# Dynamic structure-soil interaction characterization of the “Terza Torre” building in Bologna (Italy)

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In November 2021, the National Institute of Oceanography and Applied Geophysics - OGS and the regional administration of Regione Emilia-Romagna signed a cooperation agreement to pursue the common goal of characterizing the possible dynamic soil-structure interaction due to seismic forcing for an exemplifying building in the urban centre of Bologna (Italy). The target area hosts both the regional administration offices and densely populated residential zones. In the perspective of urban seismic impact mitigation, the outcomes of this experiment could help the development of expected ground shaking and damage scenarios for the area by integrating the structural monitoring data to the free field records.

The selected structure is the «Terza Torre» building, located near the city centre and hosting part of the offices of the Emilia-Romagna regional government. The choice was based on a set of prerequisites: representativeness for impact reduction (densely populated urban area, part of a set of strategic buildings), structural characteristics of the building (high rise, reinforced concrete, regular), geophysical characteristics of the ground (thick low velocity sedimentary cover) and logistics (accessibility, connectivity, etc.).

Fig. 1 – Location of the «Terza Torre» structure monitored by this project, in the city centre of Bologna (Italy).

In order to study the seismic response of the building, the site was instrumented with an infrastructure for continuous seismic monitoring. This temporary facility includes a vertical array of low-cost, co-located velocimeters and accelerometers installed on the building and a seismological borehole station installed in a near free-field condition in front of the structure. Using both ambient noise and seismic signals recorded throughout 2023 and 2024, we produce a characterization of the dynamic response of the building in terms of resonant frequencies and propose a preliminary modal shape analysis. Additional data from a dedicated geophysical survey is also used to assess the local seismic response of the ground. The analysis is focused on a frequency range which is relevant for engineering purposes (0.2 – 20 Hz), allowing a characterization of the potential dynamic interactions between the soil and the high-rise building under dynamic, earthquake-induced loading conditions.

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