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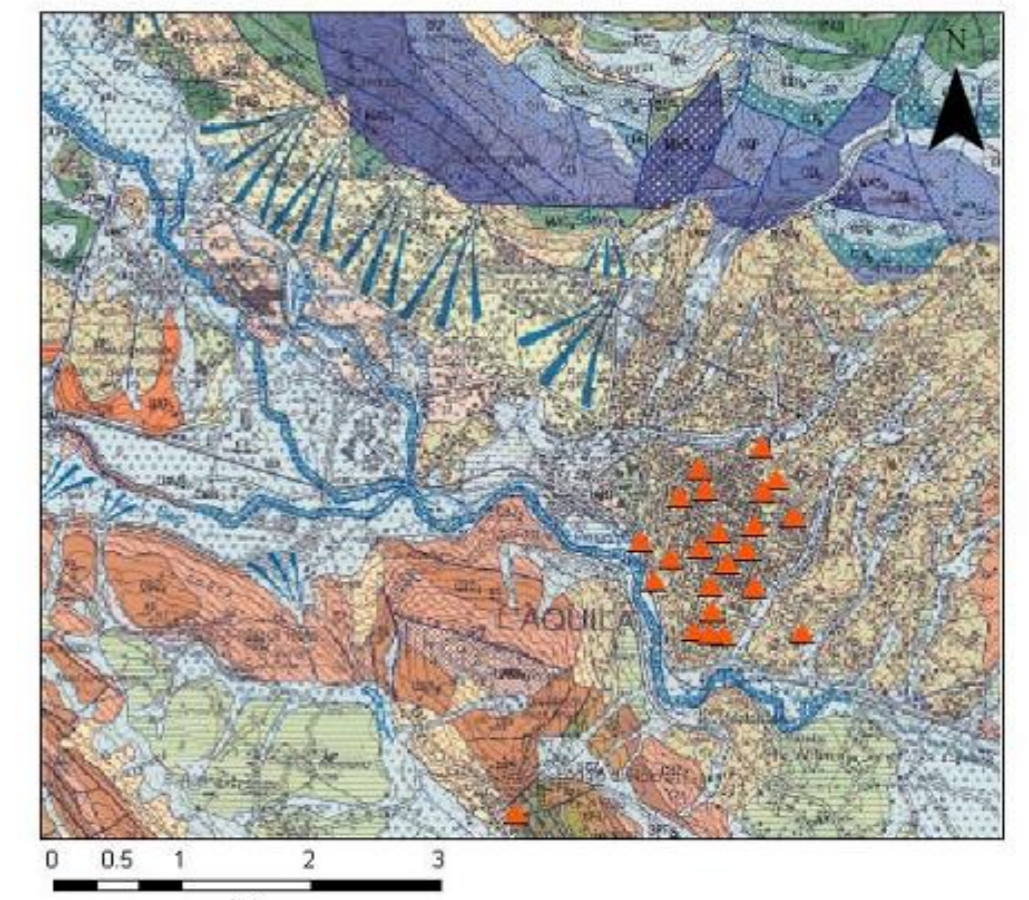
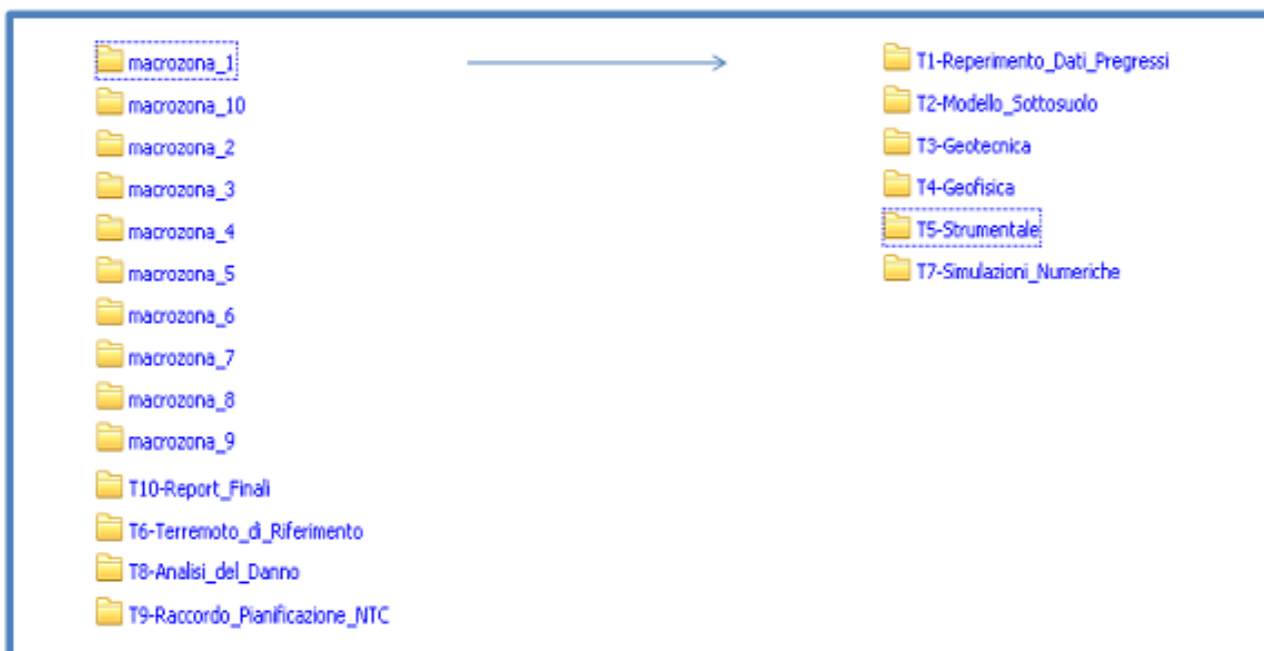
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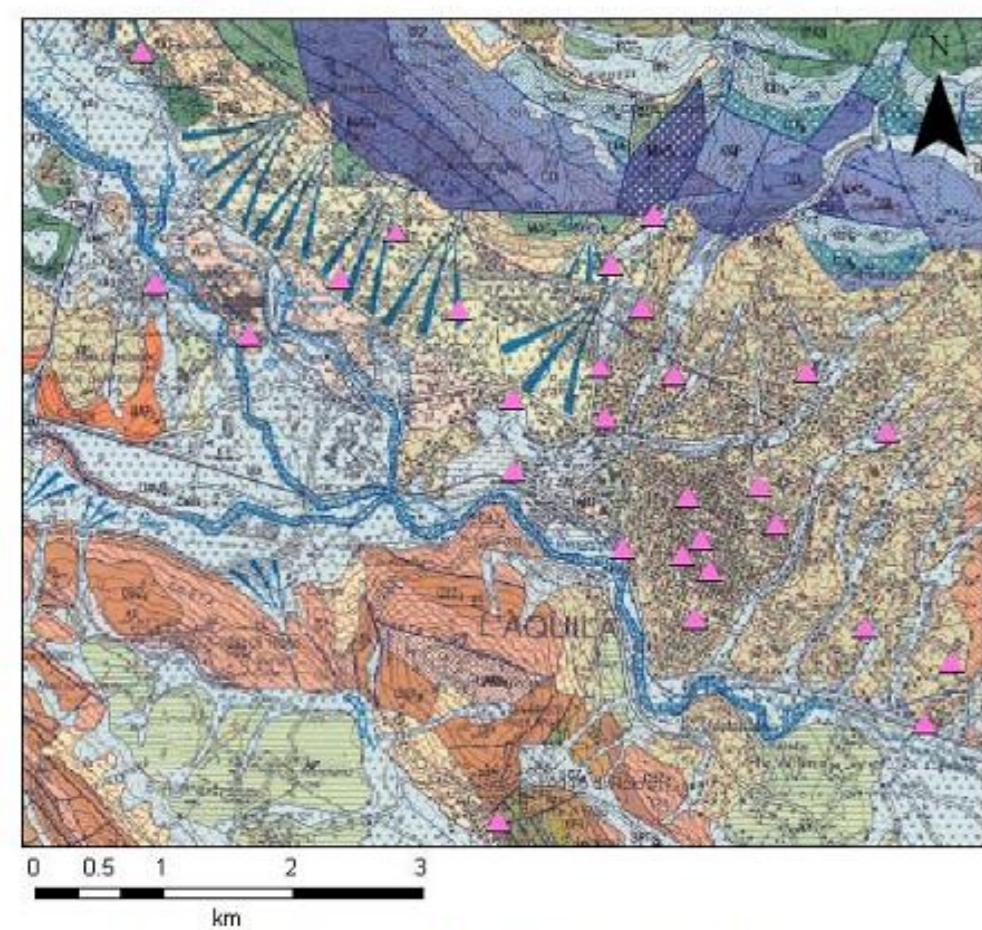
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Abstract: Following the 6th of April 2009 Mw 6.3 L'Aquila earthquake, many scientific institutions were involved by Italian Civil Defense (DPC) to perform microzonation studies in the epicentral area. The INGV-RM1 group was in charge of seismic monitoring of downtown L'Aquila and its western suburbs extending towards NW up to Cansatessa. The extension of the areas and the peculiarity of L'Aquila old city center required an important effort both in terms of number of instruments and operators for the installation, maintenance and data collection and analysis. The working group included researchers from INGV, Cete Mediterranee (Nice, France) and DPC. The installation started on May 27 in L'Aquila old town area with the deployment of 22 seismic instruments (12 from INGV, 7 from Cete Mediterranee and 3 from DPC). In the following days 3 extra instruments from INGV were deployed. Due to the seismicity rate it was possible to record a high number of events and to move some stations in different locations. The monitoring network was removed on July 3 except for two stations that are still running. Overall we monitored 37 different sites recordings more than 300 events with a good signal to noise ratio to be used for spectral ratio analysis. Some microtremor measurements were performed to extend the analysis to more than 50 sites all around the area. Data were analyzed using both the standard spectral ratio technique on earthquakes and seismic noise, and different reference sites were selected. The first results obtained confirm the presence of large amplification effects both in L'Aquila historic center and in the suburban areas. Downtown L'Aquila is characterized by a strong low frequency (around 0.6 Hz) amplification on horizontal components and a clear effect also on the vertical component with a frequency shifted towards higher frequencies (1-1.5 Hz). The suburban areas show strong amplification at frequencies ranging from 2 to 4-5 Hz. The observation can be related to the available geological and geophysical data collected as a part of microzonation activities. The obtained results can also be used to define the site response of AQK and AQU strong motion stations in the framework of DPC-S4 project. These stations recorded all the main events of the sequence and are close to some of the monitored sites.

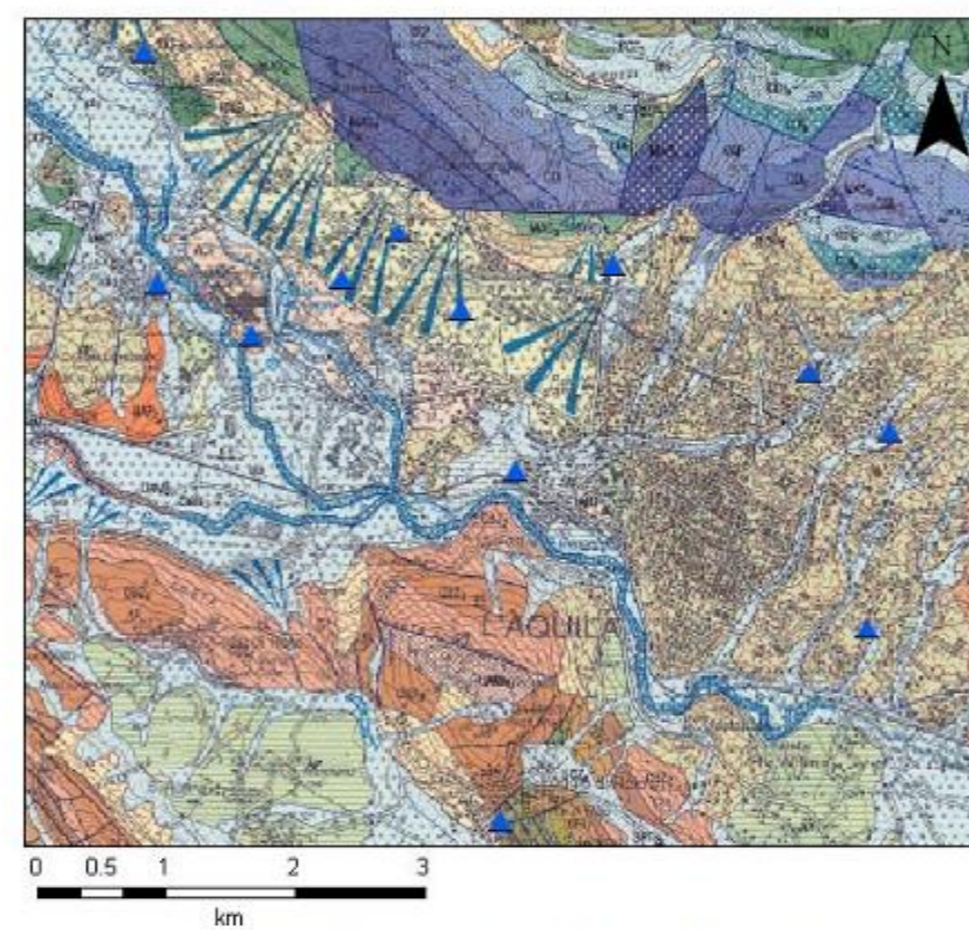
The DPC promoted in May 2009 the seismic microzonation of the area that suffered major damages due to the April 6 Mw 6.3 L'Aquila event. The territory was divided in 10 "macrozones" where to perform a wide range of activities and investigation. The activity was divided in 10 tasks, 4 transversal and 6 specific for any macrozone. INGV - ROMA1 was in charge of Task 5 for macrozone 1 and 2 and involved in Task 7 for macrozone 1.



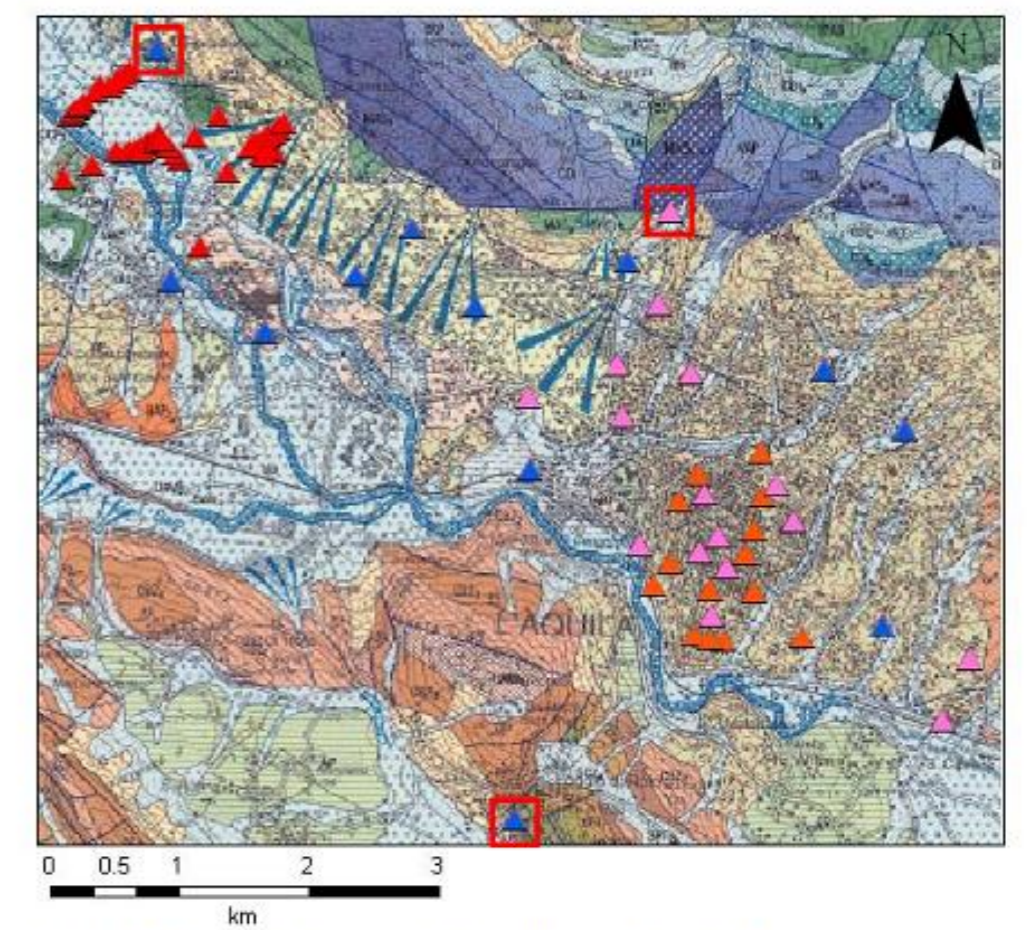
First deployment 05/29/09 - 06/11/09
13 INGV stations, 3 DPC stations, 7 Cete stations



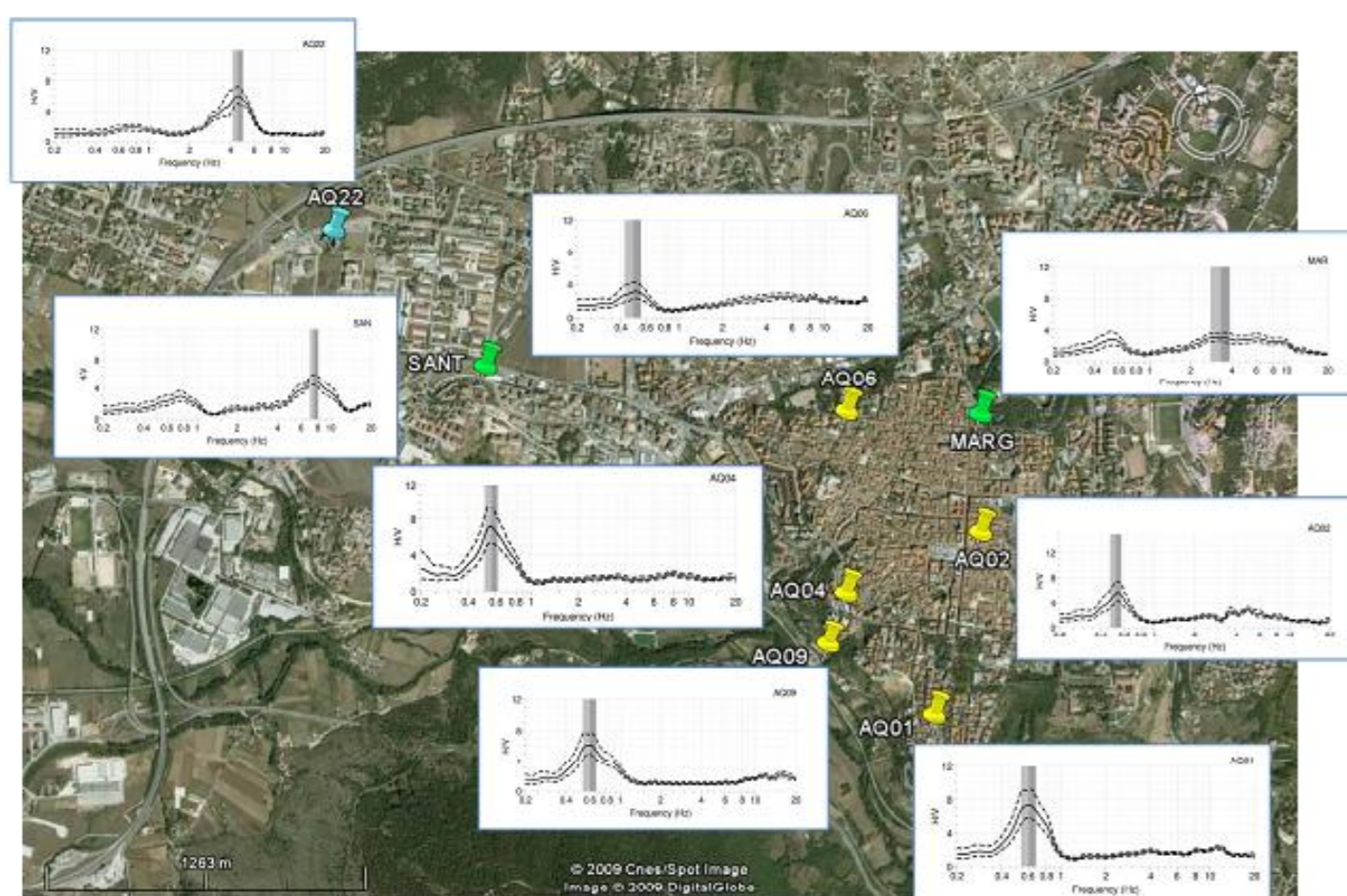
Second deployment 06/11/09 - 06/24/09
16 INGV stations, 5 DPC stations, 7 Cete stations



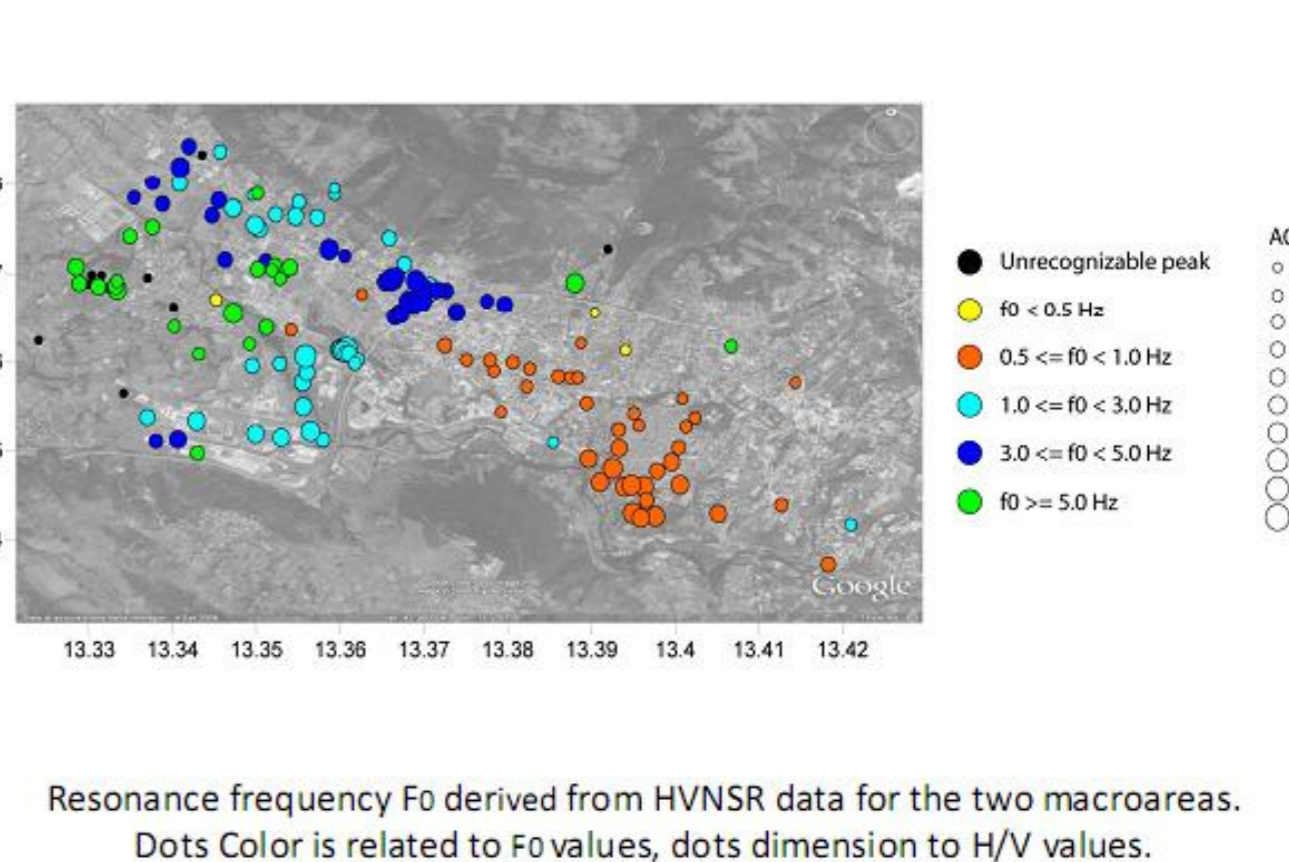
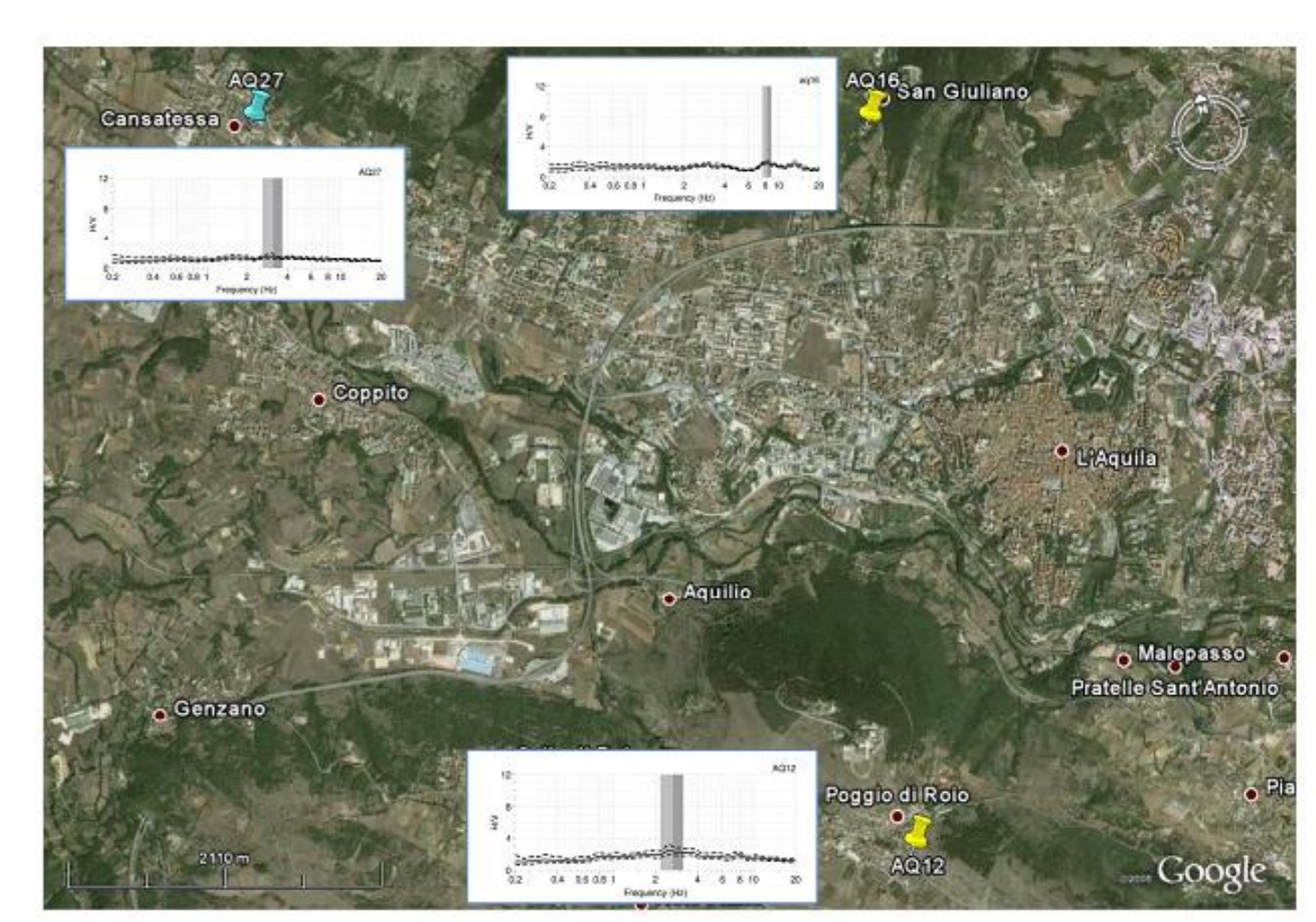
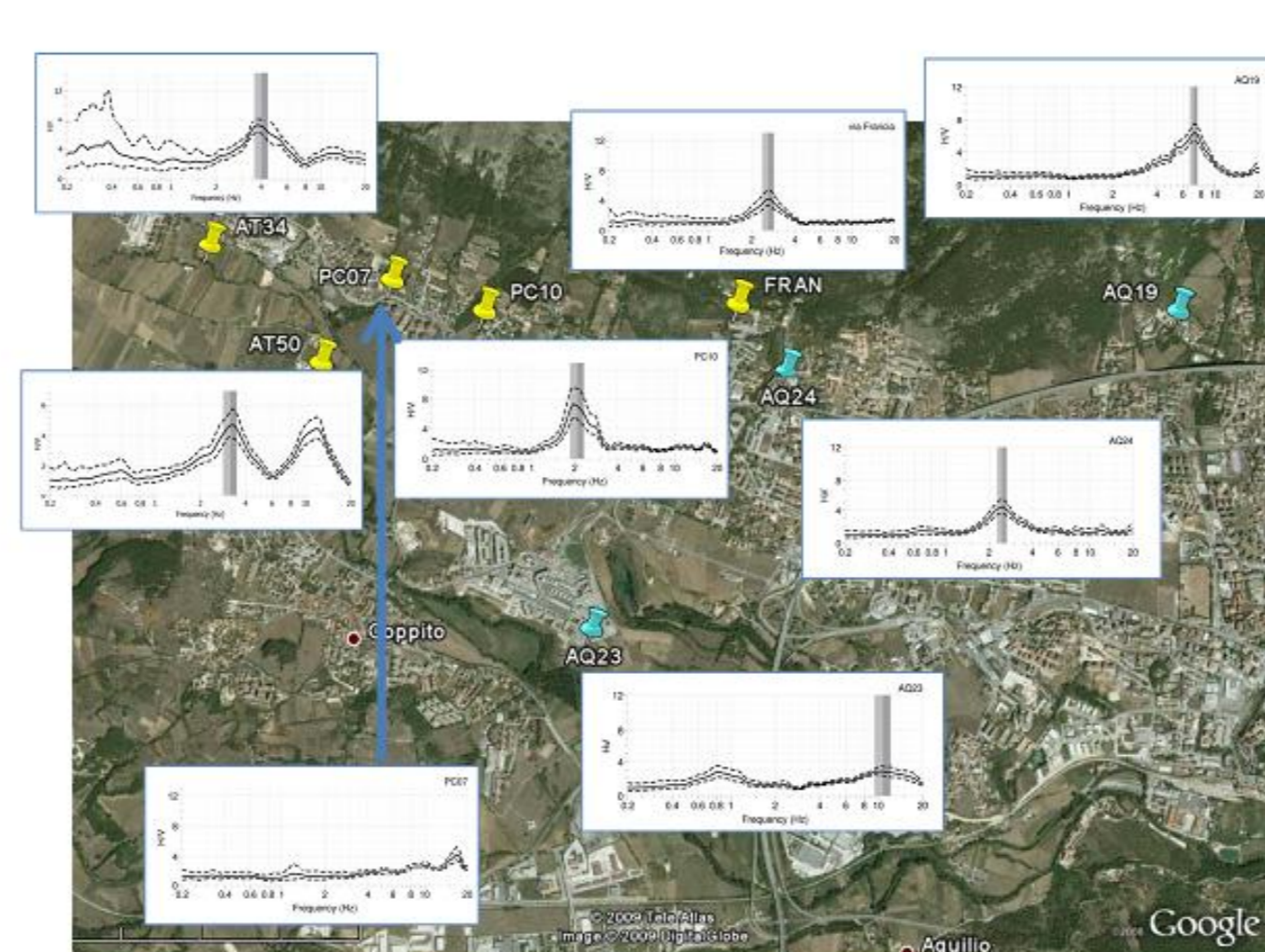
Third deployment 06/24/09 - 07/03/09
12 INGV stations



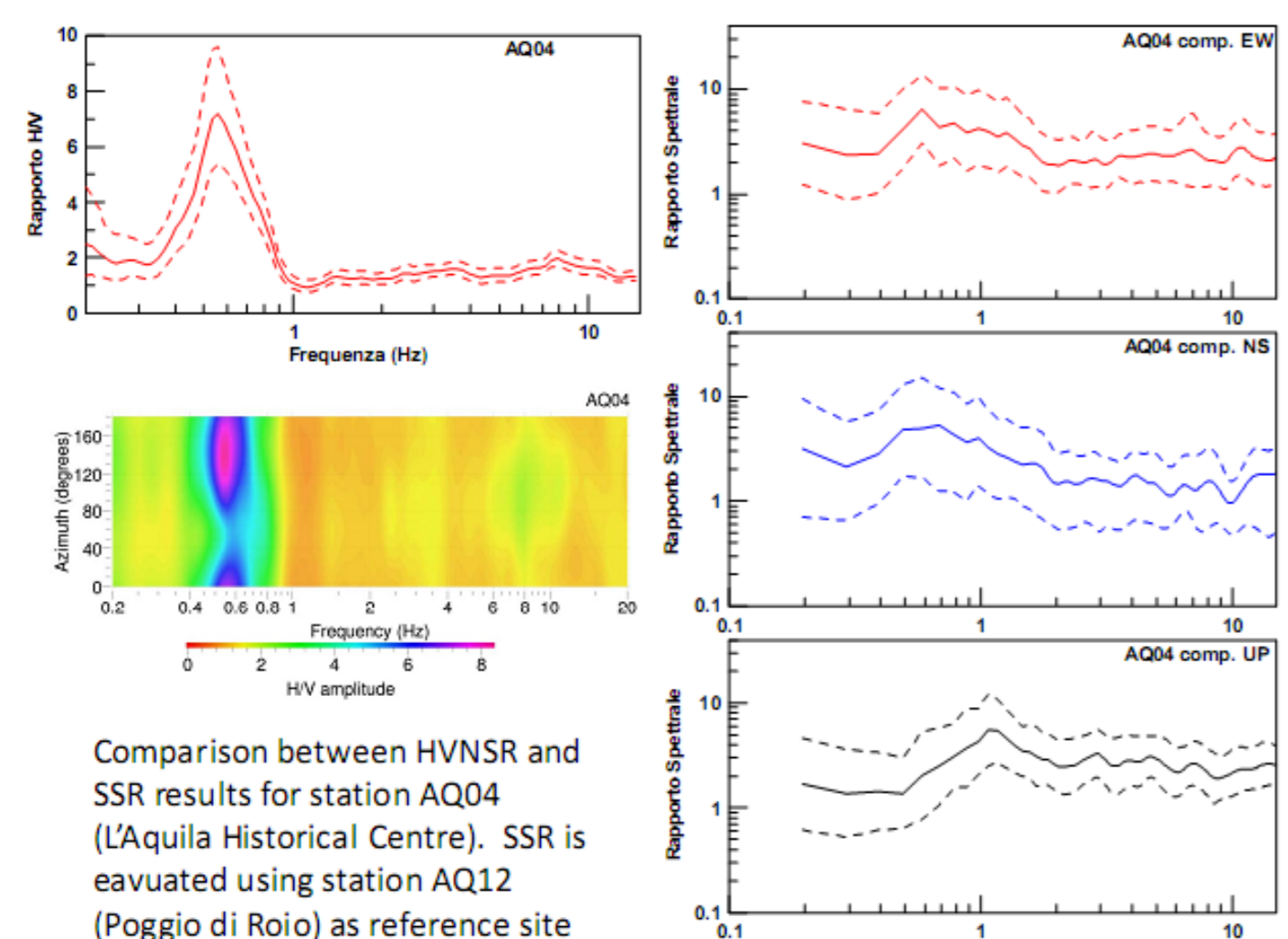
Stations used for Task 5 activities (red triangles relate to Microtremor measurements). Two stations are still operating. Red squares indicates rock reference sites



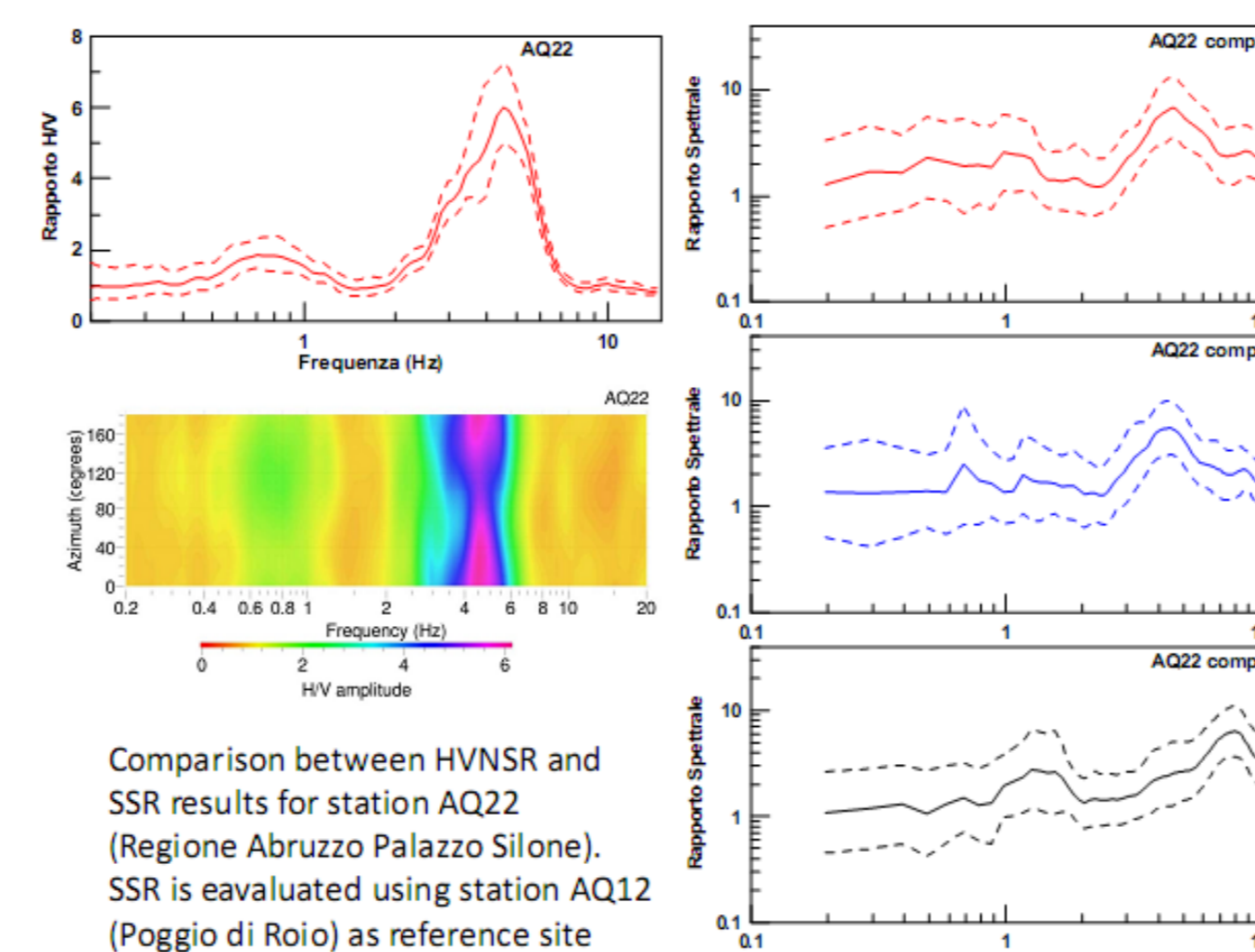
HVNSR results for some of the investigated sites. The right panel refers to the rock reference sites



Resonance frequency F_0 derived from HVNSR data for the two macroareas. Dots Color is related to F_0 values, dots dimension to H/V values.

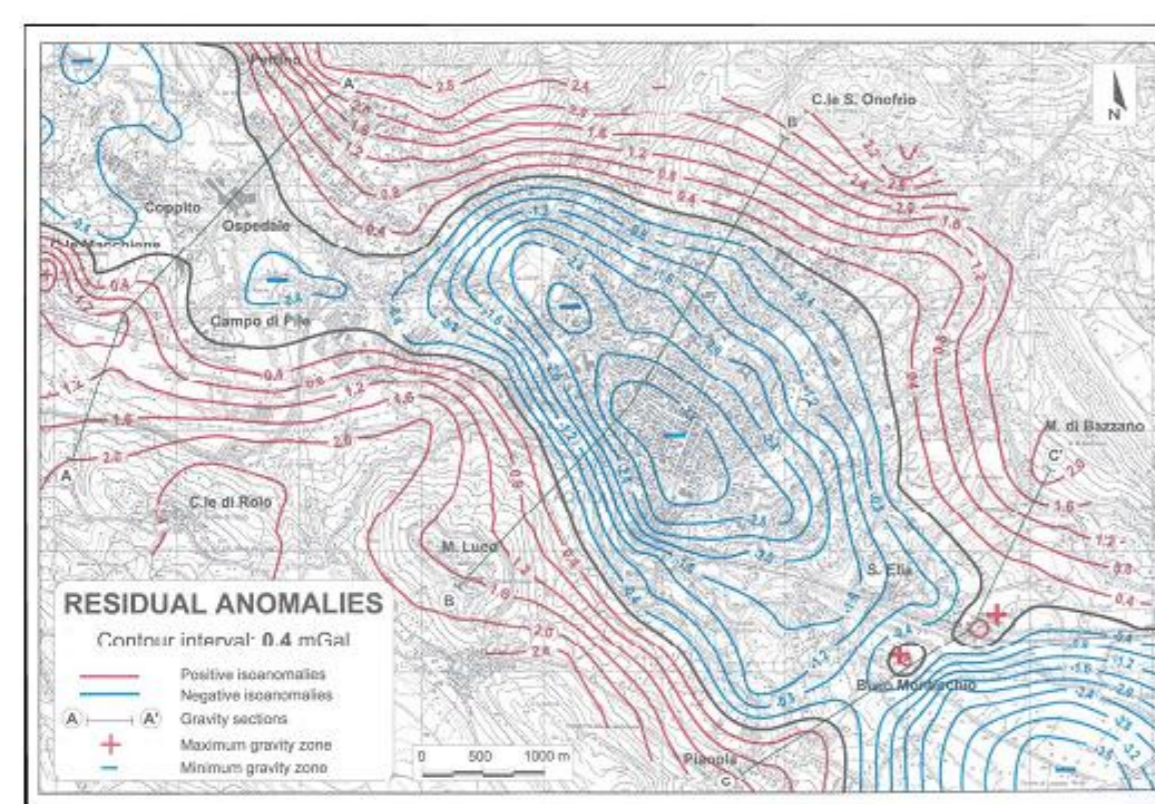


Comparison between HVNSR and SSR results for station AQ04 (L'Aquila Historical Centre). SSR is evaluated using station AQ12 (Poggio di Roio) as reference site

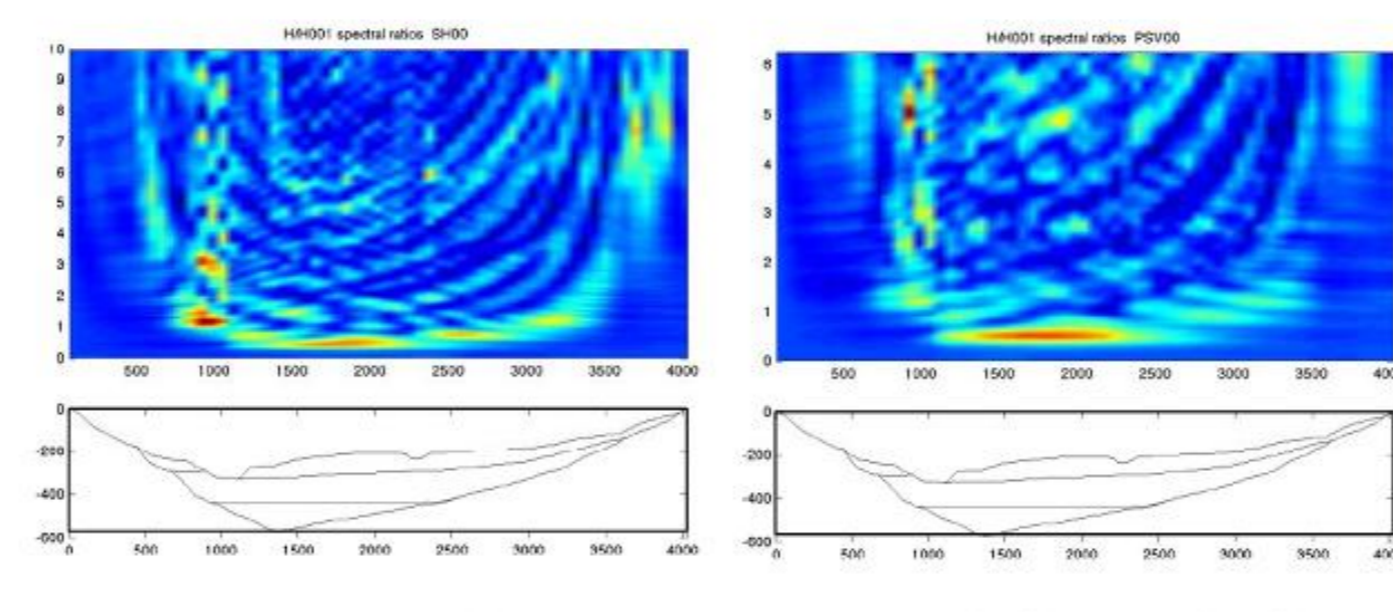


Comparison between HVNSR and SSR results for station AQ22 (Regione Abruzzo Palazzo Silone). SSR is evaluated using station AQ12 (Poggio di Roio) as reference site

Comparison of HVNSR and SSR results for two of the investigated sites.



Gravity map* for macroarea 1, the section B-B' is the one used for the 2D numerical modeling.



2D numerical modelling of L'Aquila basin response for SH (left) and PSV (right) waves propagating with vertical incidence

CONCLUSIONS

- The first results obtained confirm the presence of large amplification effects both in L'Aquila historic center and in the suburban areas.
- Downtown L'Aquila is characterized by a strong low frequency (around 0.6 Hz) amplification on horizontal components and a clear effect also on the vertical component with a frequency shifted towards higher frequencies (1-1.5 Hz).
- The suburban areas show strong amplification at frequencies ranging from 2 to 4-5 Hz.
- The results obtained from seismological data can be related to the available geological and geophysical information collected as a part of microzonation activities.
- The obtained results can also be used to define the site response of AQK and AQU strong motion stations in the framework of DPC-S4 project.
- The amount of collected data is quite impressive, so much more detailed analysis will be performed in order to better understand the behavior of ground shaking in the area and its relationship with the observed damages.

8 degli autori di questo lavoro sono ricercatori precari, il loro contributo è stato essenziale ed il loro entusiasmo ha contribuito a risolvere i problemi che un lavoro svolto in emergenza può comportare



* From: Blumetti A. M., Di Filippo M., Zaffro P., Marsan P. and Toro S. (2002). Seismic hazard characterization of the city of L'Aquila (Abruzzo - Central Italy): new data from geological, morphotectonic gravity prospecting analysis. Studi Geologici Camerti (numero speciale)