WEBINAR SERIES

INNOVATIVE SOLUTIONS FOR SUSTAINABLE DEVELOPMENT

1\textsuperscript{st} 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
2. Please open your internet browser
3. Type in your browser: [www.menti.com](http://www.menti.com)
4. Enter code: **6848 0419**
5. Please answer survey questions
Mentimeter Survey 1

1. Please use your cell phone
2. Please open your internet browser
3. Type in your browser: www.menti.com
4. Enter code: 6848 0419
5. Please answer survey questions
<table>
<thead>
<tr>
<th>Time</th>
<th>Activities</th>
<th>PIC</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>14:55 – 15:00</td>
<td>Admission of participants</td>
<td>Knowledge Management &amp; Communication Officer (KMCO) GWP-SEA</td>
<td></td>
</tr>
<tr>
<td>15:00 – 15:05</td>
<td>Welcoming remarks</td>
<td>Regional Coordinator GWP-SEA</td>
<td></td>
</tr>
<tr>
<td>15:05 – 15:15</td>
<td>Housekeeping rules &amp; Mentimeter survey 1</td>
<td>Regional Coordinator GWP-SEA</td>
<td>Mentimeter result shared by KMCO</td>
</tr>
<tr>
<td>15:15 – 15:17</td>
<td>Agenda</td>
<td>Regional Coordinator GWP-SEA</td>
<td></td>
</tr>
<tr>
<td>15:17 – 15:25</td>
<td>Opening Remarks</td>
<td>Chairman of GWP-SEA</td>
<td></td>
</tr>
<tr>
<td>15:55 – 16:35</td>
<td>Q &amp; A</td>
<td>Moderator: Regional Coordinator GWP-SEA Resource person: Candela Sancho - DETEKTI</td>
<td>Participants can submit question via chat box.</td>
</tr>
<tr>
<td>15:55 – 16:35</td>
<td>Mentimeter survey 2</td>
<td>Regional Coordinator GWP-SEA</td>
<td>Mentimeter result shared by KMCO</td>
</tr>
<tr>
<td>16:35 – 16:40</td>
<td>Wrap up &amp; Closing</td>
<td>Regional Coordinator GWP-SEA</td>
<td></td>
</tr>
</tbody>
</table>
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

- 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
**Team**

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

**Dr. Alfredo Fernández.** 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 than 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.
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 times
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 geometries

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

Combination of LOS movements in both views 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

Atazar Dam (Madrid)
1st May 2020, part of the dam wall collapsed in Sardoba (Uzbekistan), causing enormous floods and 70,000 evacuated people.
Example: Sardoba dam (Uzbekistan) – Dam failure
Example: Sardoba dam (Uzbekistan) – Dam failure
Example: Maoxian - landslide

Maoxian (China)
Example: Barcelona Port (TerraSAR-X)
Example: Mexico City – Land subsidence
Example: Mexico City – Land subsidence

Hermillob Mena

Insurgentes
3.8 cm/año
4.1 cm/año

Centenario
10.5 cm/año
12.4 cm/año

Gran Canal
17 cm/año
22.3 cm/año

Valle de Santiago
22.1 cm/año
24.5 cm/año

Avenida Central
23.8 cm/año
26.1 cm/año

CEM
21.4 cm/año
22.6 cm/año
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 (km²)
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
Ground & infrastructure surveillance from space

by detektia
Q & A session

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

Thank you
Mentimeter Survey 2

1. Please use your cell phone
2. Please open your internet browser
3. Type in your browser: www.menti.com
4. Enter code: 6848 0419
5. Please answer survey questions
Thank you!

Contact us:
- fany.wedahuditama@gwpsea.org
- secretariat@gwpsea.org

Join our partnership:
- https://www.gwp.org/en/partner/become-a-partner2/Apply-Now/