# 1st Workshop of the Geohazards Community of Practice of GEO

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# EUCENTRE

- EUCENTRE is a center for research and training in earthquake engineering based in Pavia
- It is a foundation founded by University of Pavia, IUSS, INGV and Civil Protection Department
- It is divided into several sections, including:
  - Telecommunications and Remote Sensing
  - Seismic Risk
- Will host the secretariat of the GEM (Global Earthquake Model)

# EUCENTRE proposal for GEO

- The Remote Sensing Section of EUCENTRE, after careful consideration of the GEO Workplan, has submitted a proposal, supported by the Seismic Risk section, to address seismic vulnerability mapping based on Earth Observation (EO)
- The EUCENTRE proposal was endorsed by UN-SPIDER and included into the WP 2009-2011 as the leading theme of the subtask DI-09-01a, “Vulnerability and Risk Mapping”

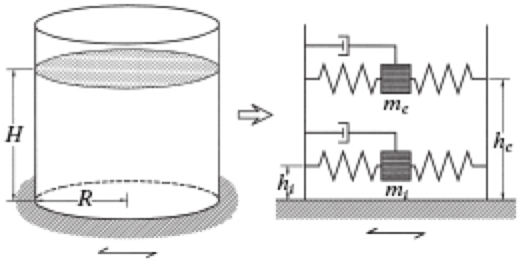
# Proposal pillars

- Framework with a combination of methods
- Addressing different aspects of vulnerability (physical, human, ease of emergency intervention and recovery, …)
- EO-based, but not exclusively (ancillary, GIS …)
- Initially focussed on urban areas
- Extraction of features of interest from satellite images (e.g. number of floors, ratio between window and façade areas, width of vertical walls between windows, …)

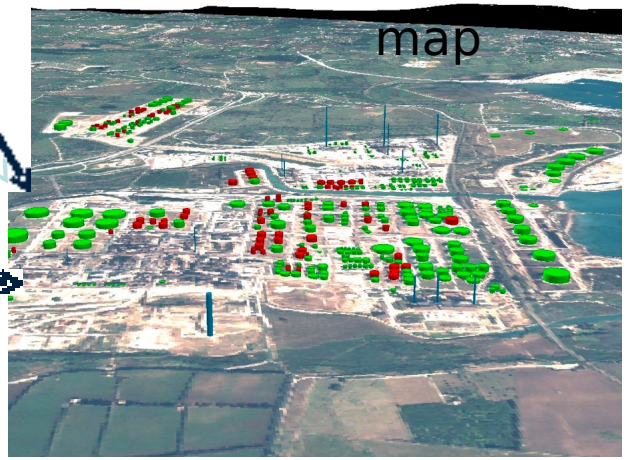
# Case study: Priolo (Italy)

High-resolution satellite image

Detection of critical features

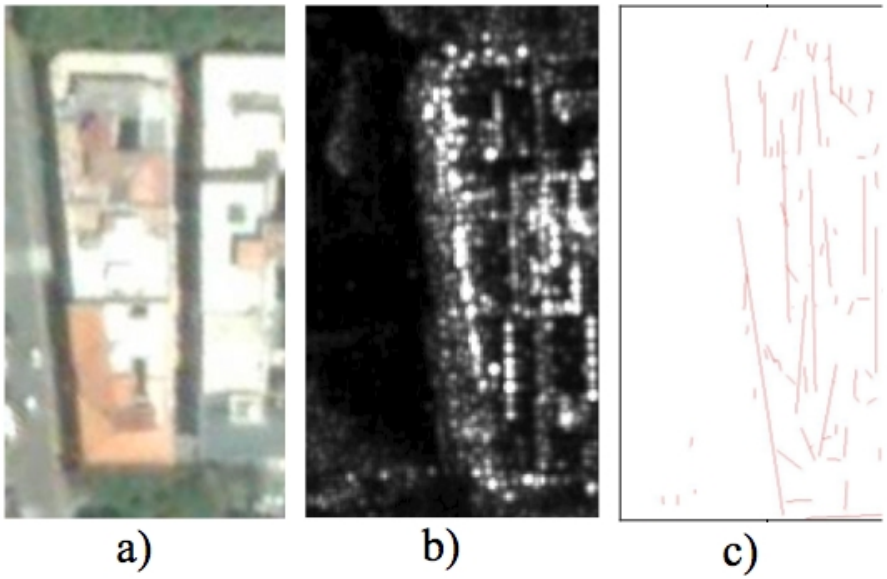



Seismic vulnerability model



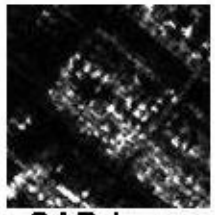
Vulnerability map

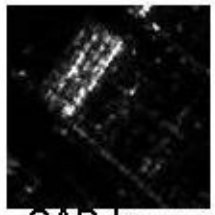
# Building vulnerability study – test case

# Building vulnerability study


Optical Image


SAR Image

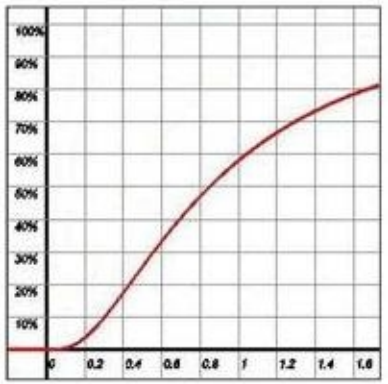

SAR Image

Footprint extractor

Information exchange

Floor extractor

SP-BELA



# Resulting vulnerability map

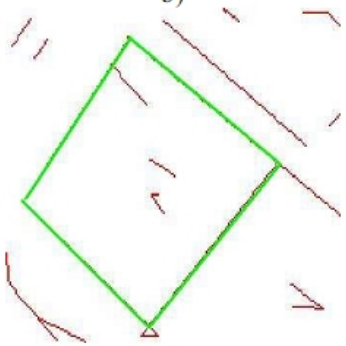
The result is a GIS vulnerabuility classes

# Messina – Study case

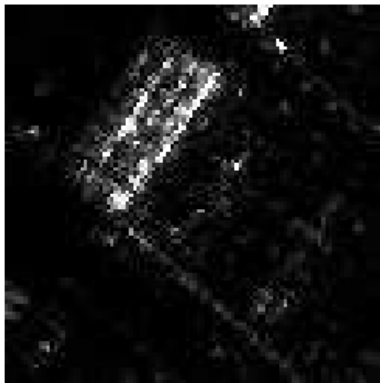
a)

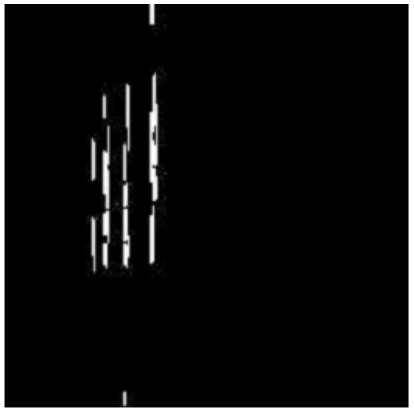
b)

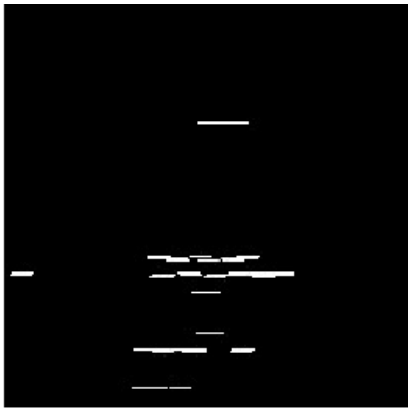
c)



d)







# What we need

- locate areas with all of the following characteristics:
  - presence of buildings with
    - different heights and numbers of floors
    - both concrete and masonry are represented
    - buildings are not too packed, i.e. free space between consecutive buildings equals at least their height
    - preferably regular (i.e. rectangular) footprint
    - if possible, both gable and flat roofs should be found in the area
  - lowest possible frequency of cloud cover and mist (to allow a suitable optical image to be acquired in a reasonable time)
  - relatively flat terrain, in order to rule out possible distortions in the images due to terrain slope, not considered in this project.
- The selected areas should be reported using .kml files with polygons, accompanied by a brief description of the building characteristics, especially those which convinced the operator to select that area.
- A seismic hazard map would be helpful

# Conclusions

- A framework for EO-based seismic vulnerability mapping has been set up under GEO Task DI-09-01a
- Preliminary case studies have been performed over Priolo and Messina, Italy, and Trinidad, Caribbean Islands.
- Seeking for more estensive funding of these activities to bring the method closer to operational use.