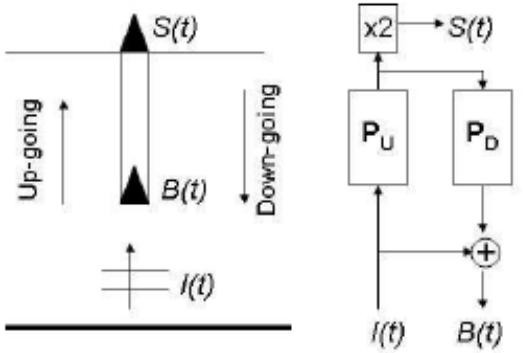
The input ground motion at depth is reconstructed from that at the surface without requiring the knowledge of the borehole velocity structure

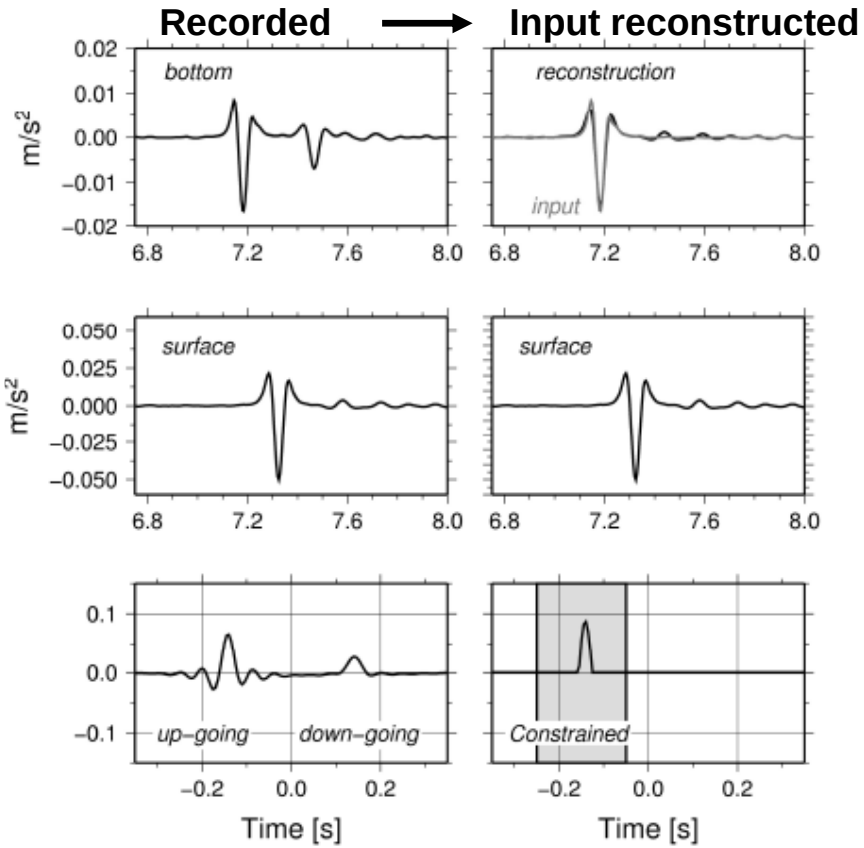


$$S_n(\omega) = W_n(\omega)\frac{u(z1,\omega)}{u(z2,\omega)}$$

where

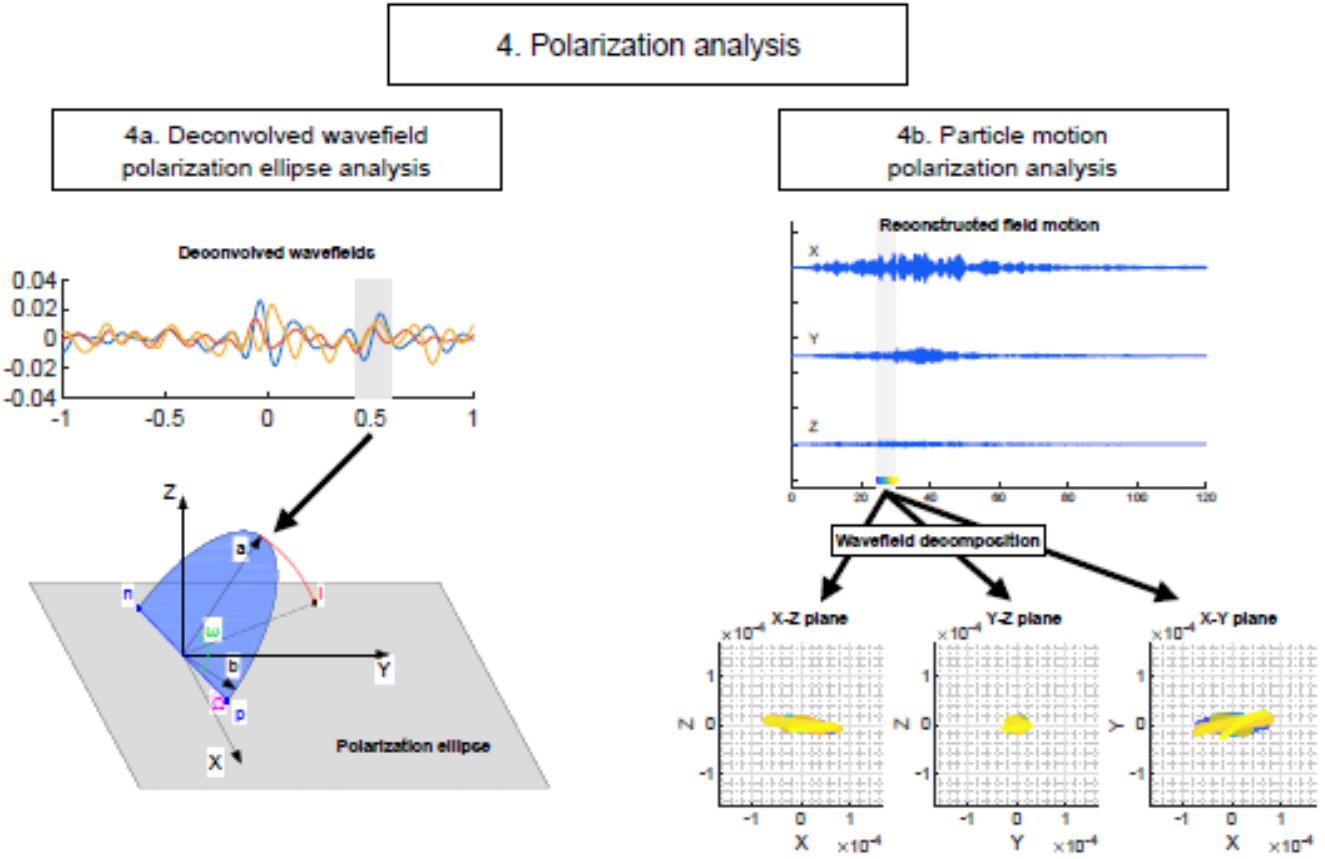
$$W_n(\omega) = 1-(1-\tau\,|\,u(z2,\omega)\,|^2)^n$$

is the Landweber filter



Bindi et al., 2010

Studying soil-structure and building-building interaction effects



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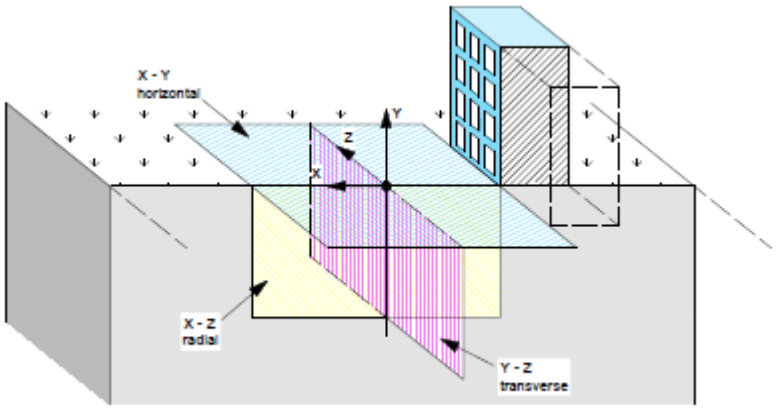

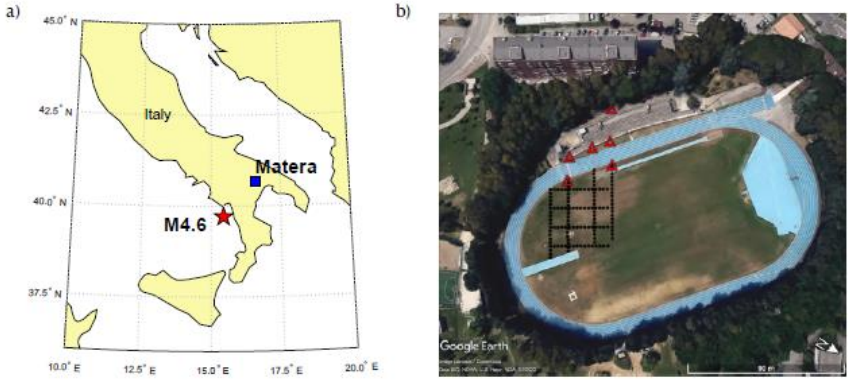

Figure 4.1: (a) Location of Matera test site (blue square) and the epicenter of the M4.6 Catanzaro earthquake on 25.10.2019 (red star). (b) Satellite view of Matera test site. Athletic field instrumentation deployment is indicated with red triangles (three-component sensors) and black dots (vertical geophones).

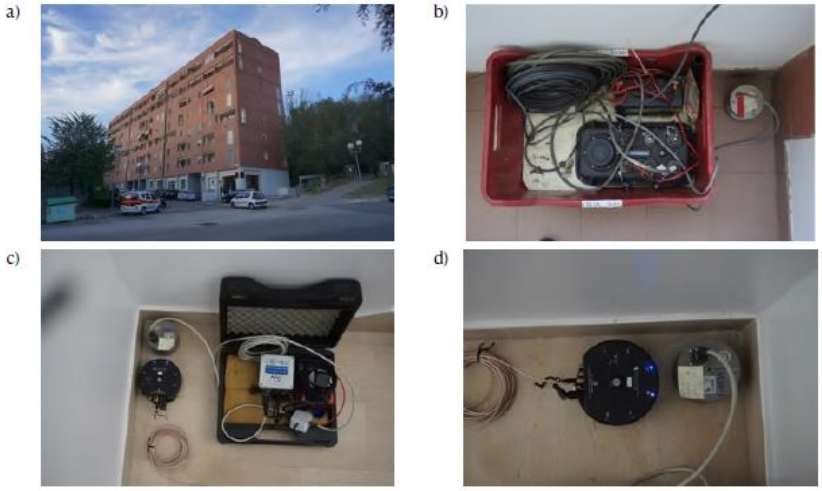

Figure 4.2: a) The building instrumented during the Matera experiment. b) Reftek digitizer connected to LE-3Dlite 1 s sensor. c) CUBE digitizer connected to LE-3Dlite 1 s sensor. d) Lunitek Sentinel Geo. Photographs author: Bojana Petrovic.

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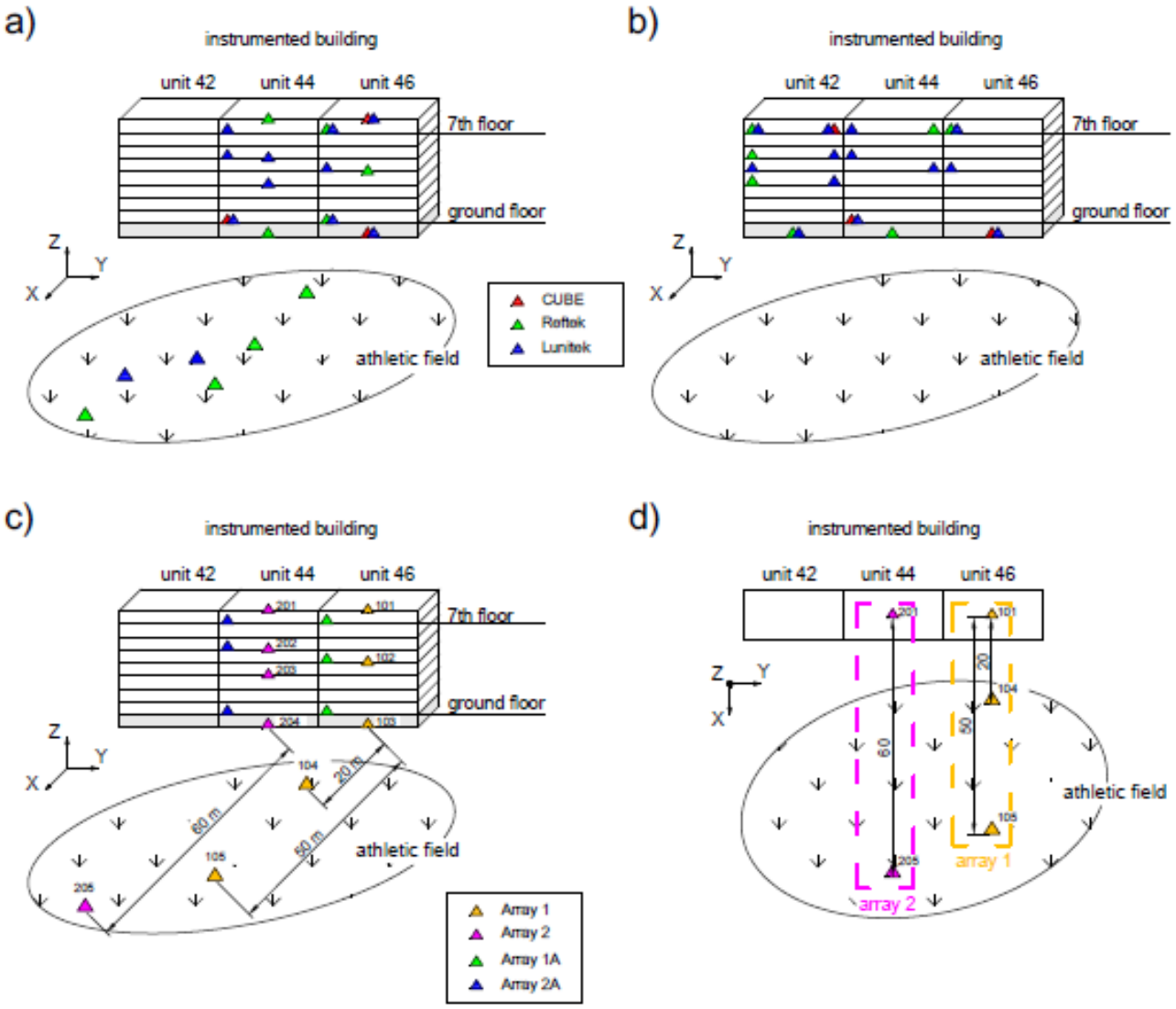

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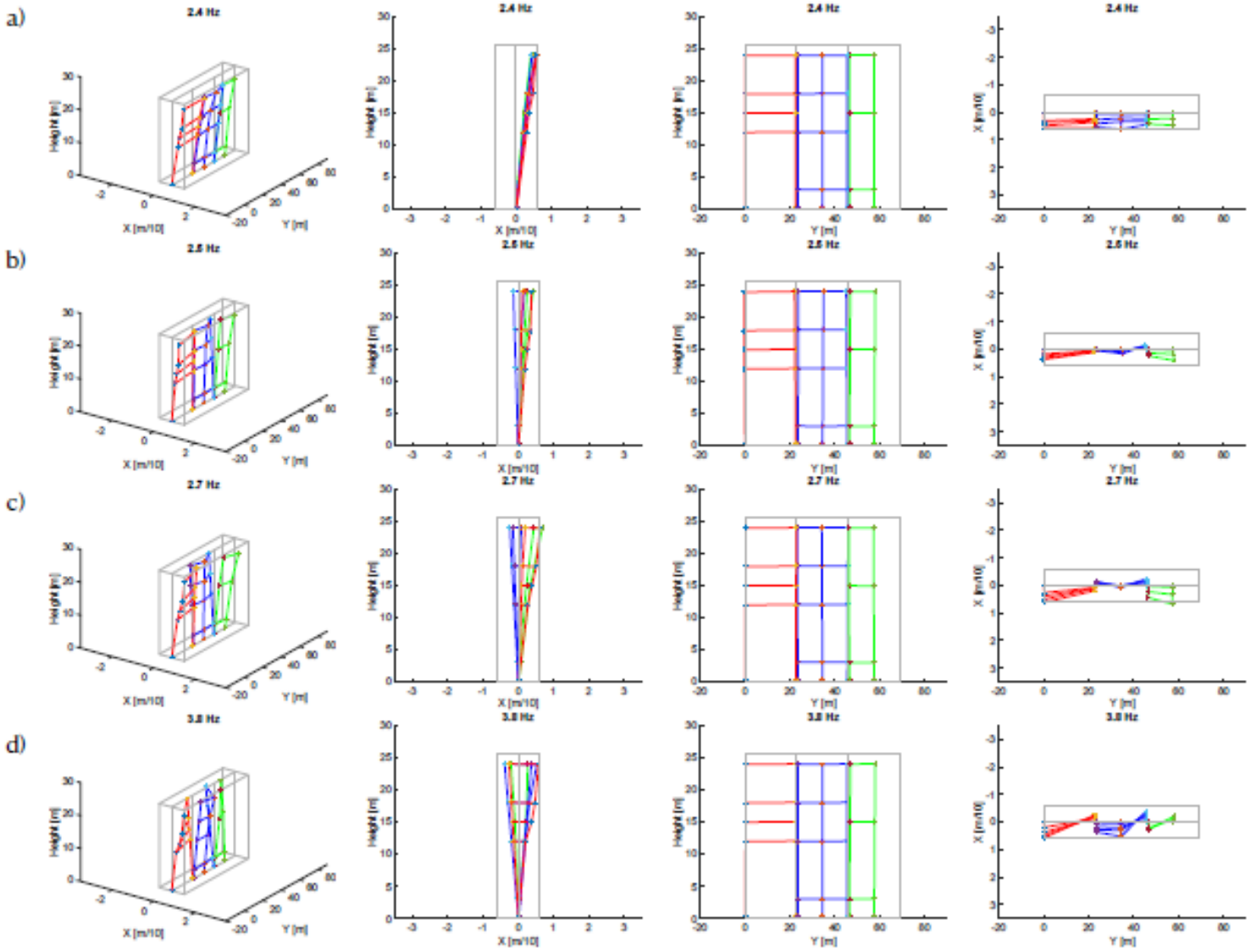

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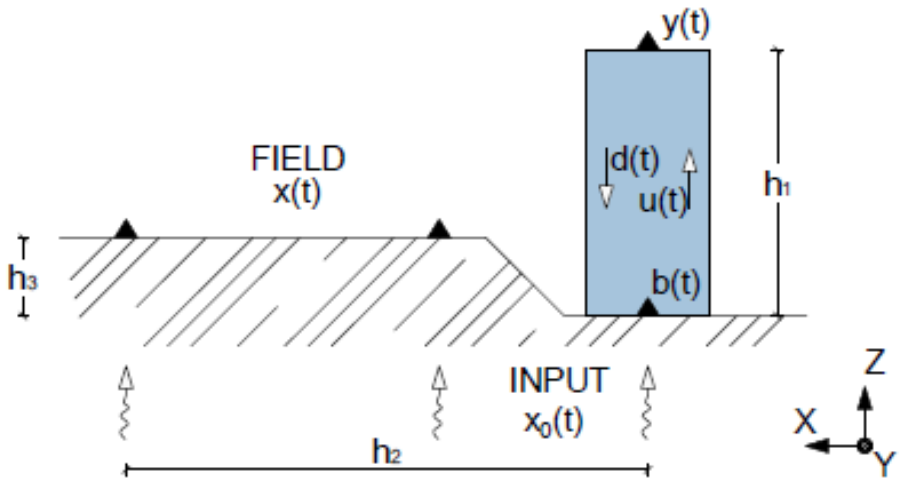

$$\frac{X(f)}{Y(f)} = P_1 + P_2 + P_3$$

$$P_1 = \frac{1}{1+r} e^{-i2\pi f(-\tau_1+\tau_3)},$$

$$P_2 = \frac{r}{1+r} e^{-i2\pi f(\tau_1+\tau_3)},$$

$$P_3 = \frac{(1-r)}{2} e^{-i2\pi f(\tau_1+\tau_2+\tau_3)}.$$

$$X(f) = Y(f)\frac{1}{1+r}[e^{-i2\pi f(-\tau_1} + re^{-i2\pi f\tau_1}] + (1-r)Y(f)e^{-i2\pi f(\tau_1+\tau_2+\tau_3)}$$

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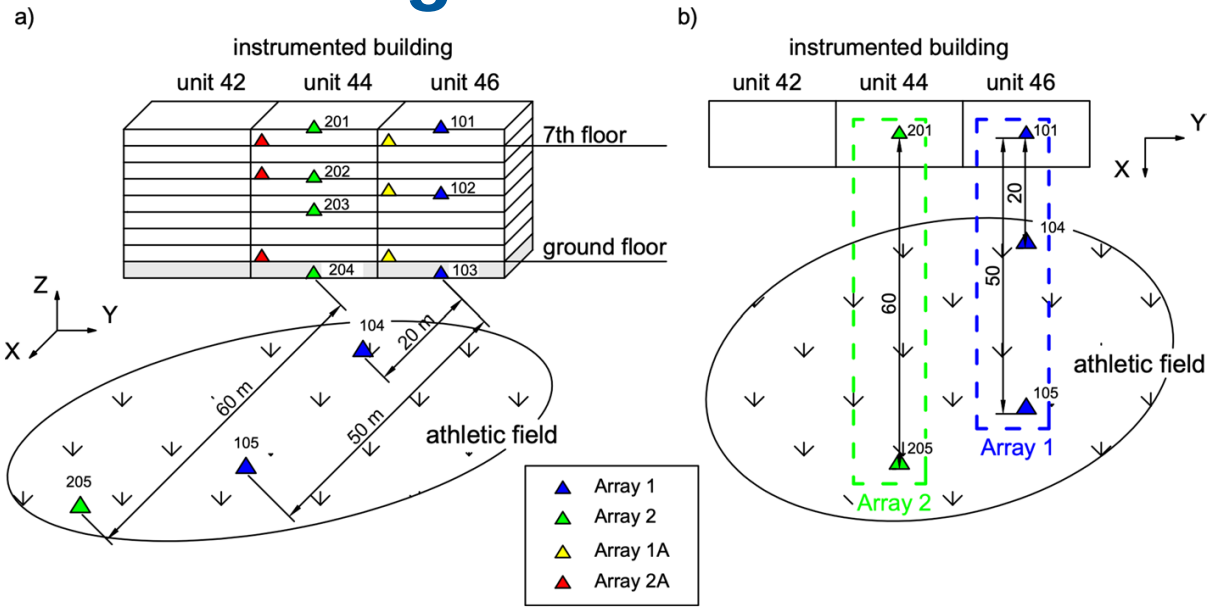

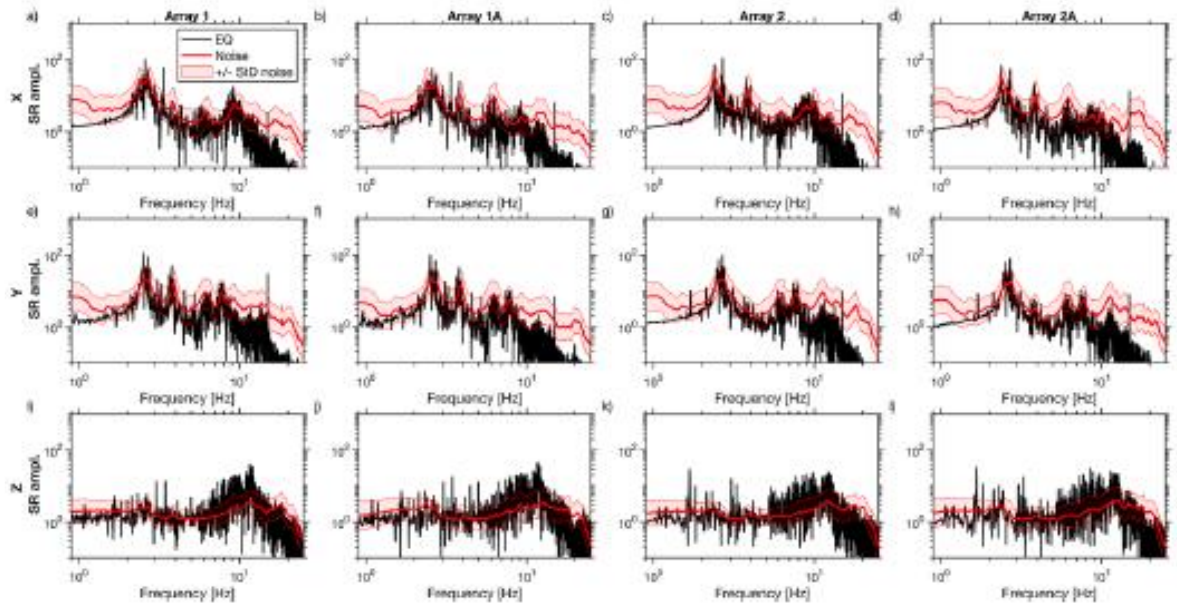

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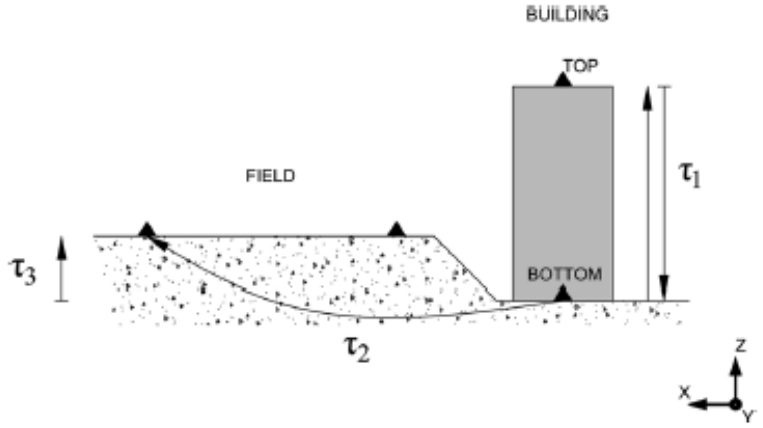

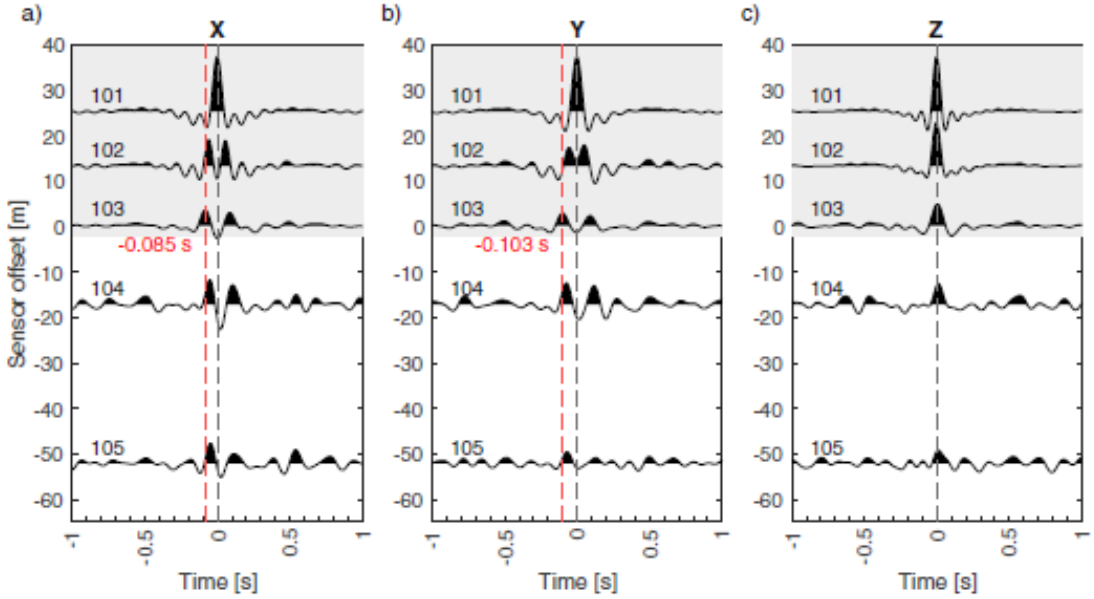

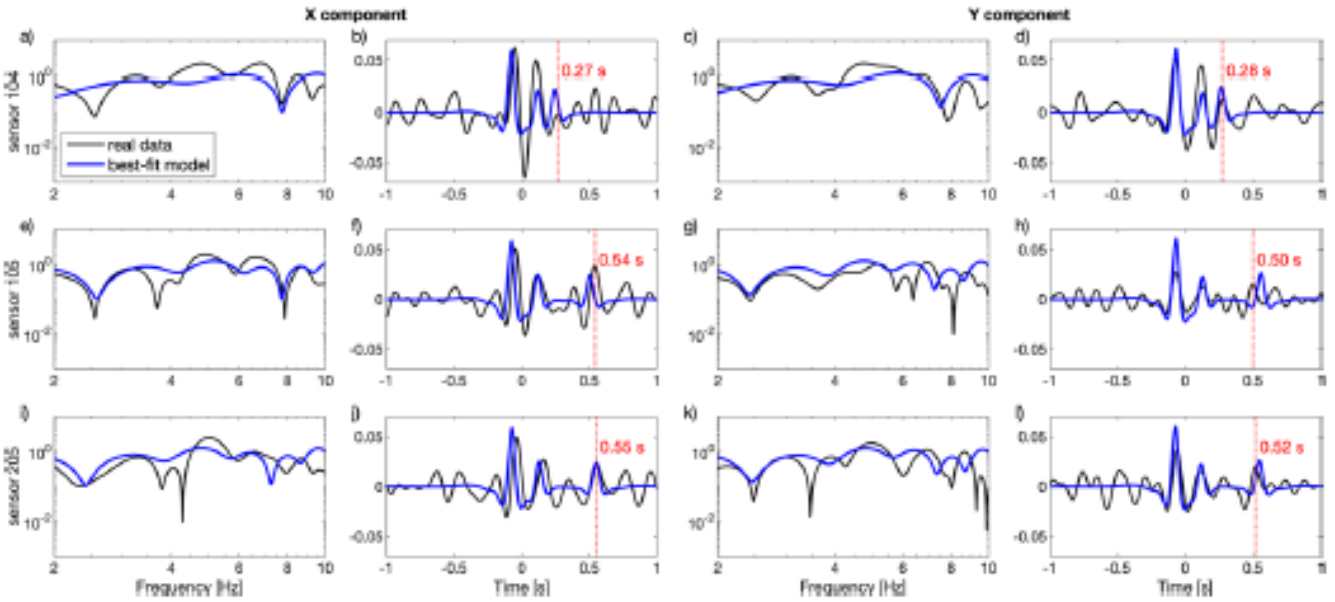

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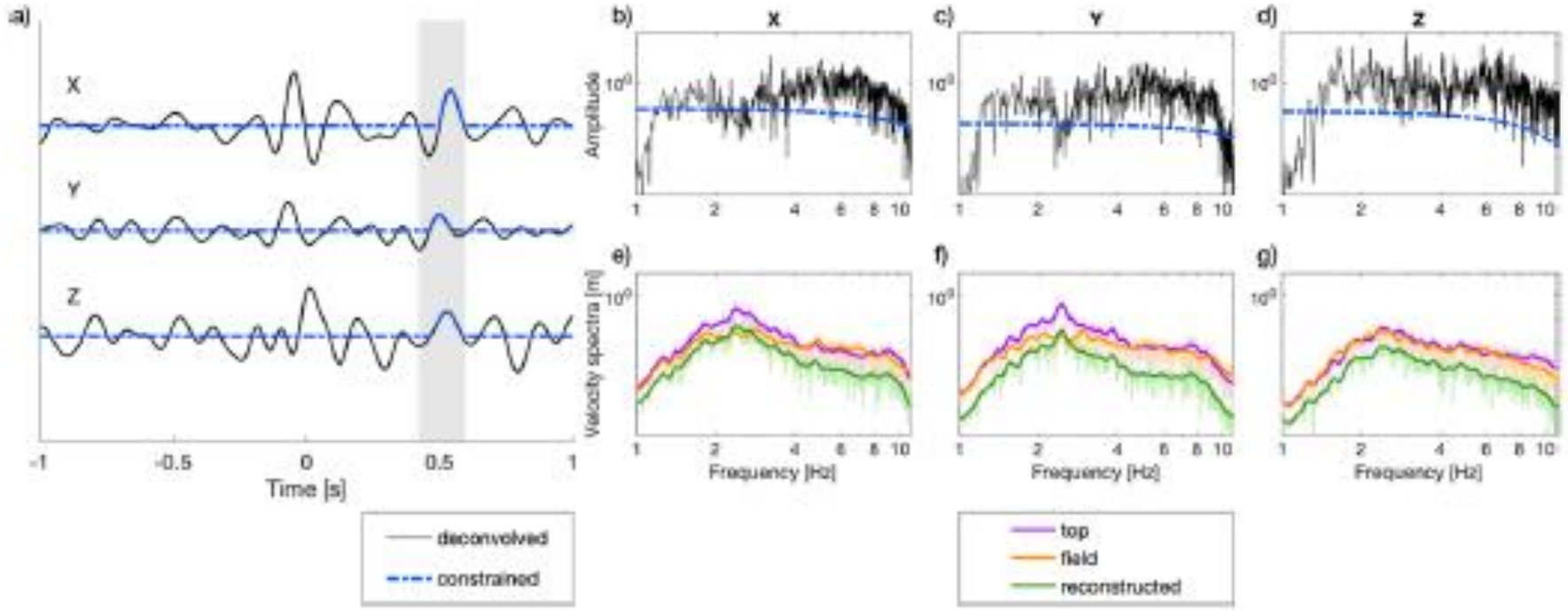
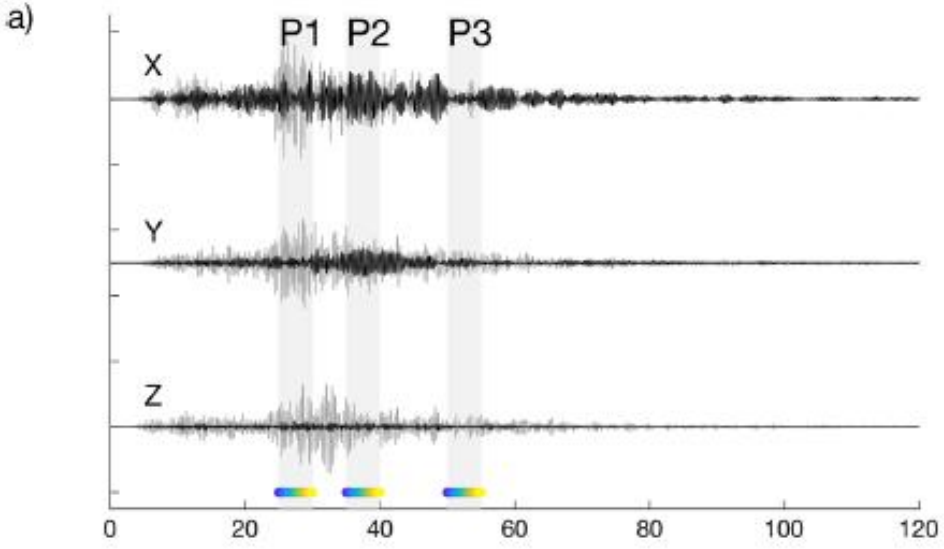
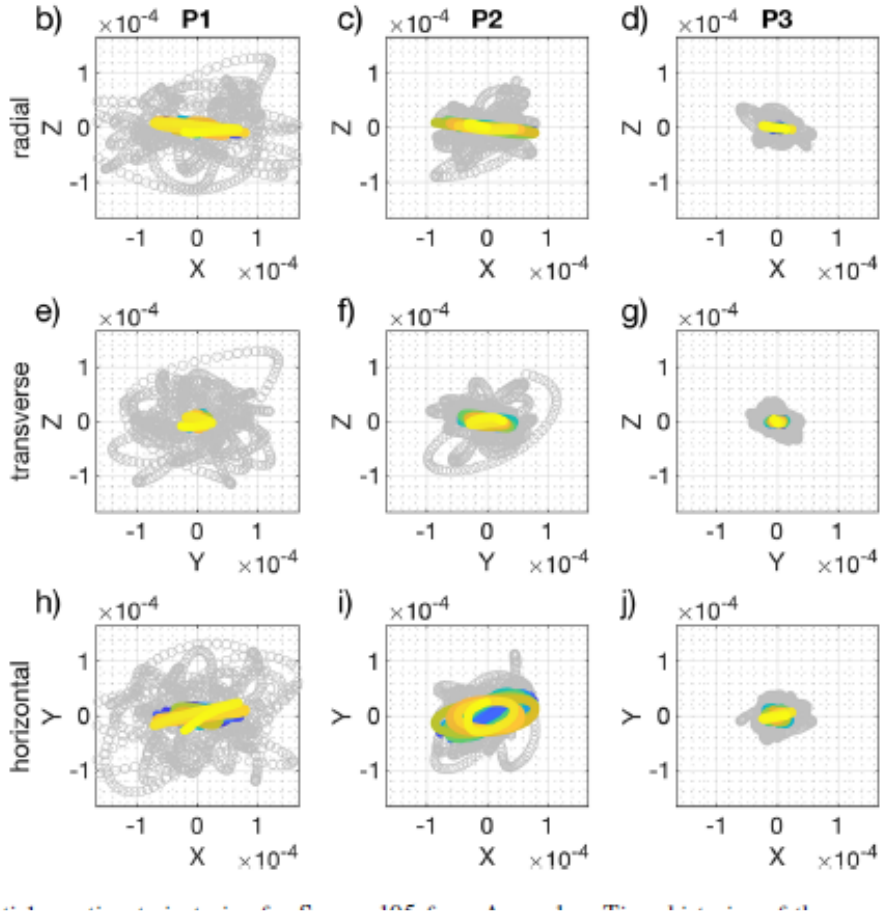
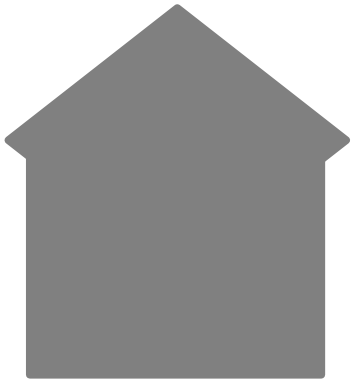


Studying soil-structure and building-building interaction effects





Damage assessment



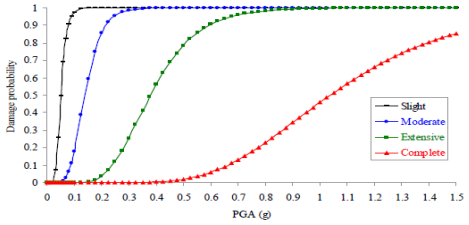
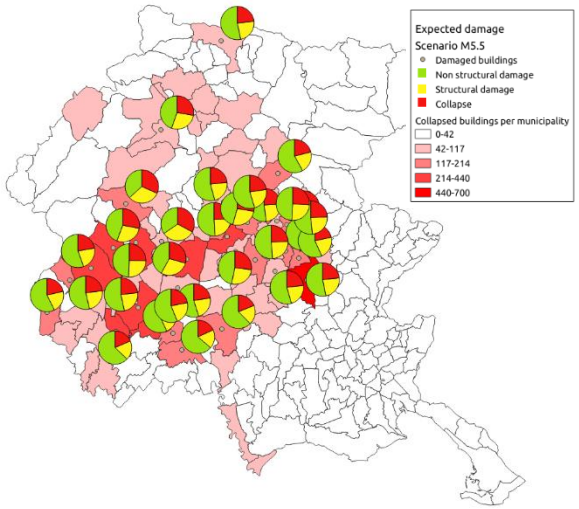


Figure 4: Typical SPSW fragility curves.

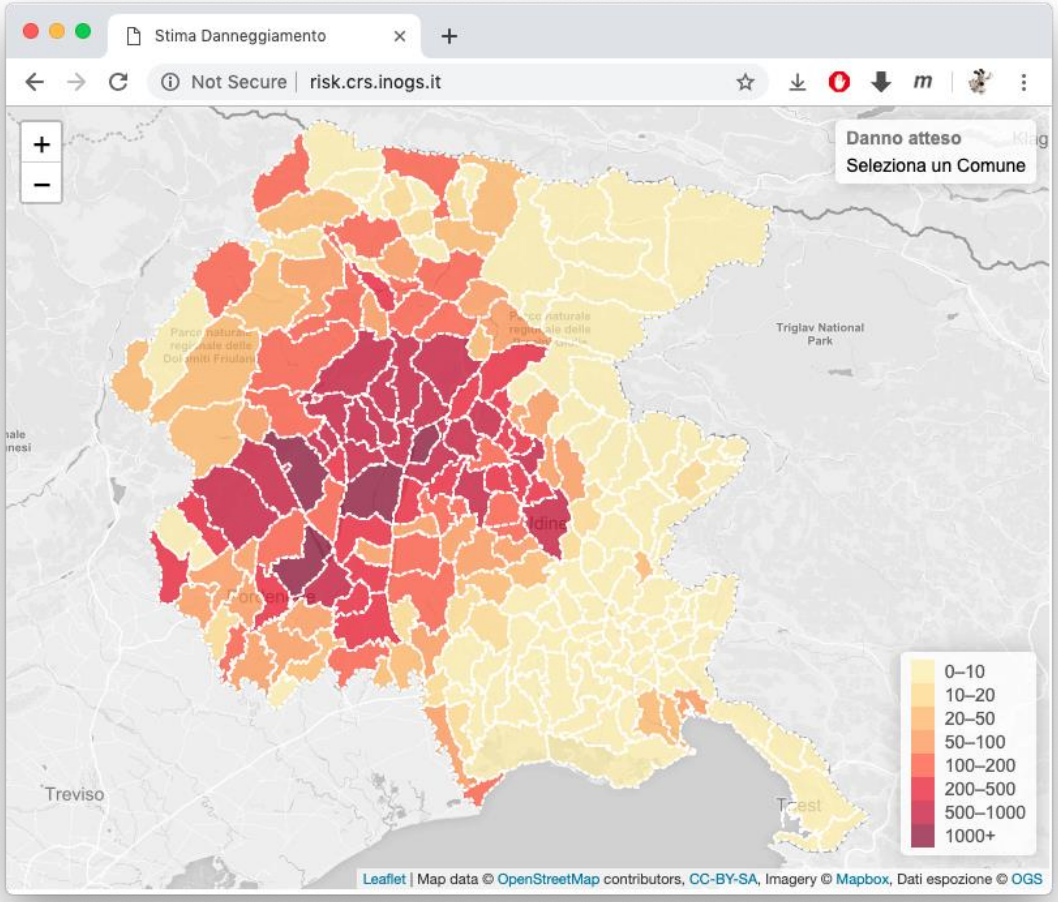


Building typologies (taxonomy to grasp specific characteristics)

Fragility curves for different damage states. Curves based on building characteristics

Number of buildings with complete, extensive, moderate and slight damage

Damage maps



Damage calculation performed by Openquake, based on Shakemaps produced at CRS.

Features:

- Multiple layers (ground motion, intensity, damage, casualties, population..)
- Different scales and granularity (municipality, census units)
- Archive of past events simulations