

# planetek italia

Rheticus® Network Alert, and the codesign with the HERA user

Pilot 6.3 | Assessing Geo-hazard vulnerability of Cities & Critical Infrastructures





Monitoring of the Earth's surface and infrastructures' stability is a key activity to ensure people's safety, environmental protection and the safeguarding of assets at all stages of the life cycle of infrastructures, from design to production, management and maintenance.

# Subsidence: a global challenge

Natural and human-induced instability consequences

- Buried pipeline collapse
- Roads & bridges structural problems
- Buildings damages
- Damages due to landslides



# Limits of traditional practices and technologies

- Surveys and inspections only when the problems occur
- No predictive info about what/where to inspect
- Time and cost uncertainties
- The use of traditional techniques for periodic monitoring of wide or remote areas requires considerable economic and time resources.

Satellite monitoring allows to overcome these limits, reaching high frequency, precise and accurate actionable information thanks to the ever-increasing availability of open data.



## Advantages of satellite monitoring

Monitoring of ground surface movements, infrastructure stability due to subsidence or landslides.

- Detection of **millimetre movements** of infrastructures, roads and buildings;
- **Historical trends** over past years
- **Continuous monitoring** with high revisiting time;
- Low-cost monitoring on **wide and remote areas**;
- No measurement devices to be installed;



## **2. Rheticus<sup>®</sup>: Satellite-based monitoring services and periodical reports**

# Satellite-based monitoring services and periodical reports

Supporting asset management, environment and citizens well-being.

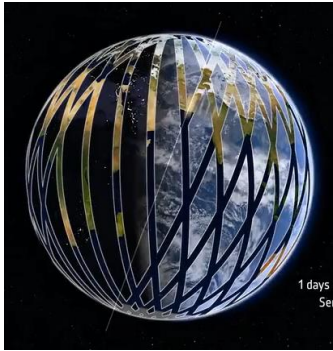


- Cloud-based
- Satellite data
- Continuous update
- Analytics, Indicators, report
- Subscription-based



# Rheticus® Workflow

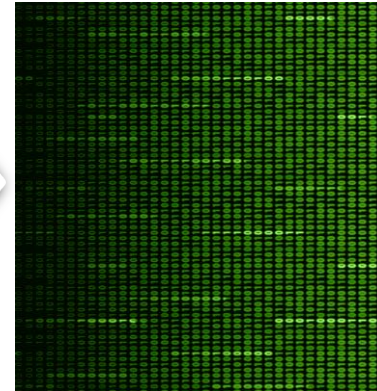
## Rheticus® Monitoring the evolution of our Earth



Satellite Data



Automatic Processing



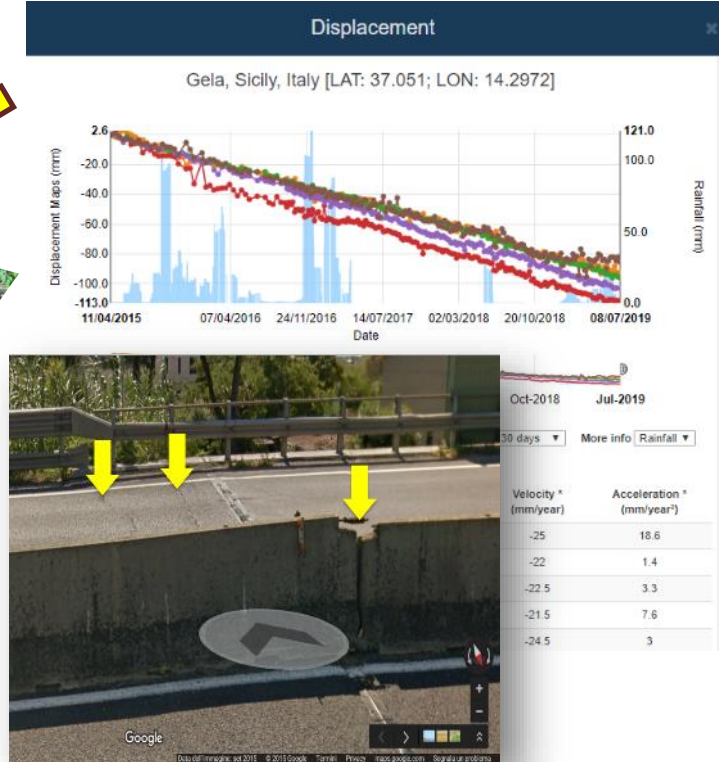
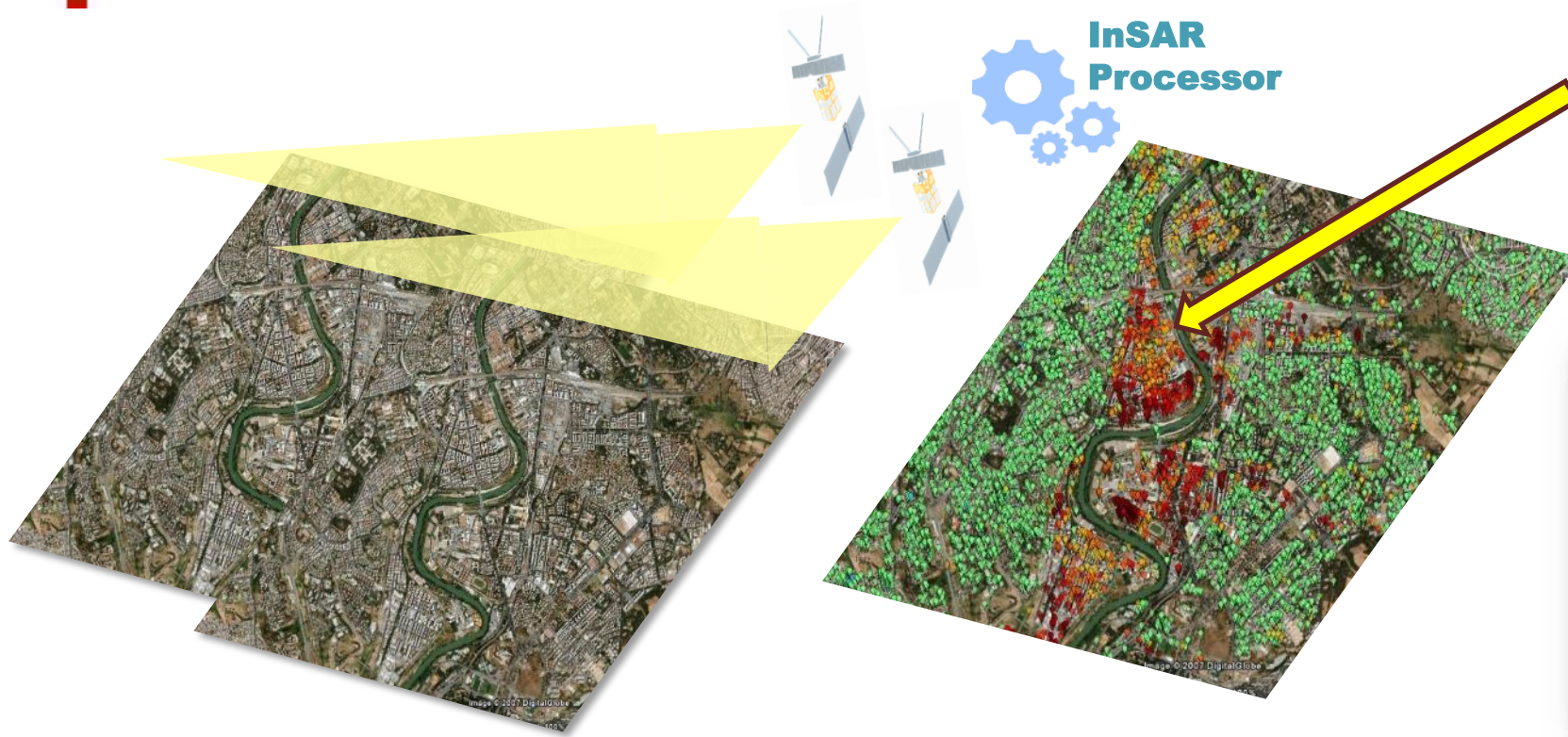
Knwoledge



Geo-Portal



# 20 years of experience with the state of the art technique for the ground motion analysis



- The Earth's surface reflects the radar signal from satellites. Nowadays, we have continuous acquisitions, up to 1 per week.

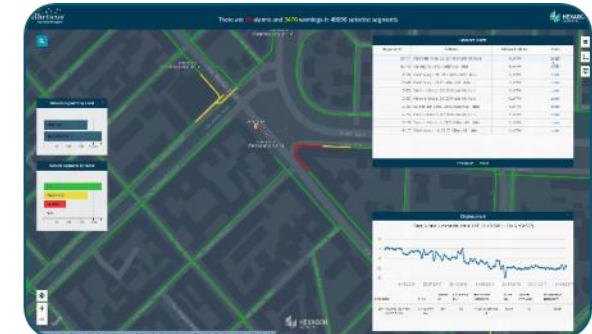
- Analyzing the microwaves in the radar signal among hundreds of satellite images, the user receives ground motion maps with millimetric accuracy together with the historical trend of the movements.

- Sorting stable areas from unstable zones, the field inspections allow assessing the level of damages on the infrastructures, maintaining the periodical monitoring over time.



## **2. Rheticus<sup>®</sup> Network Alert**

# From ground motion analysis to the knowledge on each pipeline segment



- Radar satellite images (Sentinel-1, CosmoSkyMed, TerrasarX)

- Analysis on millions of measured points on the ground
- Quantify current and historical trends
- Classification of infrastructures

- Exclusive Algorithm for the identification of critical segments
- Inspection Priority score
- Rheticus® Geo-Portal
- M2M Web services, 3<sup>rd</sup> Party Systems

## Predictive Maintenance for *utilities*

There are **59** alarms and **3476** warnings in 48696 selected segments

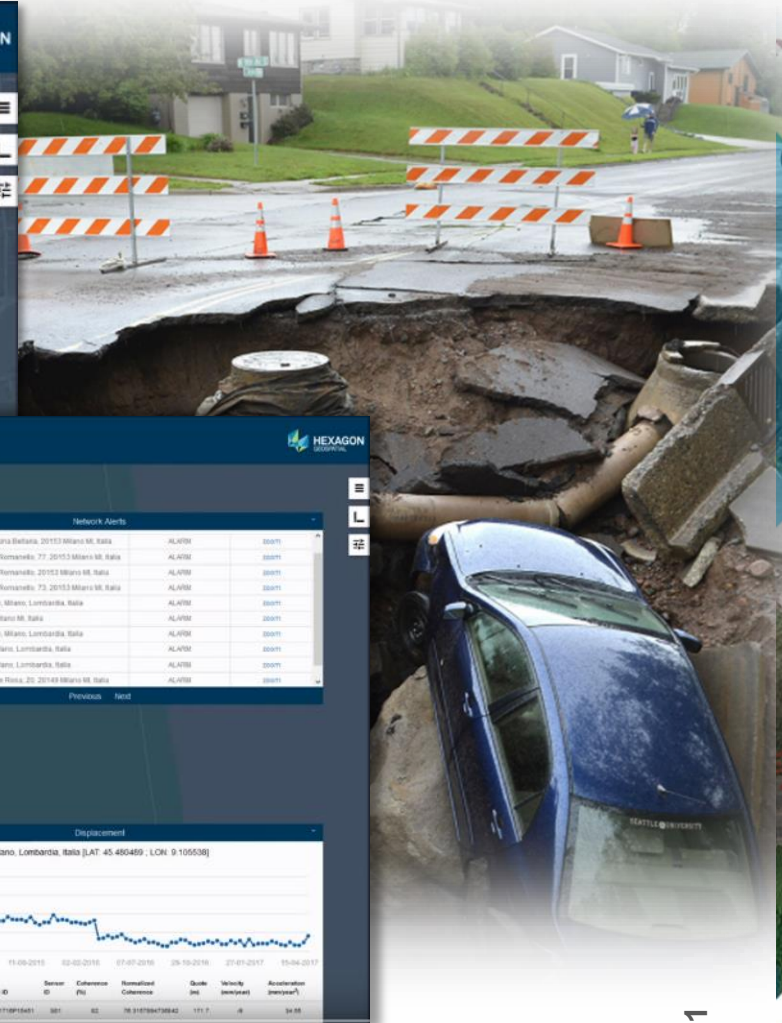
Network Alerts

14538	Via Cascina Bellana, 20153 Milano MI, Italia	ALARM	200m
14704	Via San Romanello, 77, 20153 Milano MI, Italia	ALARM	200m
14705	Via San Romanello, 20153 Milano MI, Italia	ALARM	200m
14706	Via San Romanello, 73, 20153 Milano MI, Italia	ALARM	200m
18155	Musocco, Milano, Lombardia, Italia	ALARM	200m
18159	20156 Milano MI, Italia	ALARM	200m
18163	Musocco, Milano, Lombardia, Italia	ALARM	200m
19006	Fiera, Milano, Lombardia, Italia	ALARM	200m
19946	Fiera, Milano, Lombardia, Italia	ALARM	200m
20517	Via Monte Rosa, 20, 20149 Milano MI, Italia	ALARM	200m

Network segments by level: PRIMARY, SECONDARY

Network segments by status: OK, WARNING, ALARM, N/A

The table shows the segments in ALARM status



There are **59** alarms and **3476** warnings in 48696 selected segments

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Displacement: Milano, Lombardia, Italia [LAT: 45.46489; LON: 9.105538]

Zoom on each segment

# From satellite to field inspections - codesign

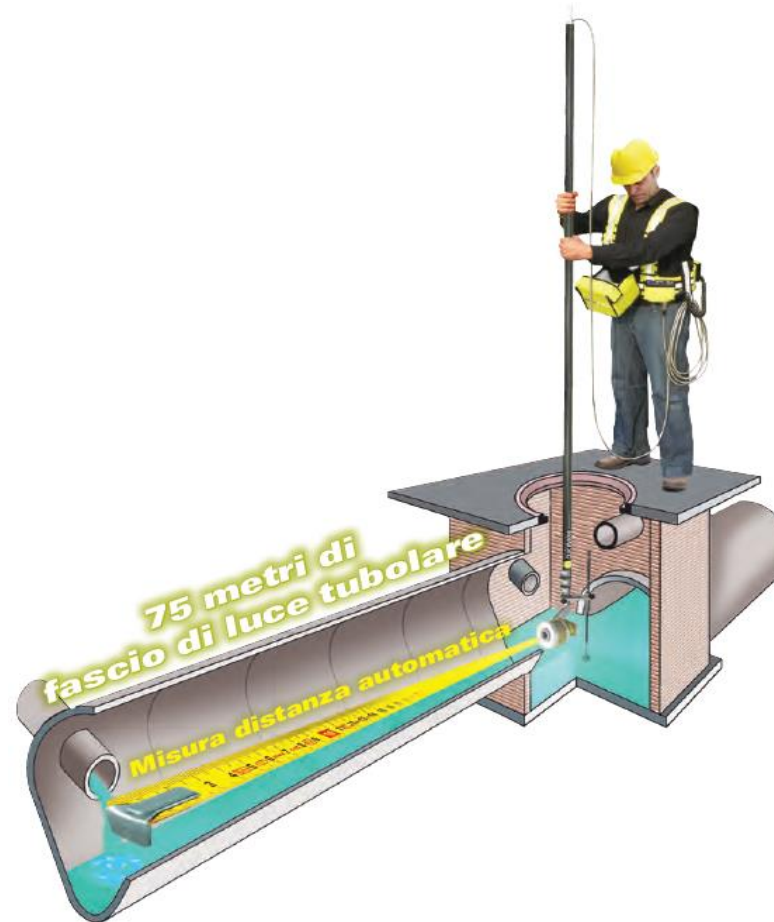
- Based on the level of mechanical stress due to the subsidence/instability, Rheticus® Network Alert indicates the critical segments

- The Utility's crew inspects the segments

- Each segment is assigned to a specific damage class\*

There are **69** segments to inspect and **0** segments to assess out of 69

Segment ID	Address	Network Status	Tools
1754	Via Manduria, 20142	to INSPECT	zoom
1899	Viale Ortles, 20141, Milano	to INSPECT	zoom
1937	Via Manduria, 20142	to INSPECT	zoom
1938	Via Manduria, 20142	to INSPECT	zoom
1965	Via Manduria, 20142	to INSPECT	zoom
2098	Viale Bligny, 8, 20136, Milano	to INSPECT	zoom
2326	Via privata Pienza, 20142, Milano	to INSPECT	zoom
3172	Via Lomellina, 26, 20133, Milano	to INSPECT	zoom
4805	5, 20121, Milano	to INSPECT	zoom
8468	20090, Milano	to INSPECT	zoom

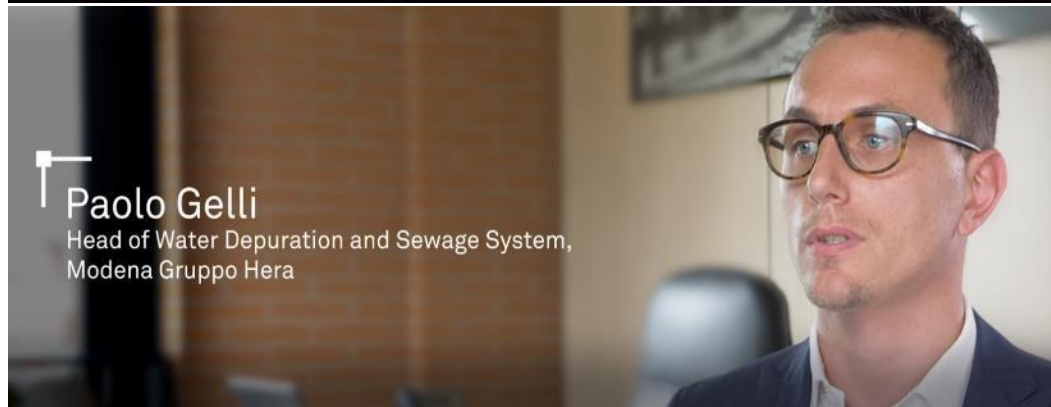


MONOGRAFIA POZZETTO ISPEZIONATO					
DATI GENERALI					
Comune:	Tipologia pozzetto: pozzetto di ispez. con chiusura ghisa				
Ubicazione (via, piazza):	Via all'interno dello stabilimento				
Data ispezione:	Superficie di posa: asfalto				
Posizione chiusura:	Sistema di coordinate: Gauss Boaga - Monte Mario				
Coordinata X:	Coordinata Y:				
<table border="1"> <tr> <th>INQUADRAMENTO TERRITORIALE</th> <th>SCHEMA GRAFICO</th> </tr> <tr> <td></td> <td></td> </tr> </table>		INQUADRAMENTO TERRITORIALE	SCHEMA GRAFICO		
INQUADRAMENTO TERRITORIALE	SCHEMA GRAFICO				
FOTO ESTERNA DEL POZZETTO	FOTO MONTE RISPETTO VERSO REFLUO (condotta A)				
FOTO VALLE RISPETTO VERSO REFLUO (condotta B)	ZOOM EVENTUALI ANOMALIE (condotta B; nome file: 302324.JPG)				
ZOOM EVENTUALI ANOMALIE (condotta B; nome file: 302512.JPG)	ZOOM EVENTUALI ANOMALIE (condotta A; nome file: 302332.JPG)				
<p><b>Defetti riscontrati:</b></p> <p>Condotta in cis composta da tubi lunghi 1m cadauno. Si evidenziano sui tubi sia a monte che a valle cedimenti strutturali sulla parte superiore con presenza di radici di alberi.</p>					
Data invio cliente	21/04/2016				

\*as the local and internal regulation defines



Hera subscribed Rheticus® nel 2017. Improving the sewer inspection rate by 40% , the success case has been presented at HxGn Live 2019 - Las Vegas, USA.



Paolo Gelli  
Head of Water Depuration and Sewage System,  
Modena Gruppo Hera



<https://www.youtube.com/watch?v=M4xUn6BhEFg&t=29s>

