From the European Ground Motion Service to the Displacement Gradients: A Tool to Assess the Potential Damage of buildings

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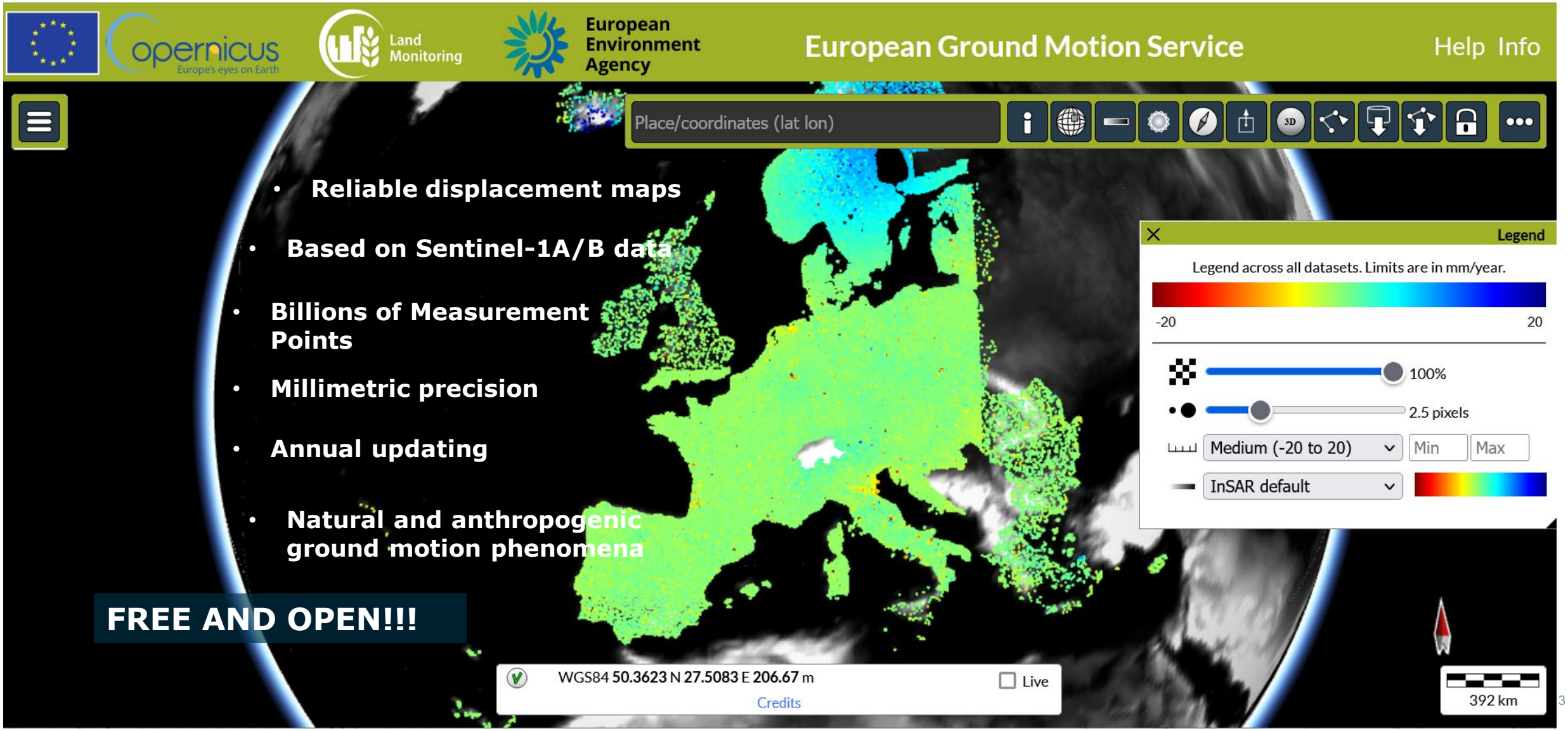
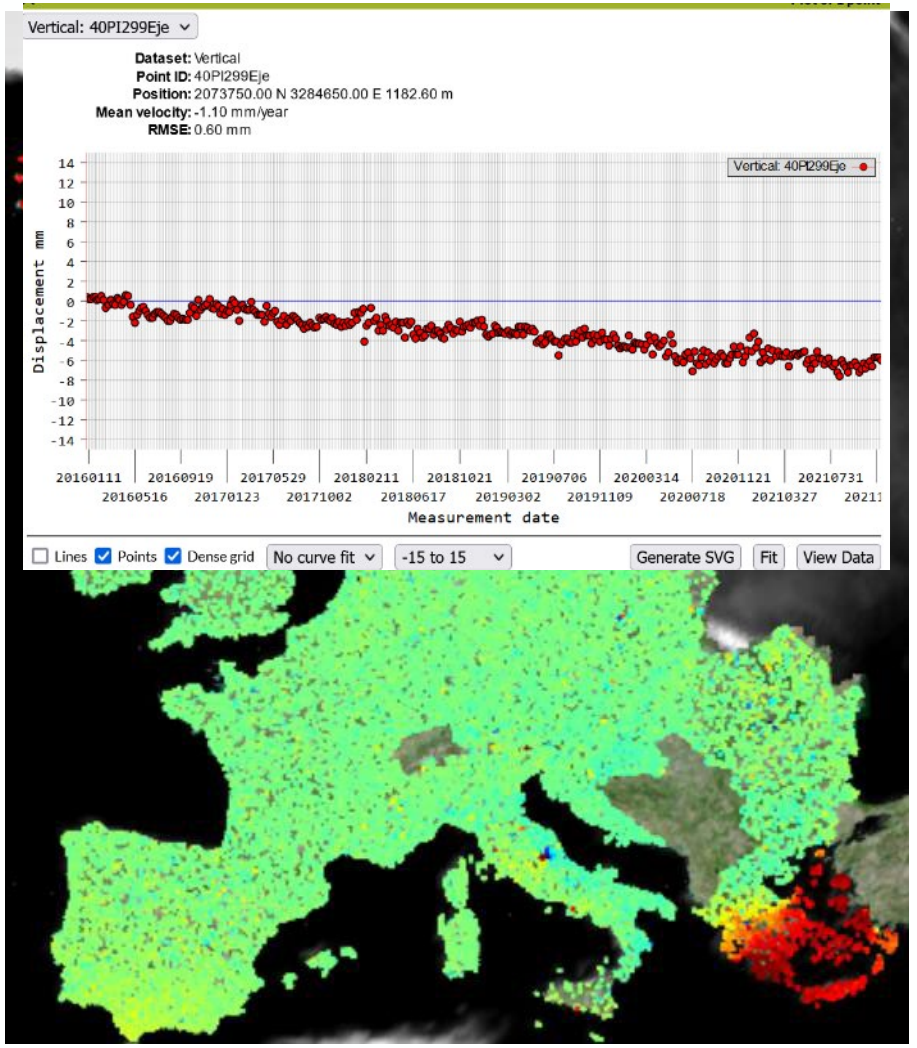
Context: The EGMS

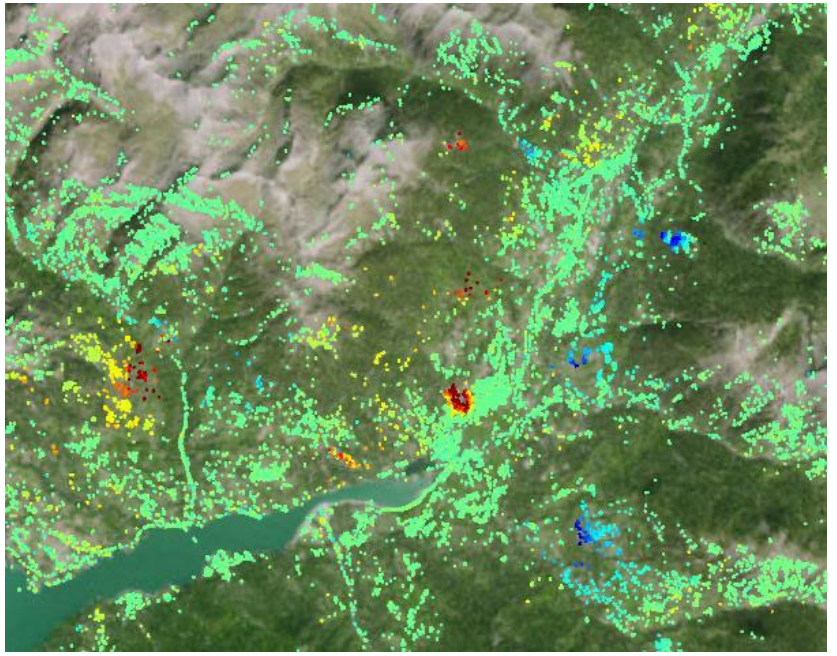


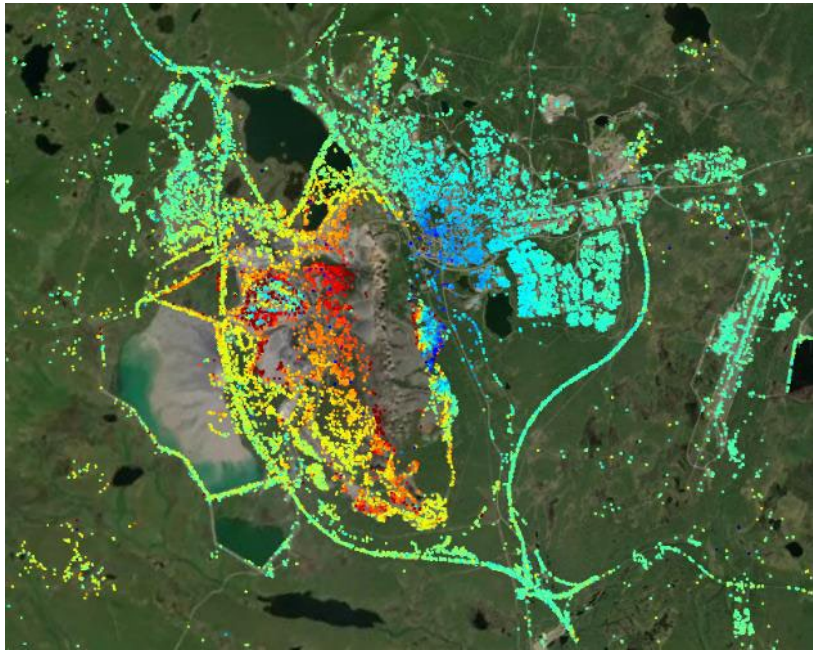
- Reliable displacement maps
- Based on Sentinel-1A/B data
- Billions of Measurement Points
- Millimetric precision
- Annual updating
- Natural and anthropogenic ground motion phenomena

FREE AND OPEN!!!

Context: The EGMS



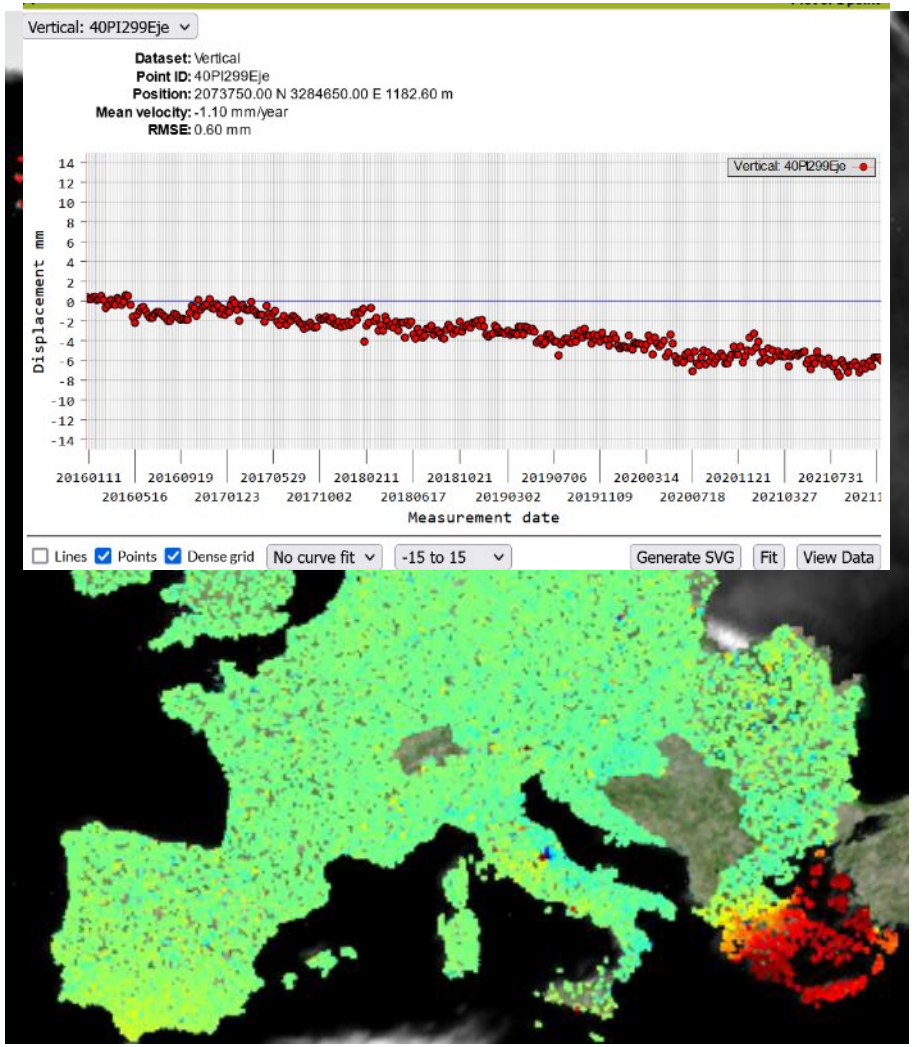


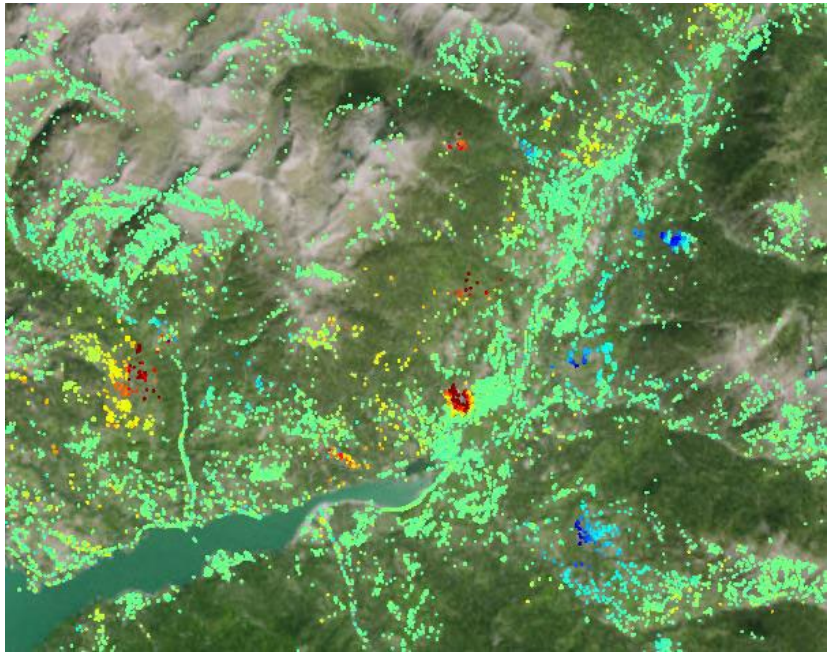


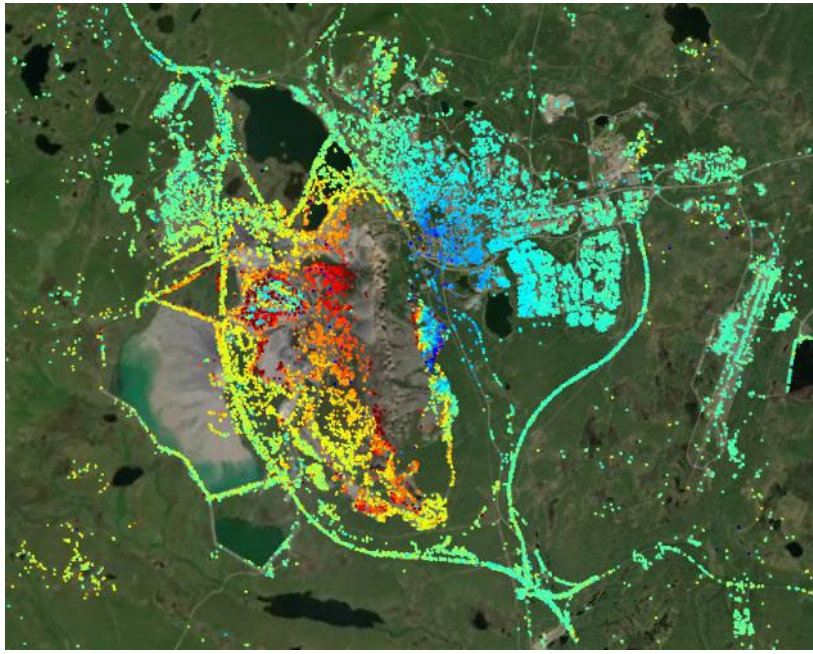
The **analysis and interpretation is difficult and time-consuming, demanding a high level of expertise** and a specific background

UNDEREXPLOITED

Context: The EGMS



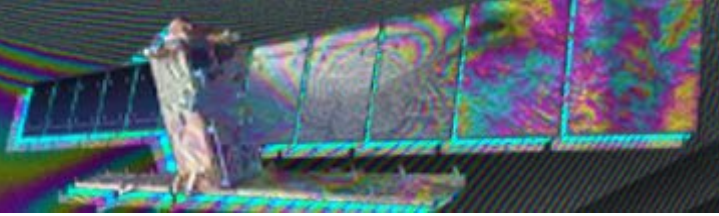




Maximise the EGMS data exploitation and the uptake by non-InSAR expert: tools to **automatically** analyse them and to generate maps to **support hazard**, **exposure** and **risk assessment**

RASTOOL

Objective



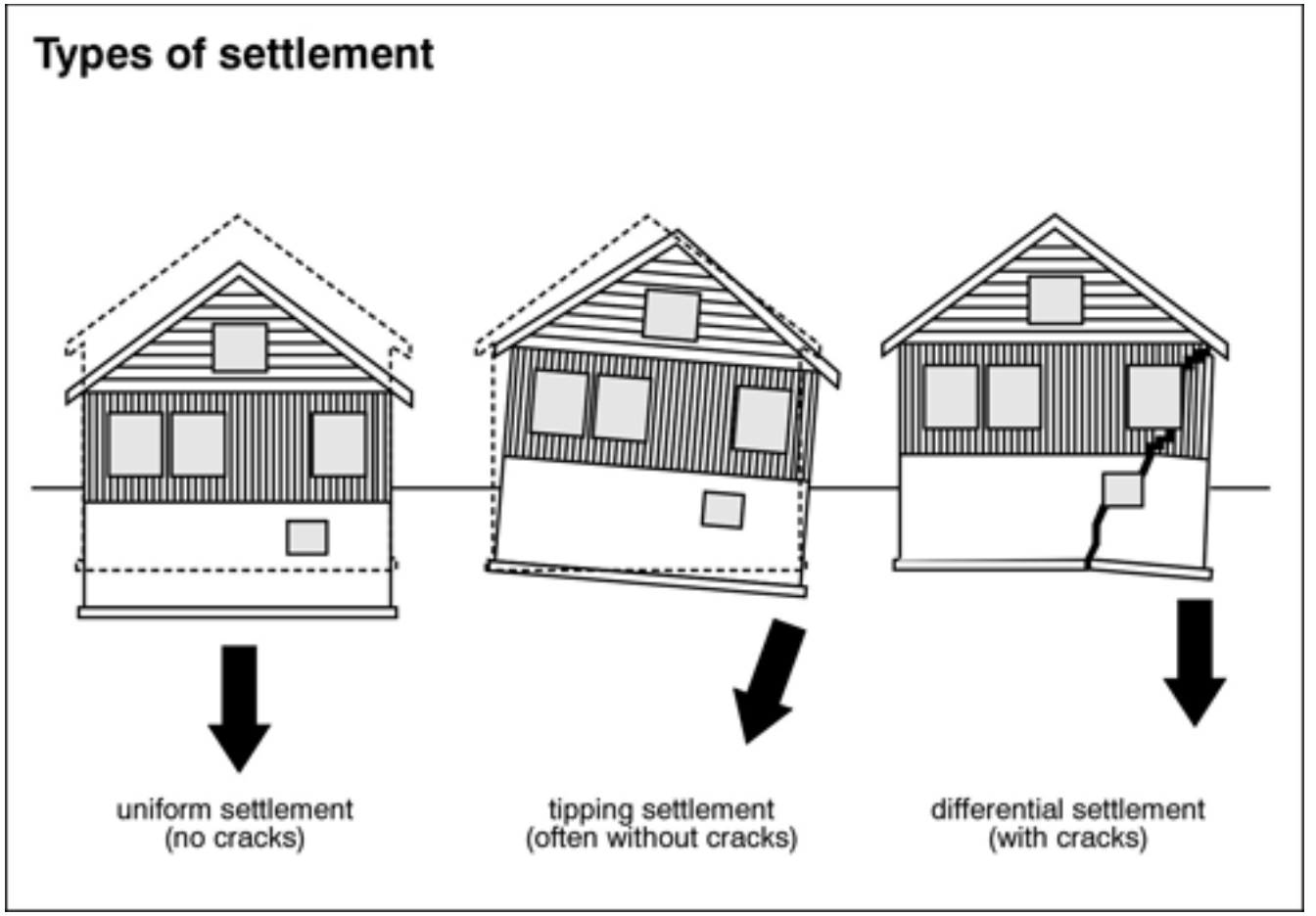
Improve the **operational use** of EGMS information through the generation of "**secondary products**"

Tool to automatically identifying buildings and urban structures that may be at risk of damage

Potential Damage Maps

Methodology

MAIN INFORMATION: spatial gradients of displacements (differential settlement)



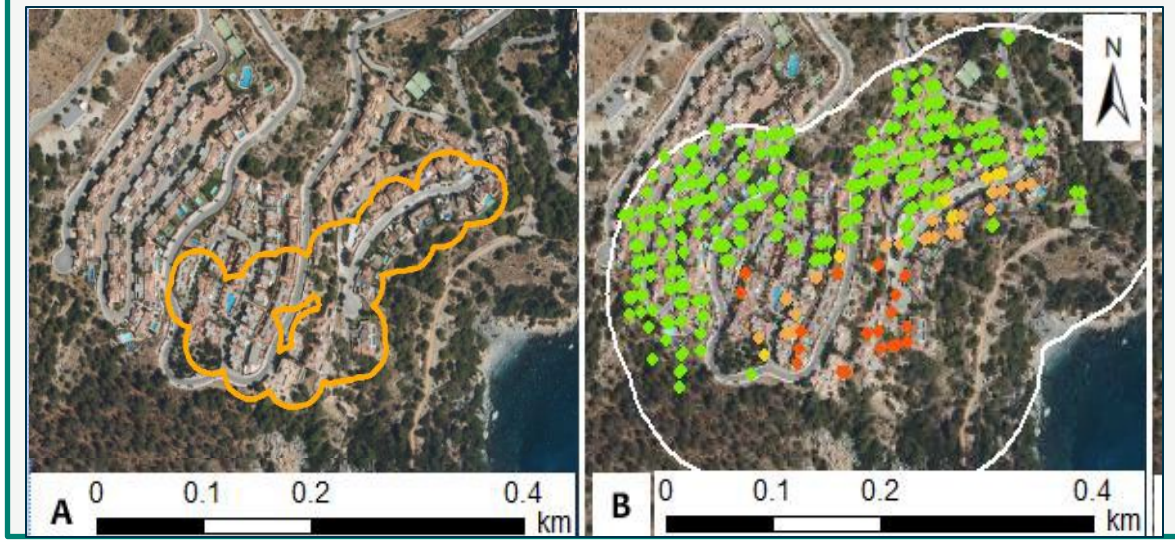
Methodology

Inputs

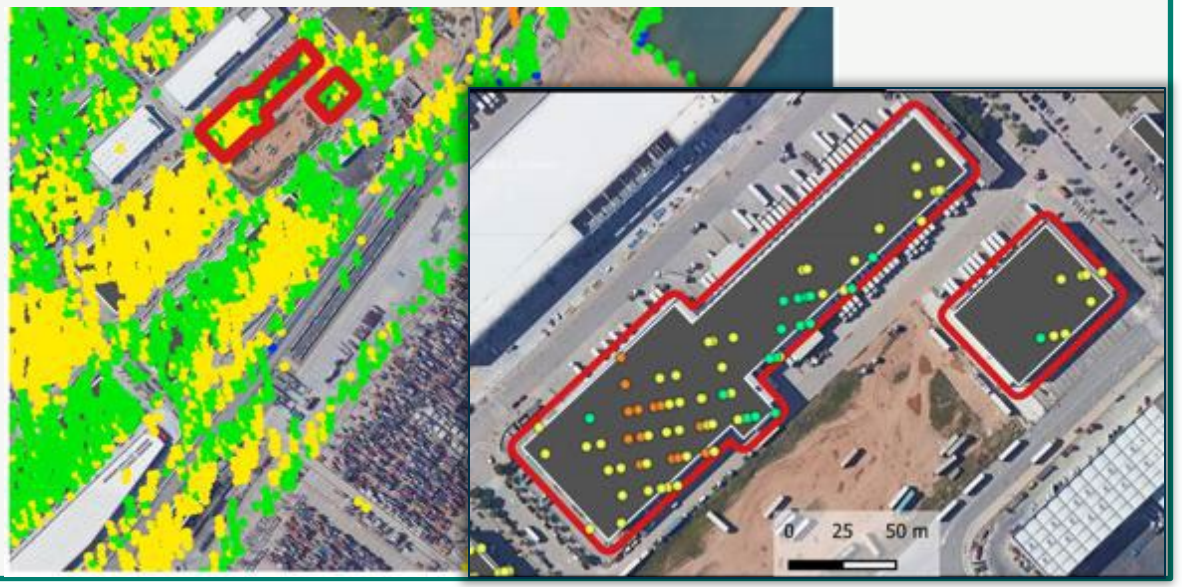
PSI displacement map: EGMS

Buildings/structures inventory: OpenStreetMap

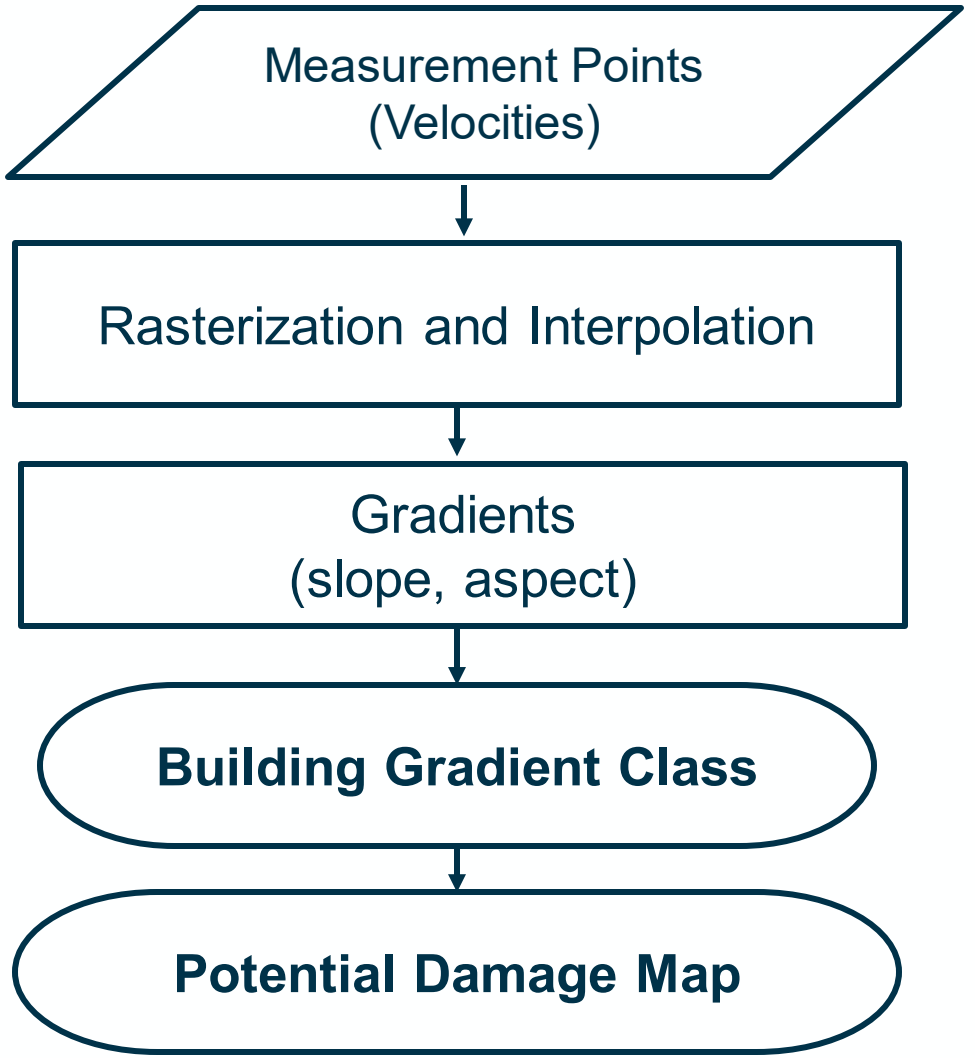
Active Deformation Areas (ADA)



Building-wise



Methodology



Methodology

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PSI displacement map:
EGMS

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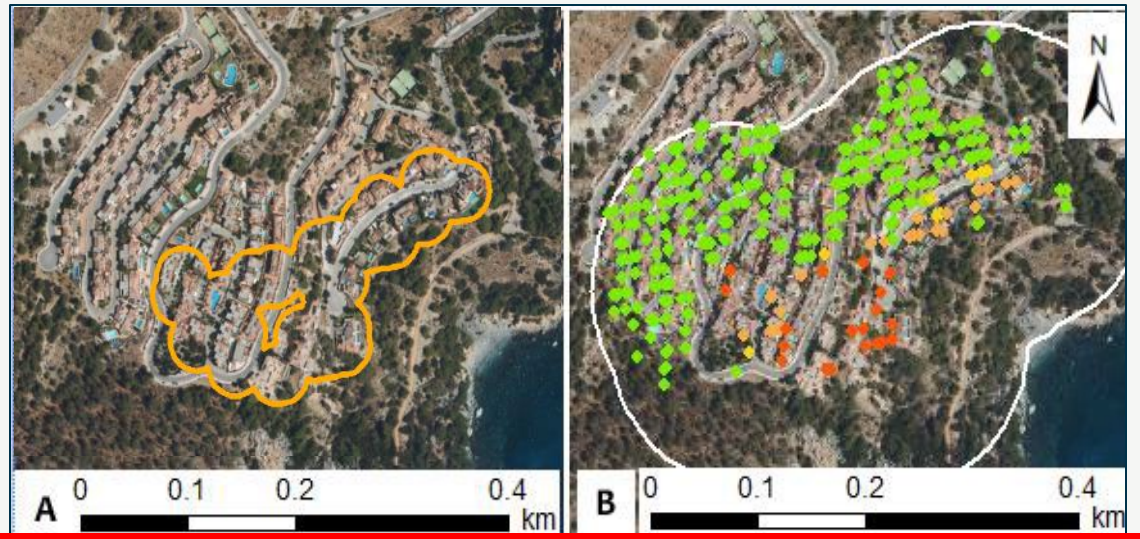

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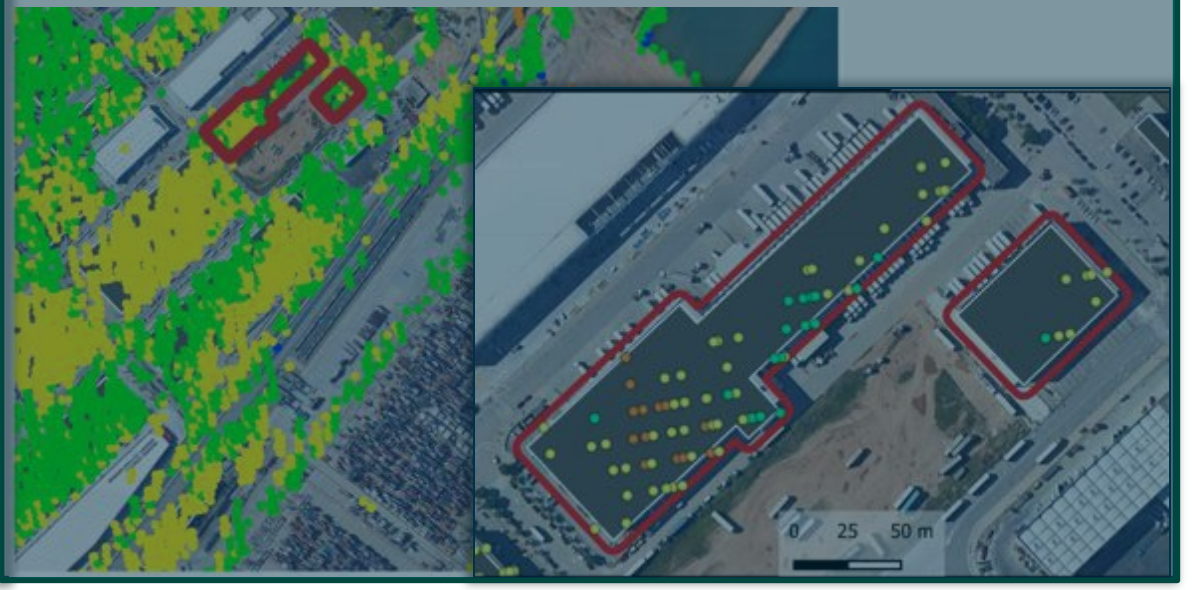
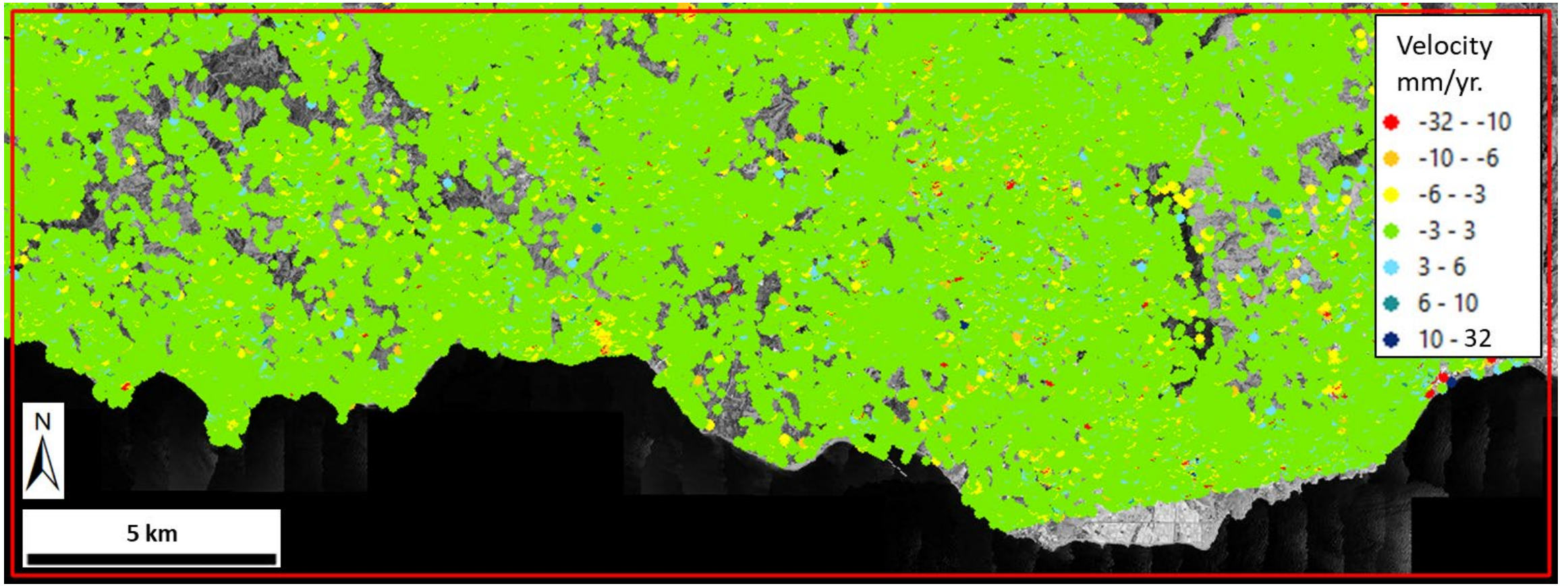


ADA-based approach: Area of Granada

ADA-based approach: Area of Granada

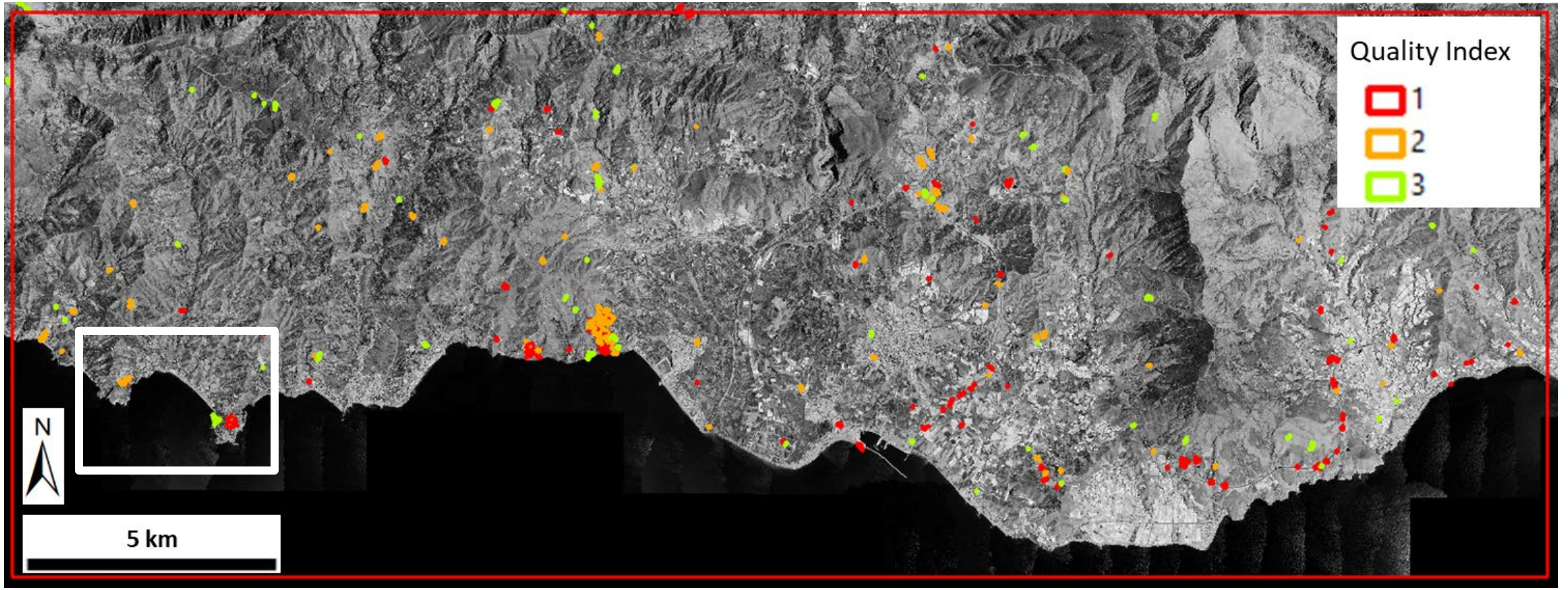
PSI displacement map



ADA-based approach: Area of Granada

ADAfinder

ADA extraction



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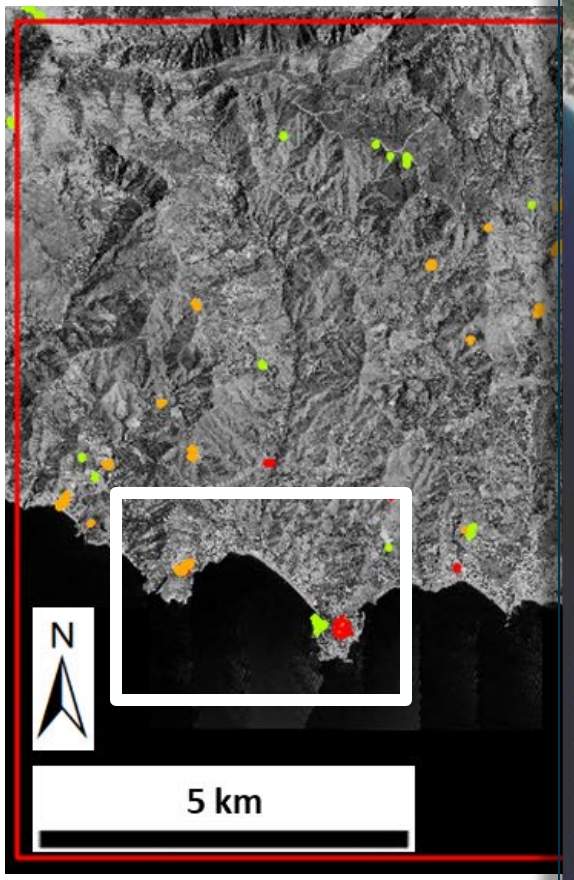
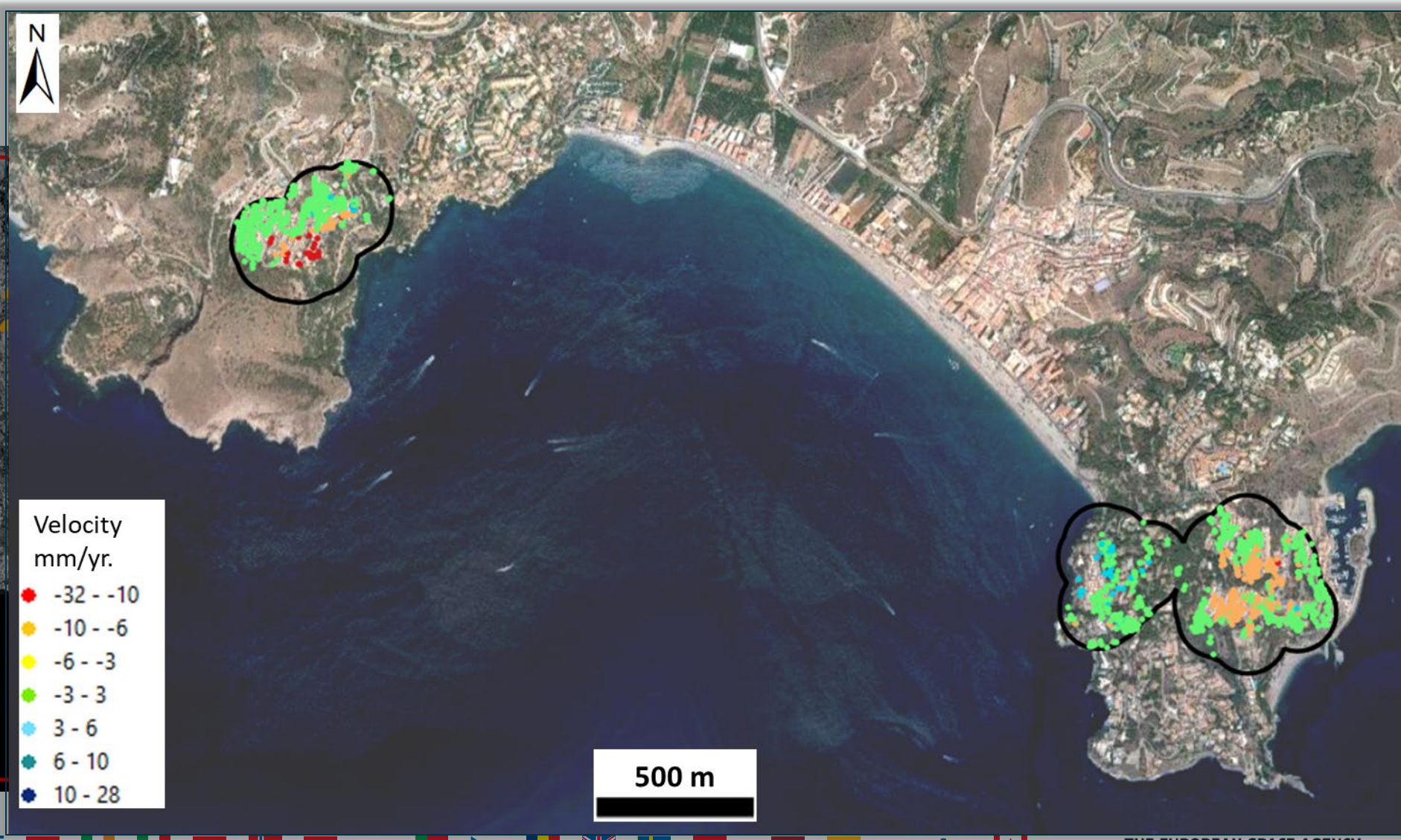
ADAfinder





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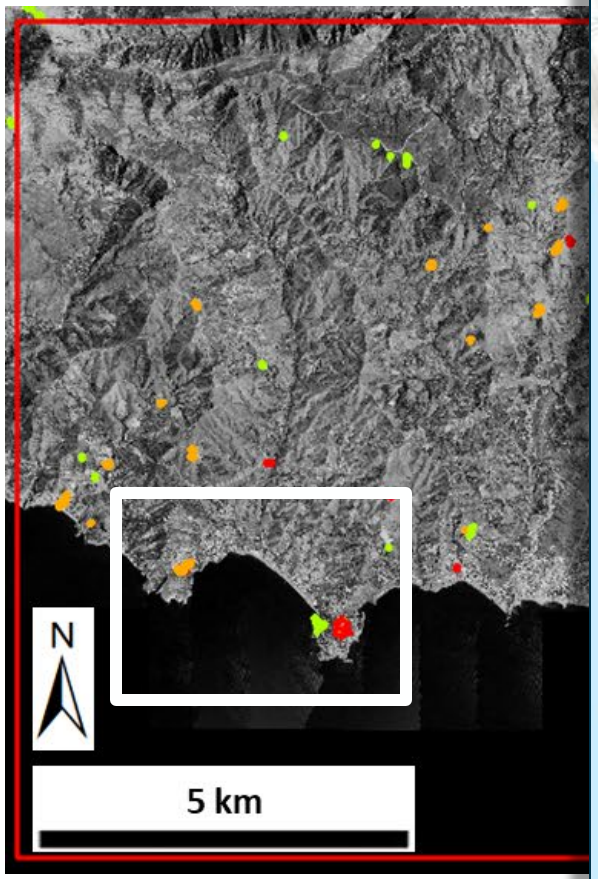

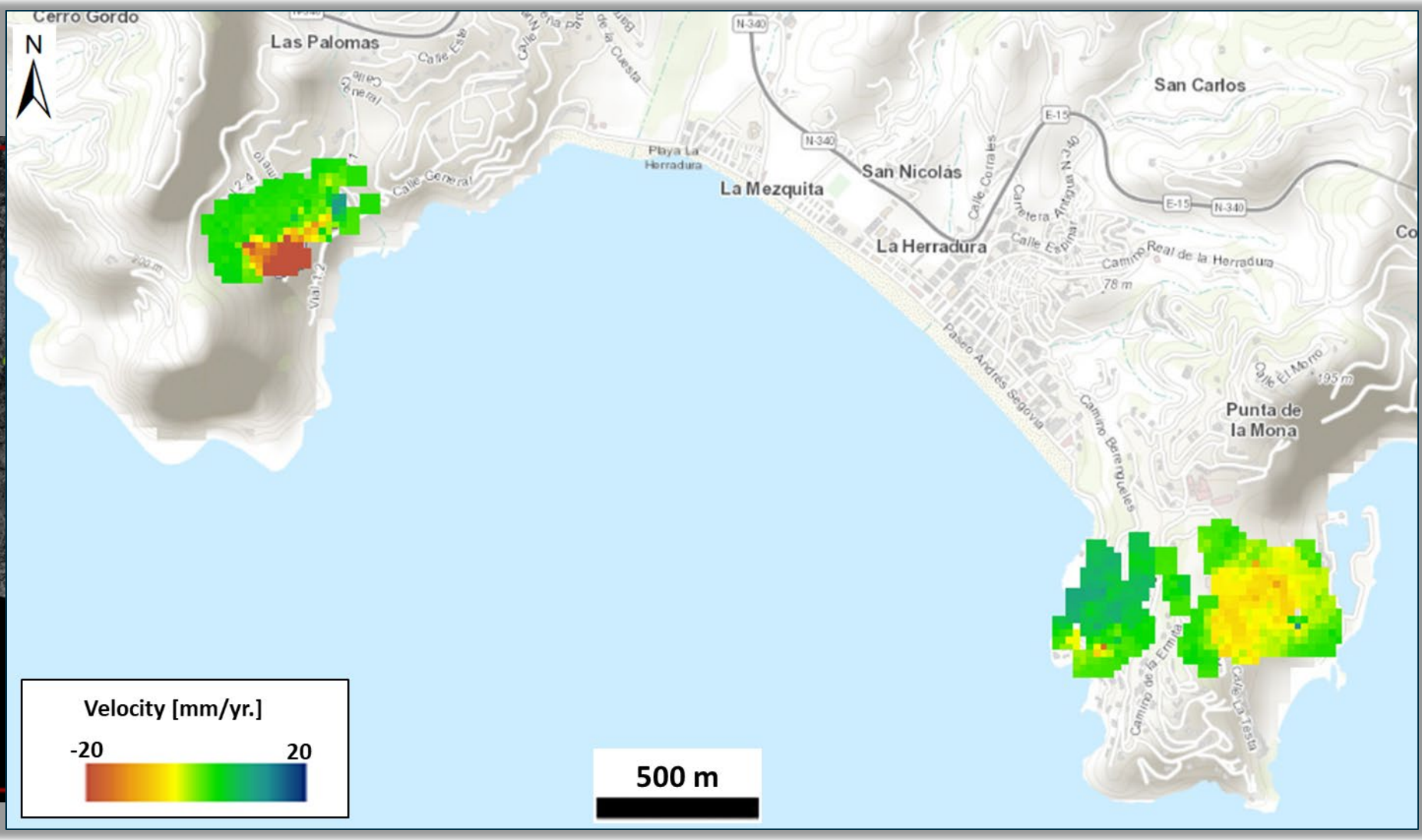

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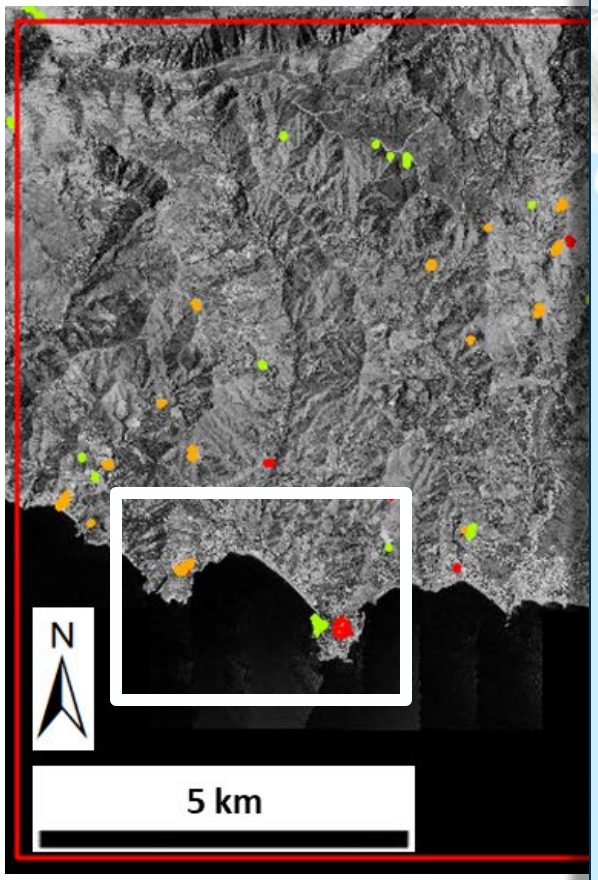

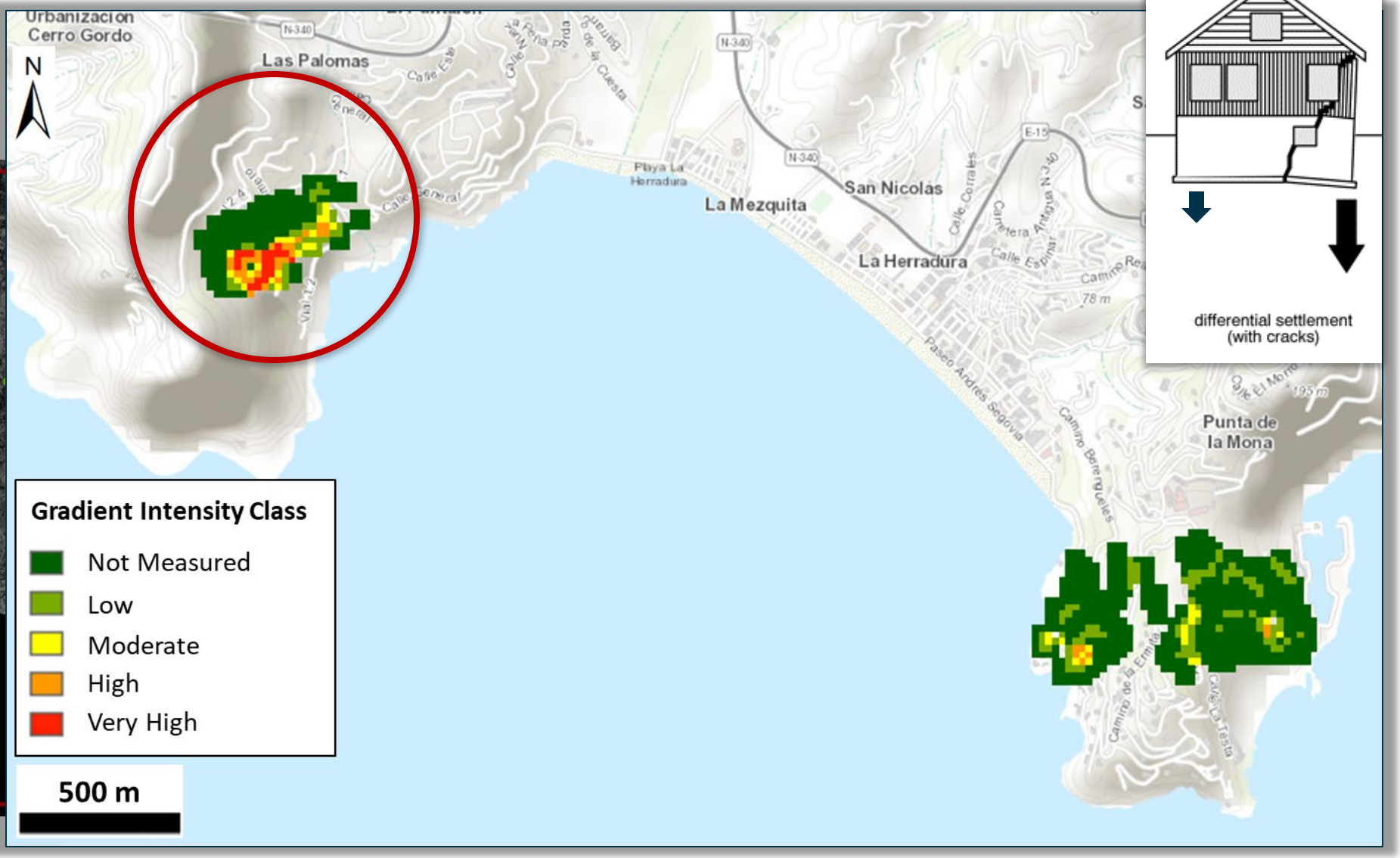

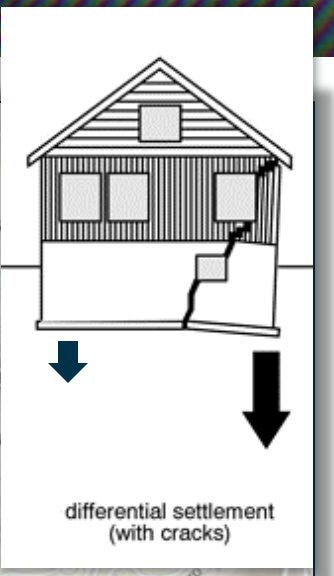

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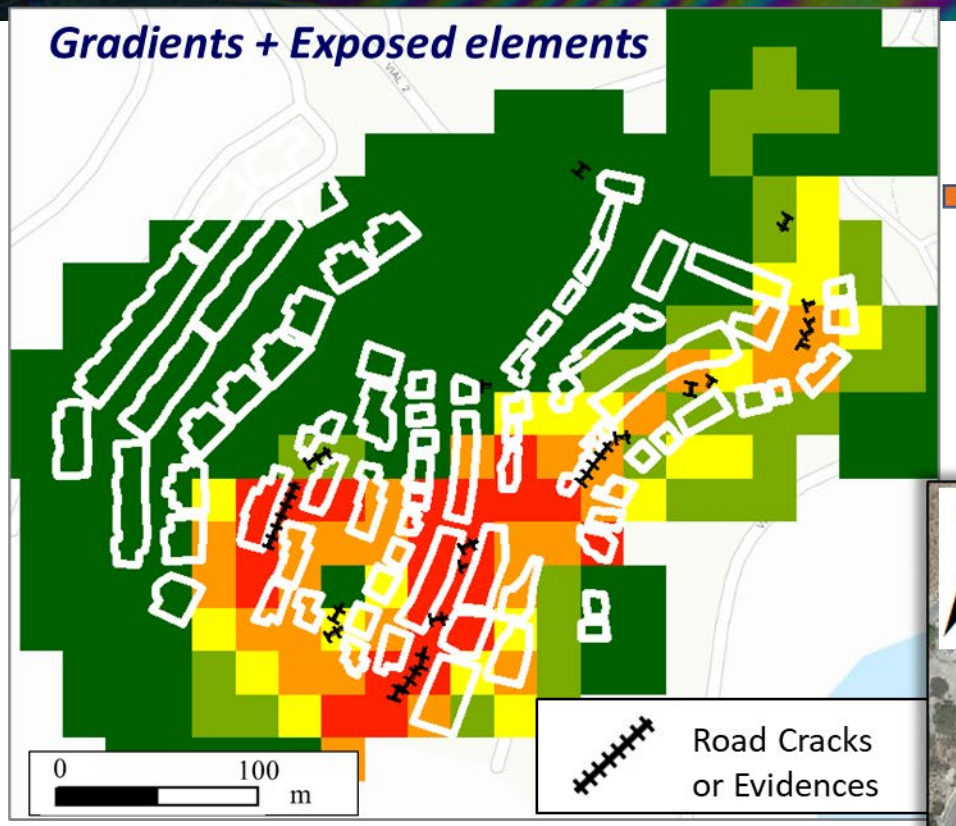
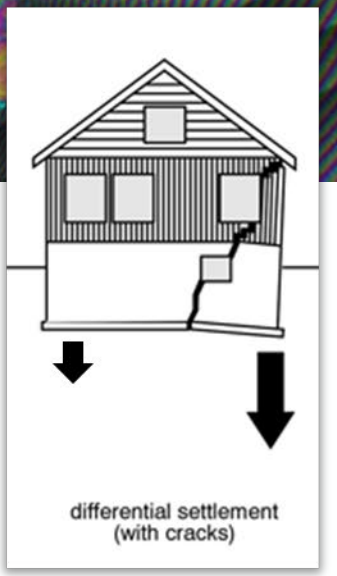
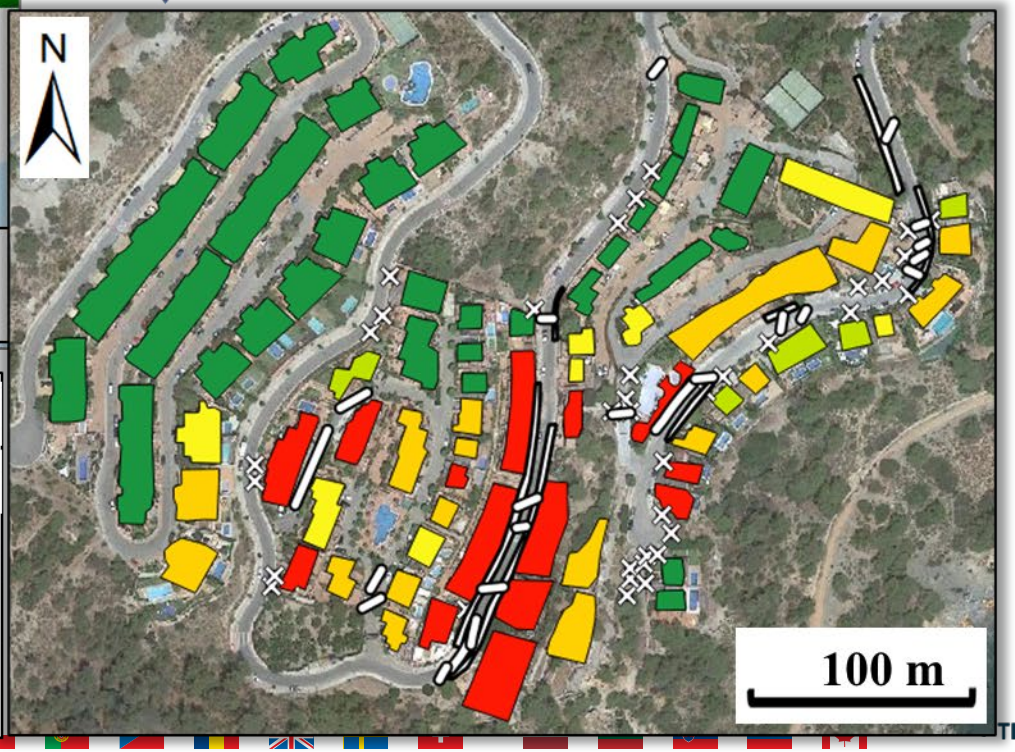




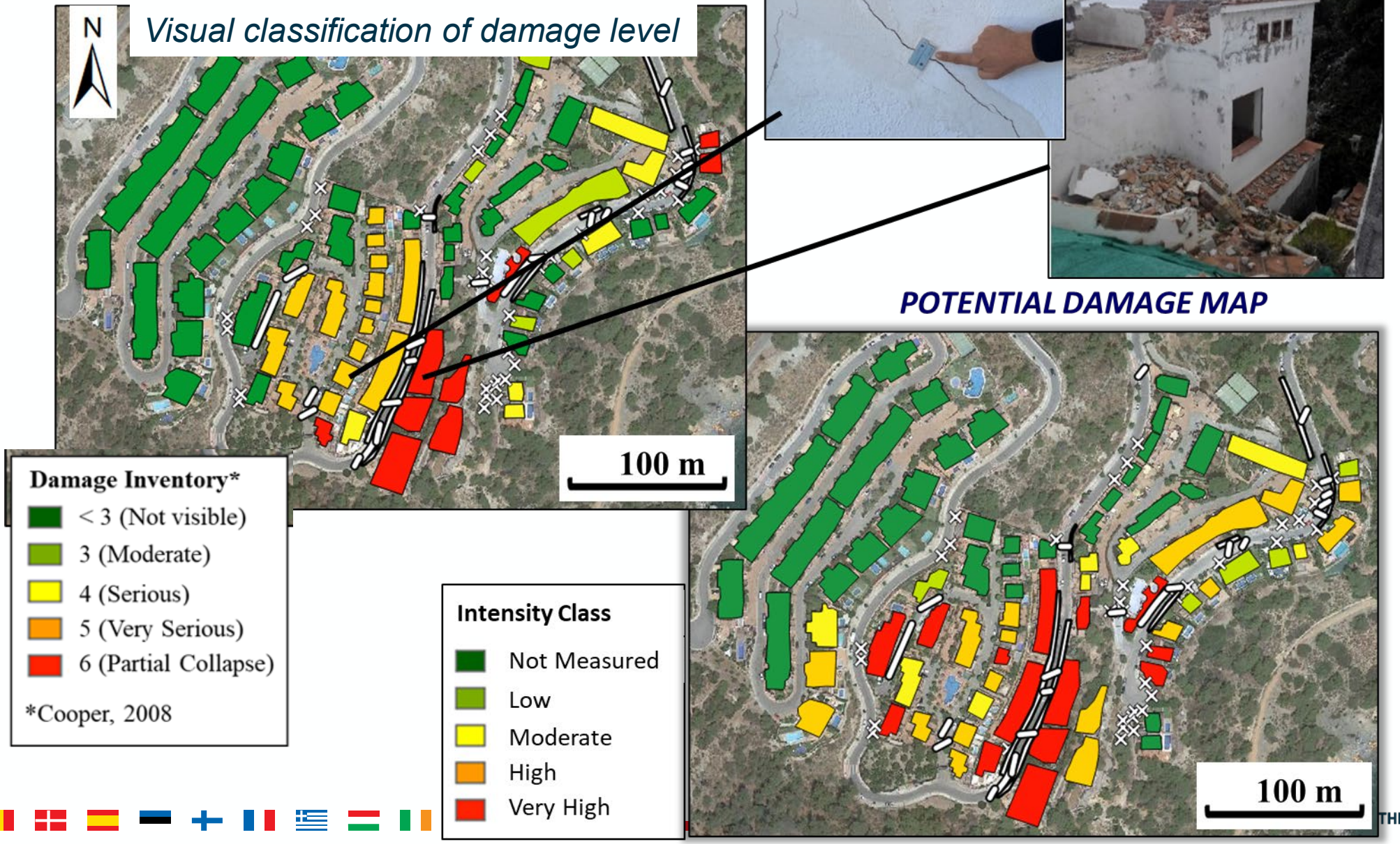
POTENTIAL DAMAGE MAP



Intensity Class

- Not Measured
- Low
- Moderate
- High
- Very High

ADA-based approach: Area of Gr



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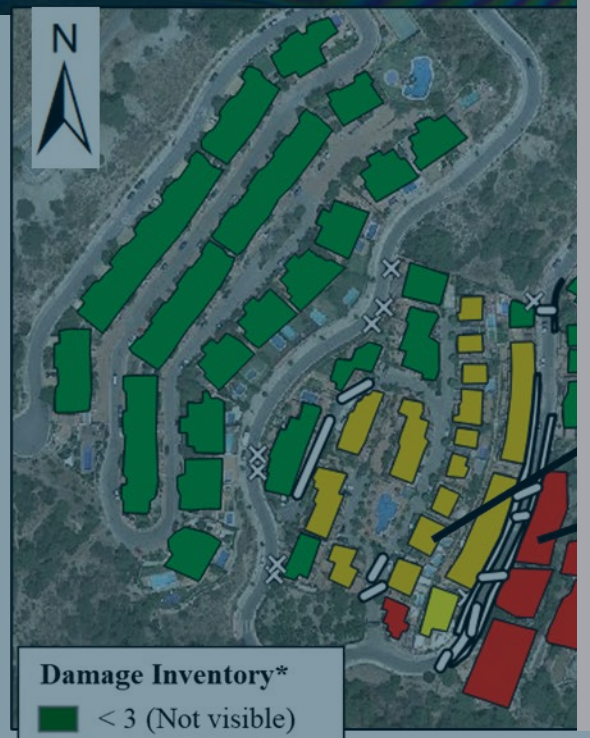

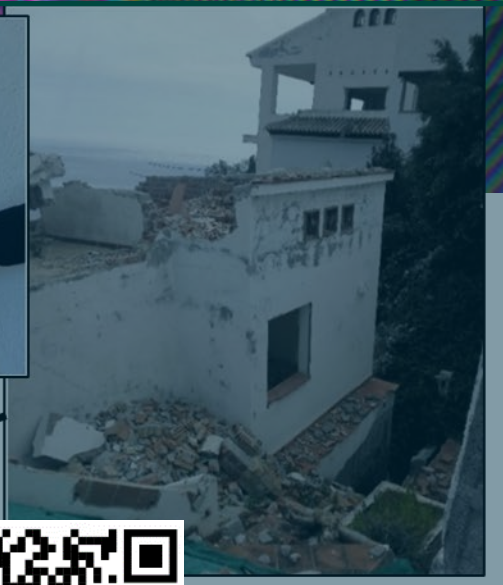

From Satellite Interferometry displacements to potential damage maps: a tool for risk reduction and urban planning

Anna Barra[a], Cristina Reyes-Carmona[b], Gerardo Herrera[b], Jorge Pedro Galve[c], Lorenzo Solari[a], Rosa María Mateos[b], Jose Miguel Azañón[c], Marta Béjar-Pizarro[b], Juan López-Vinielles[b], José Cuervas[d], Riccardo Palama[a], Michele Crosetto[a], Oriol Monserrat[a]

Methodology

Inputs

PSI displacement map:
EGMS

Buildings/structures inventory:
OpenStreetMap

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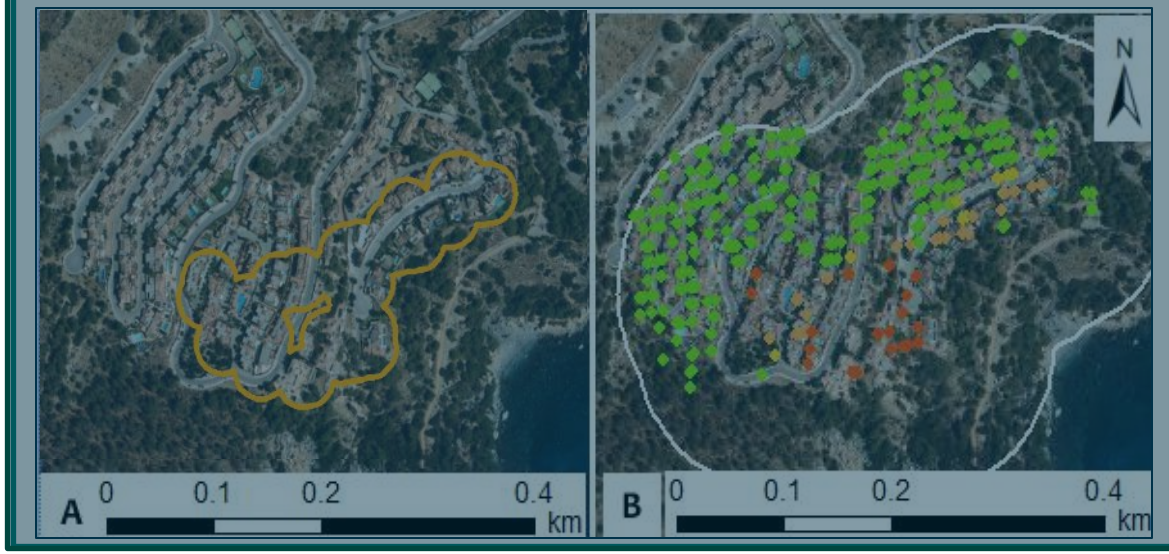
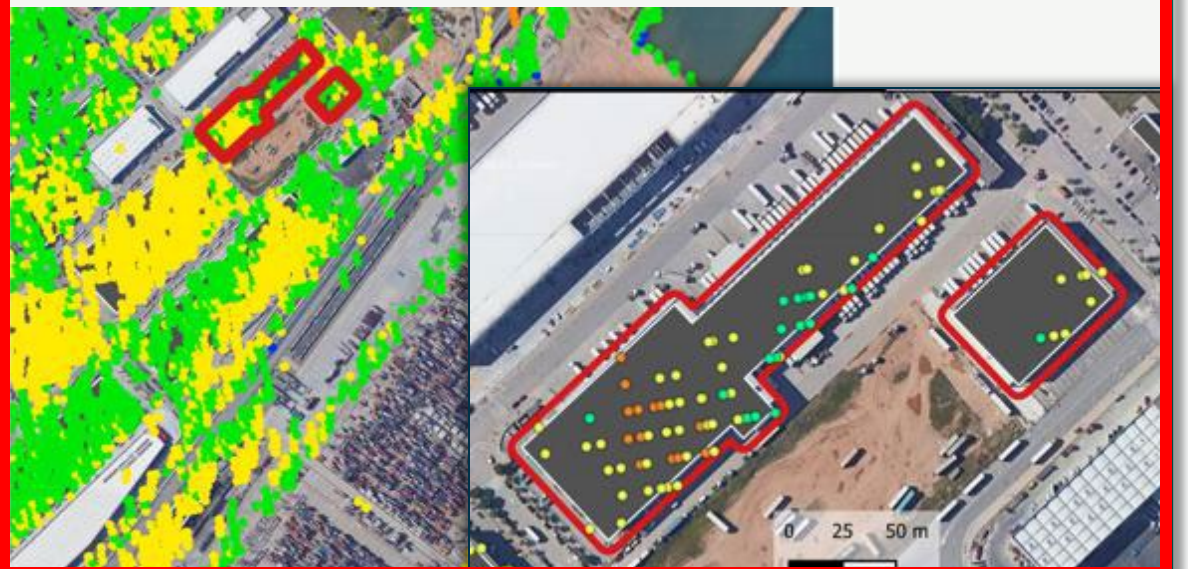
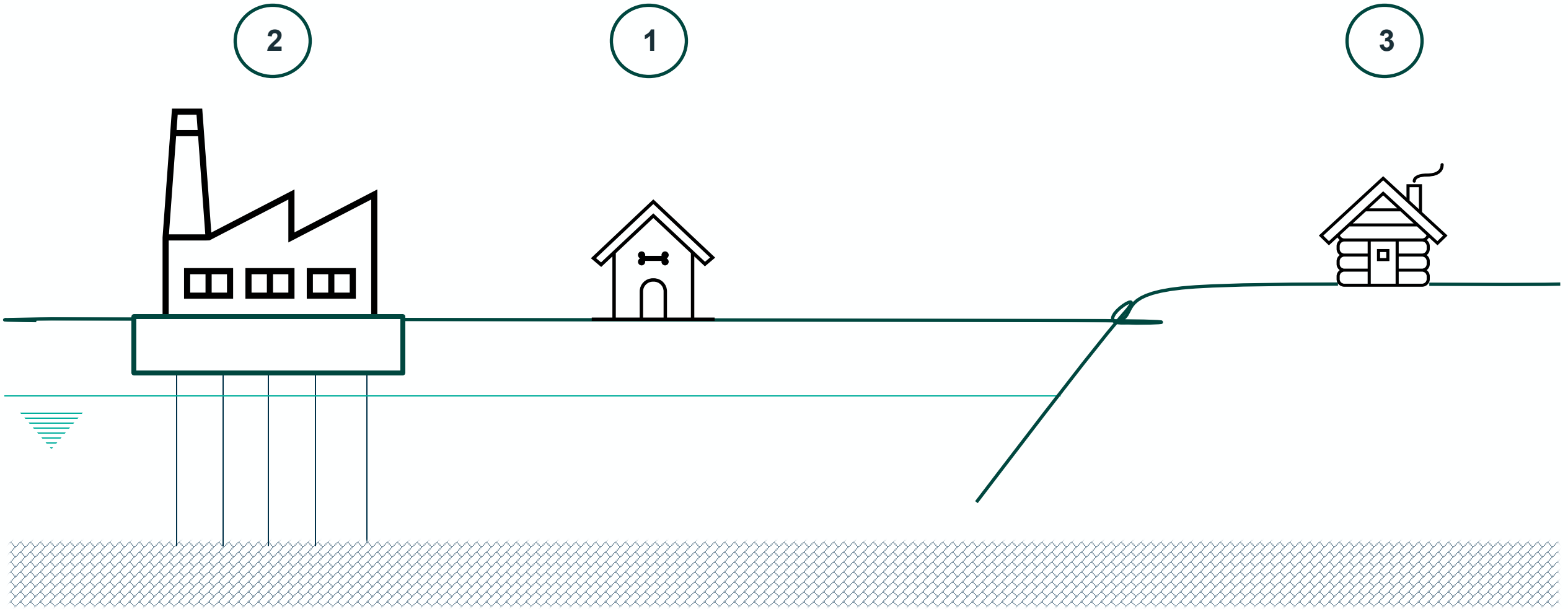


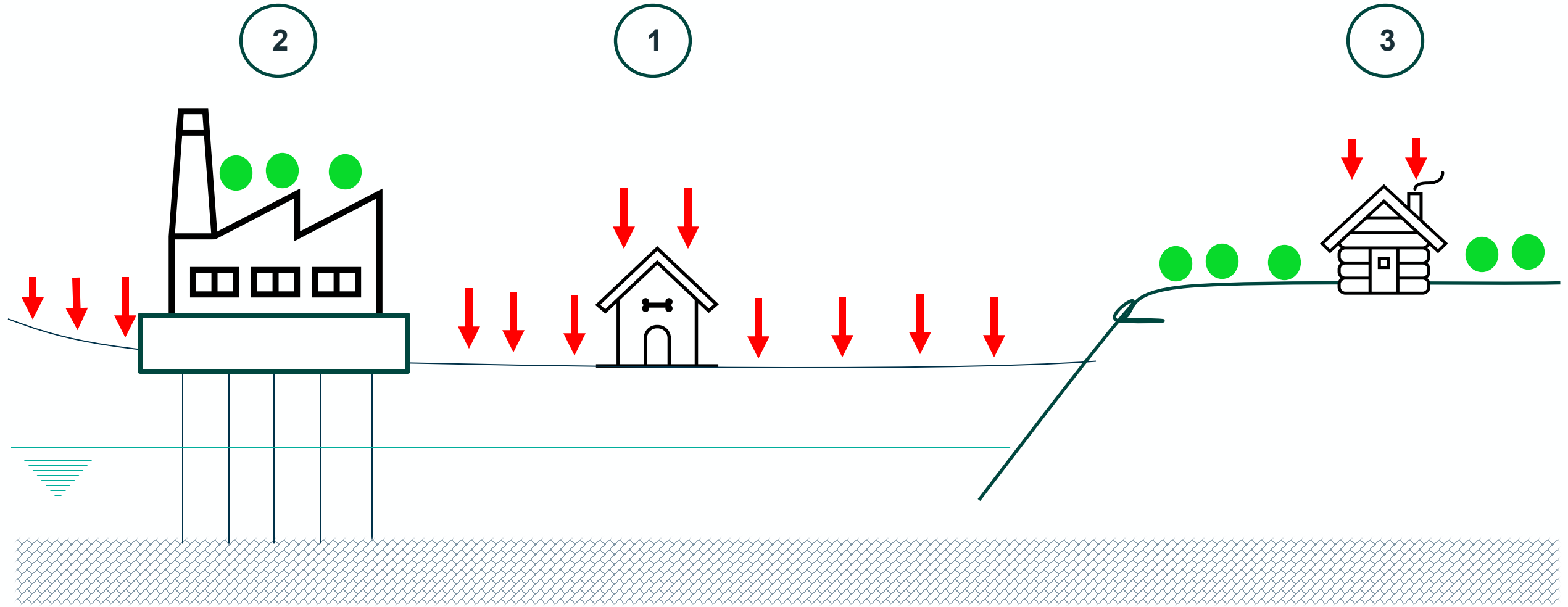
Building-wise



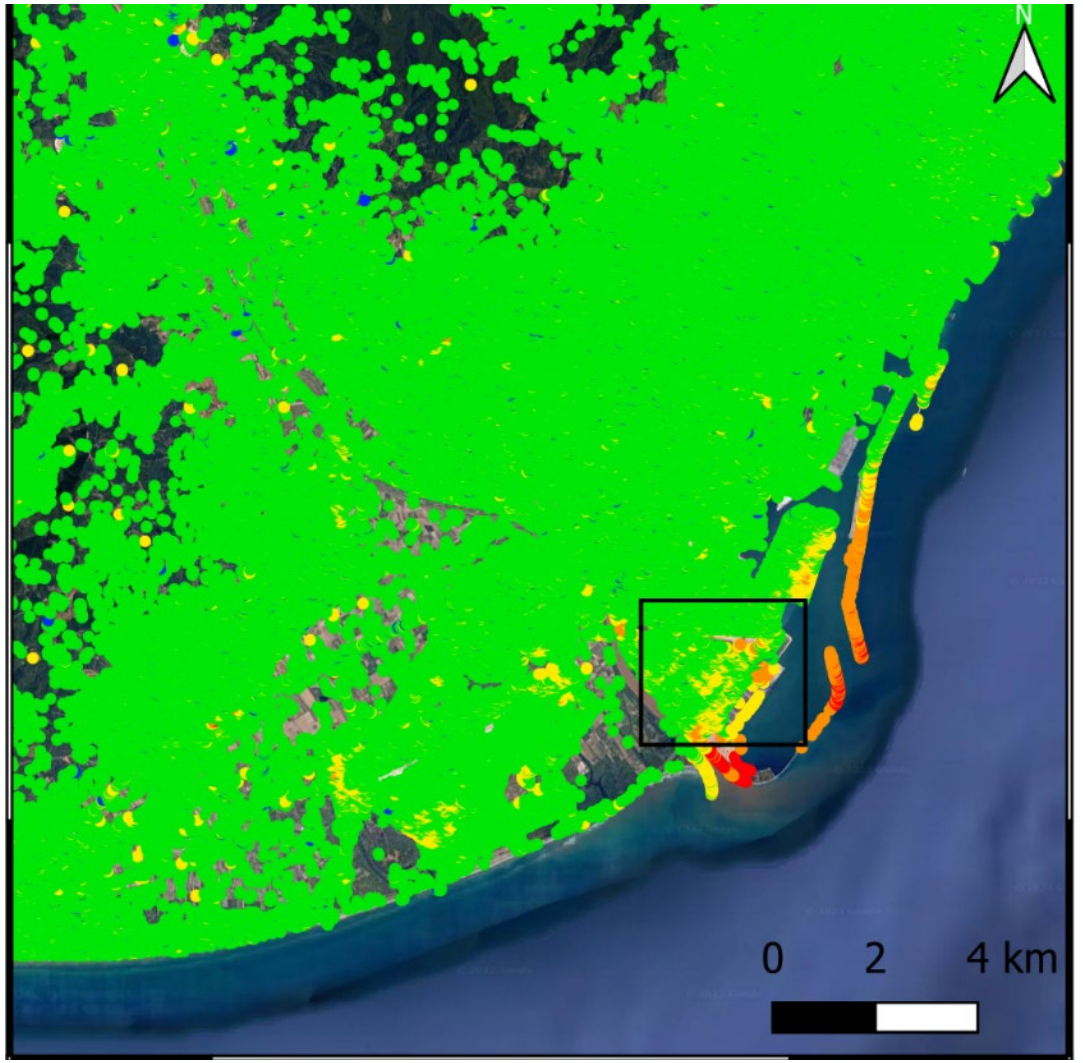
Why Building-Wise?

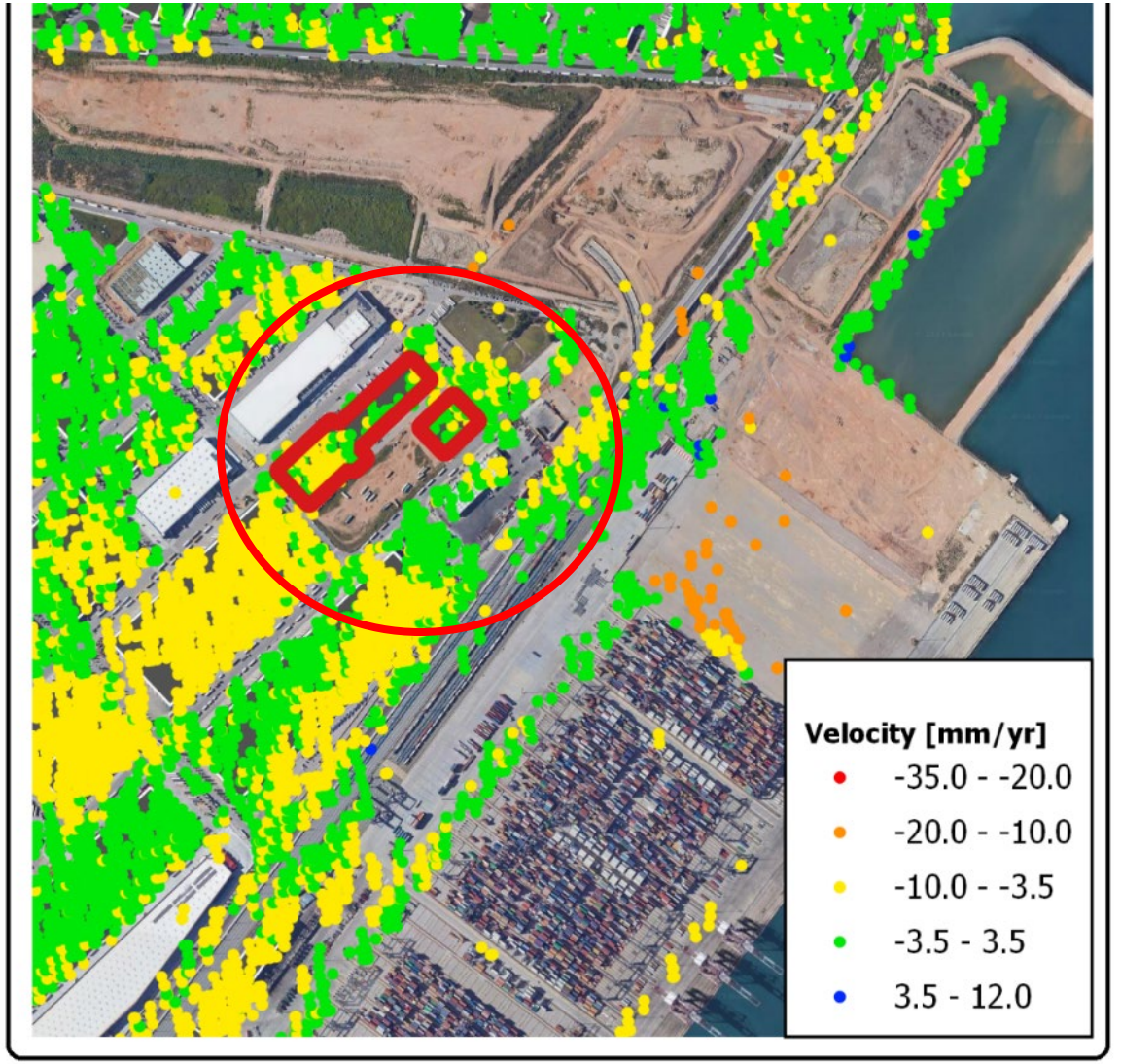


Why Building-Wise?

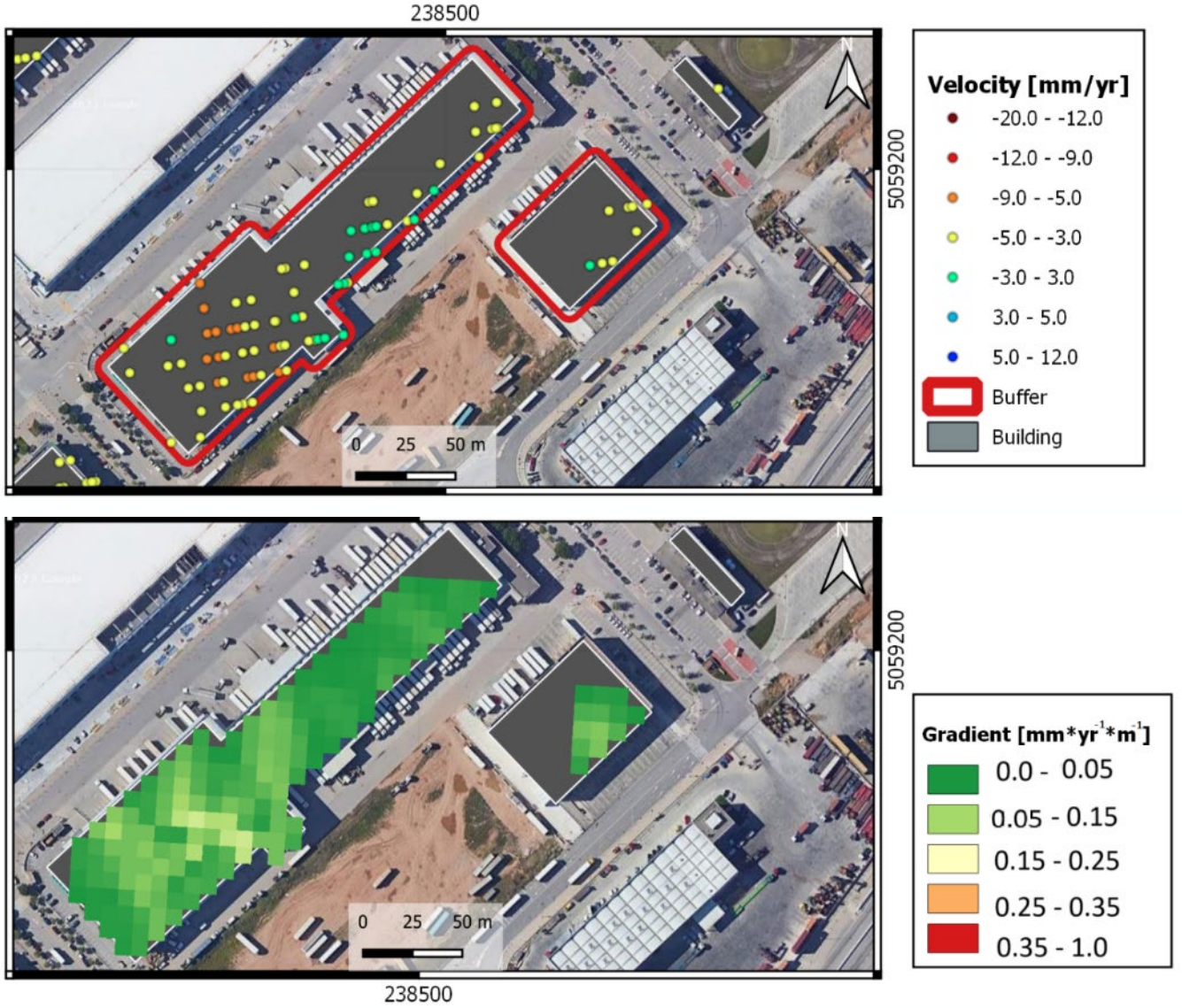


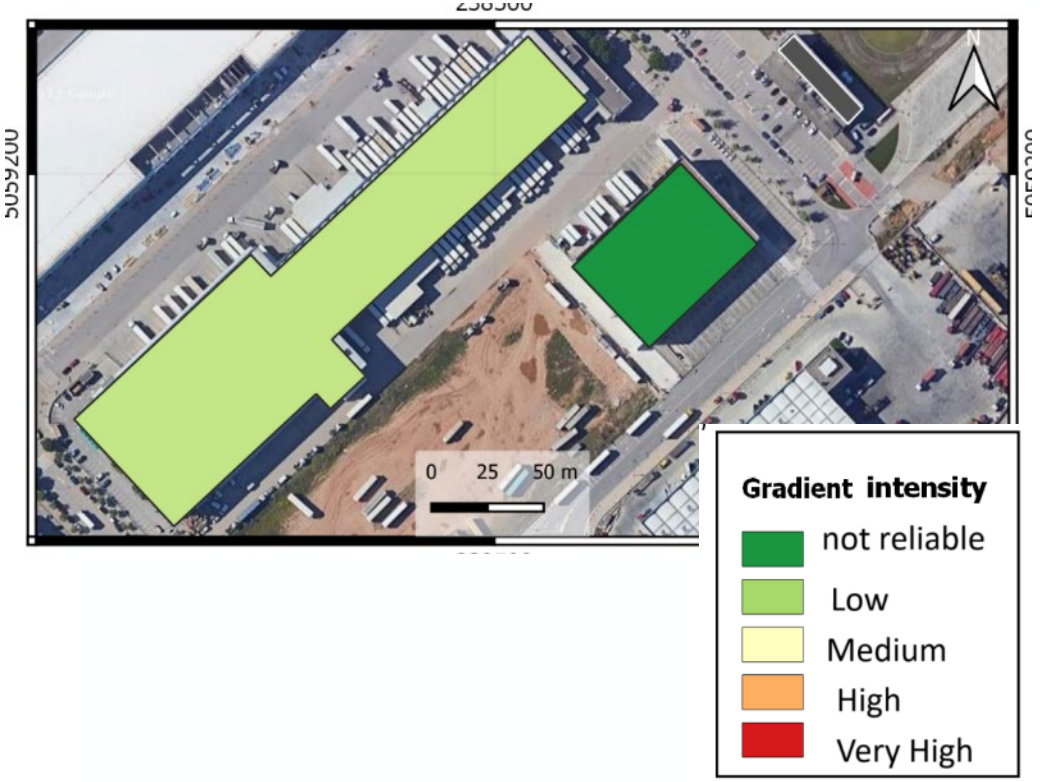
Building-wise approach: Barcelona





Building-wise approach: Barcelona



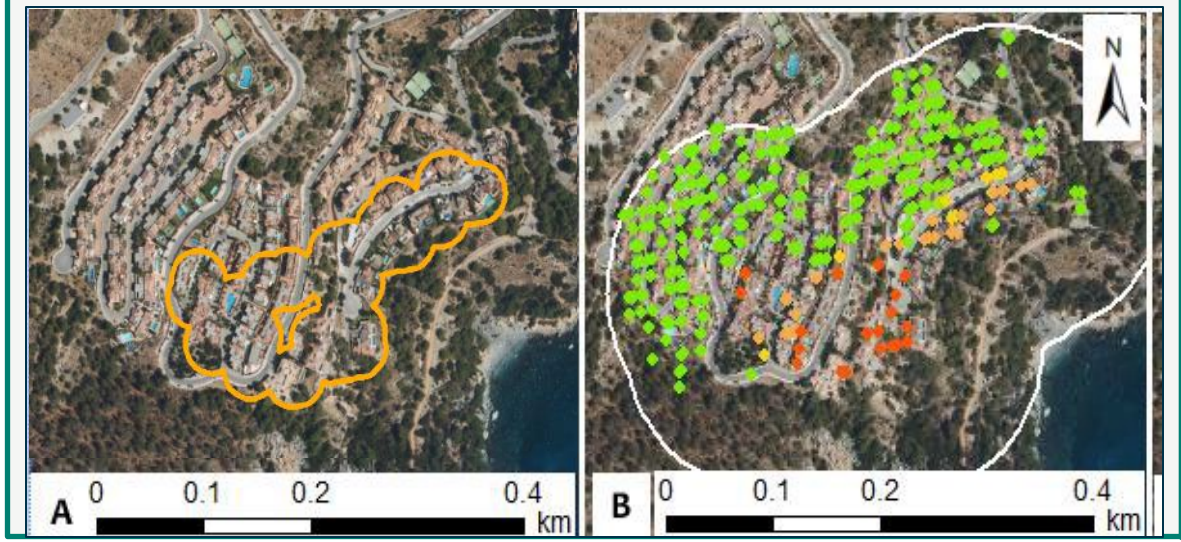


Remarks

Both methods have been implemented in tools that are optimized to work with the EGMS data, over wide areas: **soon applied to the whole EGMS data**

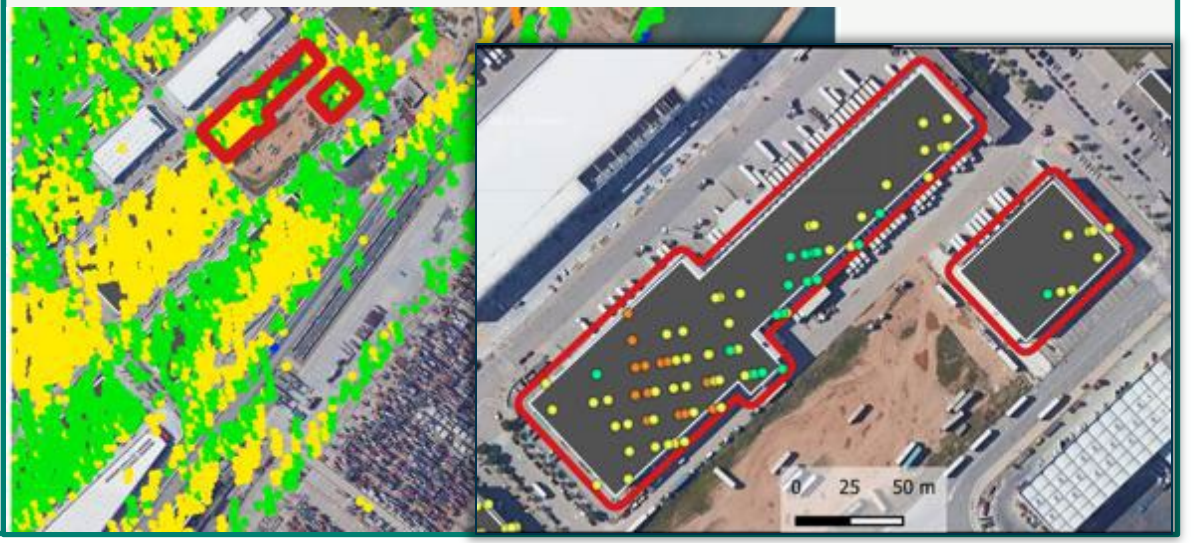
Active Deformation Areas (ADA)

- ADA-scale: less detail
- Applicable everywhere
- Small villages, urbanizations, rural areas



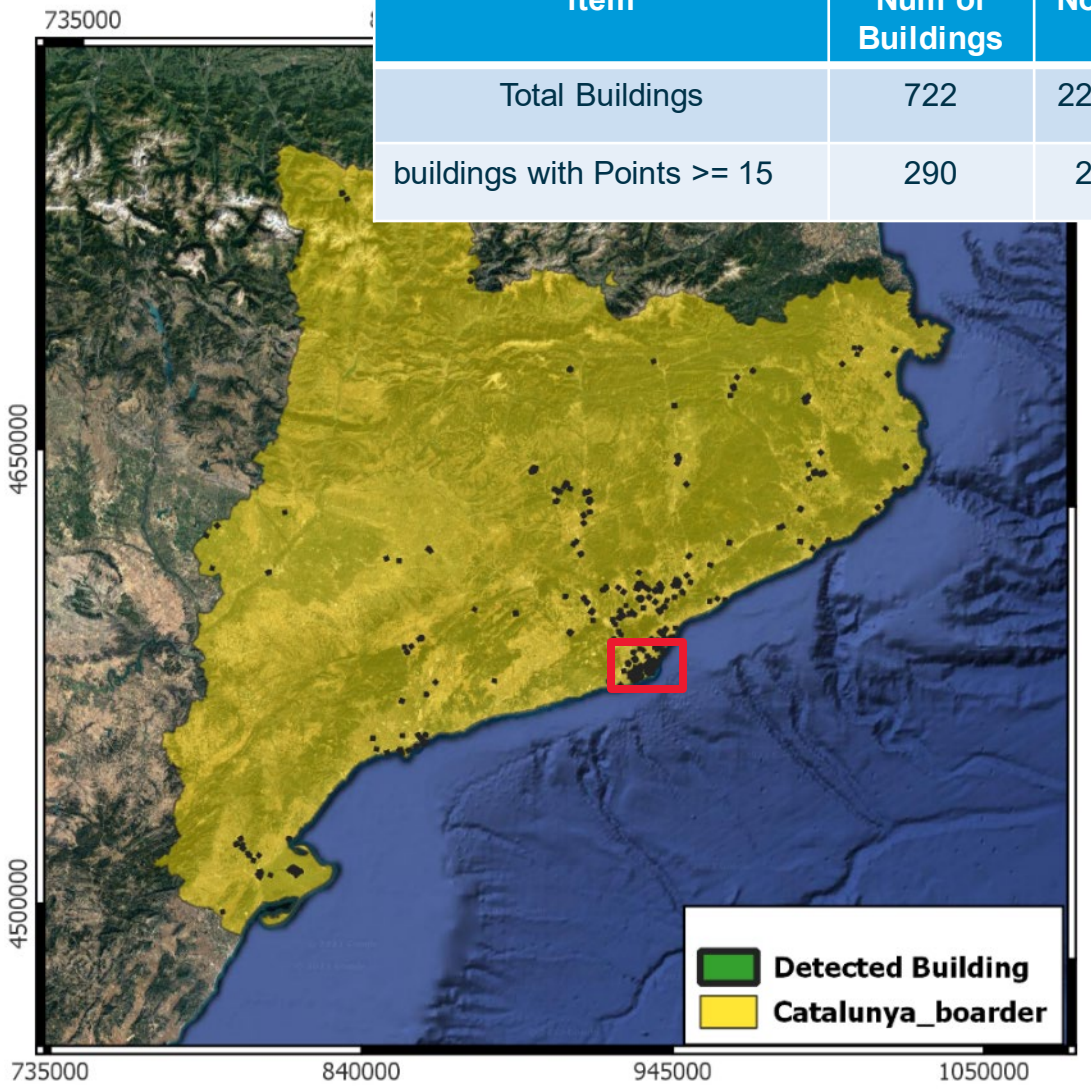
Building-wise

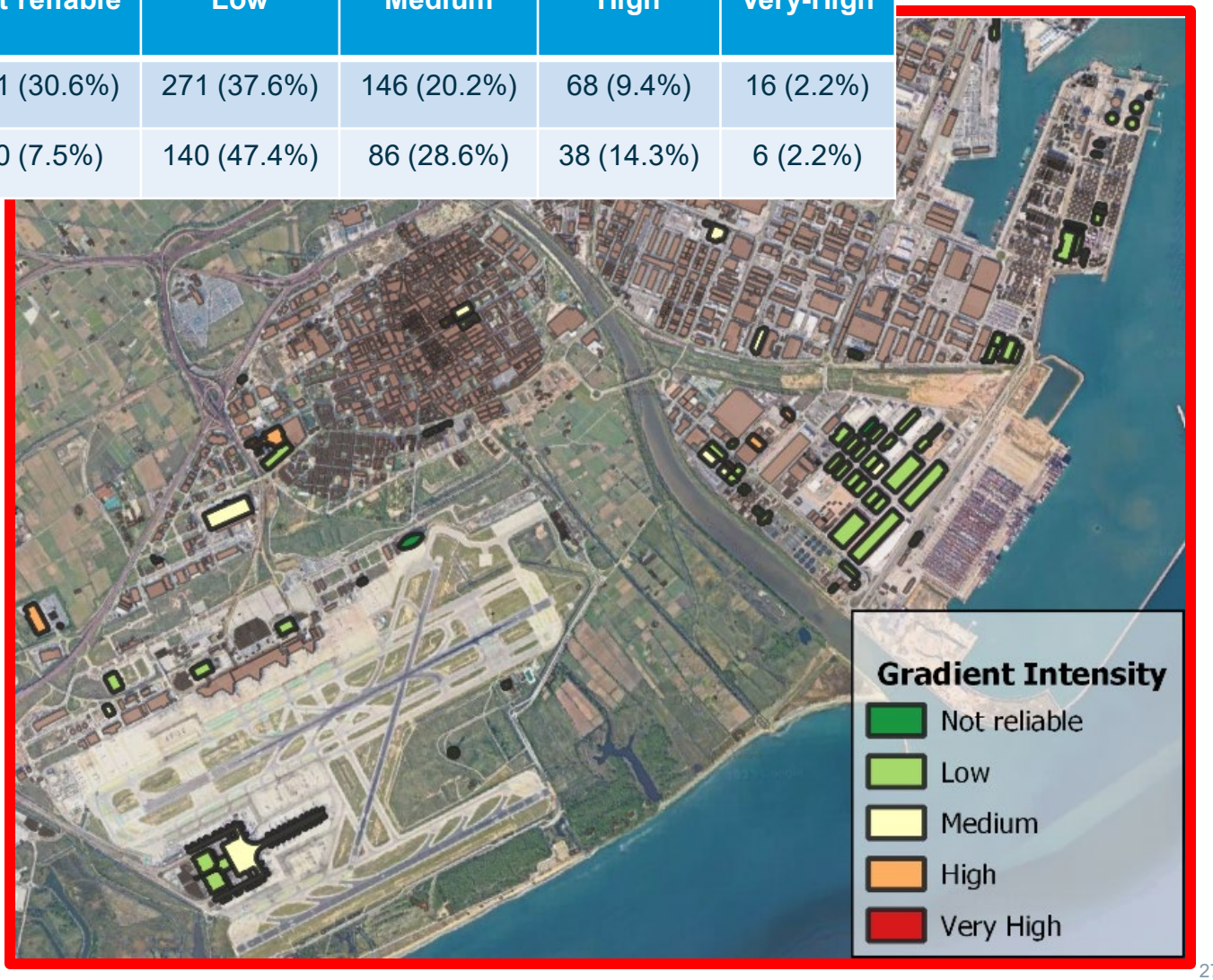
- Building-scale: more specific and detailed information
- Uncertainty analysis: a minimum number of measurement points is required
- Industrial buildings, urban areas



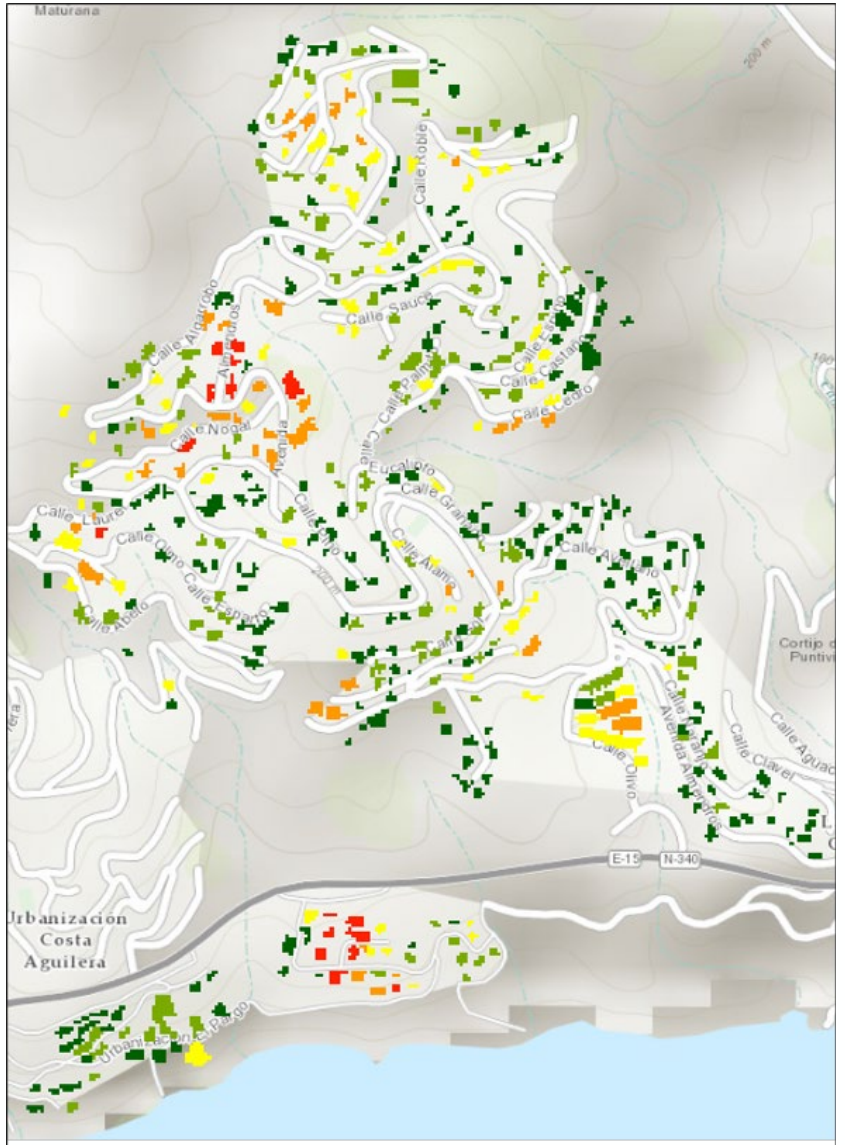
Building-wise approach: Catalunya

item	Num of Buildings	Not reliable	Low	Medium	High	Very-High
Total Buildings	722	221 (30.6%)	271 (37.6%)	146 (20.2%)	68 (9.4%)	16 (2.2%)
buildings with Points >= 15	290	20 (7.5%)	140 (47.4%)	86 (28.6%)	38 (14.3%)	6 (2.2%)





Conclusions



- Potential Damage Map: a first step towards a **vulnerability assessment**
- Product derived exclusively from **remote sensing** data
- Tool to **support risk analysis, urban planning, and territorial management**
- Clear information for different actors, like public institutions, civil engineers, insurance companies, etc.

Thank you for your attention

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