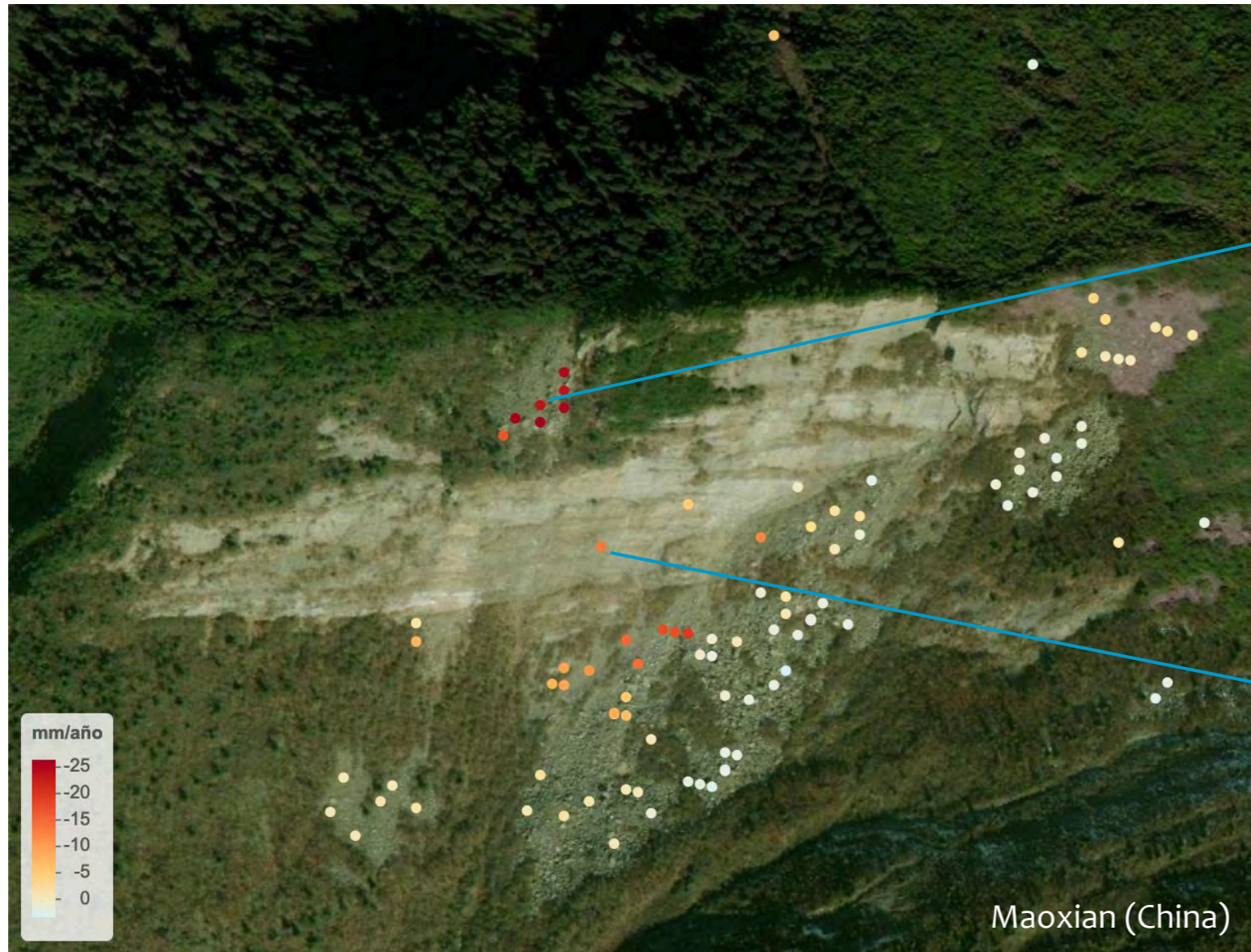


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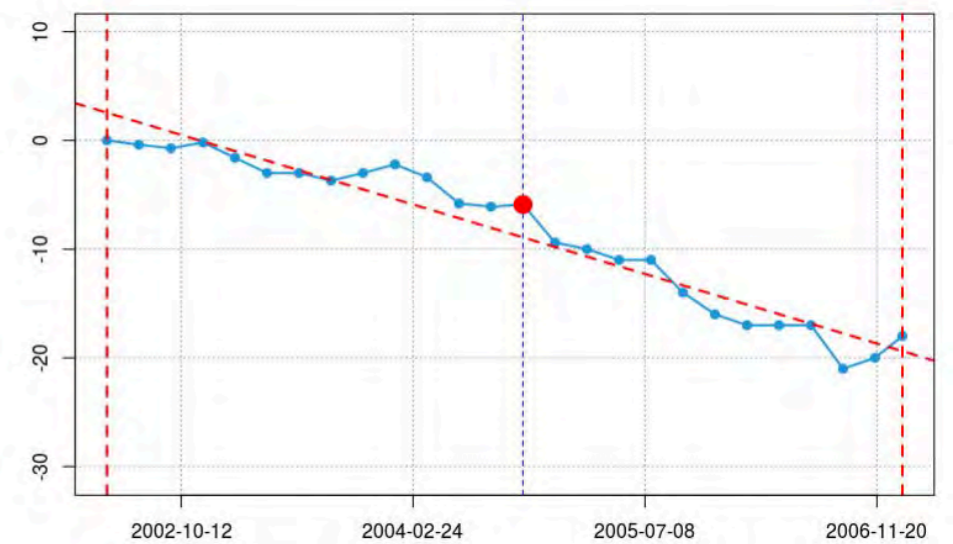




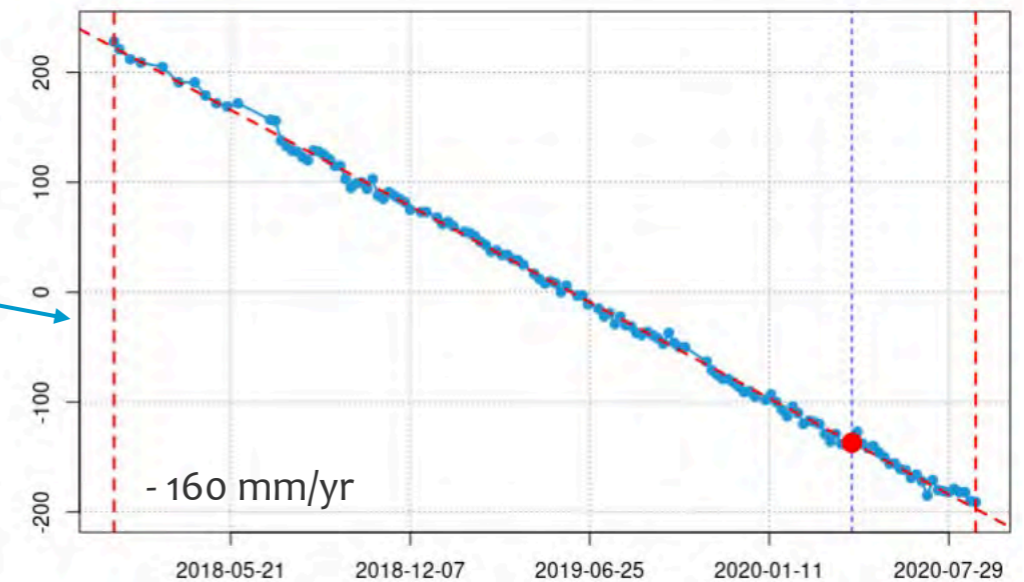
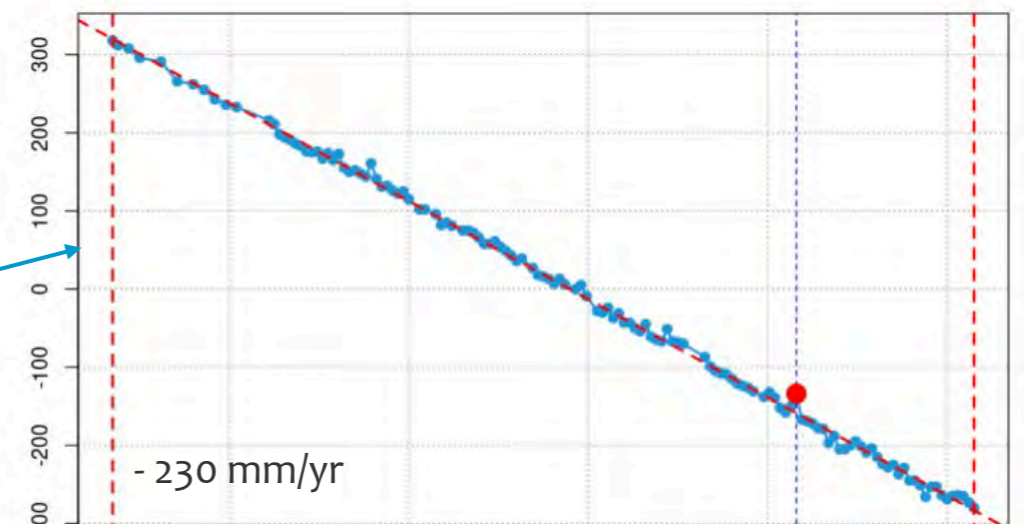
# Example: Maoxian - landslide



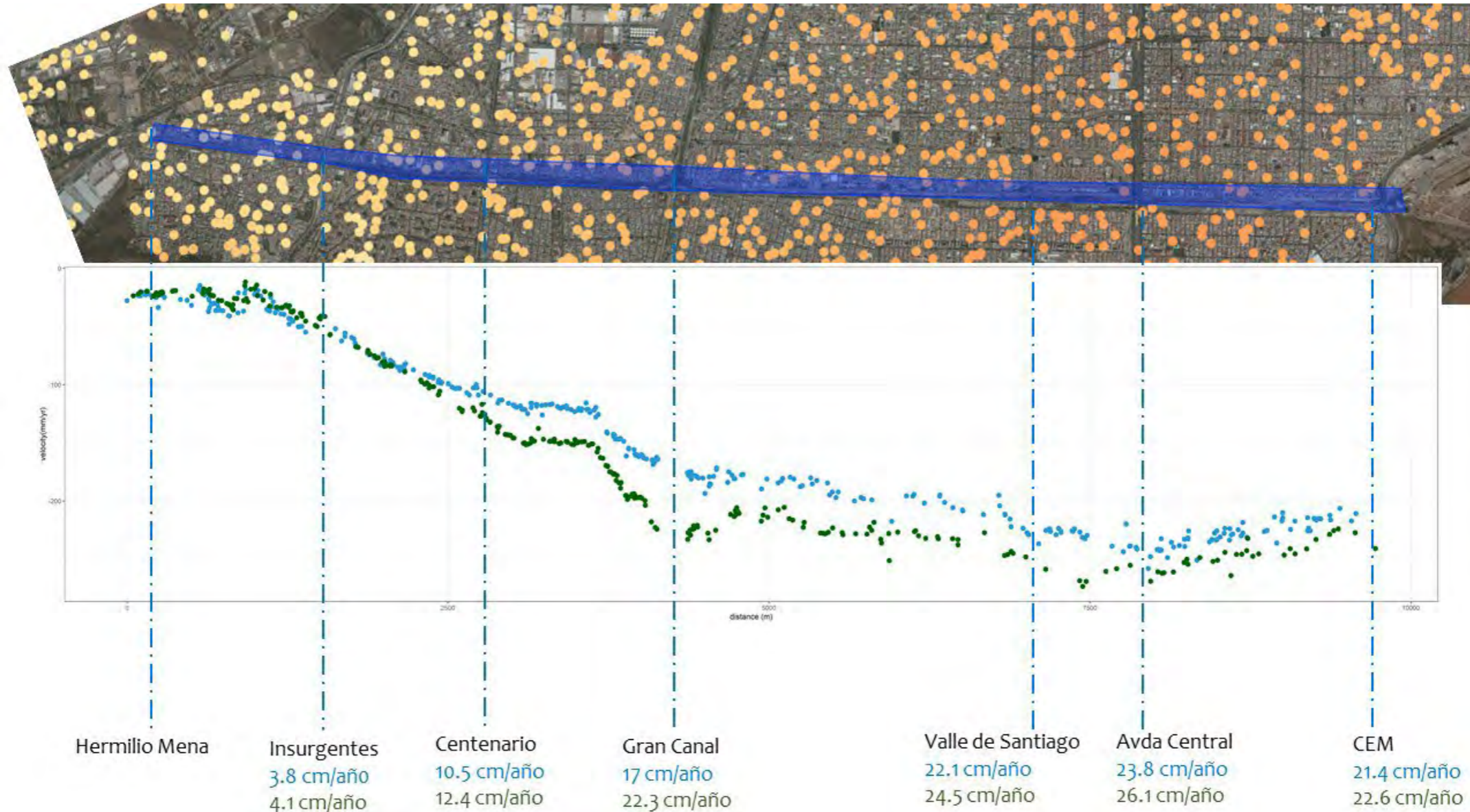
# Example: Barcelona Port (TerraSAR-X)



# Example: Mexico City – Land subsidence

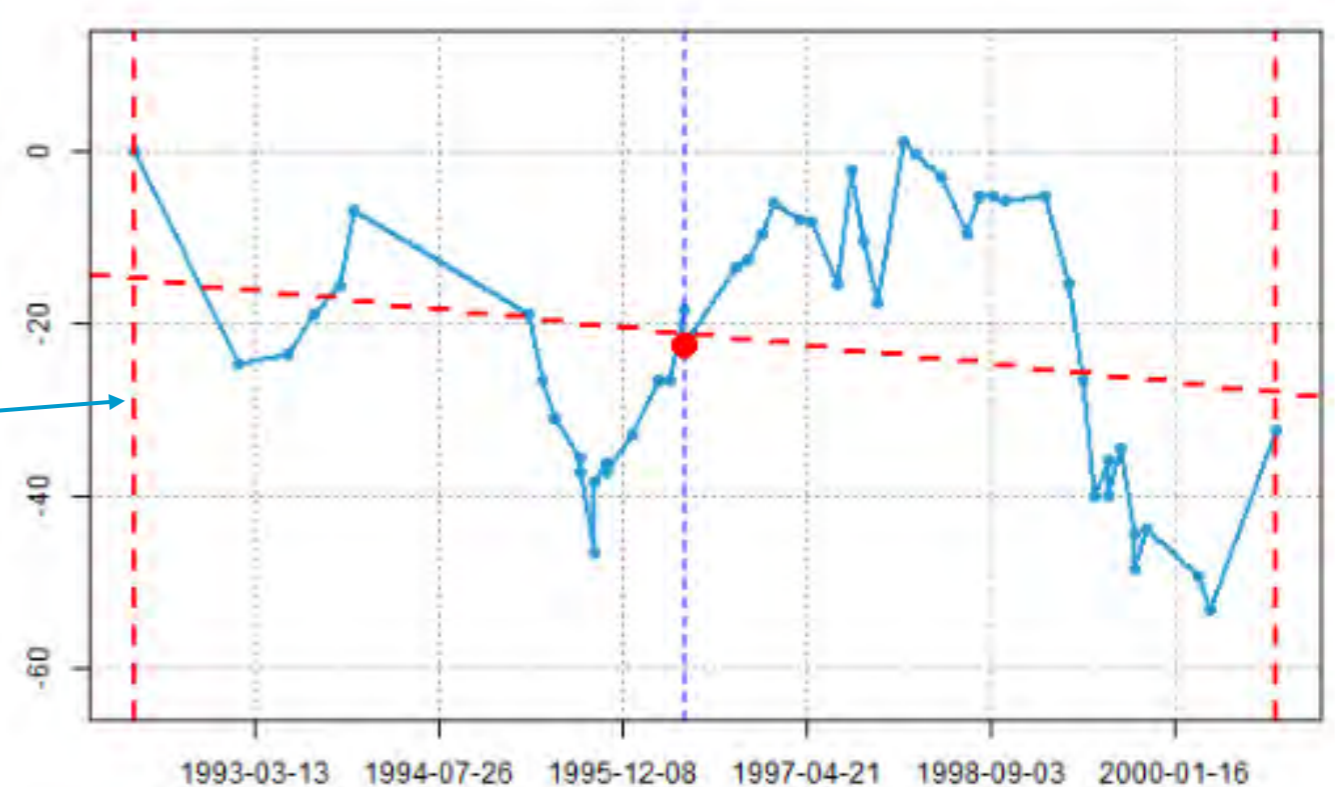
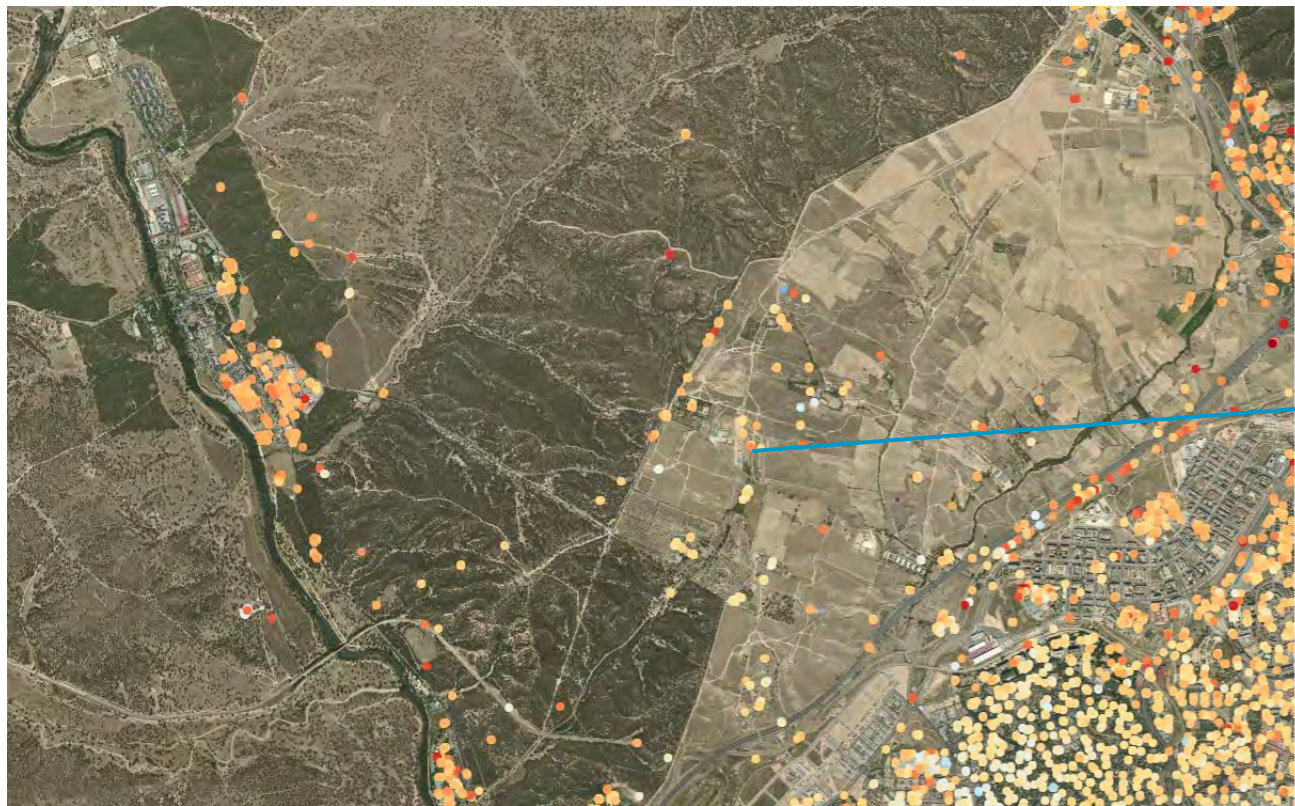


# Example: Mexico City – Land subsidence

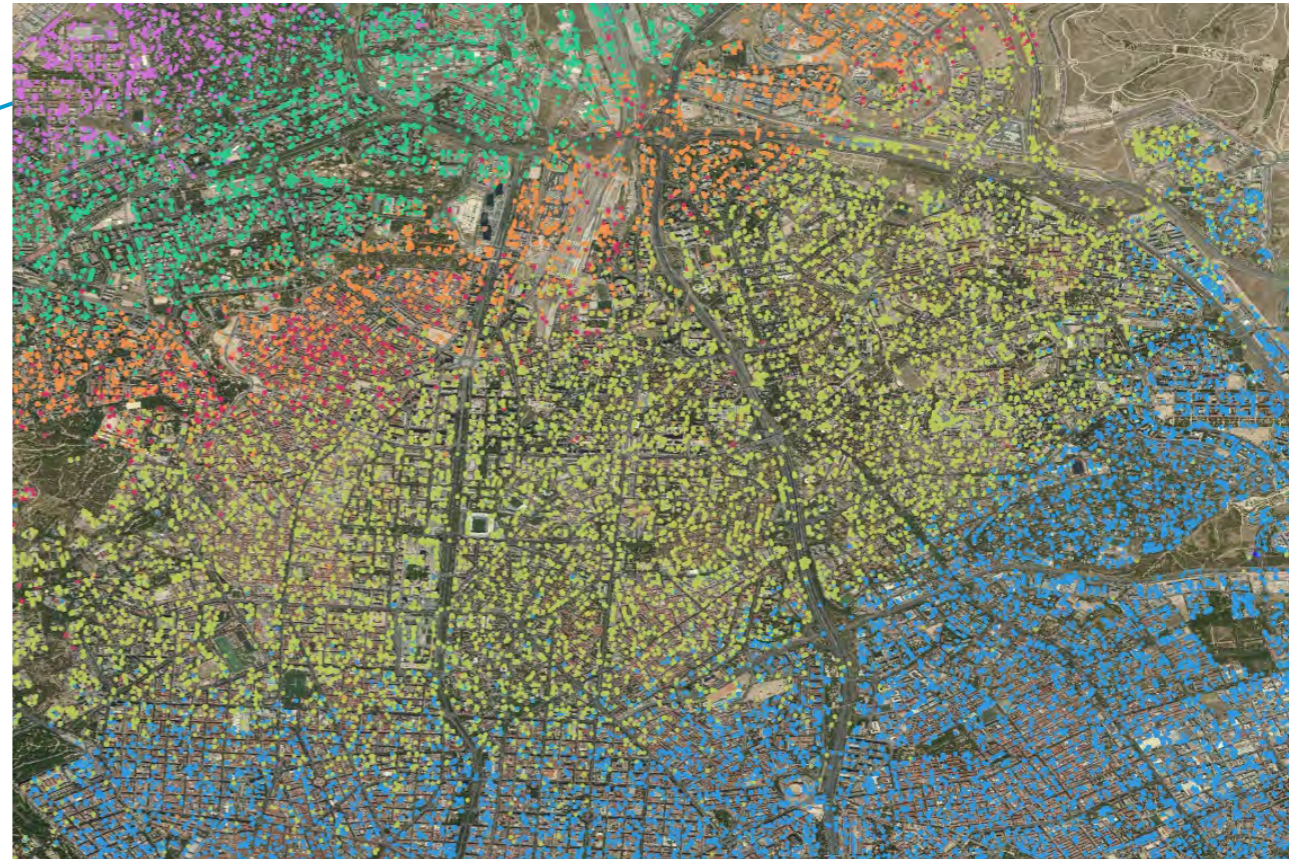
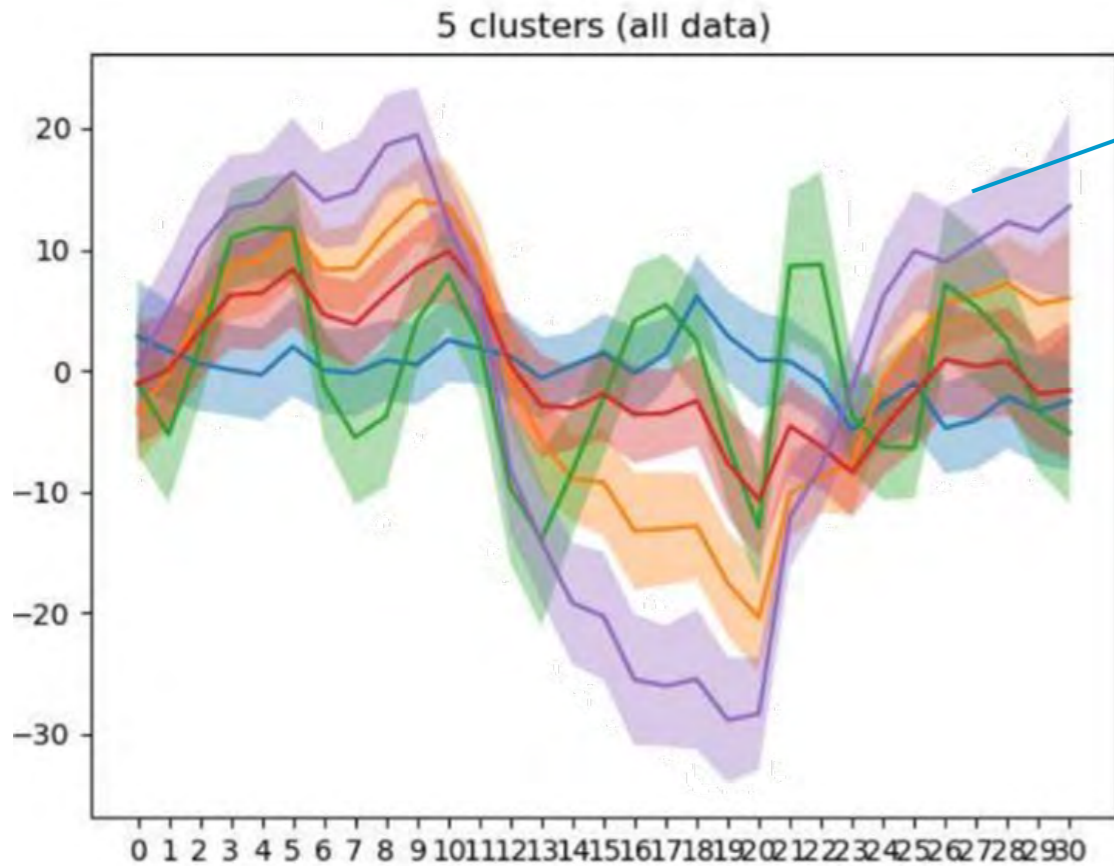


## Example: Madrid aquifer

Correlation larger than 85% between piezometric time series and DInSAR displacements. Results show the quasi-elastic behavior of the aquifer, during the recovery of the aquifer the uplift of the ground surface almost recovers from the subsidence experienced during the previous extraction phase.



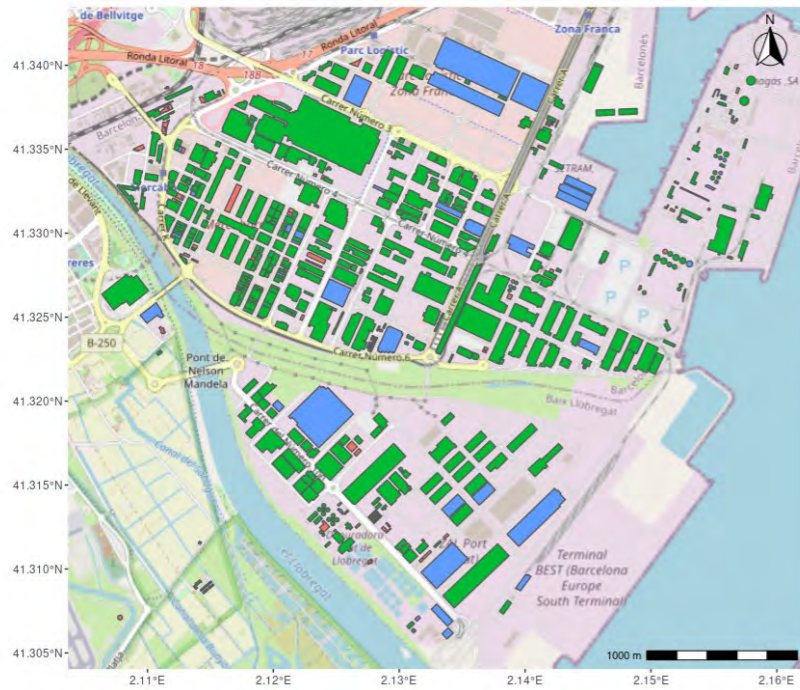
# Example: Madrid extraction wells



Madrid sits in a detrital aquifer, infrastructures are affected by subsidence and elevation induced by the dynamics of the aquifer. We have applied Artificial Neural Networks to group similar deformation behaviors throughout the metropolitan area of Madrid

# Example: Building health indices

Facilitating objective interpretation of results and decision-making.



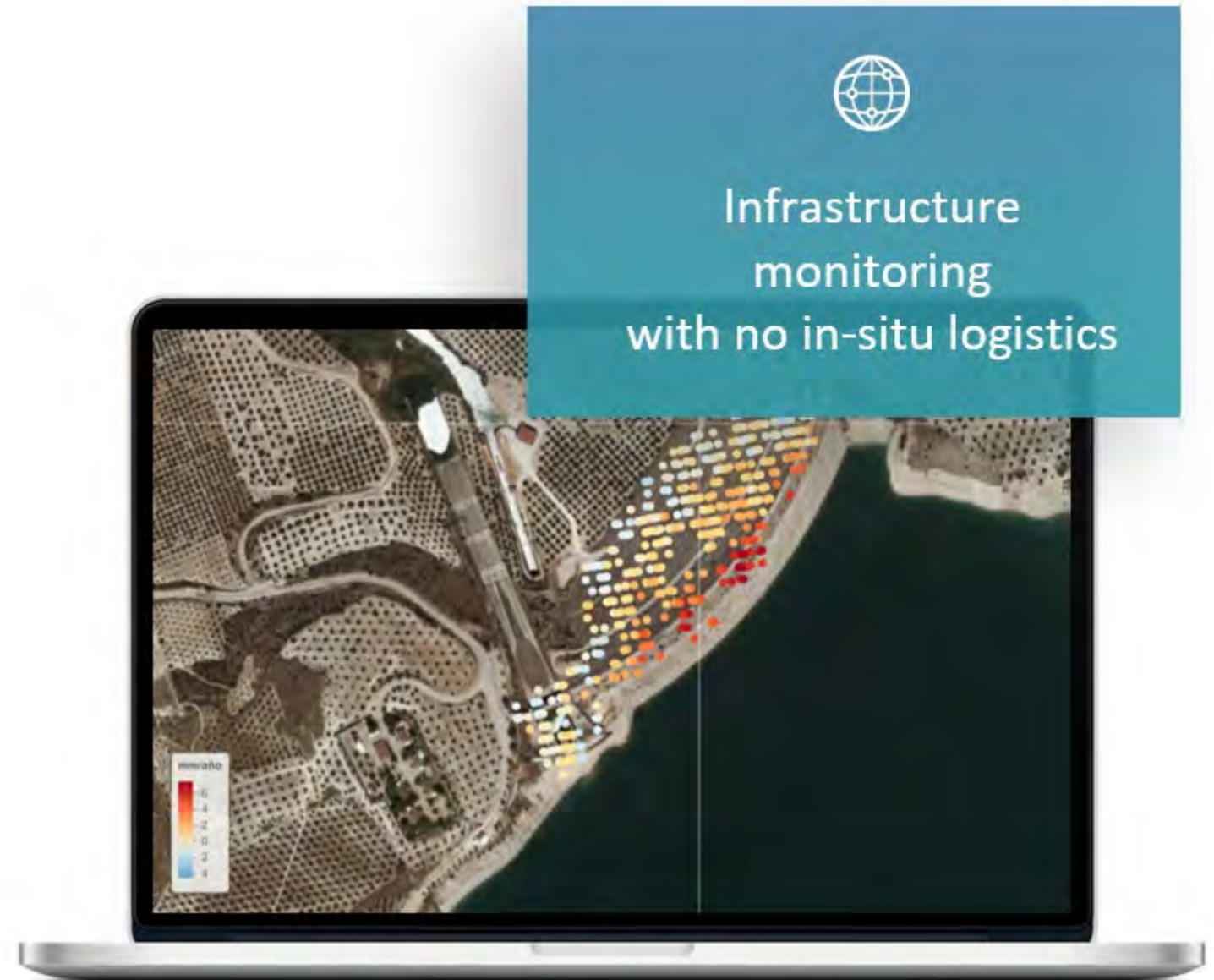
# Summary

Dams, underground works, land subsidence, railroads, landslides, ports, building structural health, groundwater... **even entire cities**

**Historical analysis** of the asset's deformation

**Monthly updates** monitoring

**Early warning system**

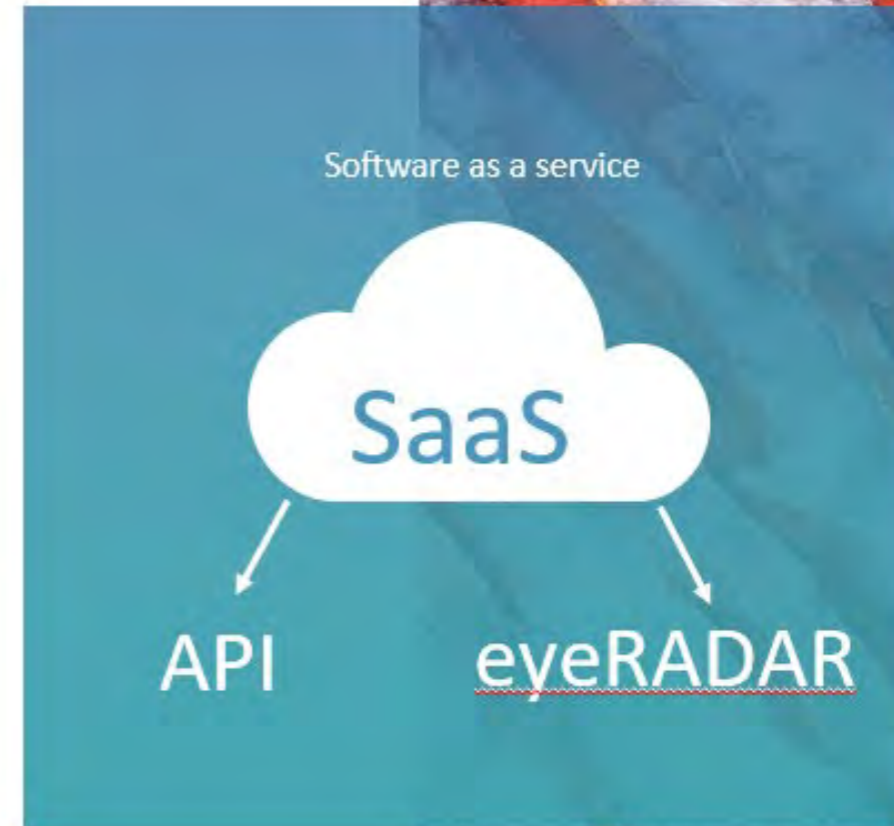




# Pricing

Depending on:

1. Number of images/years
2. Area (km<sup>2</sup>)
3. Type of infrastructure (lineal/punctual)
4. Frequency of updates
5. AI features & warning system
6. Satellite/sensor
7. API/platform





## More info & contact

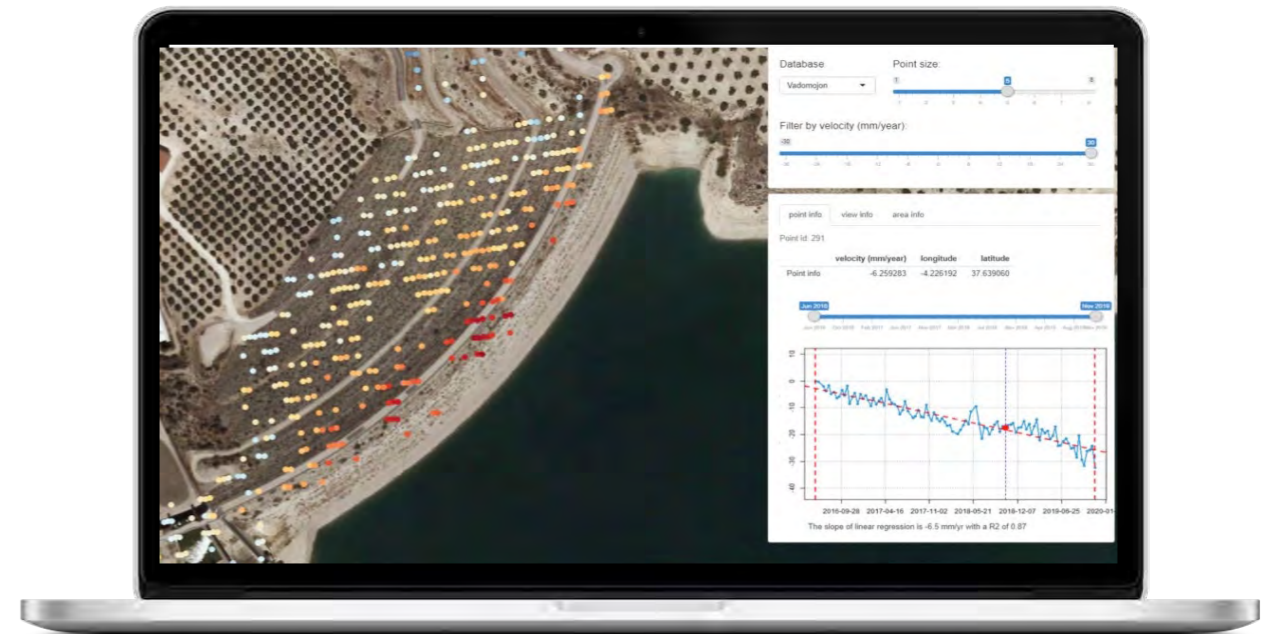
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<https://www.linkedin.com/company/detektiamonitoring/>

<https://twitter.com/detektia/>

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# Ground & infrastructure surveillance from space

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