

## Rapid estimate of earthquake intensities using array technology and multi-source attenuation model

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Right after a damaging earthquake, accurately and promptly estimating earthquake damages remain challenging, mostly due to difficulties in resolving fault pattern and slip distribution. Most earthquake intensities are estimated based on point source models, which usually are with large error. Such problem could be severe, and could mislead emergence response of local governments. A recent example is the 2008  $M_w$  7.9 Wenchuan, China earthquake.

In recent years, array technology has been extensively applied in seismology and is established in determining source extent and the radiated energy distribution along the rupture faults. Thus we propose a novel approach for rapid estimation of earthquake intensities using array technology and multi-source attenuation models. The source extent and energy radiations along the rupture fault (s) are estimated by the array technology. Then we utilize a revised multi-source attenuation model and local site effect database, the earthquake intensities in and around the source region are calculated.

We use the 2008 Wenchuan earthquake as a test case, to see how this approach works. The virtual seismic arrays in the Europe are used to back-project the source extent and energy radiations. Then a multi-source model and local site effects are used to estimate the intensities in each site. Our estimated intensities with the final intensities determined by the field investigation show similar enclosed areas for the meizoseismal area, which validated the effectiveness of this algorithm.

Given the optimal array-earthquake spatial configuration, the array technology could resolve the rupture extent and energy radiation in 10-20 min after the origin time of earthquakes, for regular large earthquakes with source duration less than 5 min. Therefore, this approach could offer trustable earthquake intensity map in 20 min, which may help the better disaster estimates and emergence response for related agencies and government operations.

Keywords: Back-project method, Attenuation model, Rapid estimate of earthquake intensities