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Global Water Partnership Southeast Asia | 25 YEARS

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WEBINAR SERIES

INNOVATIVE SOLUTIONS FOR SUSTAINABLE DEVELOPMENT

1st Series: Monitoring Ground & Infrastructures Movements from Space

27 May 2021

House Keeping Rules

1. This meeting workshop will be recorded.
2. Please **mute your audio and turn off your video** if not presenting or activate only when asked by the Host
3. Please change your Zoom ID to **Name – Organization (example: Fany – GWP-SEA)**
4. If you encounter problems, submit your questions in the chat box for further assistance

Mentimeter Survey Guidance

1. Please use your cell phone
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4. Enter code: **6848 0419**
5. Please answer survey questions

Mentimeter Survey 1

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3. Type in your browser: **www.menti.com**
4. Enter code: **6848 0419**
5. Please answer survey questions

Agenda

Time	Activities	PIC	Remarks
14:55 – 15:00	Admission of participants	Knowledge Management & Communication Officer (KMCO) GWP-SEA	
15:00 – 15:05	Welcoming remarks	Regional Coordinator GWP-SEA	
15:05 – 15:15	Housekeeping rules & Mentimeter survey 1	Regional Coordinator GWP-SEA	Mentimeter result shared by KMCO
15:15 – 15:17	Agenda	Regional Coordinator GWP-SEA	
15:17 – 15:25	Opening Remarks	Chairman of GWP-SEA	
15:25 – 15:55	Innovative Solutions for Sustainable Development: #1 Monitoring Ground & Infrastructure Movements from Space	Moderator: Regional Coordinator GWP-SEA Resource person: Candela Sancho - DETEKTIA	
15:55 – 16:30	Q & A	Moderator: Regional Coordinator GWP-SEA Resource person: Candela Sancho - DETEKTIA	Participants can submit question via chat box.
15:55 – 16:35	Mentimeter survey 2	Regional Coordinator GWP-SEA	Mentimeter result shared by KMCO
16:35 – 16:40	Wrap up & Closing	Regional Coordinator GWP-SEA	

Opening Remarks

Dr. Inthavy Akkharath

- Chairman of GWP Southeast Asia
- Director General of Water Resources Department, Ministry of Natural Resources and Environment (MONRE), Lao-PDR
- Chairman of ASEAN Water Resources Management Working Group

Candela Sancho, MSc

CEO & Co-founder of Detektia

Short bio:

- After 18 years between Madrid, Barcelona, Toronto and Amsterdam, Candela decided to launch Detektia, a technology-based company with global projection, from a small village in Spain in November 2019.
- Detektia applies DINSAR technique to problems of stability and maintenance of ground and infrastructures.
- Candela has a geophysicist background with expertise in subsidence analysis and aimed to revolutionize the control and maintenance of large engineering works contributing to create safer, more efficient and durable infrastructures.


Ground & infrastructure
monitoring from space
BY
detektia

About us

esa business incubation centre Madrid Region

fundación para el conocimiento madrid

Comunidad de Madrid

POLITÉCNICA

Global Infrastructure Hub

InfraChallenge 2021
TOP 20 team

- **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** 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**

STARTUP³

eit Climate-KIC

PARSEC ACCELERATOR

European Space Agency
The TOP 10 Finalists

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:

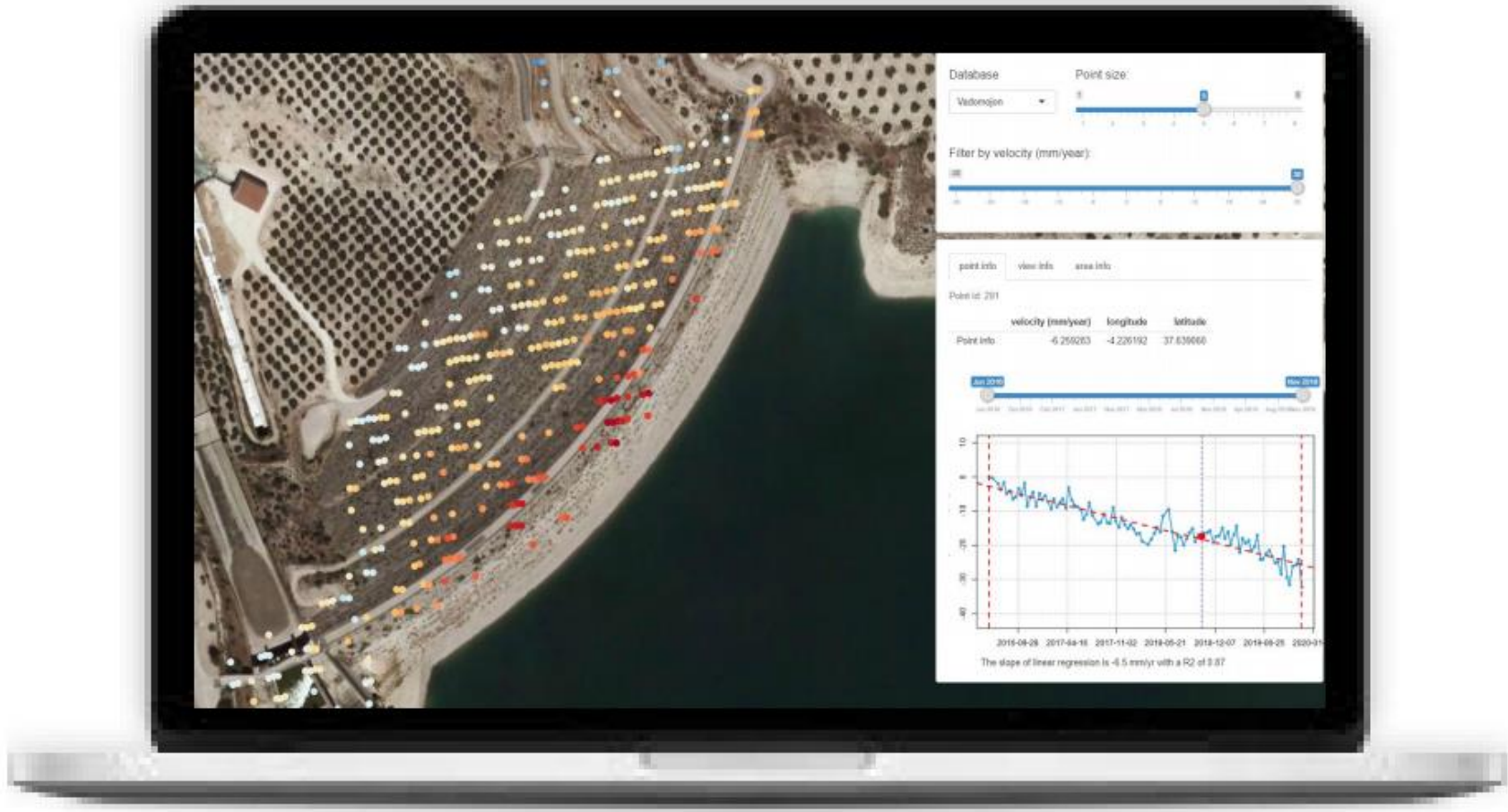
Software developer, hiring Q2- 2021

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.

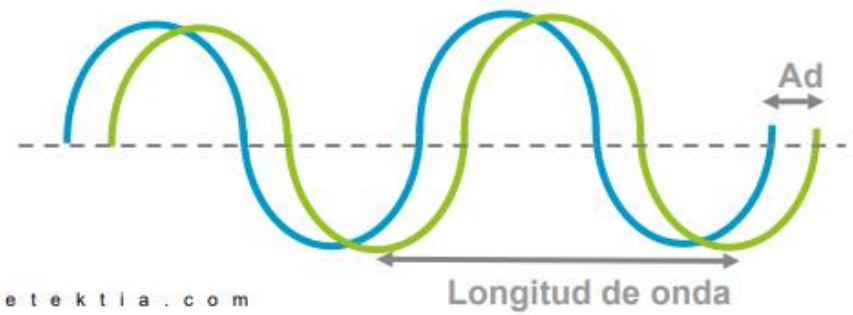


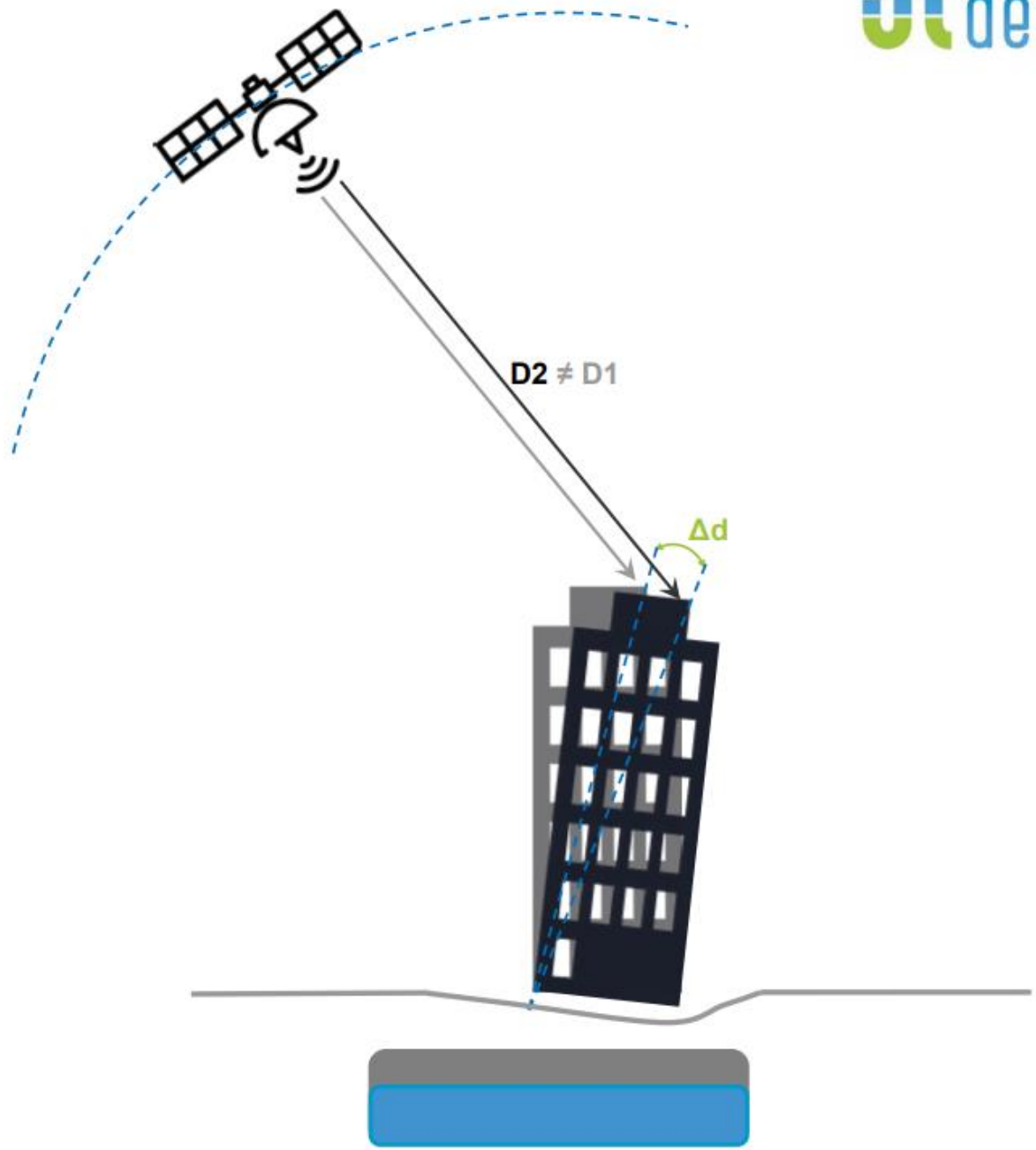
EyeRADAR

What is DInSAR?

DInSAR means Differential Interferometric Syntetic Aperture RADAR:

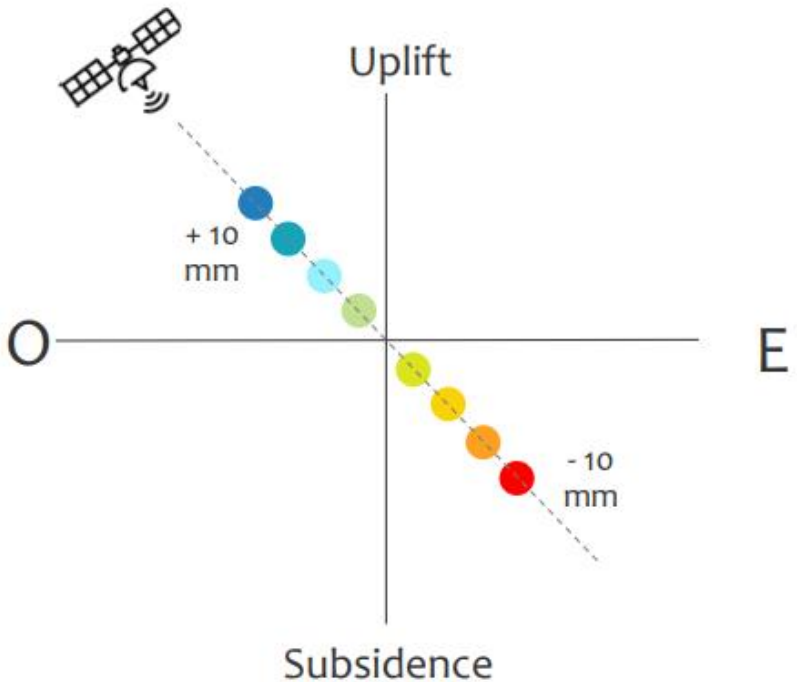
- SAR is an active sensor
- Not affected by clouds
- Works in microwave spectrum
- Measures the phase differences of two waves emitted at different

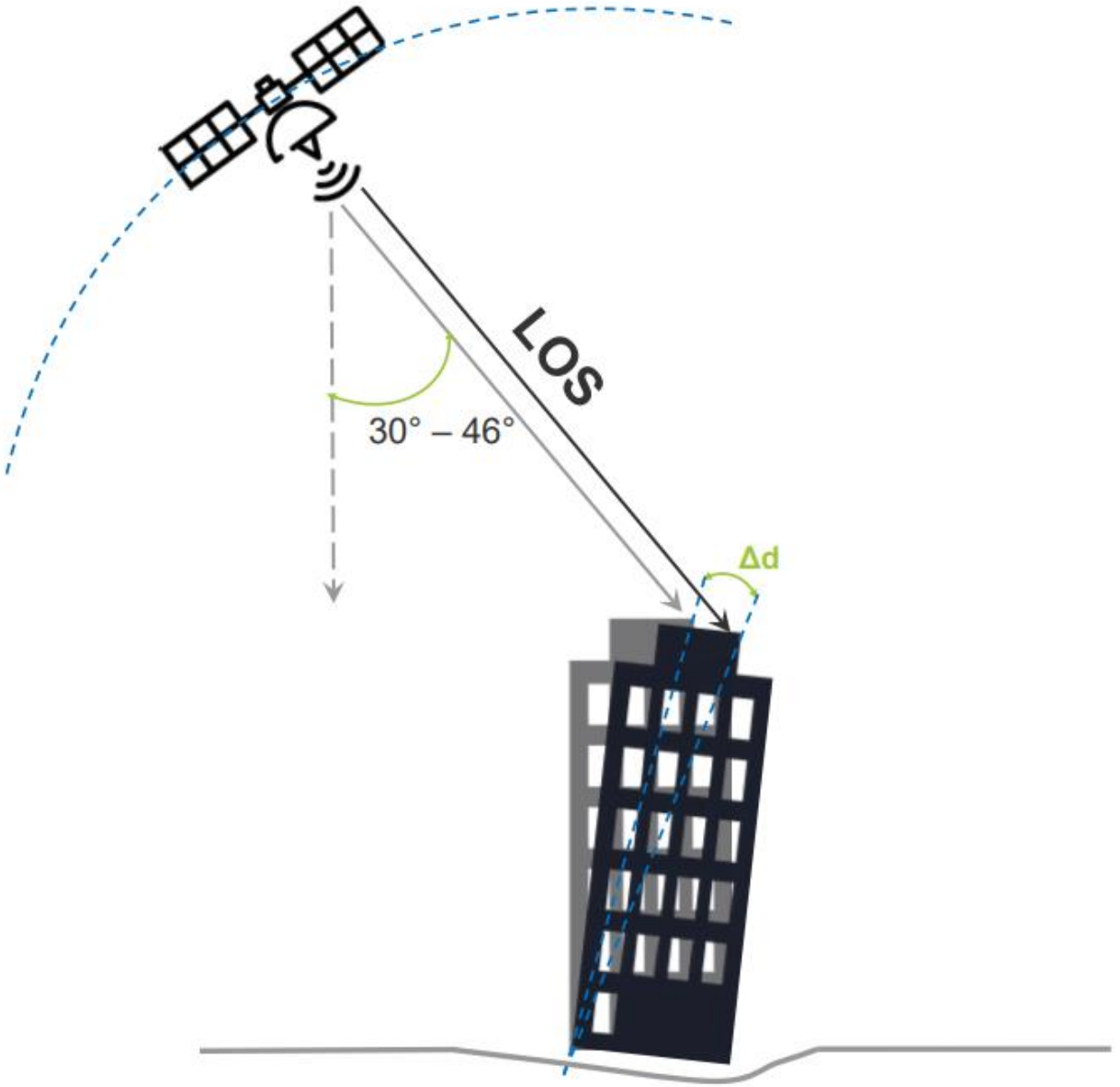




In which direction do we measure movements?

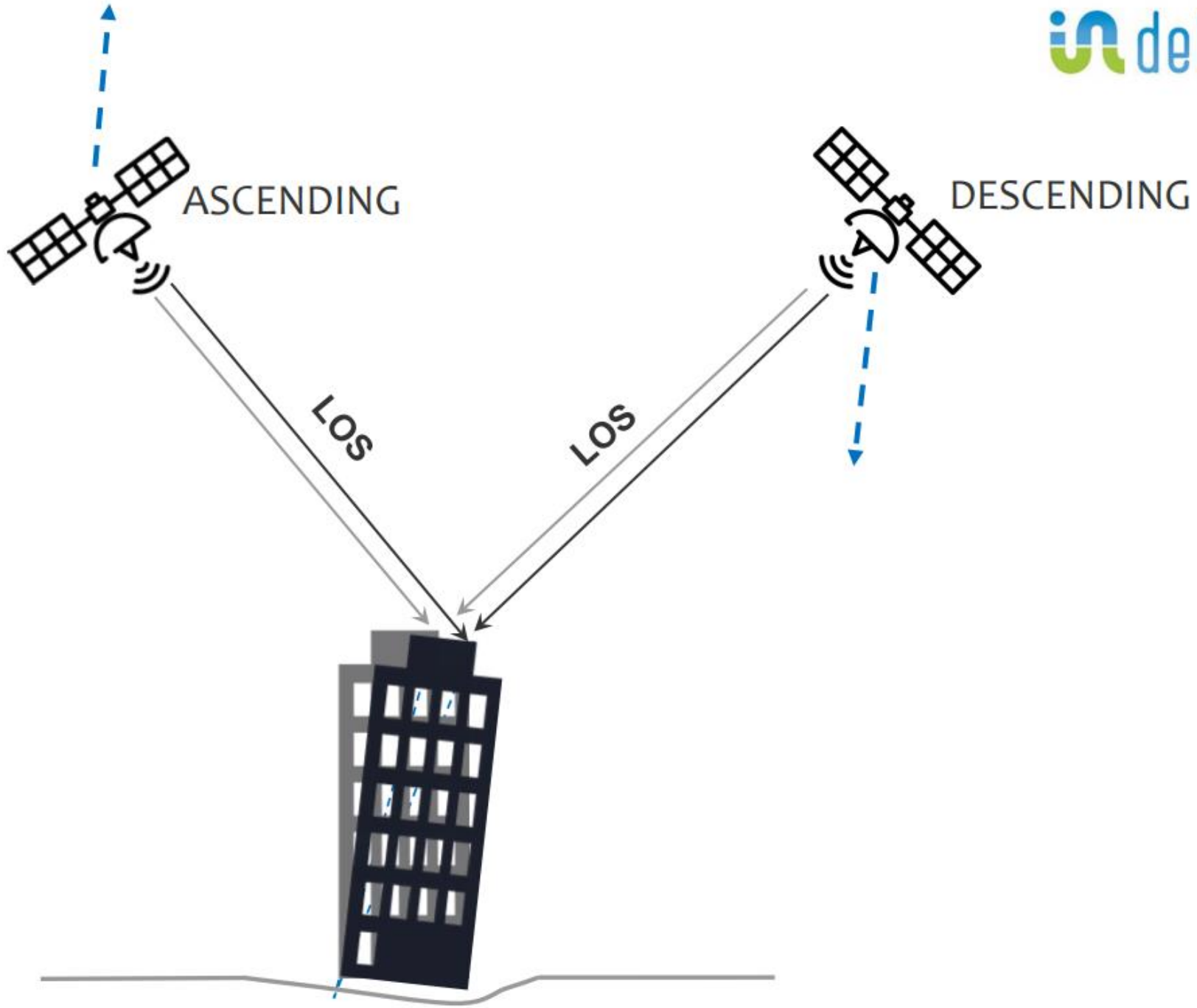
DInSAR measure movements in the direction of *line of sight* (LOS); it is the line conecting the point in surface with the satelite



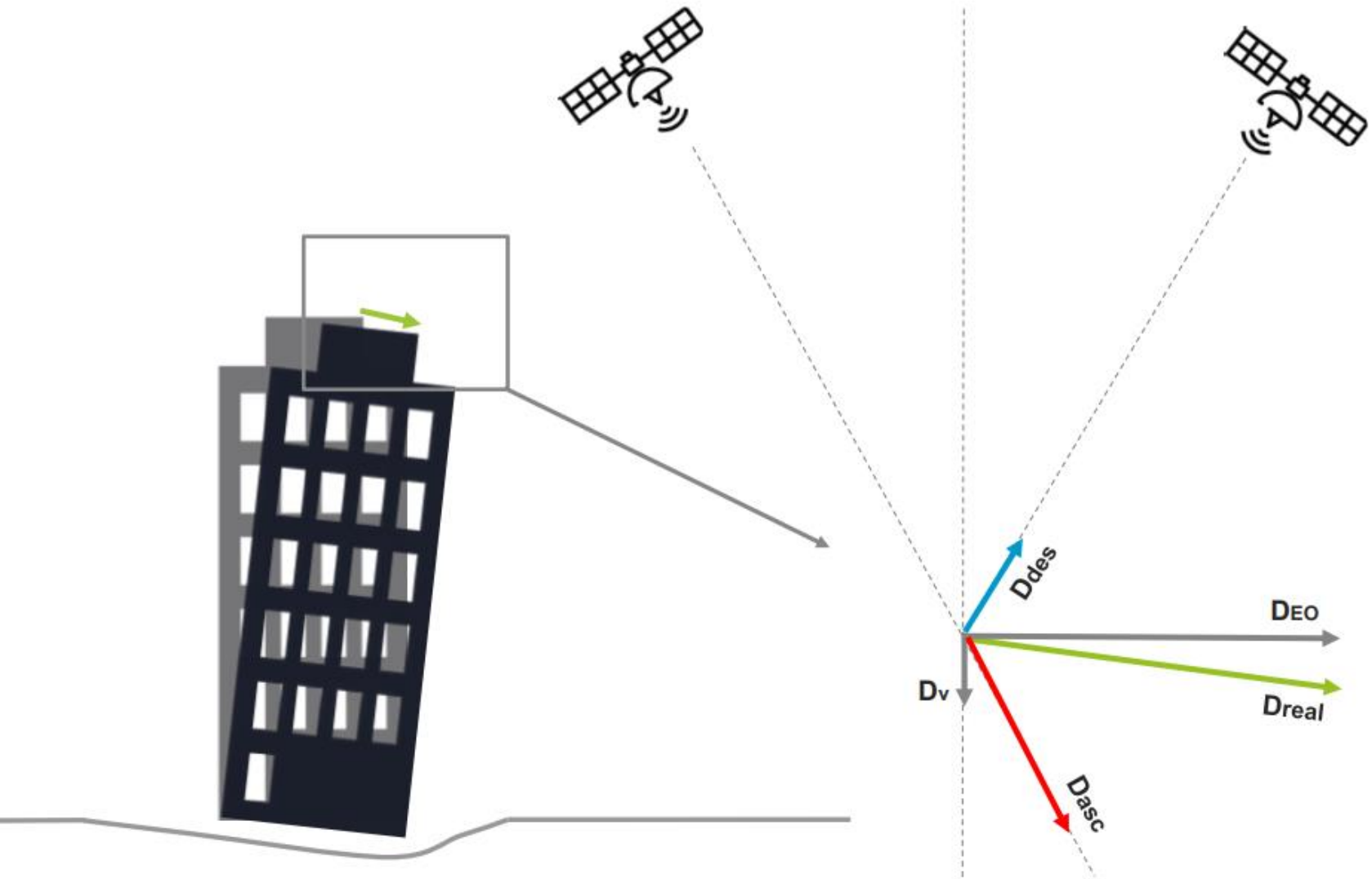


Acquisition geometríes

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



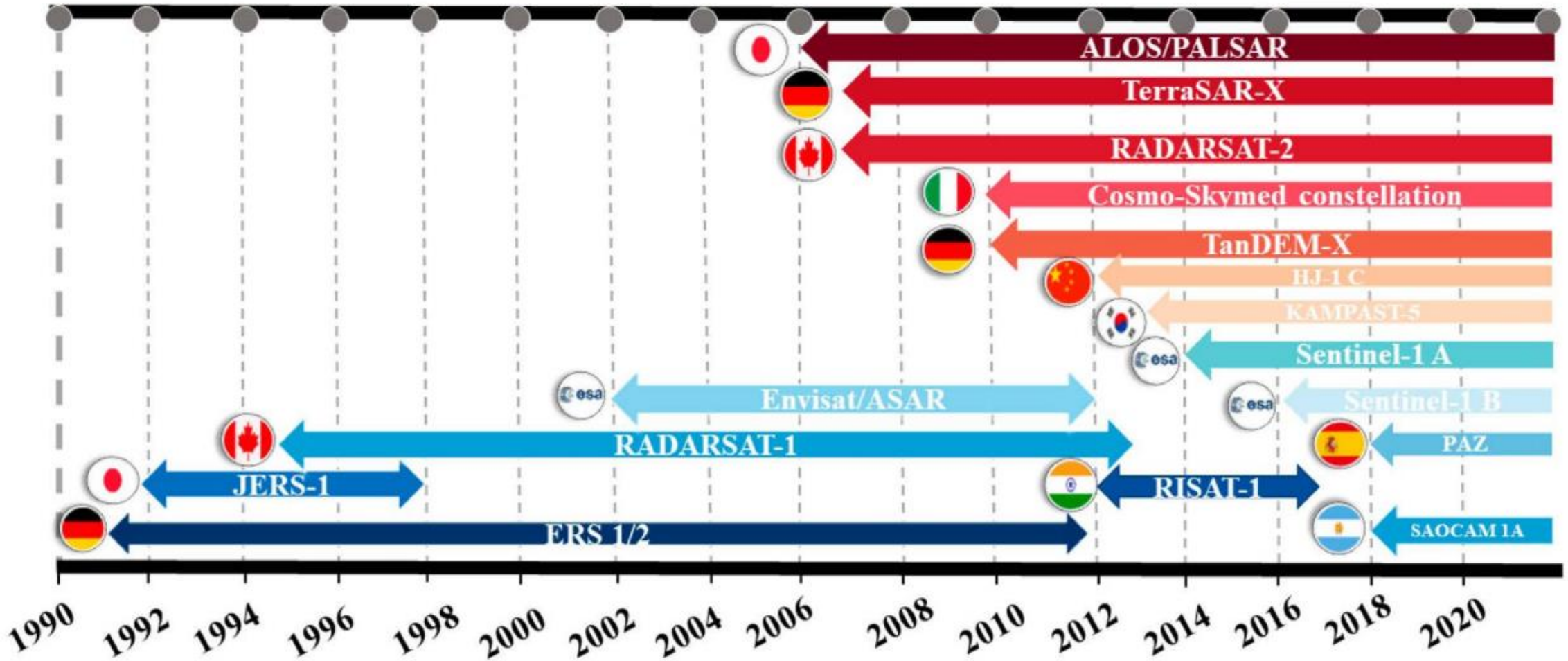
Movement descomposition



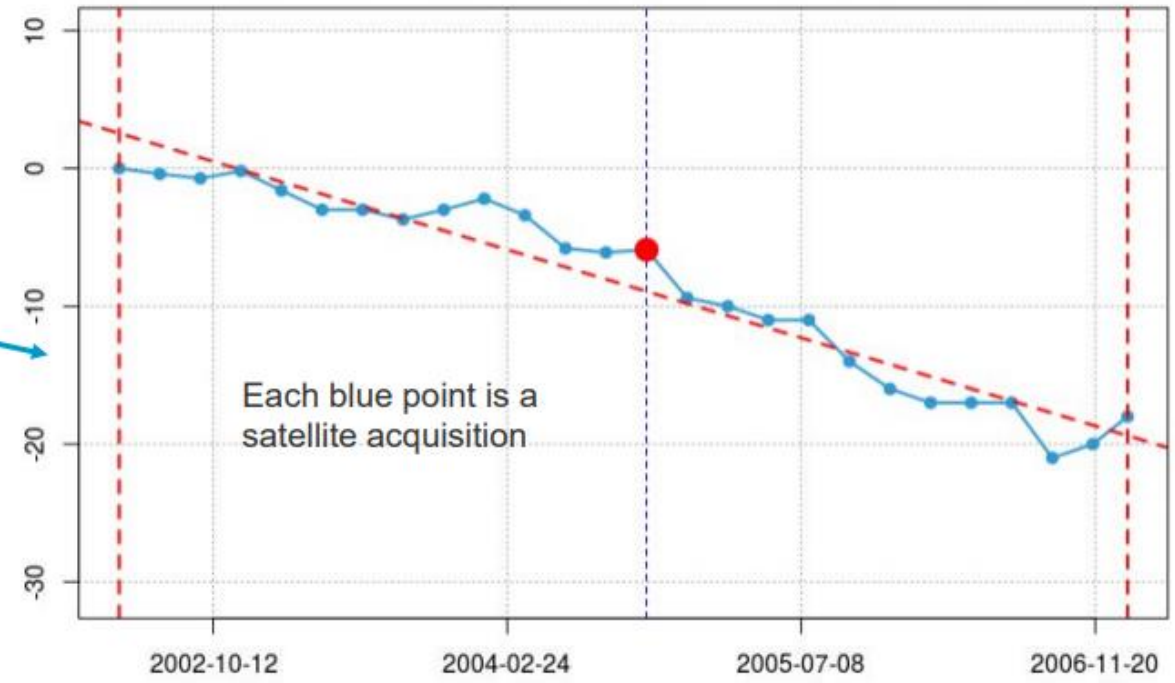
Combination of LOS movements in both vies allows for decomposition of movements in vertical plane (uplift/sunsidence) and East-West plane.

Historical Analysis

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

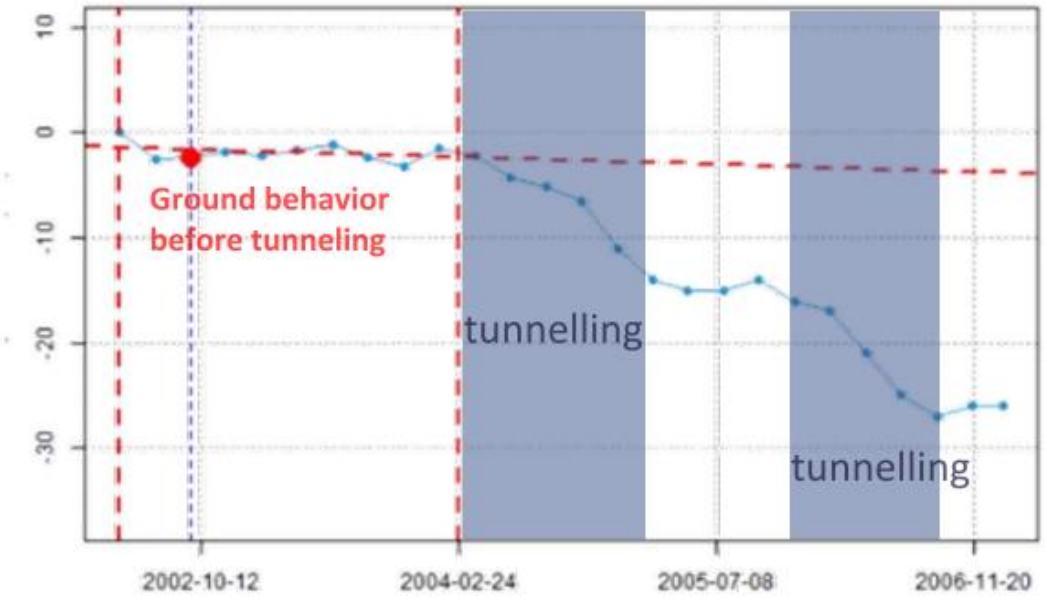


Improving accuracy

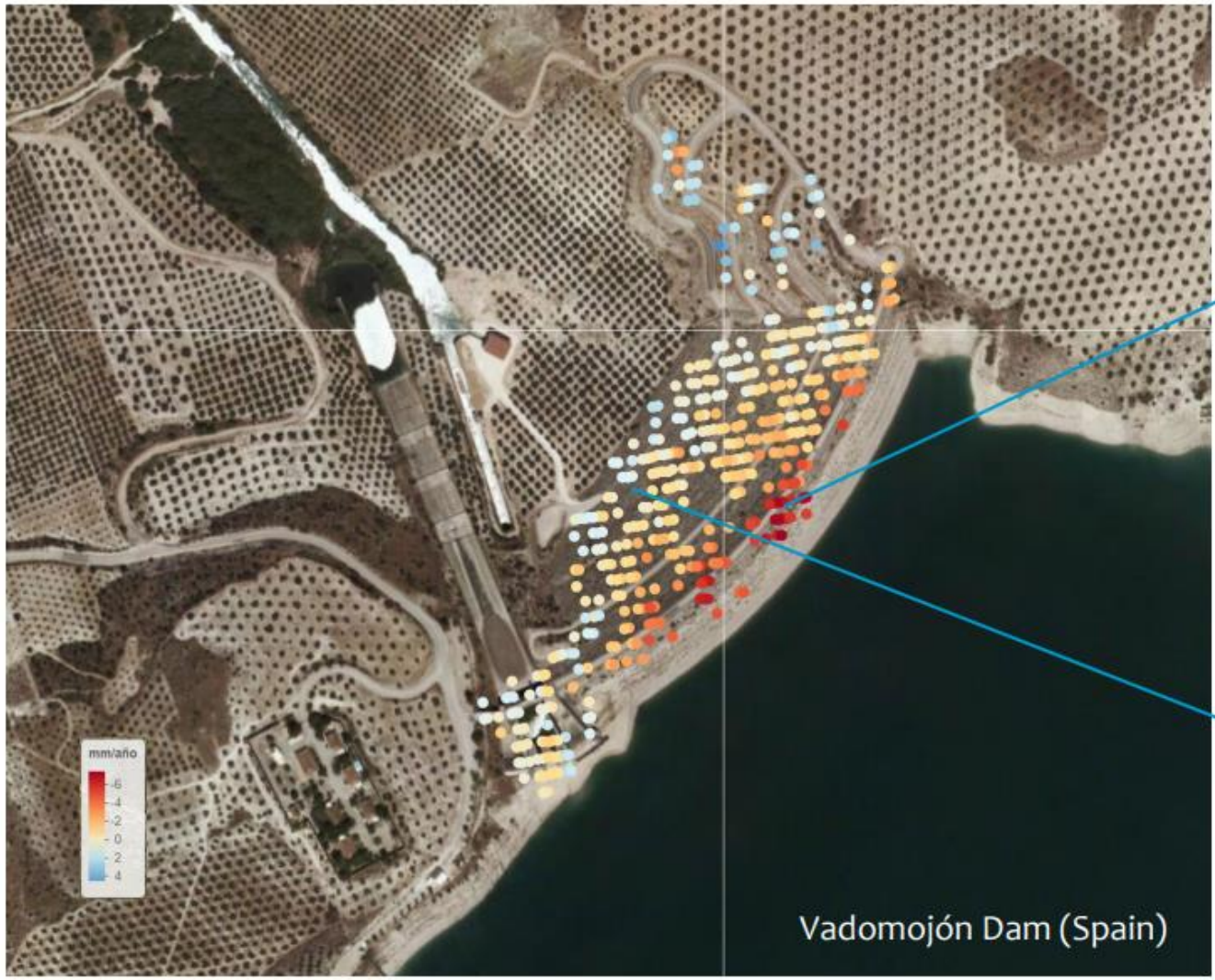


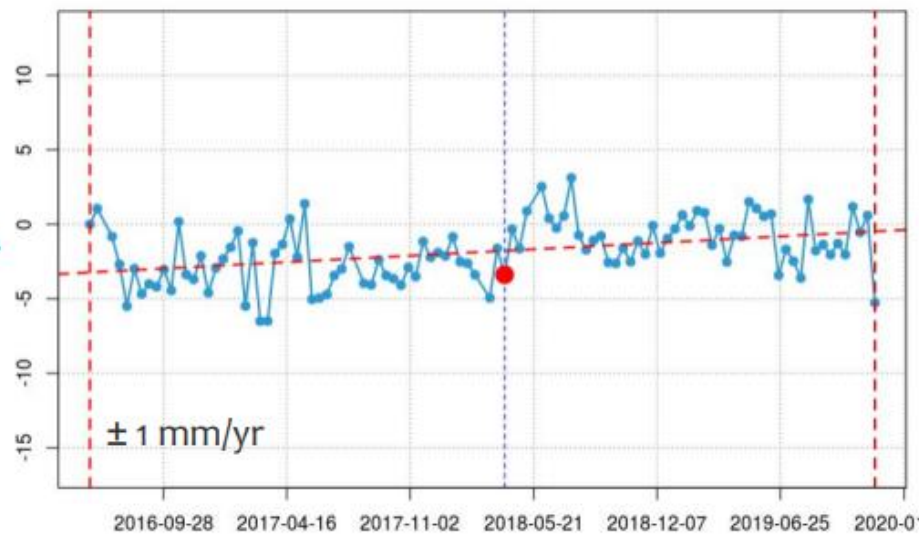
DInSAR works with data series reducing atmospheric signal noise and improving accuracy. (Mínimum: 15-20 images), creating a dense network of points ("virtual *sensors*") in ground & infrastructures. Seasonal changes are well shown within the temporal series.

Example: Tunnelling M30 (Madrid)

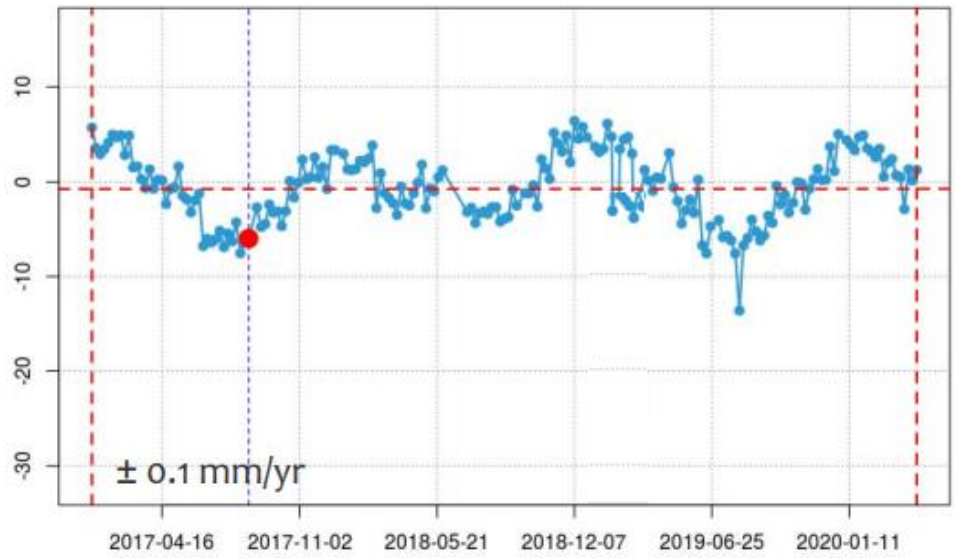


Example: earthfilled dam





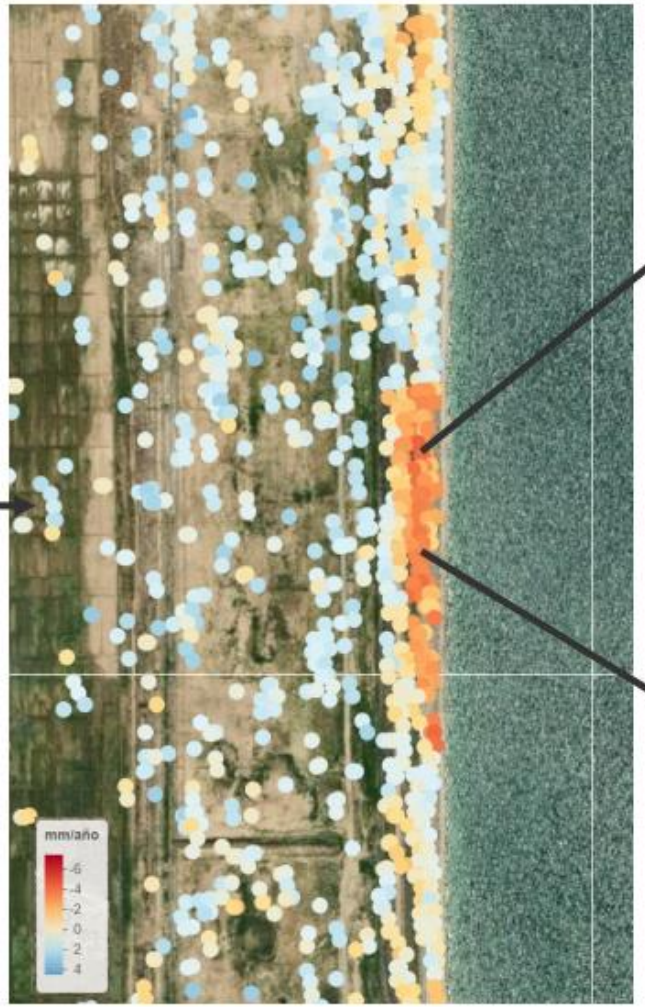
Example: concrete dam

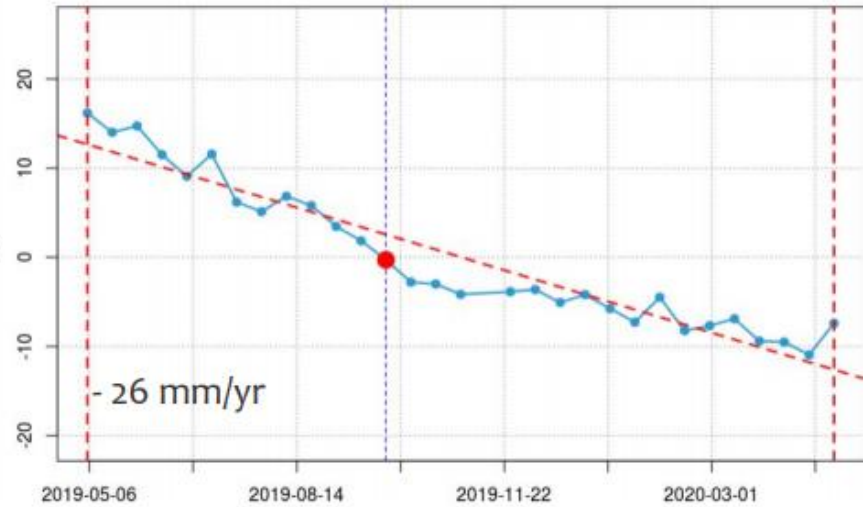


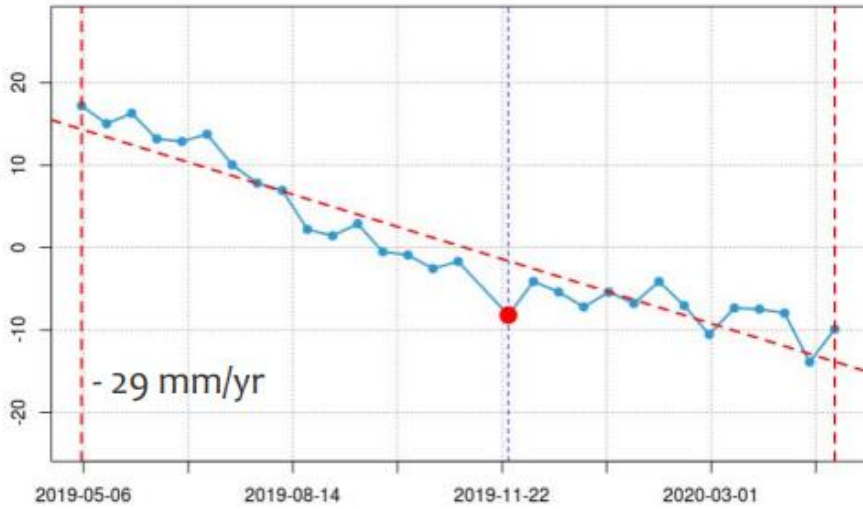
Example: Sardoba dam (Uzbekistan) – Dam failure

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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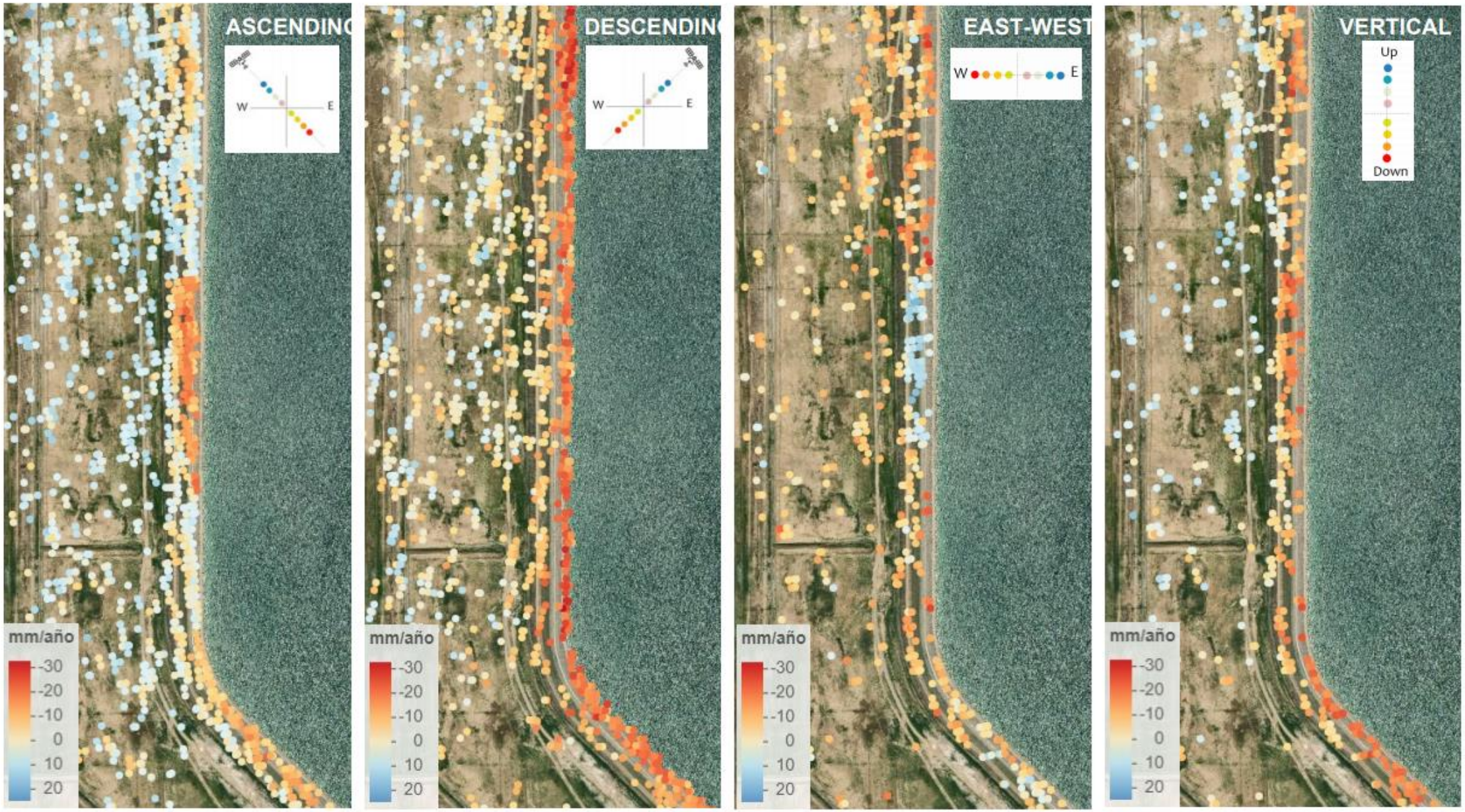
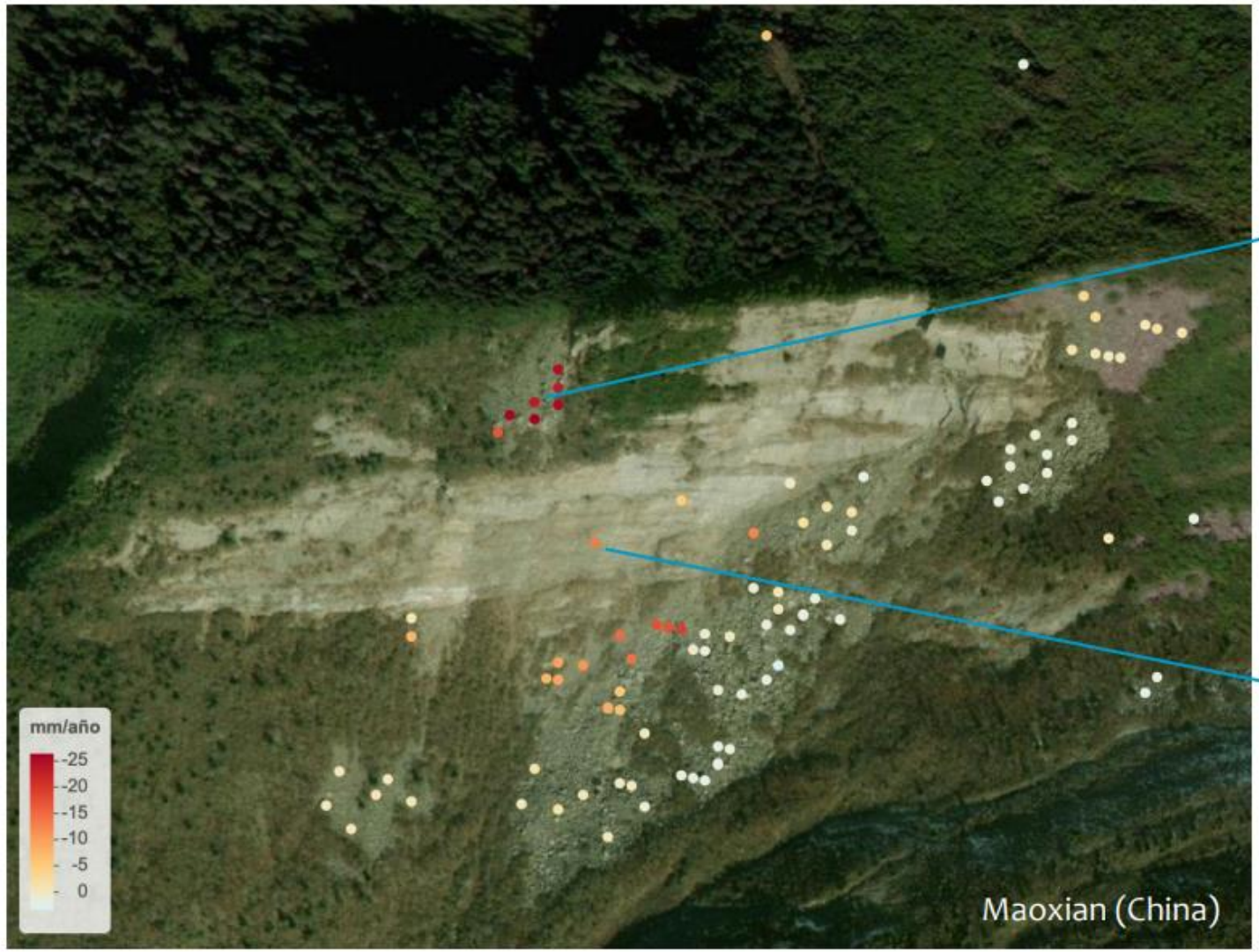
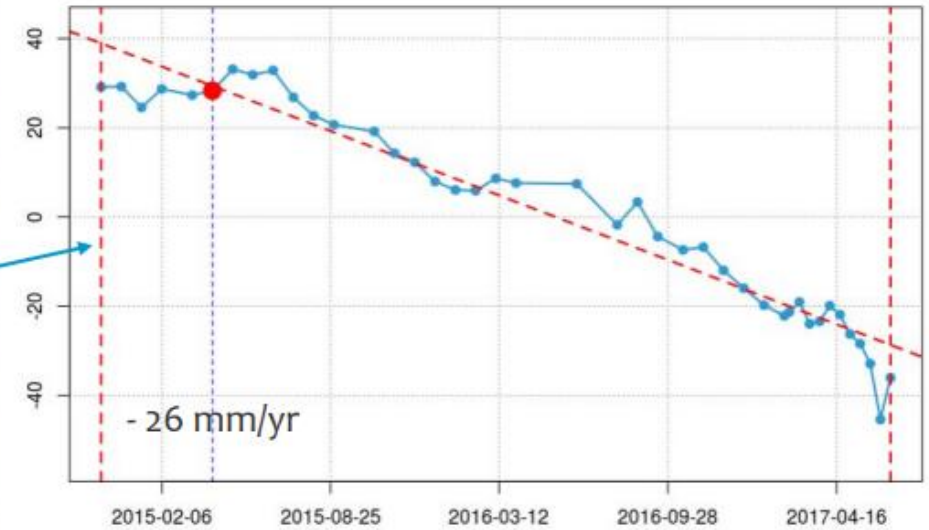
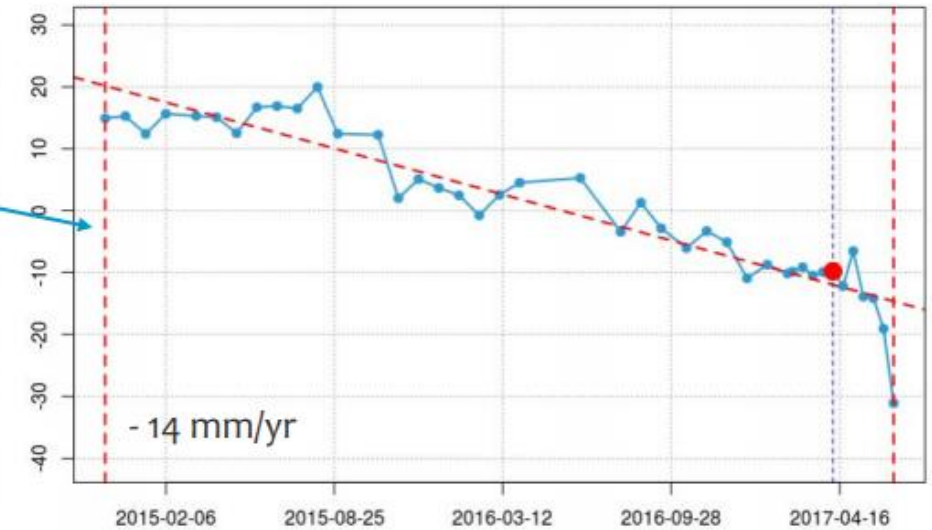


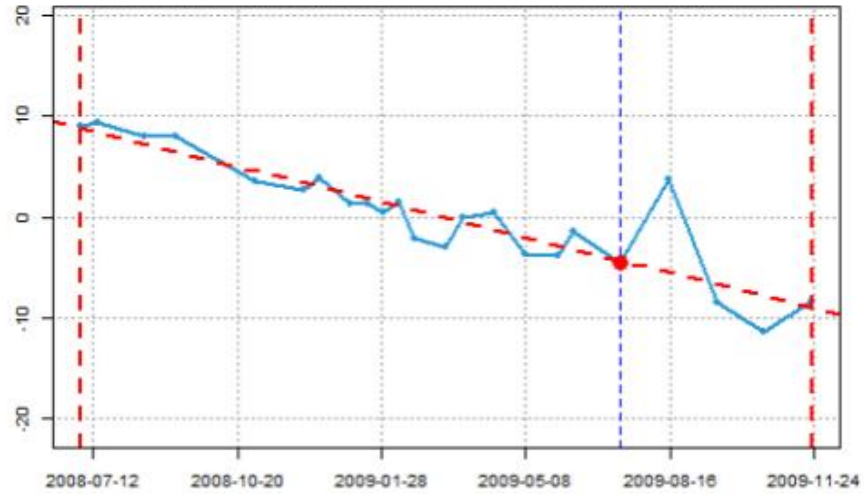
Example: Maoxian - landslide

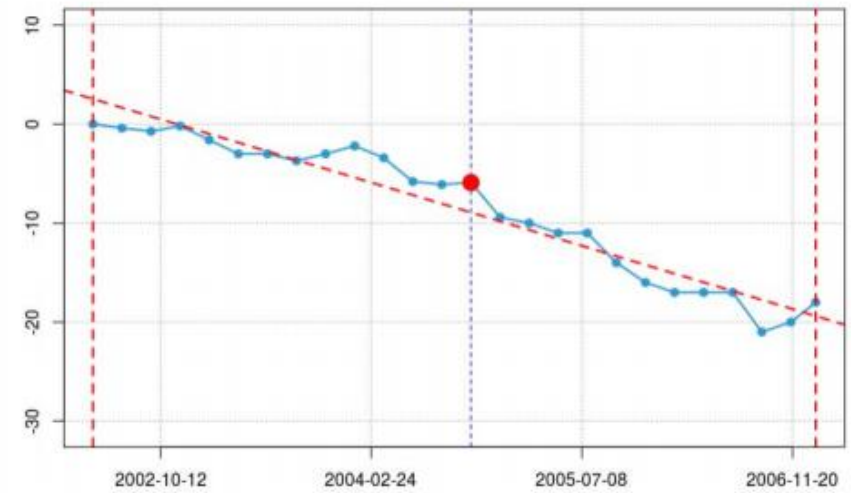




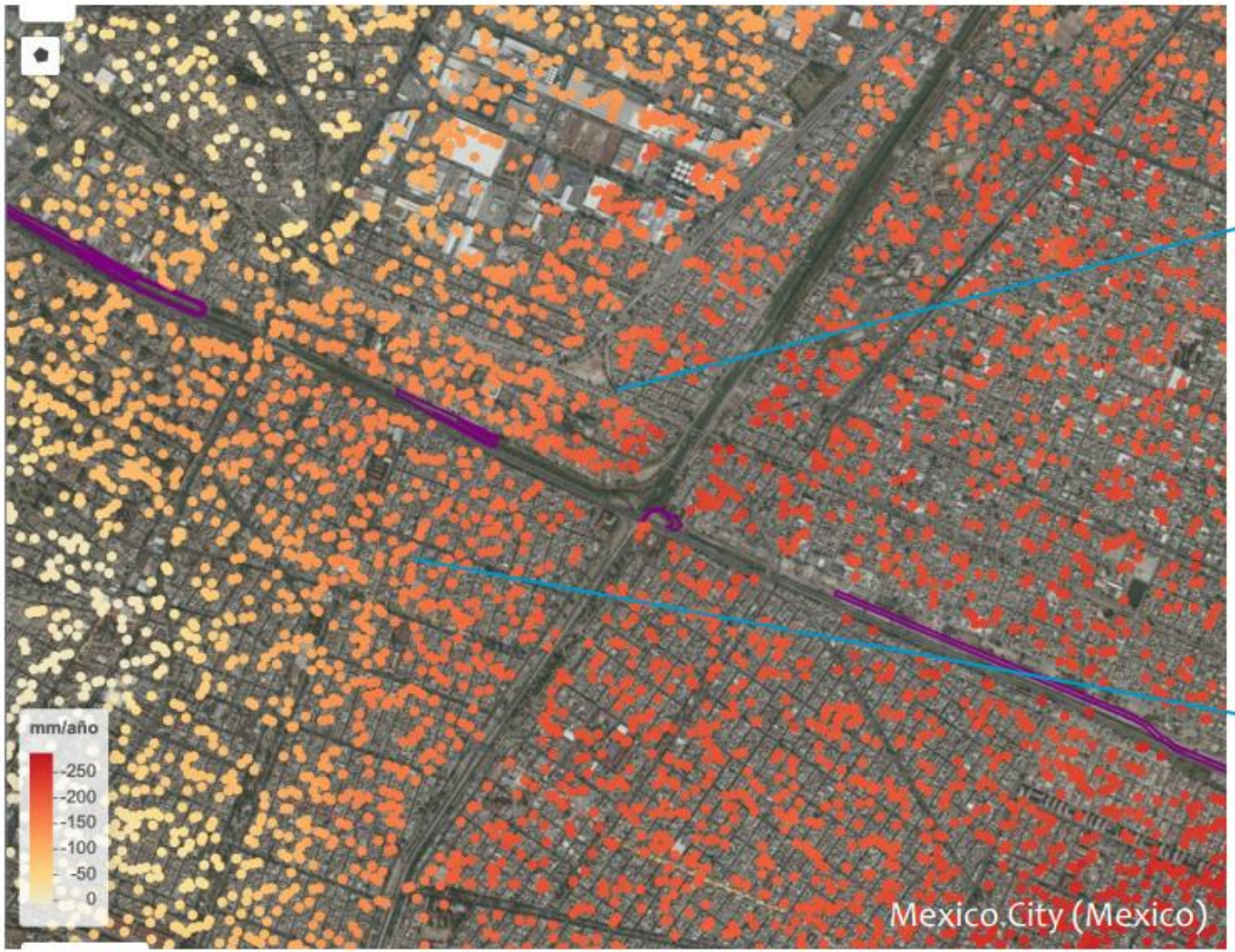


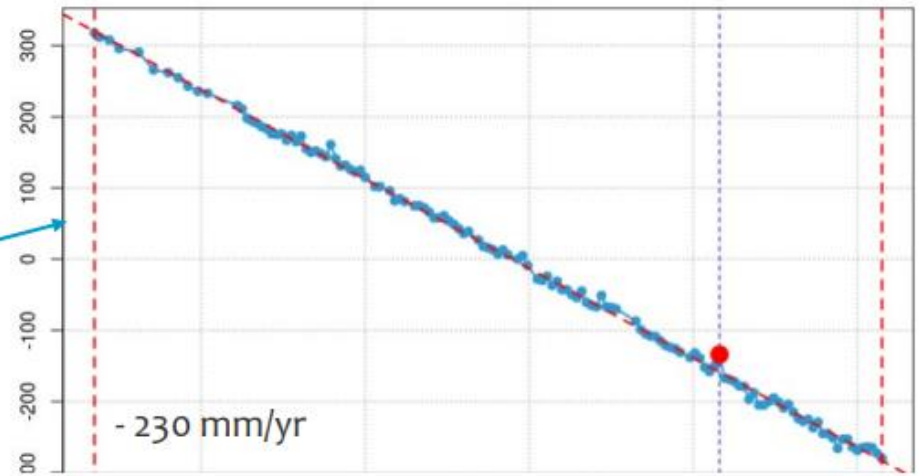
Example: Barcelona Port (TerraSAR-X)

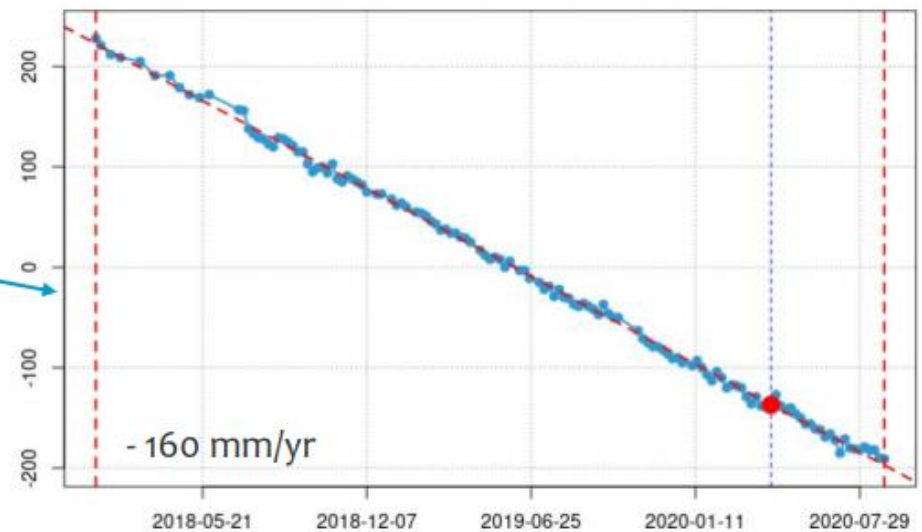




Example: Mexico City – Land subsidence







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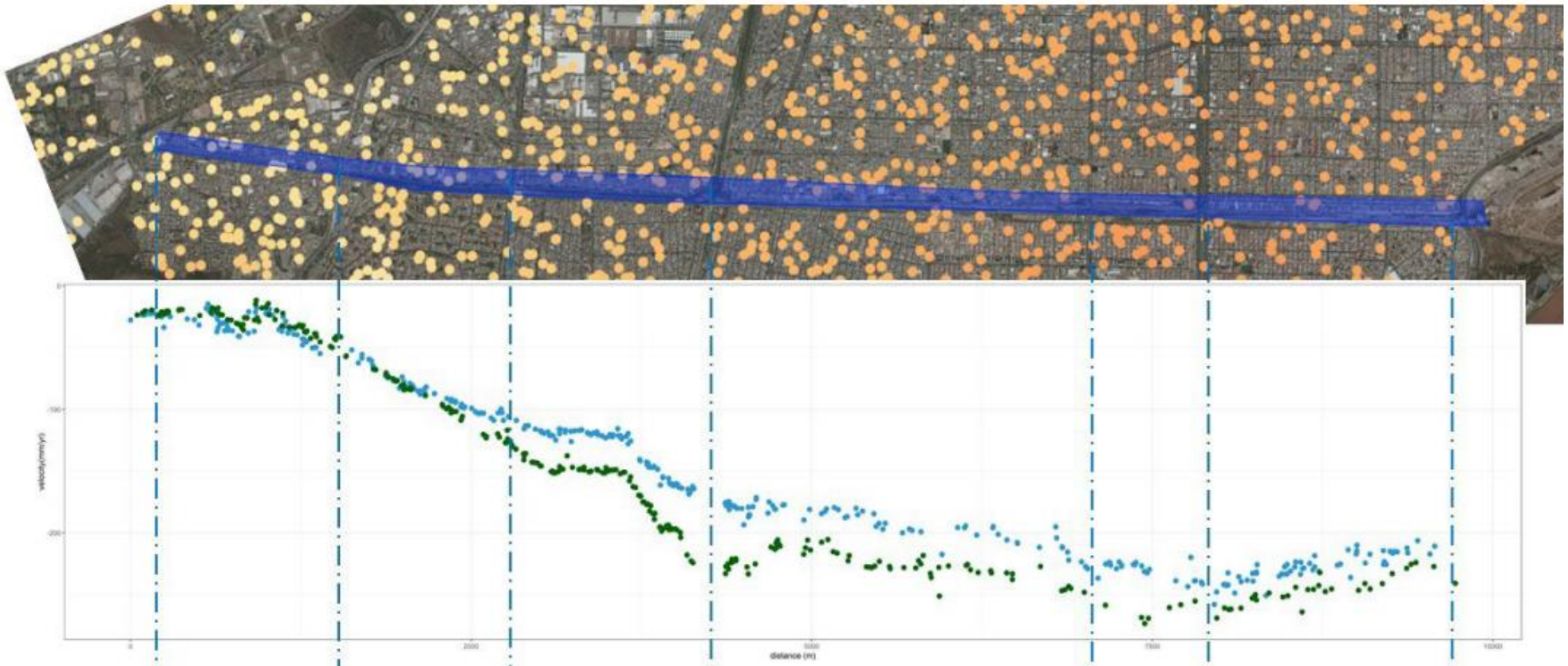
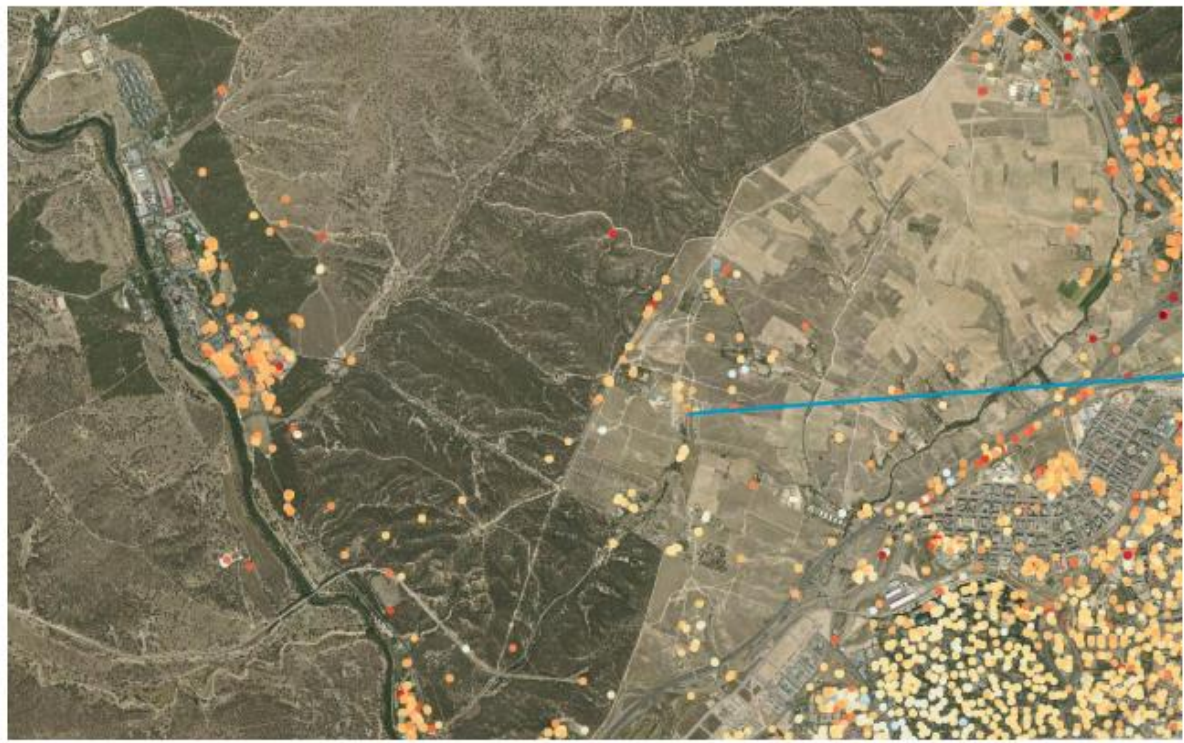
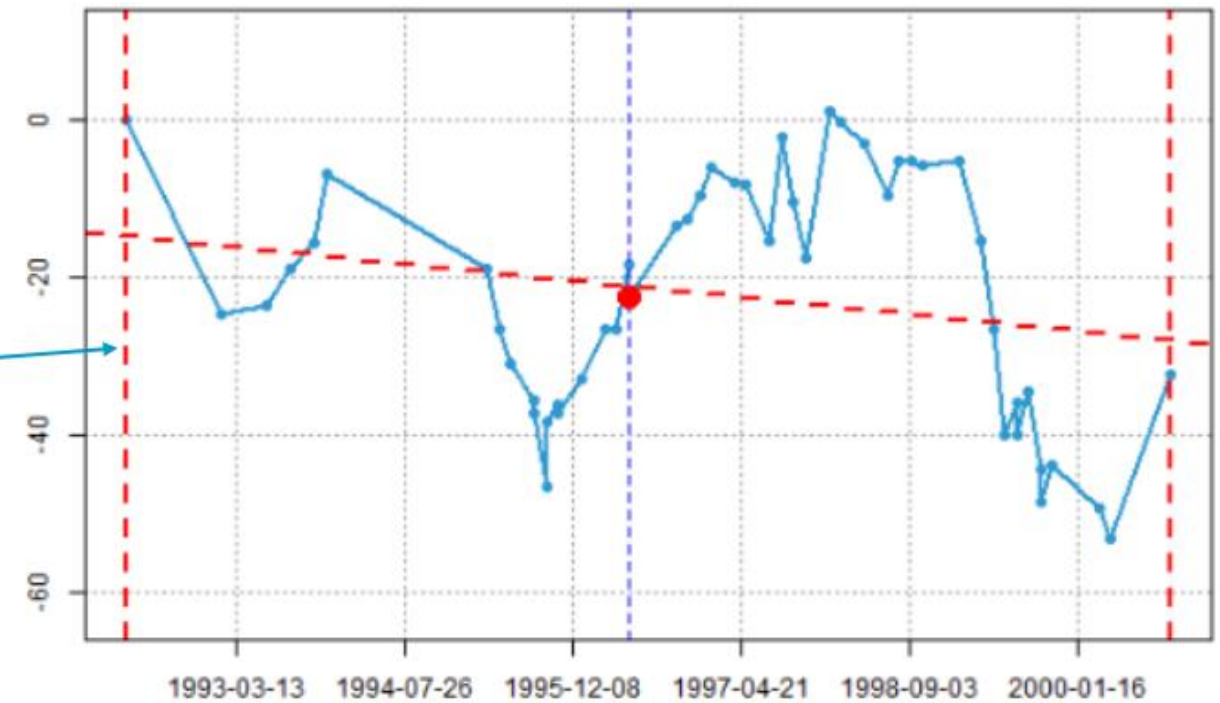


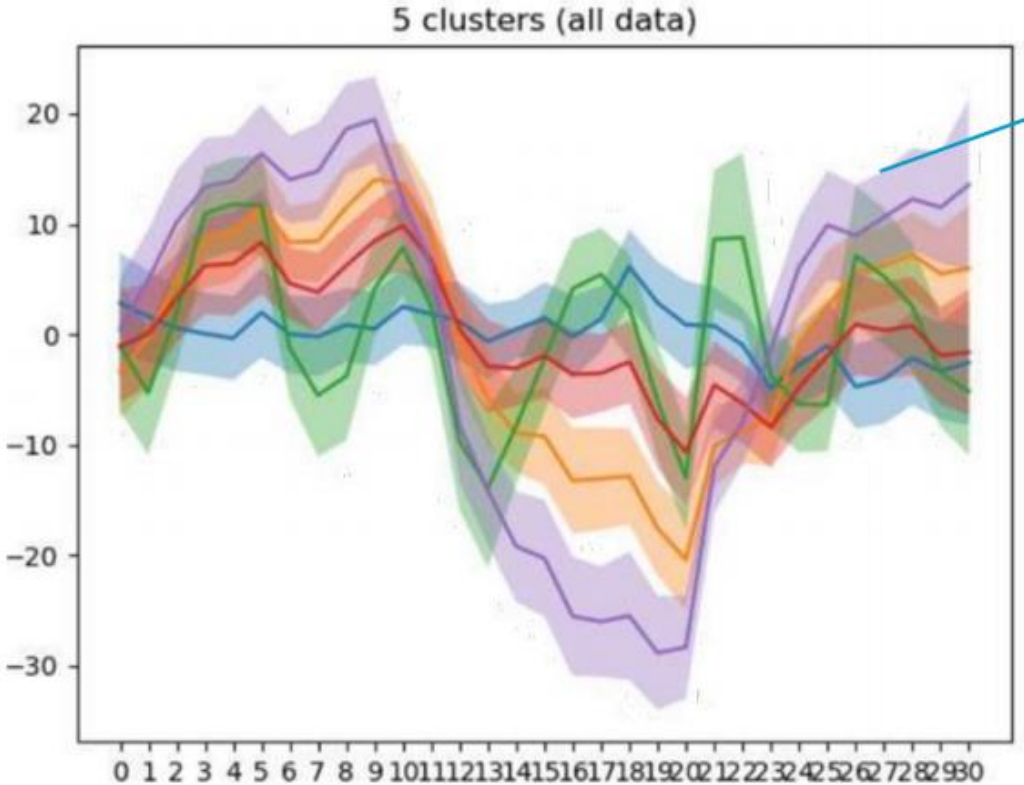
Example: Madrid aquifer

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.





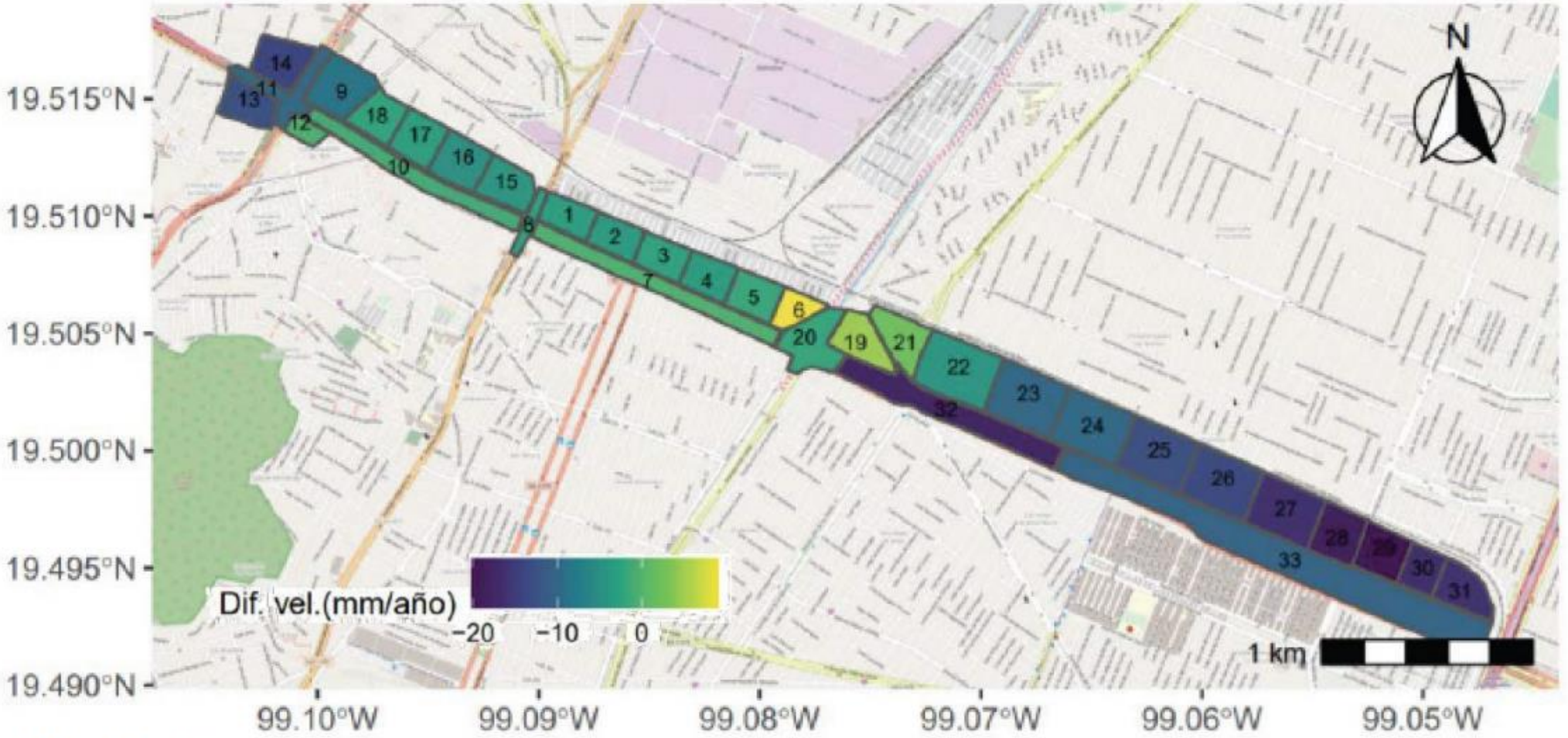
Example: Madrid extraction wells



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

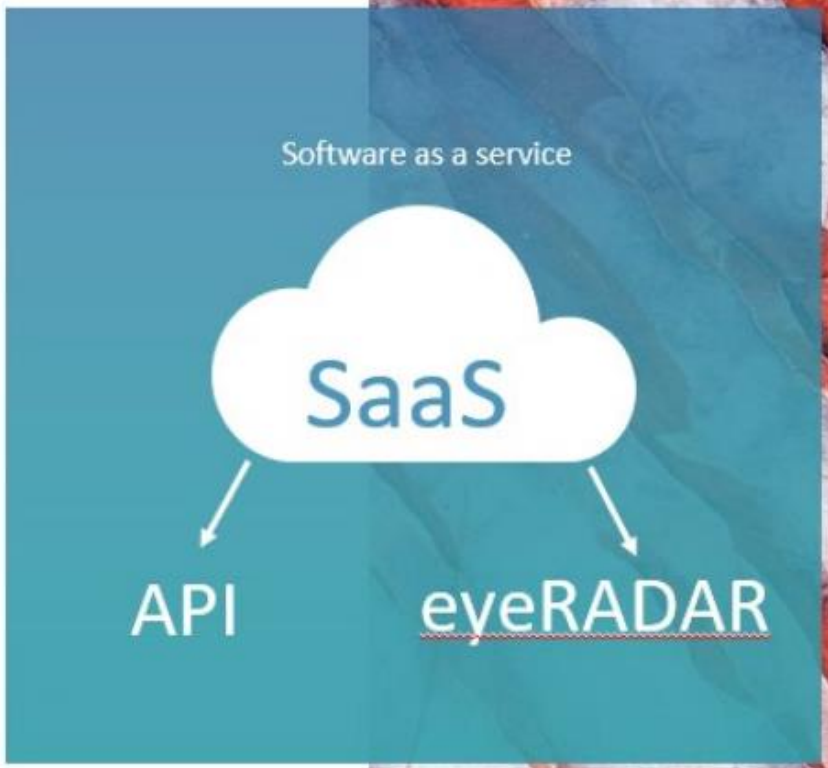
Monthly updates monitoring

Early warning system

Pricing

Depending on:

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



More info & contact

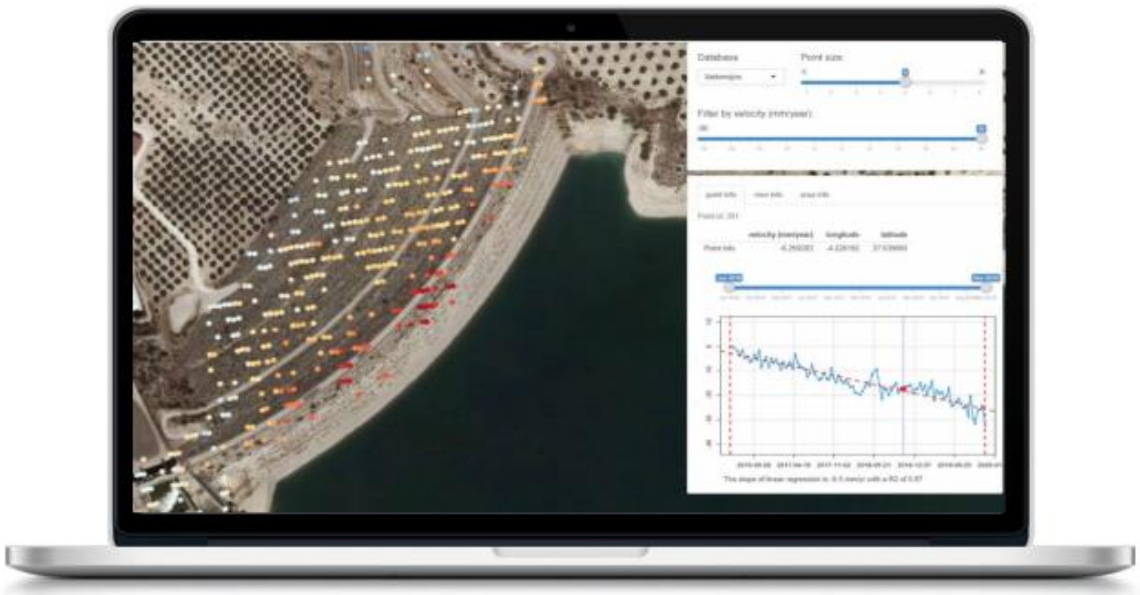
www.detektia.com

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

https://twitter.com/detektia/

Candela Sancho, CEO

csancho@detektia.com

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Q & A session

Please submit your questions through chat box or raise your hand.

Thank you

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Thank you!

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fany.wedahuditama@gwpsea.org
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