



## **Operation of ALISE, the Alert and Information System for Earthquakes in Germany**

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We present improvements of ALISE, the Alert and Information System for Earthquakes in Germany. ALISE is a fully automatic, reliable, cost-efficient earthquake alert- and information system which provides comprehensive information about the event 5-10 minutes after its occurrence. The system is based on a rather sparse network consisting of selected stations of the German Regional Seismic Network (GRSN). Therefore, the operational costs are rather low compared to systems established in other countries. The drawback of the low number of approximately 10 high quality seismic stations is compensated by elaborated data processing techniques, such as the newly developed Multiphase-Gridsearch (MPGS) method. It provides a robust initial epicenter solution from automatically picked onset times.

MPGS takes advantage of all prominent phase arrivals namely Pn, Pg, and Sg in contrast to classical automatic localization methods which take into account only first arrivals for the epicenter determination. This additional information results in rather accurate locations of processed seismic events. Other advantages of MPGS are the robustness against biased datasets containing unrelated picks, provision of a global time residual for each point of the region of interest resulting in a reliable measure of the quality of the solution and the high performance of the algorithm. These properties make the MPGS method superior to inversion methods, particularly, in the case of sparse networks.

Further processing steps are applied to refine the source parameters and to define the estimated impact in terms of radius of perceptibility, vulnerability, and potential damage. All the data is compiled by a map-server and can be displayed on any web browser connected to the internet. Due to these features ALISE is a useful tool for emergency

services and disaster relief organizations. Additional information such as satellite images, high resolution topographic maps, power plants, historical earthquakes, oil and gas fields can be optionally added by the user.

In order to check the reliability of the system and to quantify the accuracy of the determined parameters a test set of significant German earthquakes recorded during a period of 12 years was processed and the results are presented.