
Ground & infrastructure
monitoring from space
BY
detektia

About us

- **2019** Spin-off of the **Civil Engineering School** of **Universidad Politécnica de Madrid (Spain)**
- **2020** Participating in European **EIT Climate-KIC, PARSEC, STARTUP3 & Space Endevours** acceleration programs
- **2020** Incubated by the **Agencia Espacial Europea (ESA)**
- **2020** Winners of **Sacyr Innovation iChallenges**
- **2020 Top10** of the **ESA Startup Competition**
- **2021 Top10** of the **Global Infrastructure Hub Challenge**

Team

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

Dr. Alfredo Fernánde.z Expert in remote sensing, artificial intelligence and interactive app development.

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

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

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

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

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

Next additions:

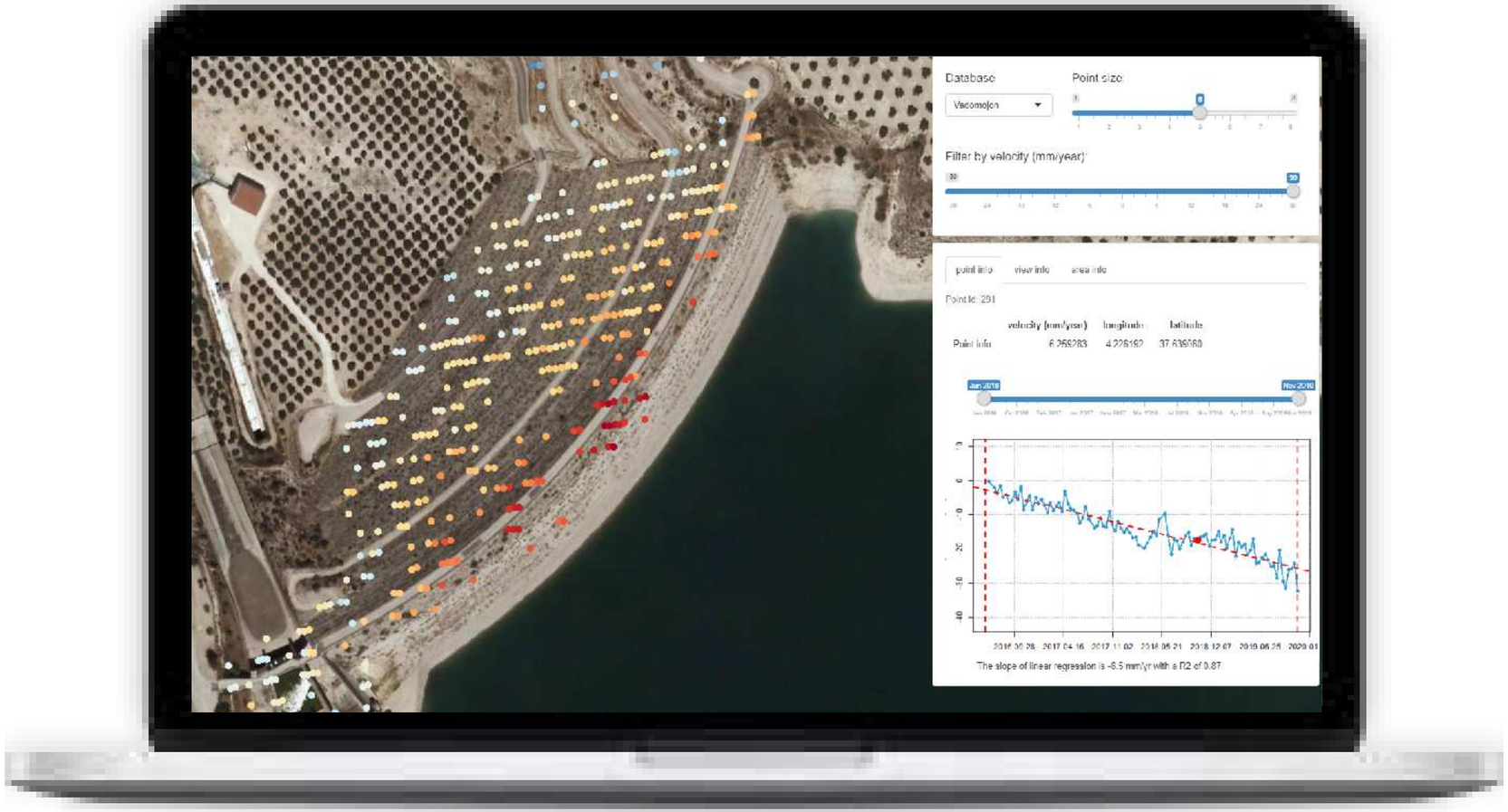
Software developer, hiring Q2- 2021

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.

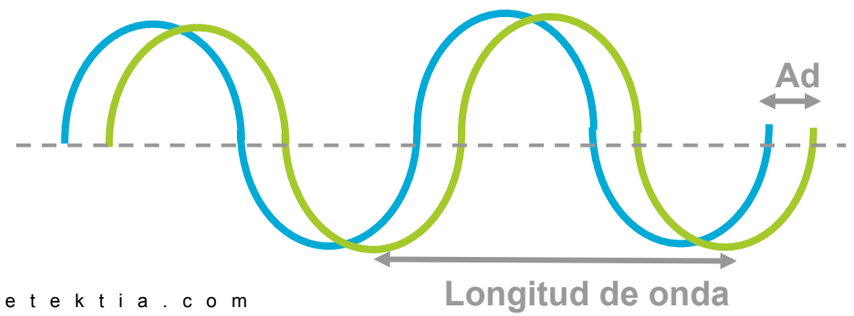


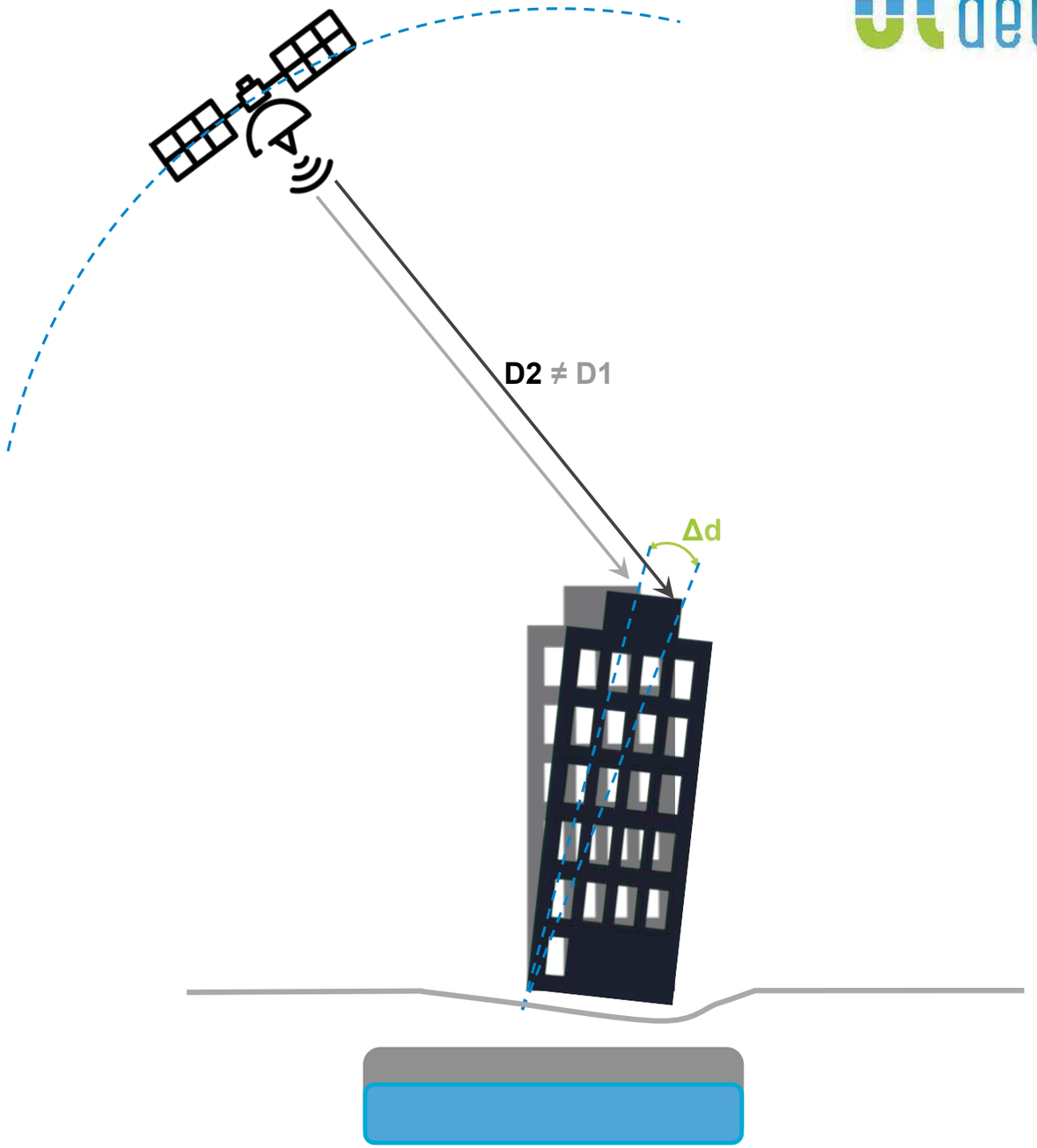
EyeRADAR

What is DInSAR?

DInSAR means Differential Interferometric Syntetic Aperture RADAR:

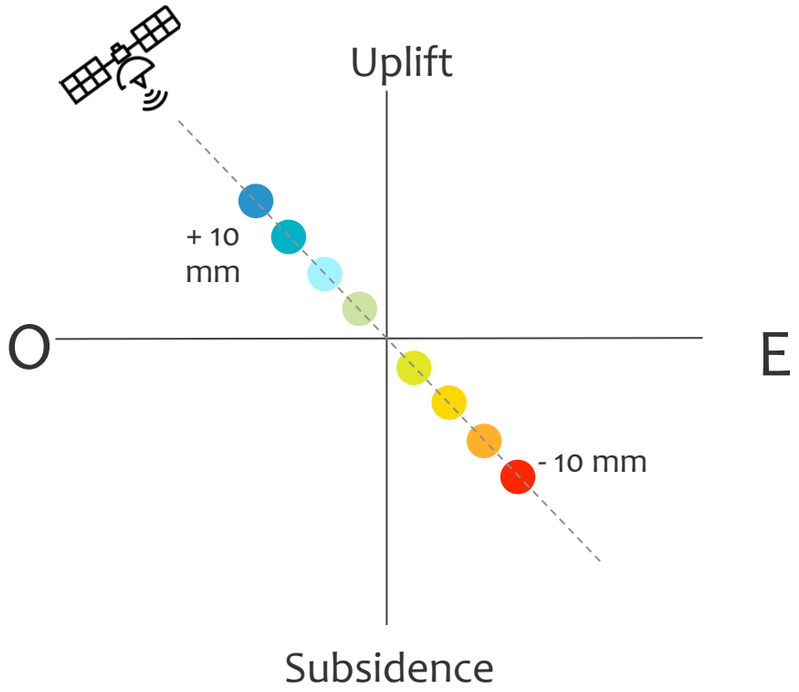
- SAR is an active sensor
- Not affected by clouds
- Works in microwave spectrum
- Measures the phase differences of two waves emitted at different

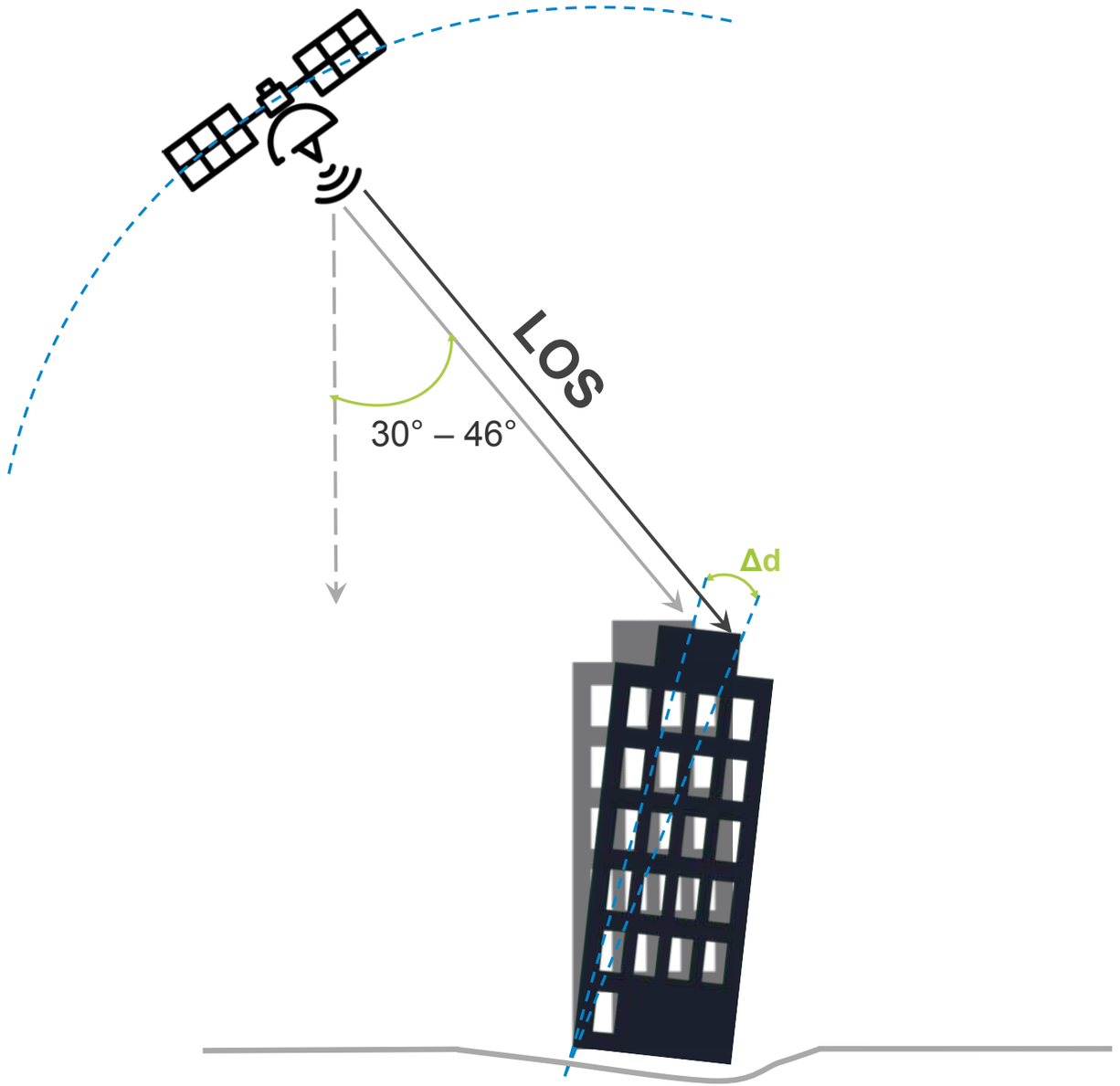




In which direction do we measure movements?

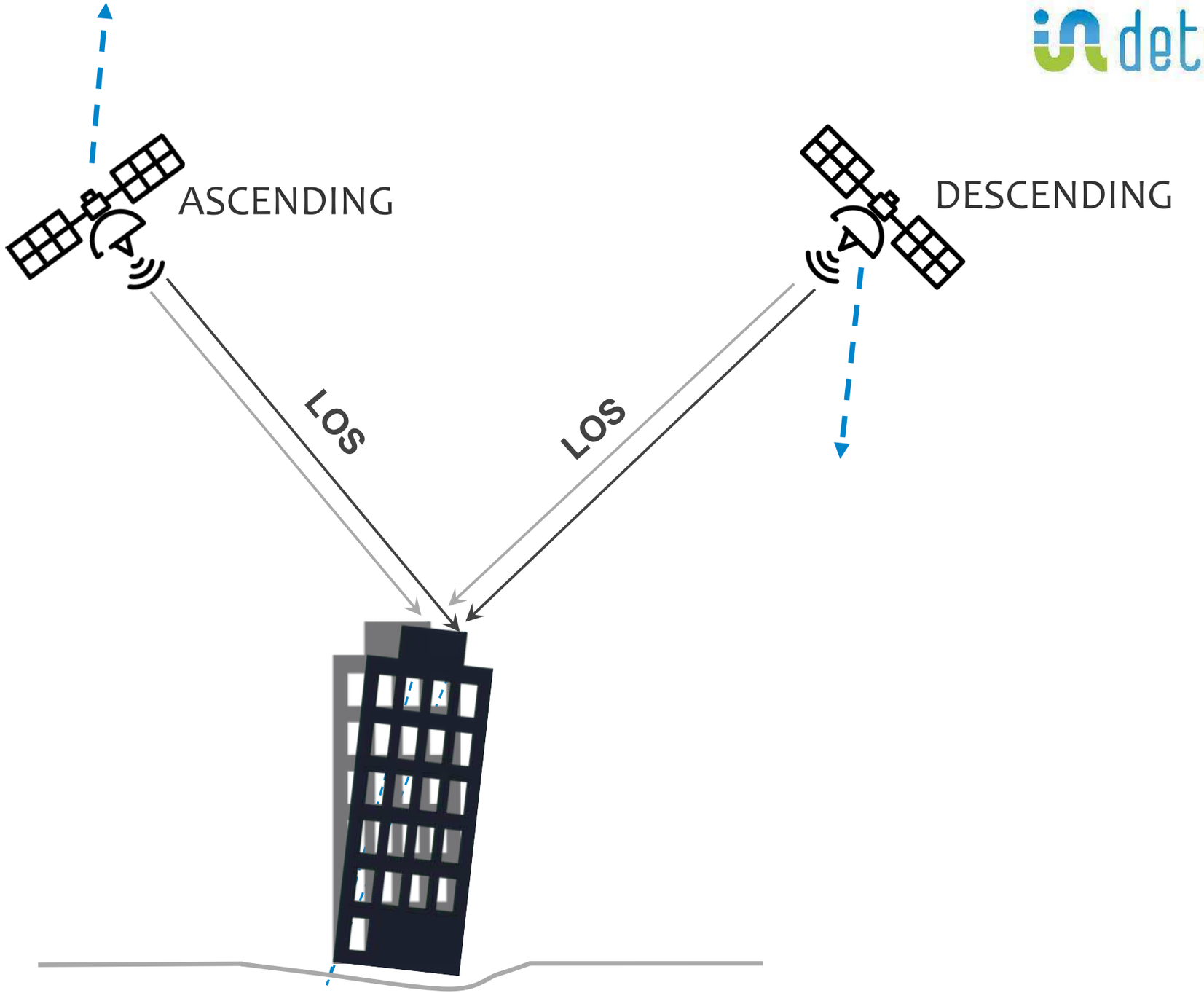
DInSAR measure movements in the direction of *line of sight* (LOS); it is the line conecting the point in surface with the satelite



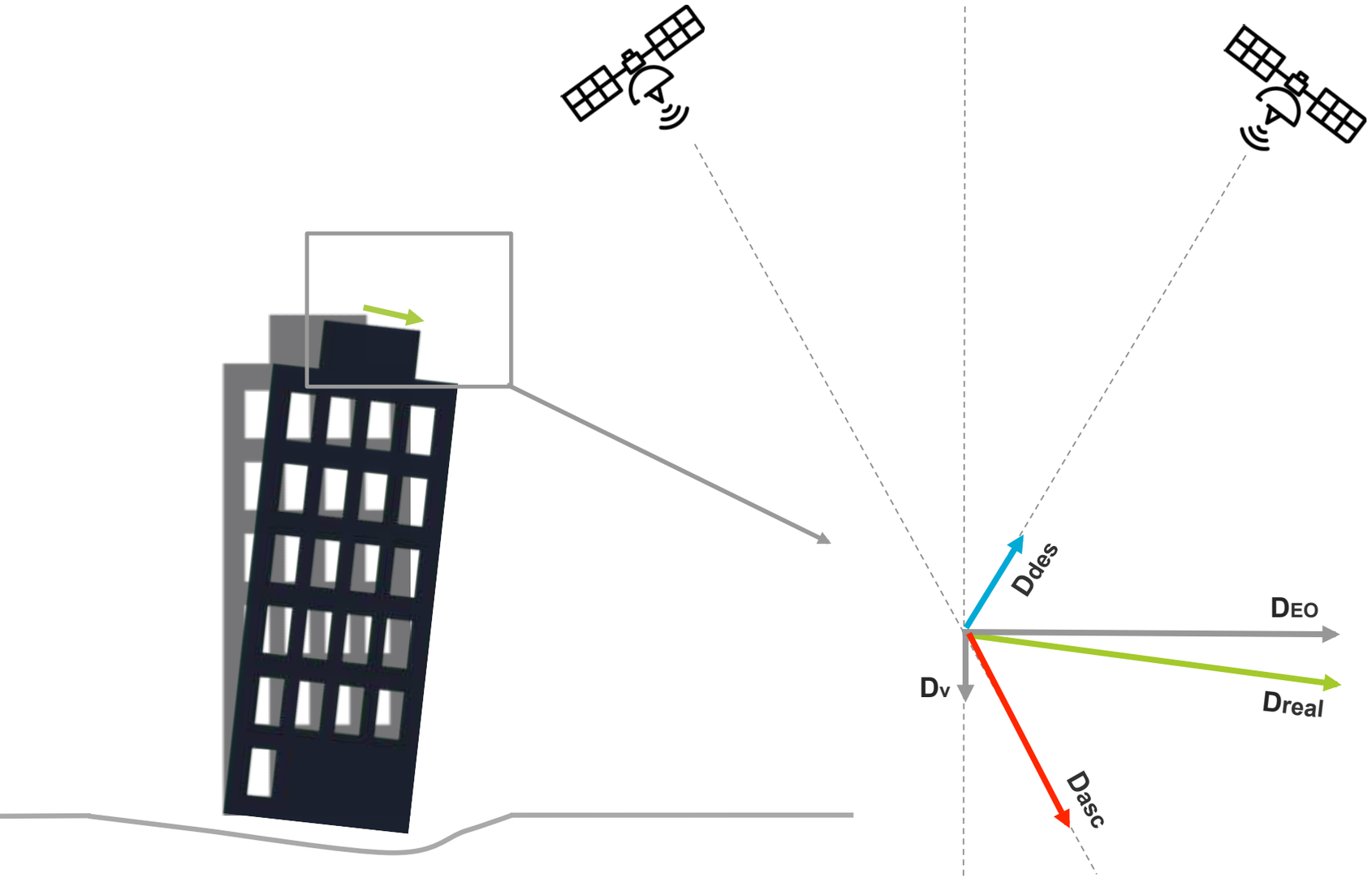


Acquisition geometríes

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



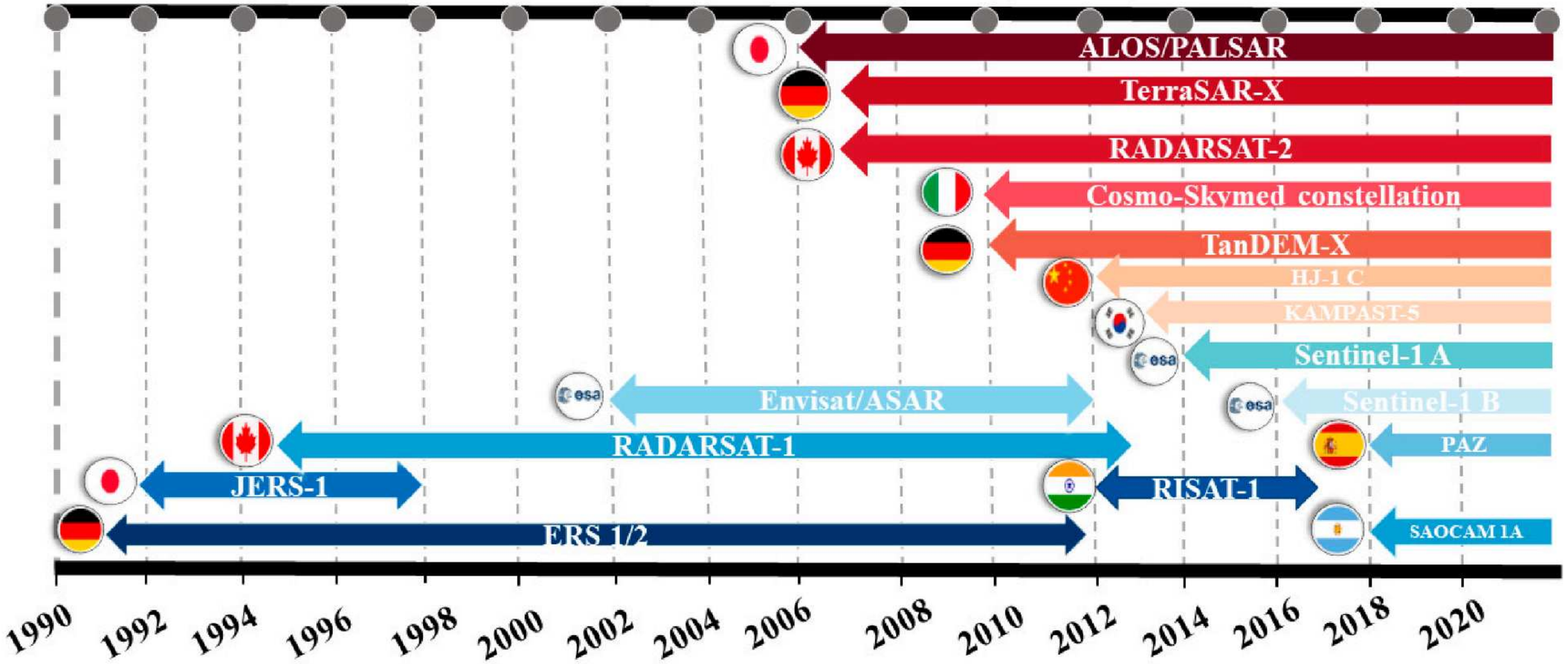
Movement descomposition



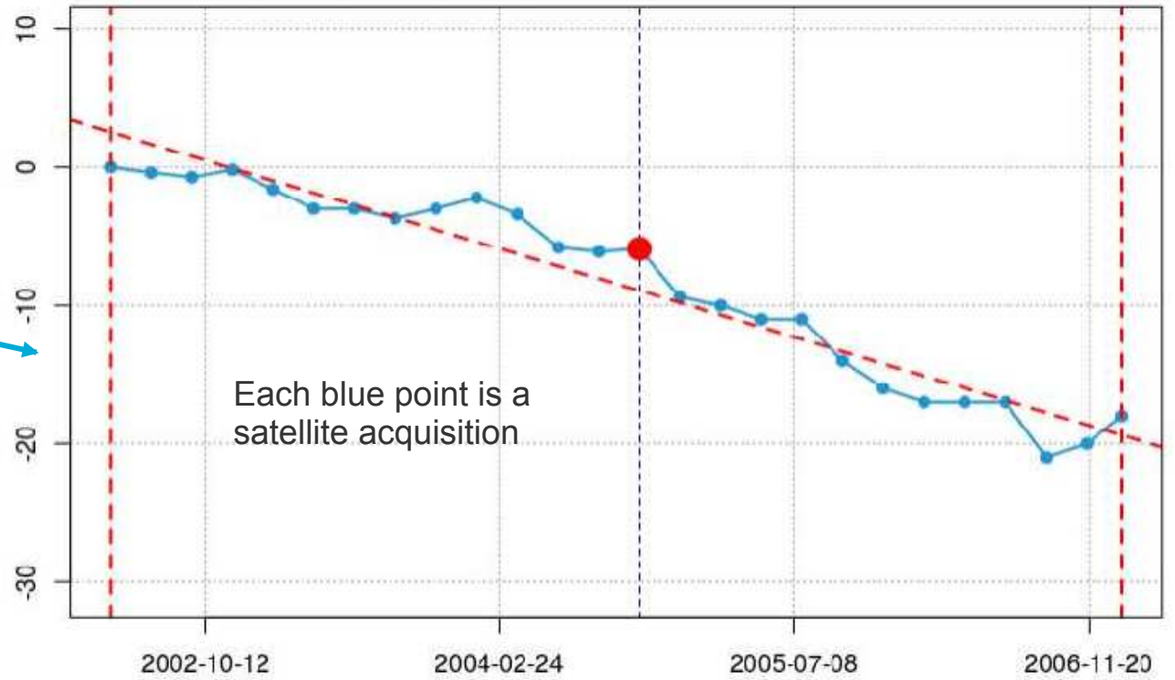
Combination of LOS movements in both vies allows for decomposition of movements in vertical plane (uplift/sunsidence) and East-West plane.

Historical Analysis

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

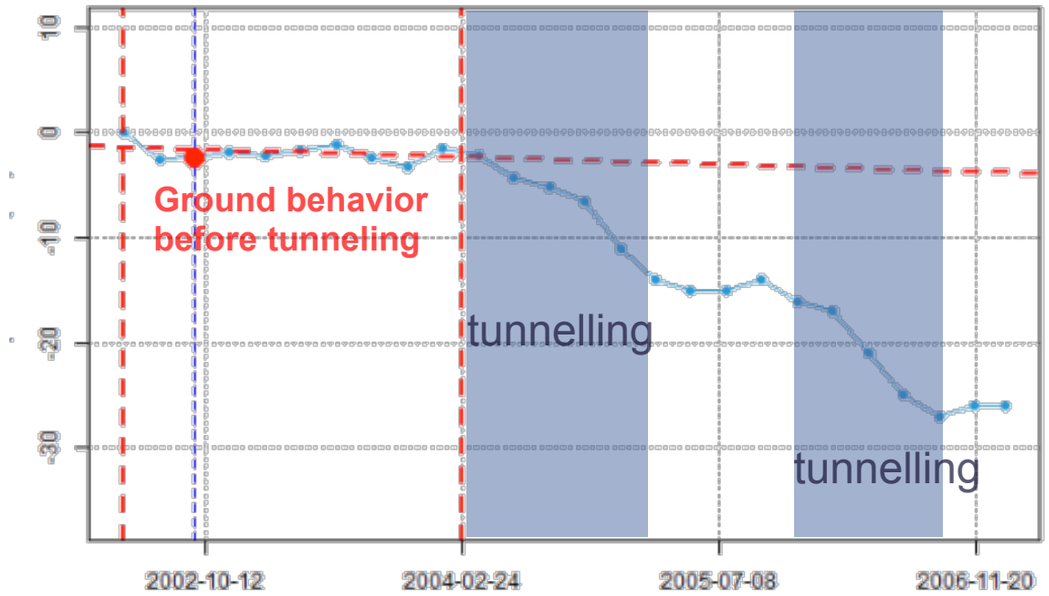


Improving accuracy

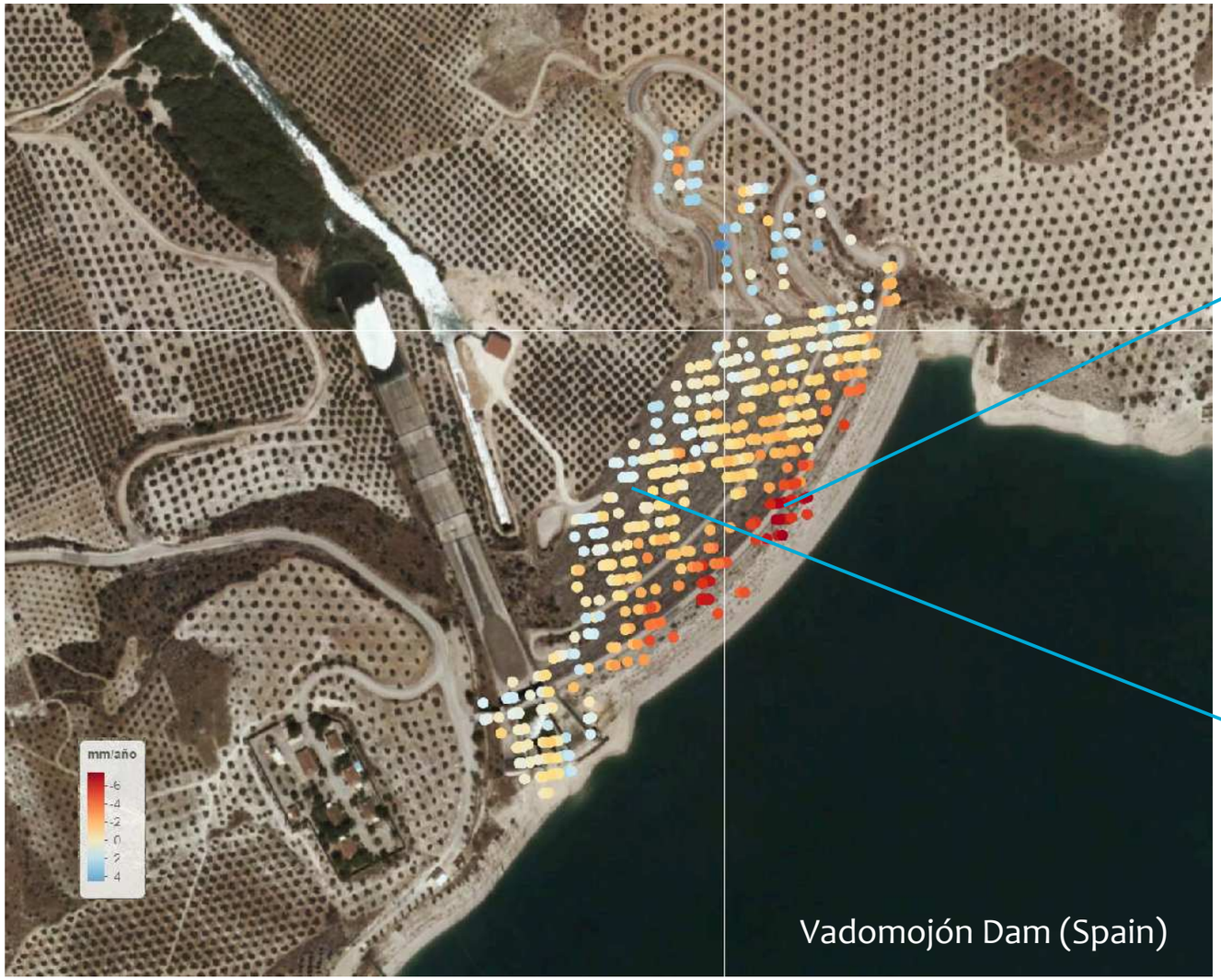


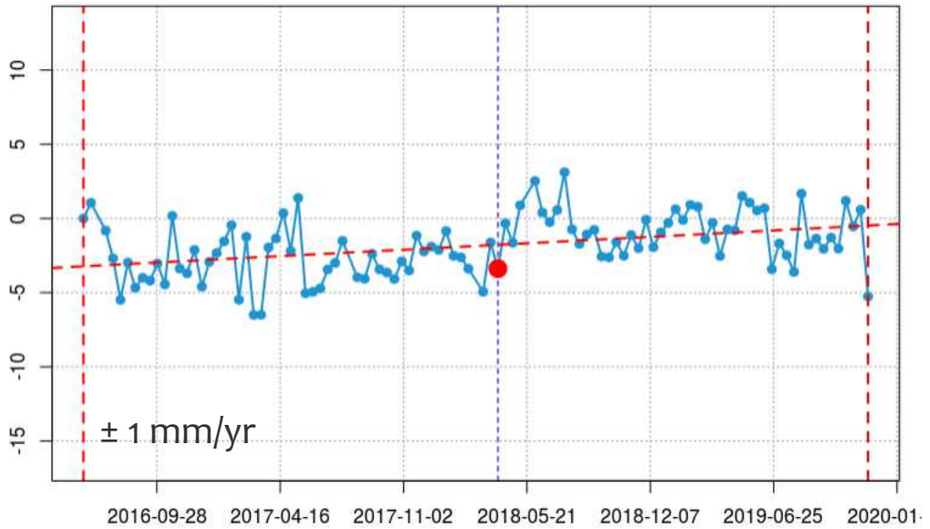
DInSAR works with data series reducing atmospheric signal noise and improving accuracy. (Mínimum: 15-20 images), creating a dense network of points ("virtual *sensors*") in ground & infrastructures. Seasonal changes are well shown within the temporal series.

Example: Tunnelling M30 (Madrid)

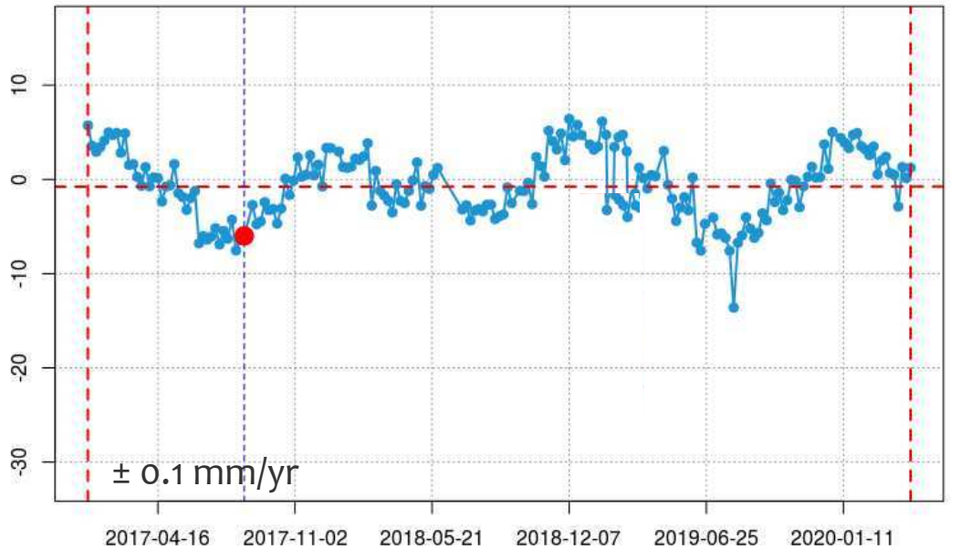


Example: earthfilled dam





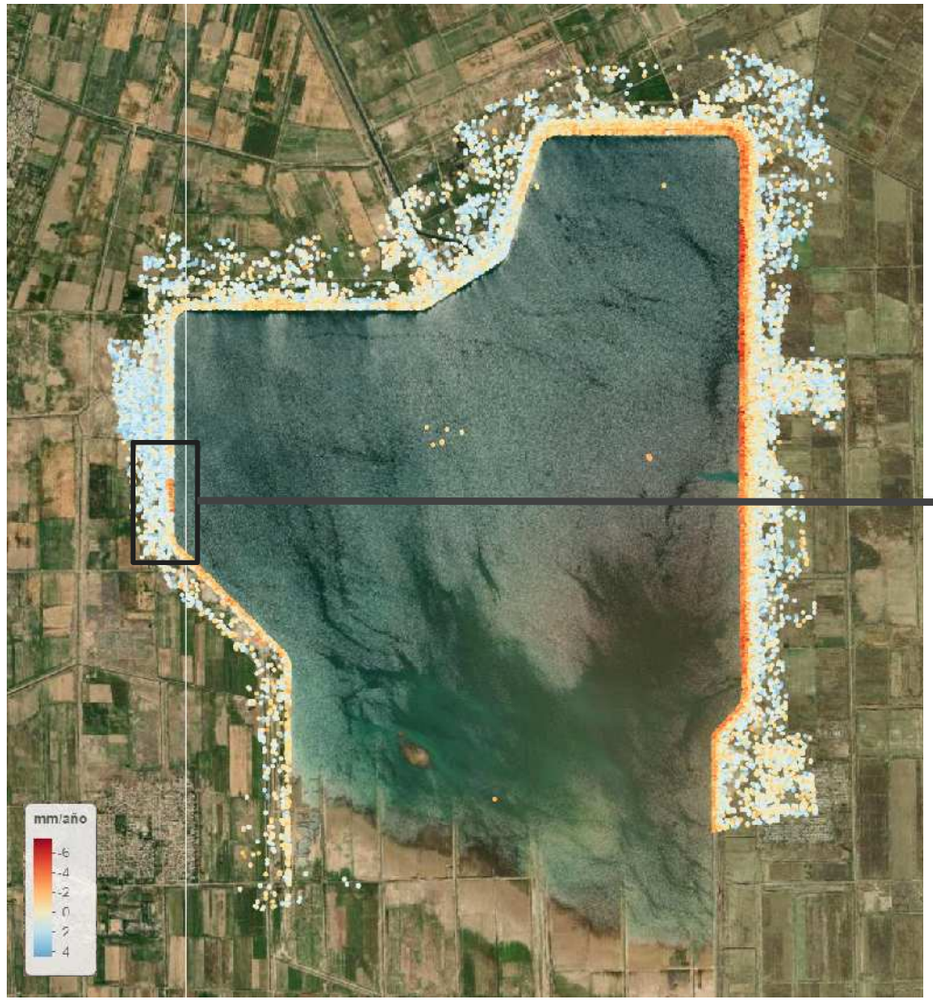
Example: concrete dam

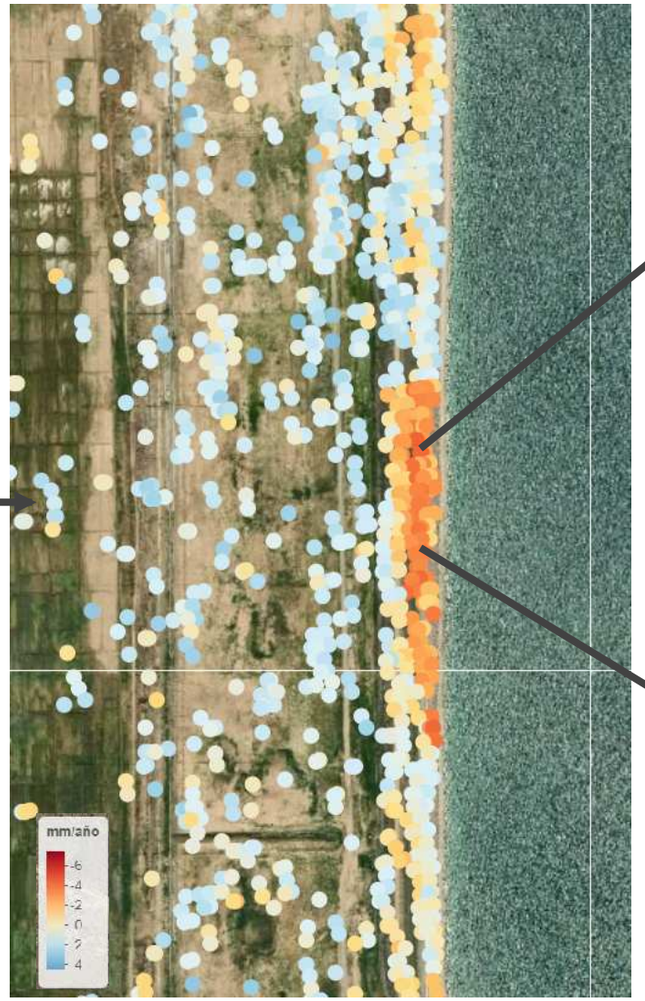


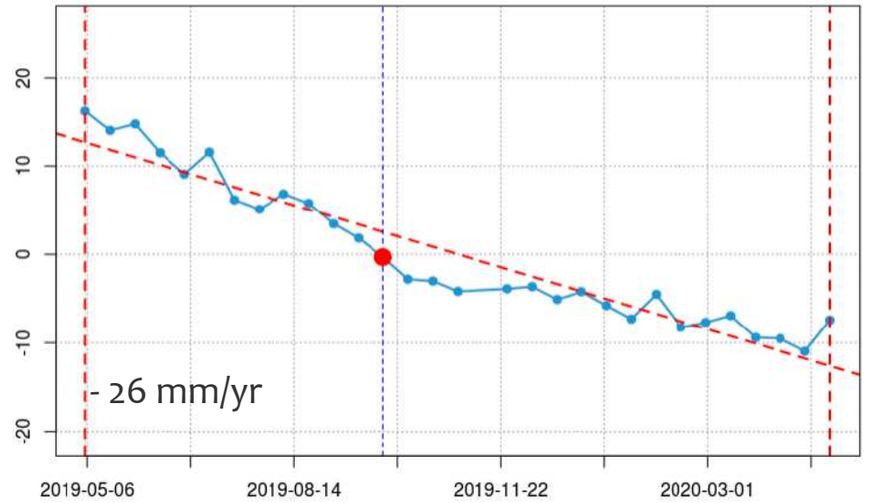
Example: Sardoba dam (Uzbekistan) – Dam failure

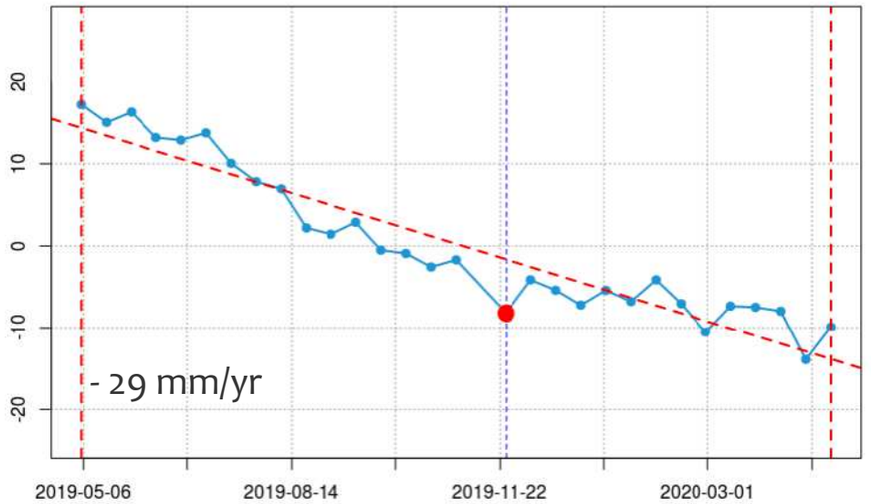
1st May 2020, part of the dam wall collapsed in Sardoba (Uzbekistán), causing enormous floods and 70.000 evacuated people.

Example: Sardoba dam (Uzbekistan) – Dam failure









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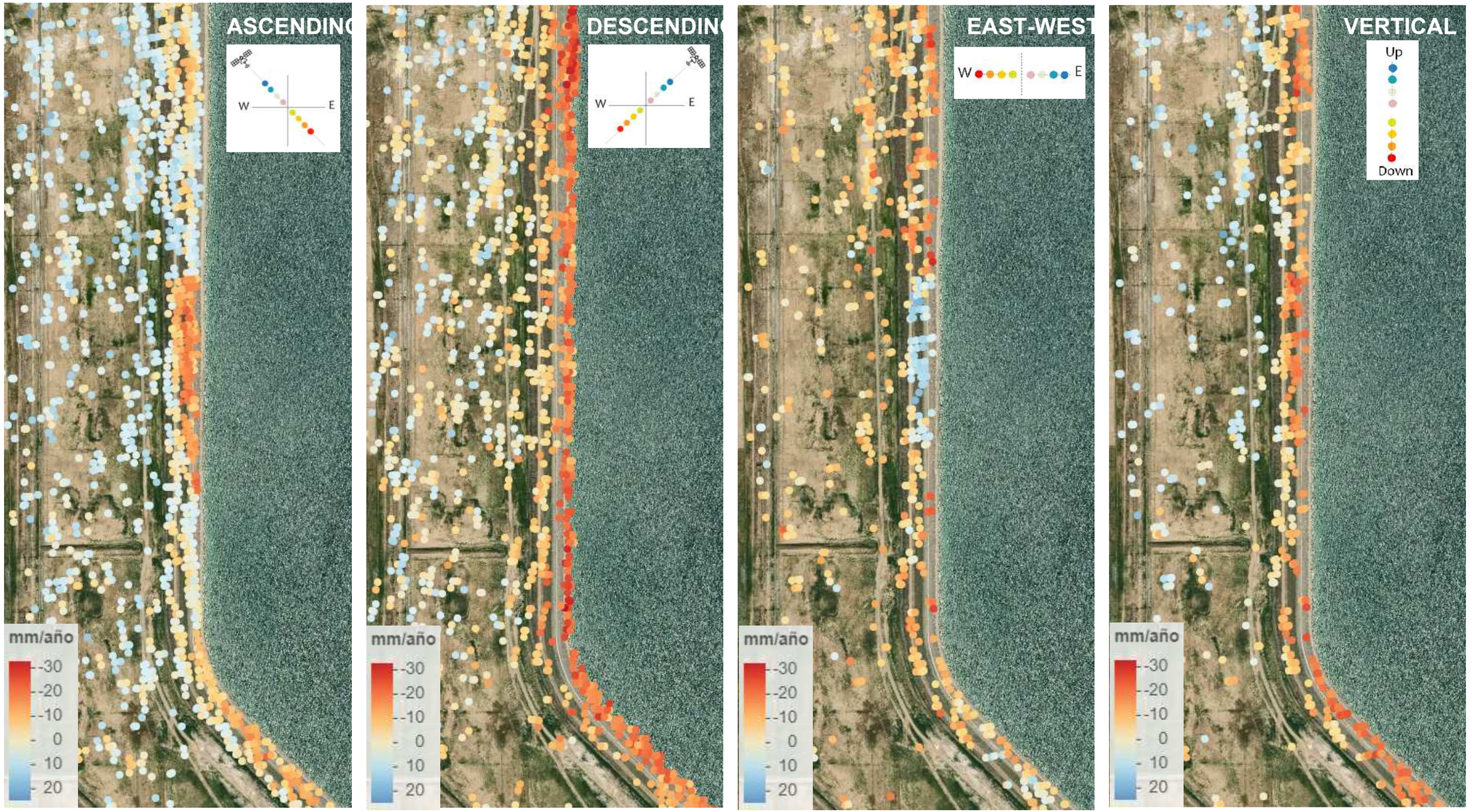
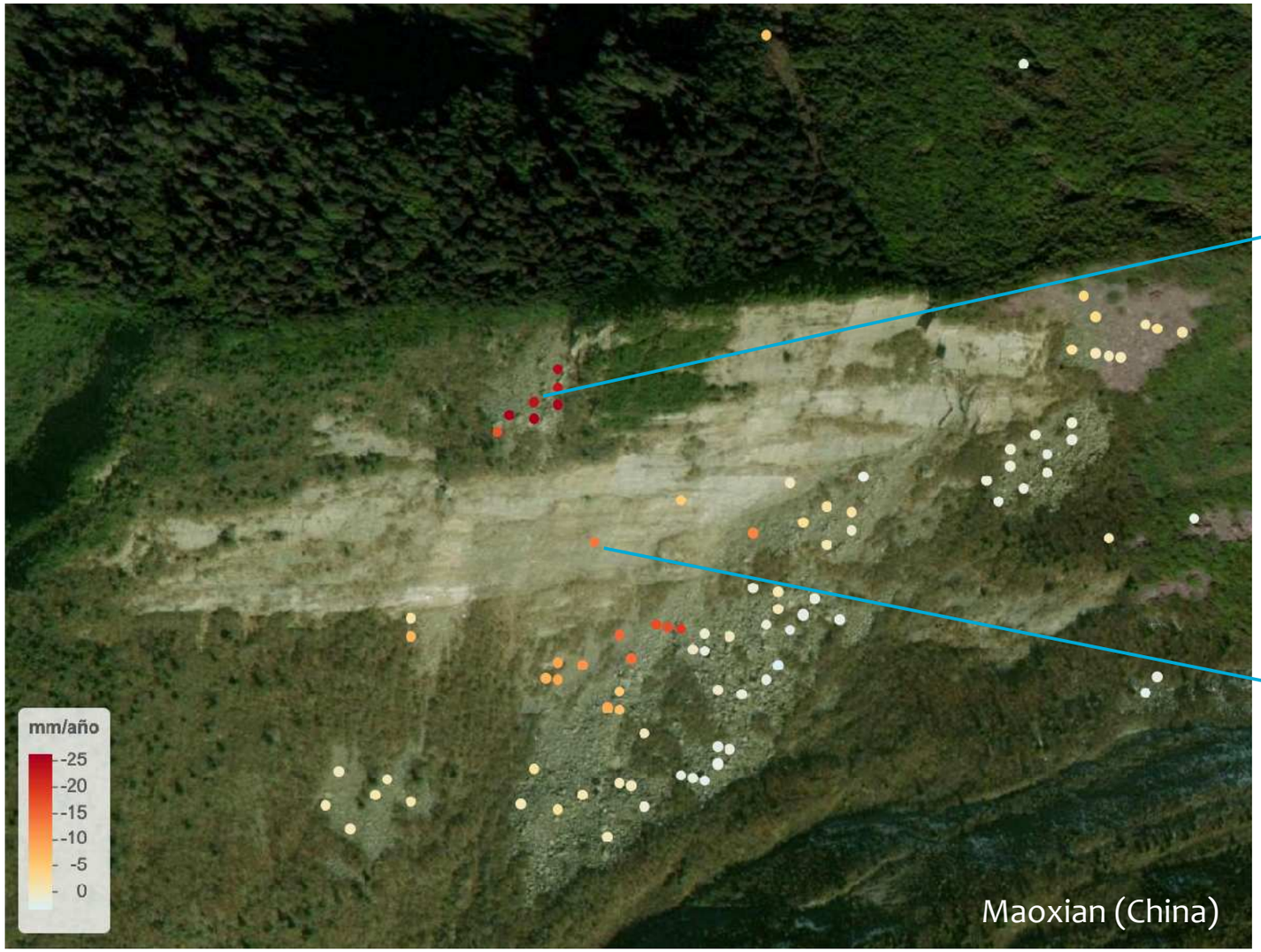
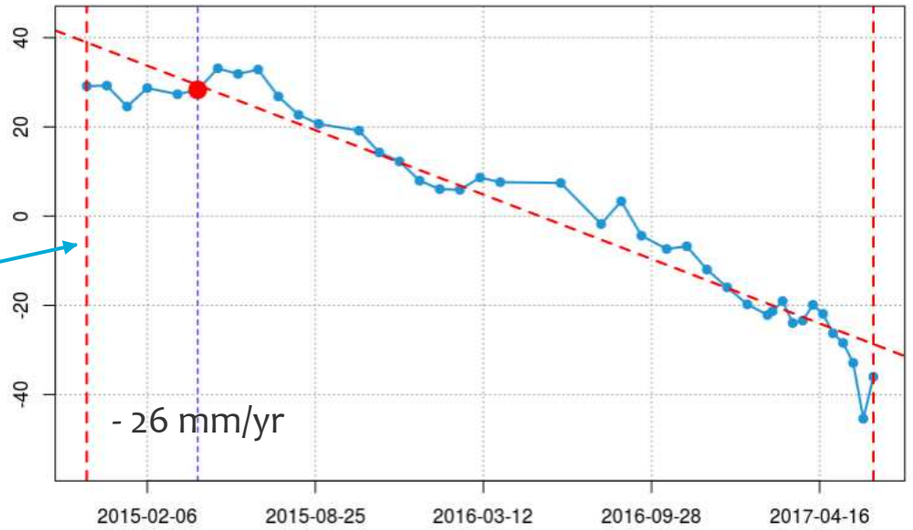
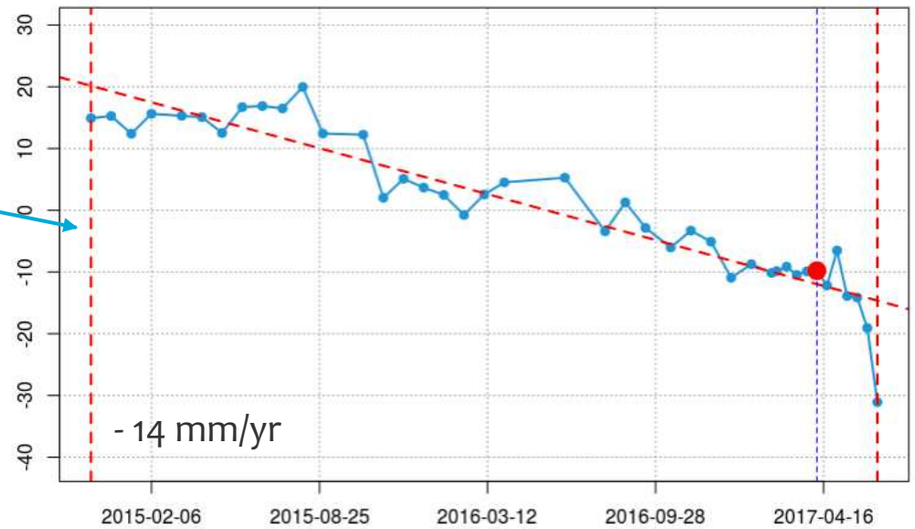


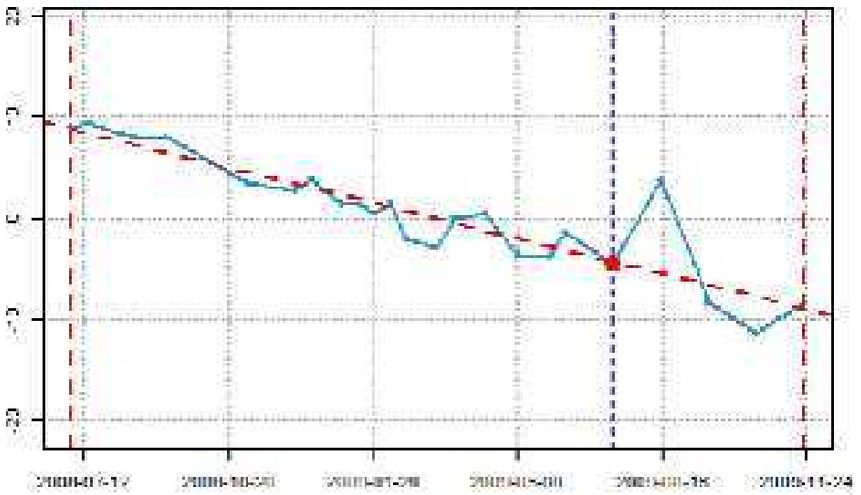
Example: Maoxian - landslide

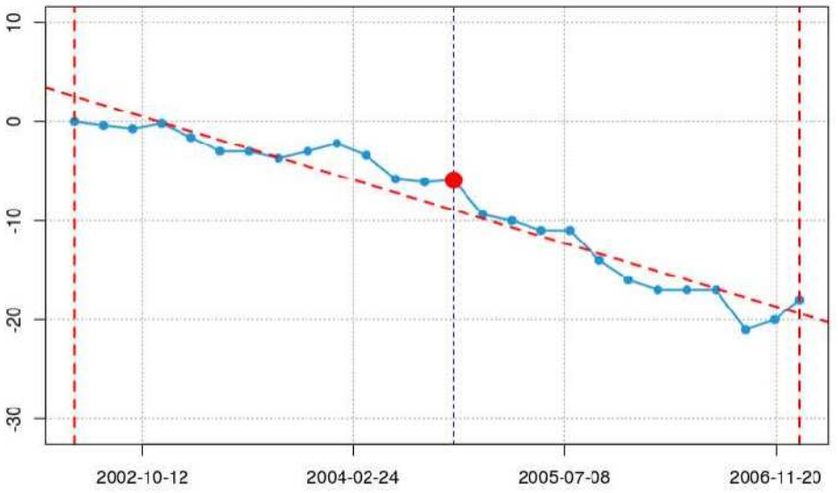




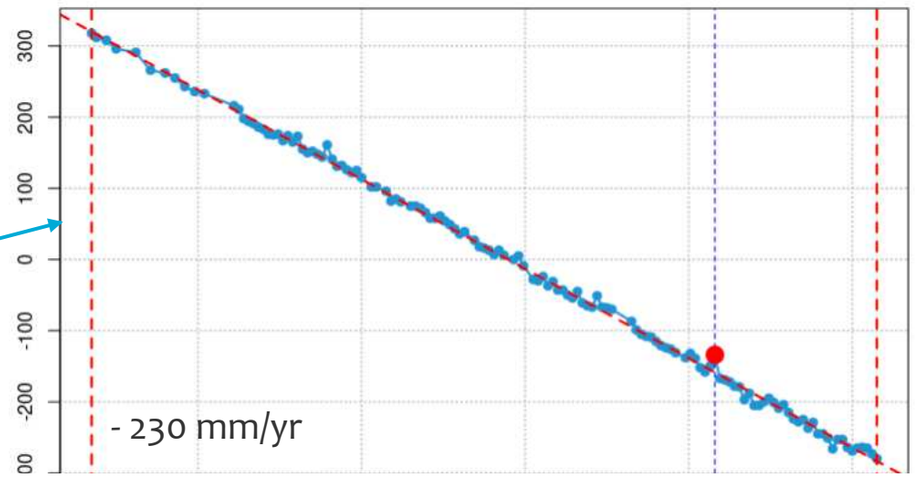


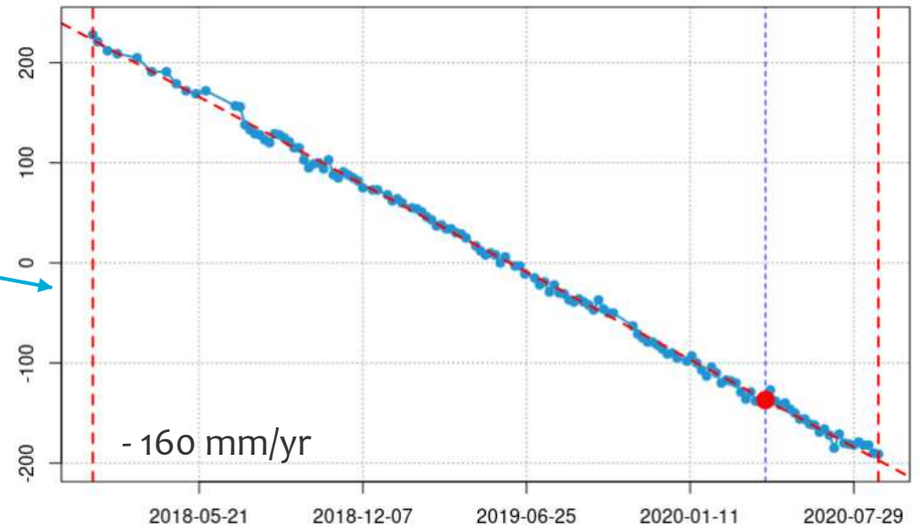
Example: Barcelona Port (TerraSAR-X)





Example: Mexico City – Land subsidence





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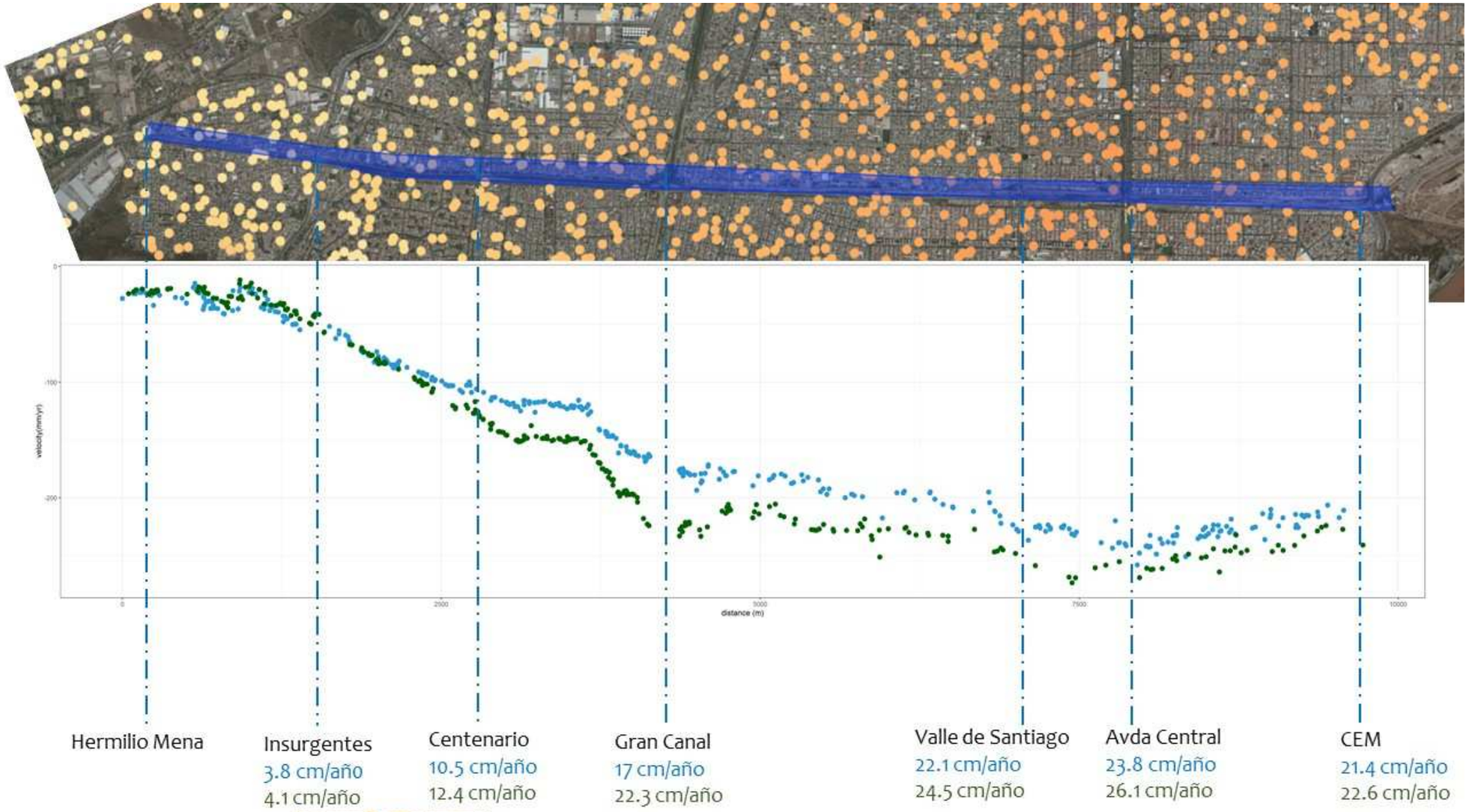
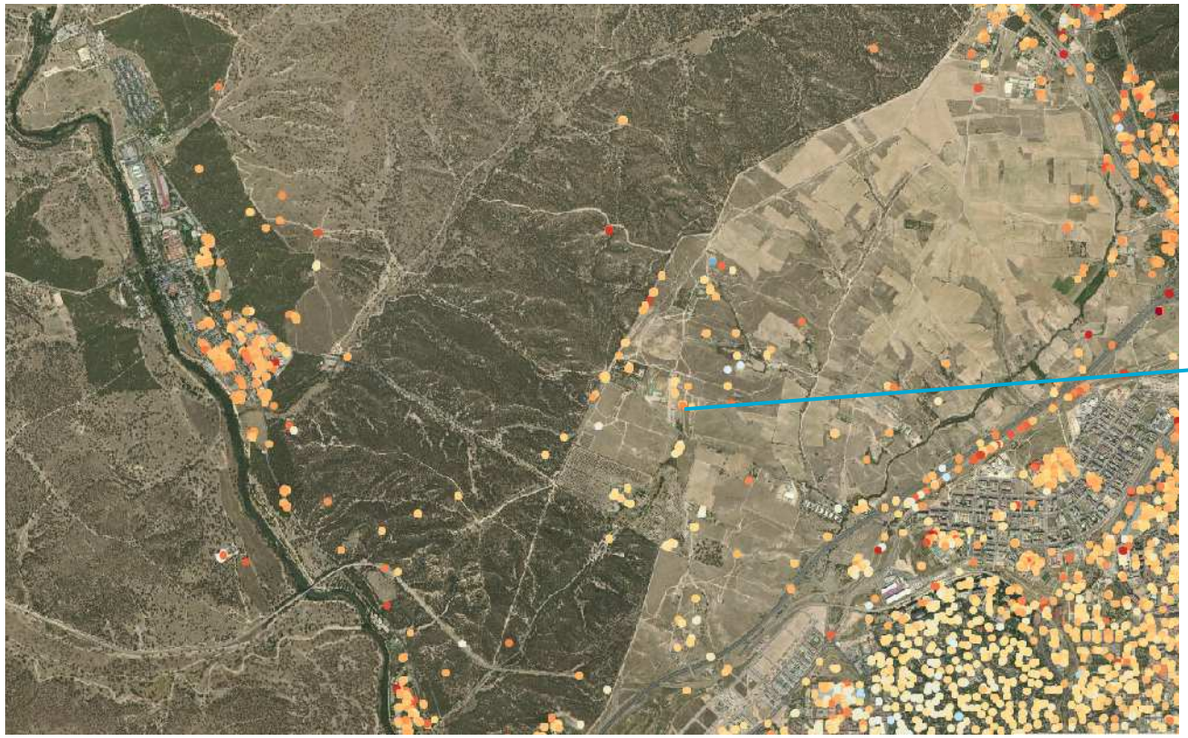
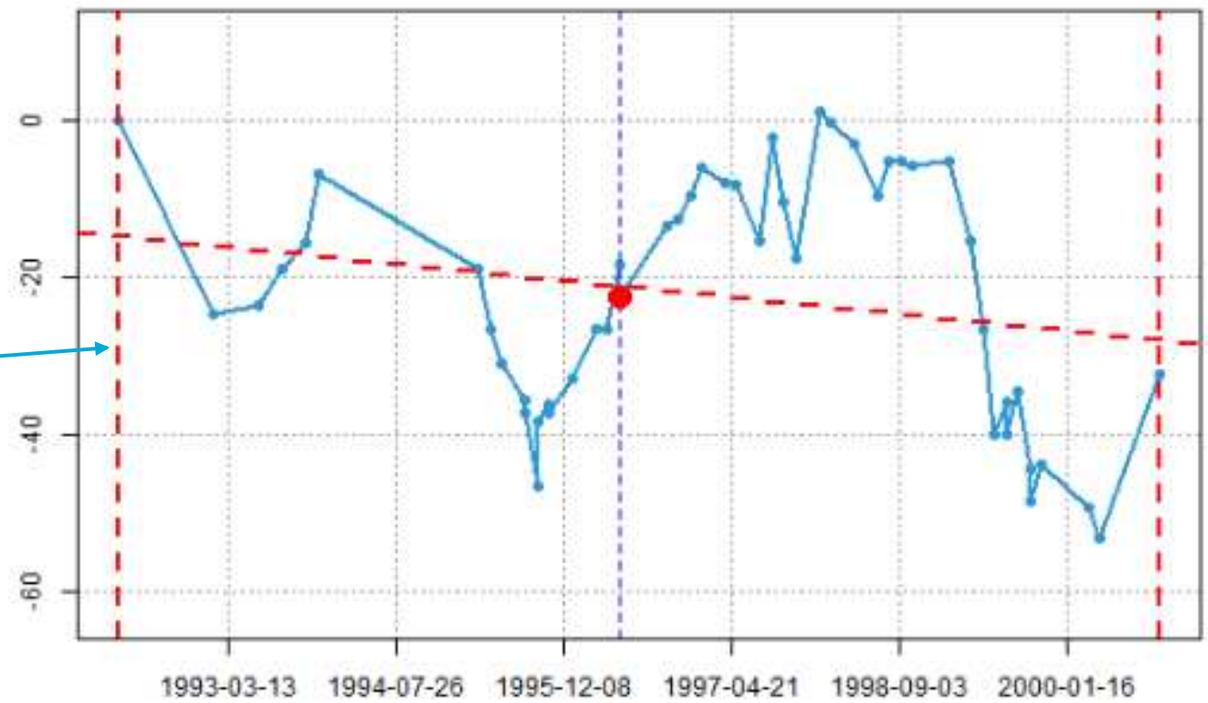


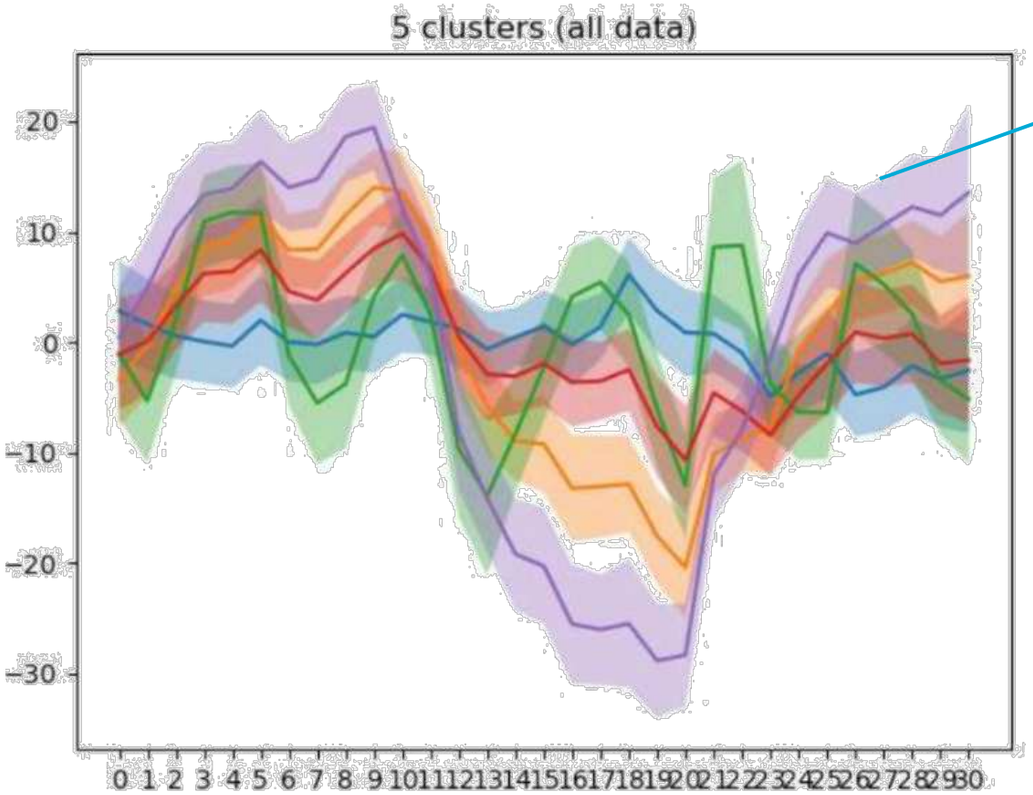
Example: Madrid aquifer

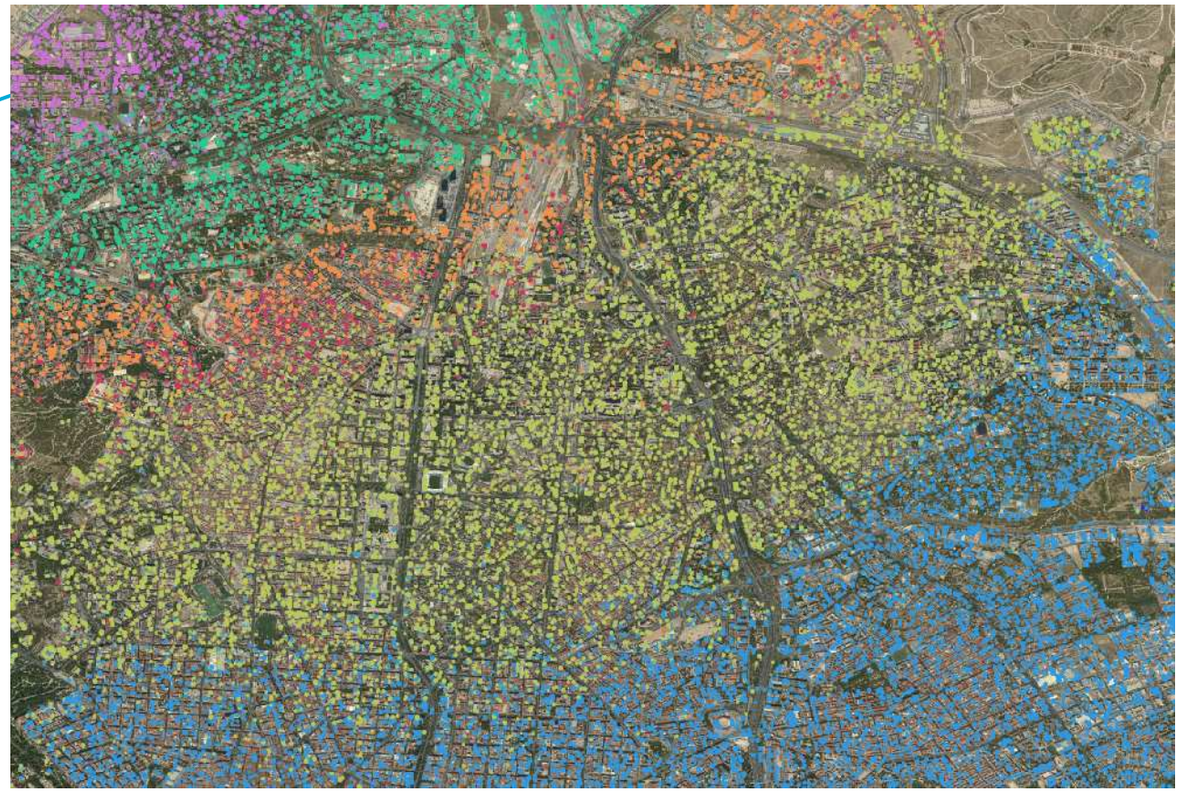
Correlation larger than 85% between piezometric time series and DInSAR displacements. Results show the quasi-elastic behavior of the aquifer, during the recovery of the aquifer the uplift of the ground surface almost recovers from the subsidence experienced during the previous extraction phase.





Example: Madrid extraction wells

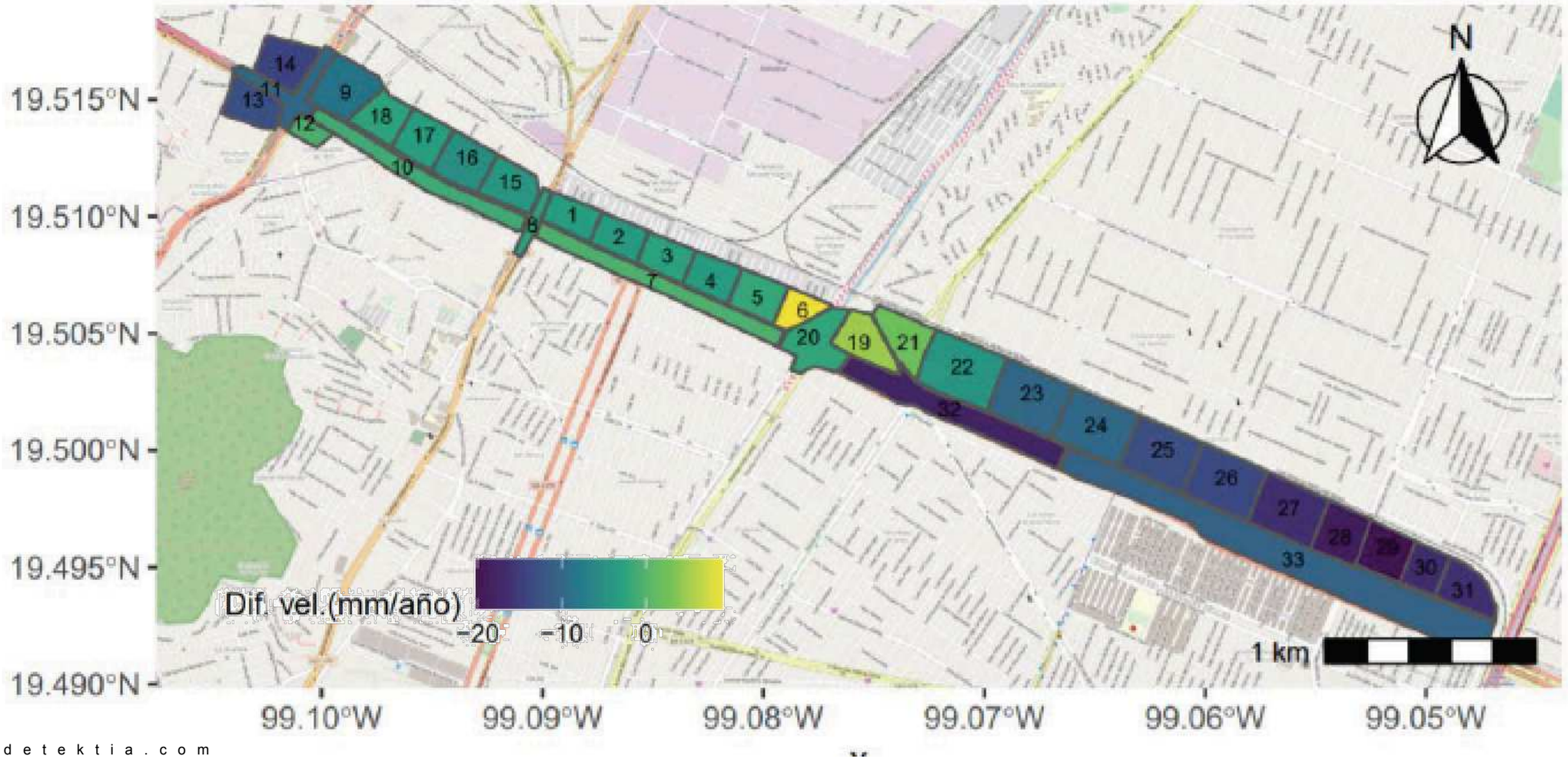




Madrid sits in a detrital aquifer, infrastructures are affected by subsidence and elevation induced by the dynamics of the aquifer. We have applied Artificial Neural Networks to group similar deformation behaviors throughout the metropolitan area of Madrid

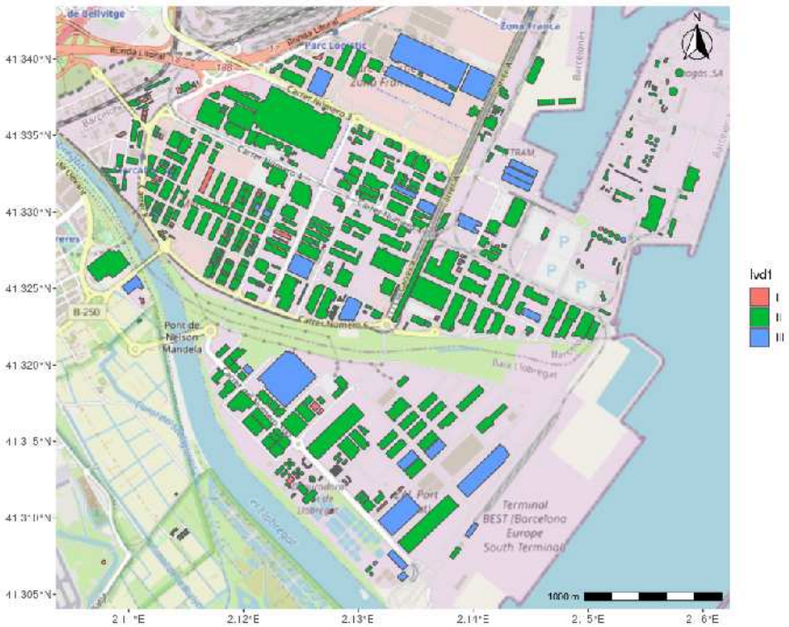
Example: Building health indices

A change in the indices during the work execution period indicates that the underground work has affected nearby buildings



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


Ground & infrastructure
surveillance from space
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