



The importance of in-situ observations for rapid loss estimates in the Euro-Med region

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A major ($M > 7$) earthquake occurring in a densely populated area will inevitably cause significant damage and generally speaking the poorer the country the higher the number of fatalities. It was clear for any earthquake monitoring agency that the M7.8 Wenchuan earthquake in May 2008 was a disaster as soon its magnitude and location had been estimated.

However, the loss estimates of moderate to strong earthquakes ($M5$ to $M6$) occurring close to an urban area is much trickier because the losses are the result of the convolution of many parameters (location, magnitude, depth, directivity, seismic attenuation, site effects, building vulnerability, repartition of the population at the time of the event. . .) which are either affected by non-negligible uncertainties or poorly constrained at least at a global scale.

Just considering one of this parameter, the epicentral location: In this range of magnitude, the characteristic size of the potentially damaged area is comparable to the typical epicentral location uncertainty obtained in real time, i.e. 10 to 15 km. It is then not possible to discriminate in real time between an earthquake location right below a town which could cause significant damage and a location 15 km away which impact would be much lower.

Clearly, if the uncertainties affecting each of the parameters are properly taken into account, for such earthquakes the resulting scenarios of losses will range from no impact to very significant impact and then the results will not be of much use.

The way to reduce the uncertainties on the loss estimates in such cases is then to collect in-situ information on the local shaking level and/or on the actual damage at a number of localities. In area of low seismic hazard, the cost of installing dense accelerometric network is, in practice, too high and the only remaining solution is to rapidly collect observations of the damage. That is what the EMSC has been developing for the last few years by involving the Citizen in earthquake response.

It developed an original approach to map the area where an earthquake has been felt and whether there has been widespread damage within 5 to 8 minutes of the earthquake's occurrence by analysing the immediate variations of the geographical origin of the visitors of its web site. Felt earthquakes are characterised by large and brutal surges of traffic on our web site due to people looking for information on the event they just felt; localities where it was felt exhibit large increase in the number of visitors while damaged areas exhibits lack or absence of visitors. In order to characterise the level of shaking or damage, online macroseismic questionnaires have been implemented in more than 20 languages with the automatic production of the macroseismic map. Finally, witnesses have now the possibility to share their pictures of the damage on the EMSC web site and this is proving effective .

We will show in this talk that put together the collected observations can significantly and rapidly reduce the uncertainties of losses estimates and make them usable even for moderate and strong earthquakes.