The Key Role of Eyewitnesses in Rapid Impact Assessment of Global Earthquakes

www.citizensseismology.eu

EMSC wants to thank its members for their support and data contributions which are at the base of its Real Time Earthquake Information Services with a special thank to its host, CEA DASE and its staff for their essential and long-term support.

Uncertainties in rapid impact assessments of global earthquakes are intrinsically large because they rely on 3 main elements (ground motion prediction models, building stock inventory and related vulnerability) which spatial variations are poorly constrained. Furthermore, variations of location and magnitude within their respective uncertainty domain can lead to significantly different shaking level for centres of population and change the scope of the disaster.

This poster presents strategy and methods implemented at the Euro-Med Seismological Centre (EMSC) to rapidly collect in-situ observations on earthquake effects from eyewitnesses for reducing uncertainties of rapid impact assessment of global earthquakes. We show how Internet and new technologies are creating new potential for rapid and massive public involvement by both active and passive means. We underline the importance of merging results of different methods to improve performances and reliability. We then explore what could be the next technical development phases, driven notably by pervasive smartphones rapidly replacing traditional website for rapid earthquake information. Finally, we discuss how this approach not only augment data collection on earthquake phenomenon at little cost but also how they change the way we, as scientists, interface with eyewitnesses and how it pushes us to better understand and respond to public demands and expectations after earthquakes through improved information services.

1 Indirect Data Contributions

EMSC web traffic related to the widely felt earthquakes in Greece - 2014-01-24 to 2014-03-18

After feeling shaking, some people:

- Visit EMSC real time earthquake information website to identify the cause of the shaking
- Both methods detect felt events in 1-2 min regardless their magnitude and independently any reliable data
- More than seismic detections

2 Indirect Data Contributions: Crowdsourcing

Online Questionnaires in 32 languages

Collection of Geolocated pics

M7.1 Bohol, Philippines earthquake, October 15, 2013

Collection of Comments

M4.5 Kephalonia, Greece earthquake, Jan. 26, 2014

3 Data Reliability Assessment

Indirect Data - too hard to track large data volume worldwide after shaking

Statistical Analysis

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Even isolated observations can reduce assessment uncertainties by excluding some of the sources

Automatic Qualitative Impact Assessment

4 Next Steps and Concluding Remarks

- Citizen operated seismic networks being deployed in Patras & Thessaloniki (Greece) to engage with Citizens and augment ground motion prediction in urban regions
- A smartphone app: focusing on earthquakes that matters to the public & optimise pics and videos collection to be released in June
- Thanks to IT, eyewitnesses can provide direct and indirect timely information to constrain rapid impact assessment and in turn improve response
- Tailored earthquake information are essential to attract and engage with eyewitnesses to optimise data collection
Key Roles of Mobile Devices, Social Networks, and Improved Earthquake Information Services

Discrimination of Alarming Shaking Level

Localities where shaking reaches levels where structures make noises are characterised by a higher ratio of website visitors to number of inhabitants.

Detection of Network Failure or Damage

Severe damage or network disruption are detected through the concomitant loss of Internet sessions originating from the impacted region.

Detection of a power outage which affected part of Santiago Del Chile on March 6, 2014 at 10:27:30 UTC.
Key Roles of Mobile Devices, Social Networks, and Improved Earthquake Information Services

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M5.8 Virginia Aug, 23, 2011

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Citizens’ participation allow fast detection of earthquakes and timely information on their effects. It feeds a Quakebot which automatically publishes earthquake information on Twitter (@LastQuake). Example above for M6.5 April 24, 2014 Vancouver Islds earthquake.

Smartphones & Tablets represent only a fraction of the total number of visits but up to 50% of the early visitors after a felt event. They require dedicated, simplified websites. Example (left) for EMSC website where questionnaires have been replaced by thumbnails (below).