SeIsmic monitoring and vulneraBilitY framework for civiL protection

Overview of the state of the project

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The SIBYL Consortium

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AMRA S.c.a.r.l., Naples, Italy

Aristotle University of Thessaloniki, Thessaloniki, Greece

Technical University of Berlin, Berlin, Germany

Total budget: 637,848 EUR

EU requested contribution: 478,386 EUR (75%)

Civil Protection Authorities SIBYL has endeavored to interact with

Federal Agency for Technical Relief (Germany)
- Kick-off & final meeting, field work in Cologne, l'Aquila workshop.

Federal Agency for Civil Protection and Disaster Assistance (Germany)
- Final meeting

Bundesamt für Bevölkerungsschutz und Katastrophenhilfe

National Service of Civil Protection (Italy)
- L'Aquila workshop

PROTEZIONE CIVILE
Presidenza del Consiglio dei Ministri
Dipartimento della Protezione Civile

General Secretariat for Civil Protection (Greece)
- Mid-term meeting, L'Aquila workshop

Aims of SIBYL

SIBYL set out to develop an operational framework for Civil Protection (CP) authorities to rapidly and cost-effectively assess the seismic vulnerability of the built environment.

This framework is intended to advise CP authorities as to the most appropriate preventative actions for cases where:

- There is a need for short-notice vulnerability assessment in a pre-event situation.
- For the monitoring of the build environment's dynamic vulnerability during a seismic sequence.

Aims of this meeting

- Presentation of each groups/tasks results to the consortium as a whole, and, to the representatives of civil protection and EC ECHO in particular.
- Planning the final stages of completing outstanding deliverables and products.
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- Preparation and planning of the final reports (technical and financial). Opportunities to ask the EC ECHO representative questions related to this.
- Discussion of future funding opportunities.

The fundamental problem!

Seismic swarms and foreshocks require CP authorities to rapidly assess the vulnerability of an area's structures.

- Especially important for areas with little or no data about the vulnerability, seismic hazard, etc..
  (The case even for the most developed countries).
- Need for real-time information as the crises unfolds.
- Need to dynamic tag structures in terms of their structural safety.
- Provide advice to the general population as to if they can return home, while helping to plan emergency accommodation.

However, state-of-the-art data acquisition methods generally are costly and expertise intensive.

Work flow and tasks

TASK A: Task management and reporting to the commission.

TASK B: Rapid data collection and integration

TASK C: Rapid and low cost in-situ building vulnerability assessment.

TASK D: Real-time monitoring during a seismic sequence.

TASK E: Training and capacity building

TASK F: Task publicity.

Project meetings and dissemination

- EC ECHO Kick-off-meeting (Jan. 2015, Brussels, Belgium).
- Preliminary planning and technical meeting (Jan. 2015, Potsdam, Germany).
- Website established.

www.sibyl-project.eu

- First period report (Sep. 2015).
- Dissemination plan developed and revised.
- Mid-term meeting (Feb. 2016, Thessaloniki, Greece).
- Civil Protection Workshop (May 2016, L'Aquila, Italy).
- Final meeting (Dec. 2015, Potsdam, Germany).

Status of deliverables

Due Date	Deliverable	Responsible Partner
2.2015	DA1: Kick-off-meeting report.	GFZ
8.2015	DA2: First progress report	GFZ
4.2016	DA3: Second progress report	GFZ
1.2017	DA4: Final technical and financial report	GFZ
9.2015	DB1: Guidelines for the remote-sensing assessment methodology	GFZ
10.2015	DB2: Software platform including processing tools with related manual	GFZ
10.2015	DB3: Guidelines of the mobile mapping system and remote rapid visual screening	GFZ
6.2016	DC1: Guidelines for the building assessment procedure and short-term monitoring	TU-BERLIN
6.2016	DC2: Guidelines for undertaking site-effect surveys	AUTH
6.2016	DC3: Documentation for the developed software tools	TU-BERLIN
11.2016	DC4: Reports on the case studies	TU-BERLIN
12.2016	DD1: Guidelines for the assessment of time-variant seismic risk of monitored single structures	AMRA
06.2016 – Preliminary 12.2016 – Finalized.	DE1: Training materials for the use of the developed framework and tools	GFZ
12.2016	DE2: Report on the potential for the developed system to be transferred to other hazard types	GFZ
2.2015	DF1: Project website	GFZ
2.2015	DF2: Detailed plan for project publicity	TU-BERLIN
12.2016	DF3: Report on public outreach events/activities	GFZ
12.2016	DF4: Report on technical and professional outreach	AUTH

Comments on first period report (reminder)

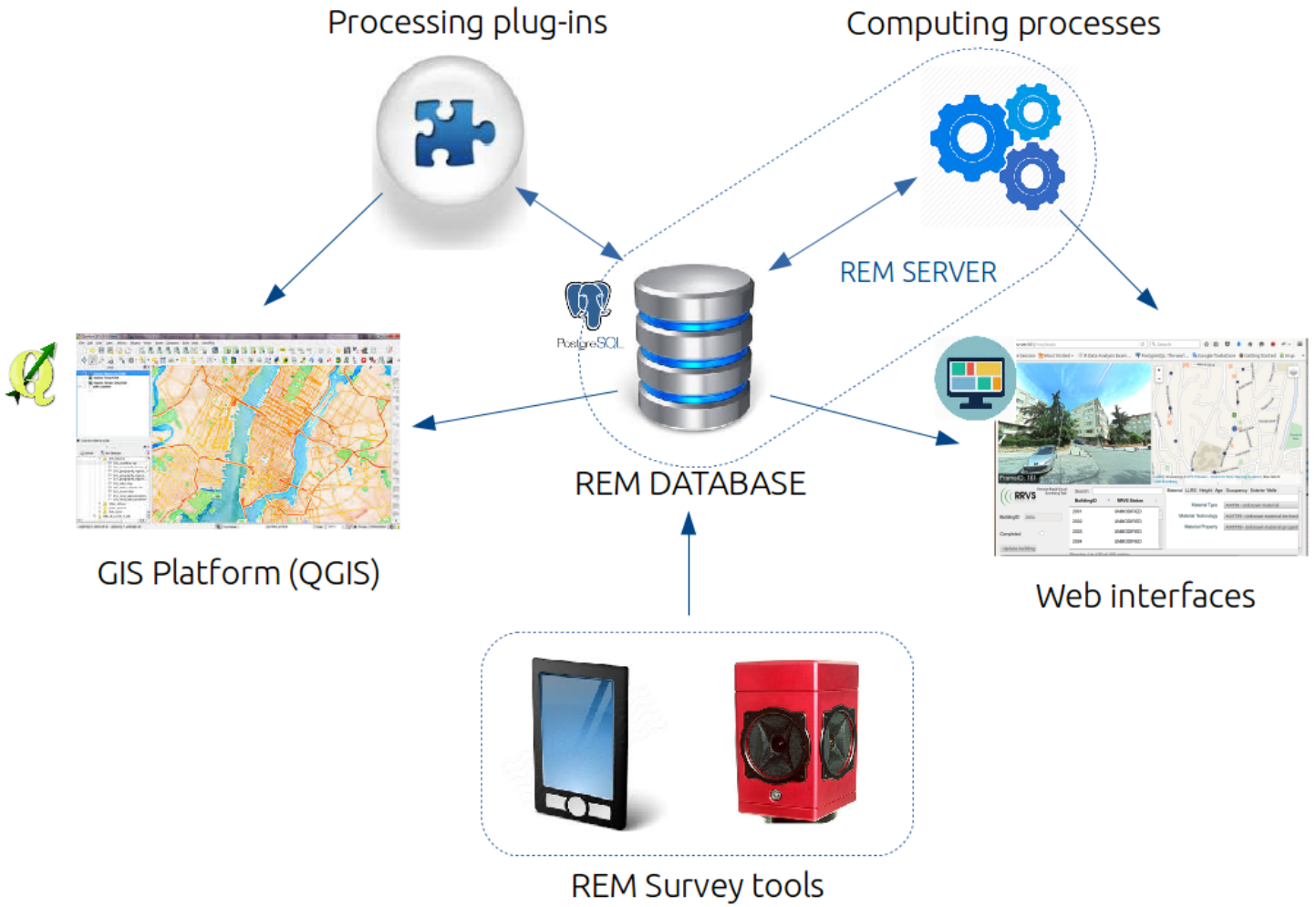
- EC ECHO seemed generally satisfied with the progress of the project.
- They expressed some concerns about outstanding deliverables (see list in the next slide).
- Requested we keep updating the webpage

  (see discussion this afternoon)
- Very interested in how the communication with CP was going, and how it could be improved/expanded upon.

  (topic of discussion this afternoon)
- Some concern at the relatively low amount of spending so far, but this was explained adequately.

Activities: GFZ

Mainly involved in project management and Task B “Rapid data collection and integration”.



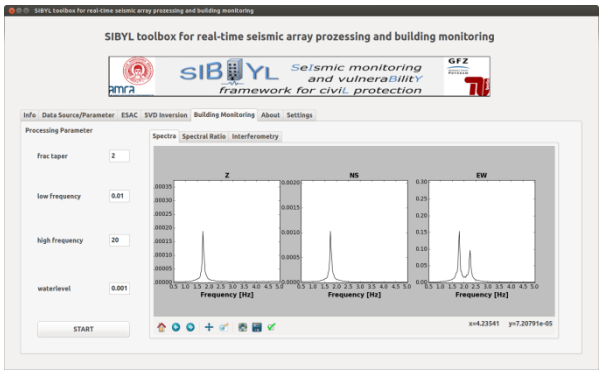
Activities: GFZ

Other activities included:

- Field work (Thessaloniki, Greece; Cologne, Germany; l'Aquila and Amatrice, Italy).

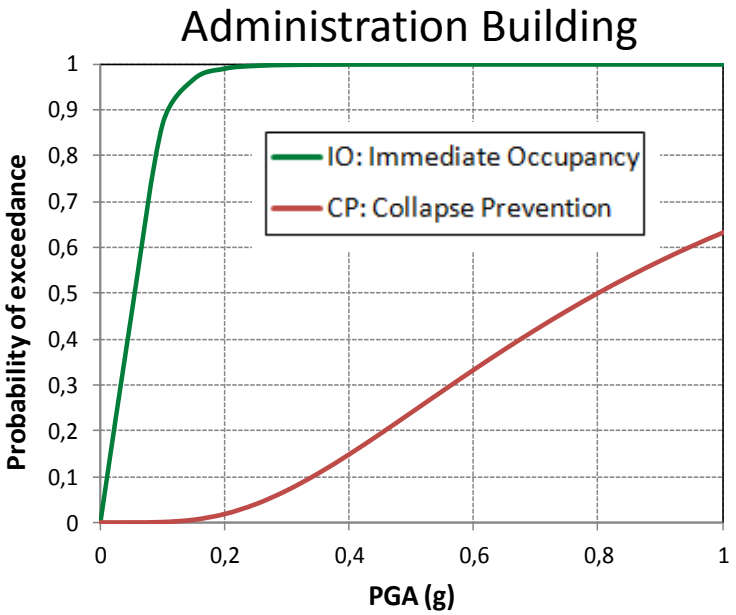
- Instrumental development, specifically the MPwise (Multi Parameter wireless sensing system)

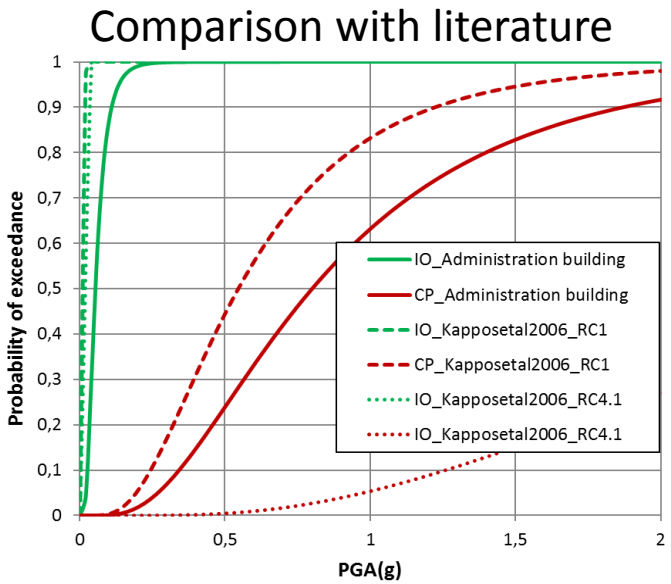
- Real-time data processing for the MPwise sensors.



Activities: AUTH

- Seismic vulnerability assessment using data from the monitoring of 2 buildings on the AUTH campus (Administration and Faculty of Philosophy buildings).
- Monitoring data in combination with updating methods are used to build a refined finite element model that represents the actual state of the instrumented building.
- The comparison of the derived building-specific fragility curves with generic curves from the literature show that the selection of conventional curves to represent buildings may lead to inaccurate results.

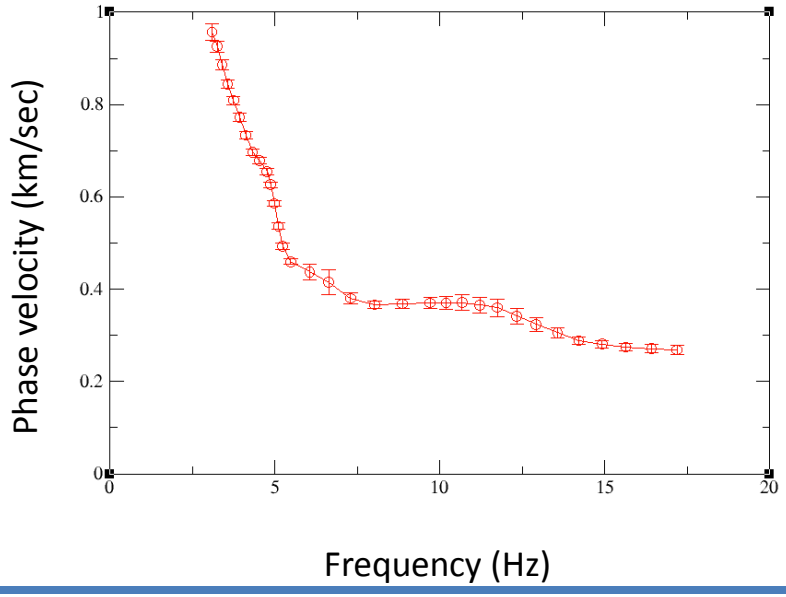




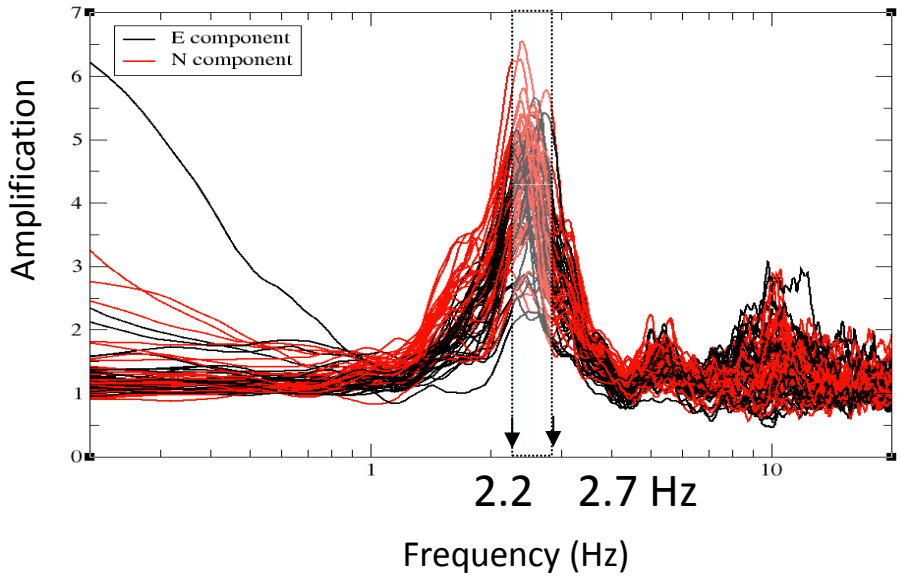
Activities: AUTH

- Ambient noise measurements for site characterization of the foundation soil between 2 buildings at the AUTH campus (in cooperation with Potsdam and Berlin).
- Processing of the noise data using SPAC and HVSR methods.
- Determined the phase velocity dispersion curve of Rayleigh waves and the 1D Vs velocity profile.
- Site response characterization of the foundation soil in terms of resonance frequency, amplification factor and depth to the seismic bedrock.
- Comparison of the results with existing information regarding the dynamic properties and the site response of the foundation soil

Phase velocity dispersion curve of Rayleigh waves



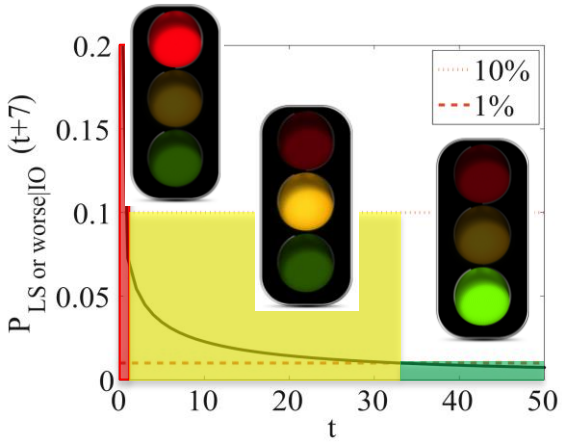
Resonant frequency & amplification of soil



Activities: AMRA

Mainly involved in Task D “Real-time monitoring during the seismic sequence”.
A methodology for assessing the time-variant seismic risk of single structures over short time-scales was developed. The resulting model allows the implementation within fully-automatic system for the so-called building tagging.

- The theoretical methodology for the assessment of structural seismic reliability during aftershock sequences has been developed. It is suitable for any kind of structure for which state-dependent fragility curves can be derived;



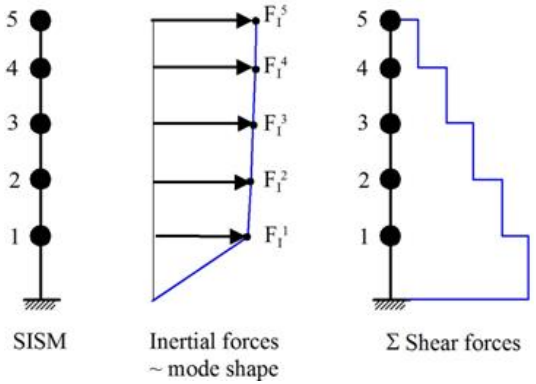
- Algorithms for building-tagging have been coded in Matlab® and have been made available to GFZ for their implementation into automatic sensors;

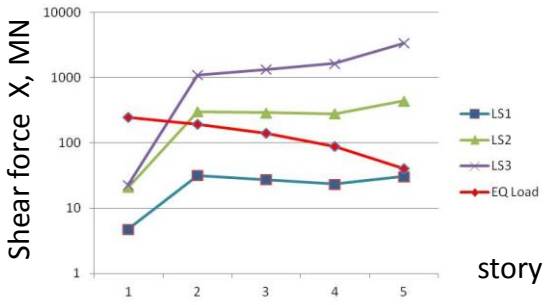
- AMRA has actively collaborated with the organization of the L’Aquila meeting and to the necessary activities for the identification of the case-study building in L’Aquila.

Activities: TU-BERLIN

Mainly involved with Task C: “Development of approaches and software for fast vulnerability assessment”. Activities included:

- Measurements in Thessaloniki (2 buildings), Cologne (7 buildings) and L’Aquila (1 building).
- Detailed case studies on vulnerability (1 in Thessaloniki, 1 in L’Aquila, 1 in Cologne).
- Number of dissemination activities (see Task E and task F report this afternoon).





Field activities

- **Thessaloniki, Greece (Sep./Oct. 2015).**
  Inspections and monitoring of the Administration and Faculty of Philosophy buildings of AUTH, 2D array measurements and the maintenance of the network in the AHEPA hospital.

- **Cologne, Germany (Dec. 2015).**
  Inspection and monitoring of selected school buildings in the area, and undertaking 2D array measurements in the vicinity.

- **L'Aquila, Italy (Dec. 2015).**
  Some inspections and surveys were carried out to demonstrate the SIBYL techniques and tools during the civil protection workshop.

- **Amatrice, Italy (September 2016).**

Next steps

- Finalize the remaining deliverables.
- Prepare the final technical and finacial reports.
- What opportunities are there to present the SIBYL results?

  e.g., EGU 2017, Vienna.
- What other funding opportunities are there?