EMS98 intensity estimation of the shallow Le Teil earthquake, ML 5.2, by Macroseismic Response Group GIM

Antoine Schlupp1,2, Christophe Siran2, Emeline Maufroy3, Ludmila Provost4, Remi Dretzen2, Etienne Bertrand5, Elise Beck6, and Marc Schaming1,2
1UMR 7516 IPGS, CNRS-Université de Strasbourg, Strasbourg, France
2UMS 830 EOST, CNRS-Université de Strasbourg, Strasbourg, France
3ISTerre, Université Grenoble Alpes, Grenoble, France
4IRSN, Fontenay-aux-Roses, France
5CEREMA, Sophia-Antipolis, France
6PACTE, Université Grenoble Alpes, Grenoble, France

BCSF-RéNaSS (Bureau central sismologique français – Réseau national de surveillance sismique) manages the collection of data from the field for any earthquake in mainland France of magnitude greater than 3.7 and ensures their interpretation in terms of macro-seismic intensities (severity of ground shaking) on EMS98, European Macroseismic Scale (Grünthal, 1998). Unlike the magnitude, which is calculated from seismological records, the intensity of the tremor is only known in each location by analysing the observable effects on people, objects and structures. In case of damage, the GIM (Groupe d'intervention macrosismique = Macroseismic Response Group), coordinated by the BCSF-RéNaSS, establishes EMS98 intensities within a short time after the occurrence of the earthquake. It gathers together scientists (researchers and engineers in tectonics, geology, civil engineering, etc.) from various French scientific institutions.

The 2019-11-11 Le Teil earthquake of magnitude ML 5.2 occurred at 10h52 UTC, 11h52 local time. It is a very shallow event, with hypocentre at about 2km depth and a fault rupture that reached the surface. More than 2000 people who felt the tremor responded to the online survey via the www.francesisme.fr website, allowing a preliminary and rapid estimation of the intensity of the tremor. The day after the event, the BCSF-RéNaSS launched a survey toward the municipal authorities using a collective form designed for the town halls of the municipalities potentially affected. Given the damage described in the answers, the GIM was mobilized to accurately assess the EMS98 intensities of municipalities near the epicentre, based on the effects observed on buildings, people and objects, and taking into account their vulnerability.

Among the almost sixty experts that compose the GIM, seven from IRSN, ISTerre/RESIF-RAP, Cerema, Pacte/UGA, IPGS and EOST/BCSF-RéNaSS answered the call. Divided into teams of 2 or 3, they inspected 24 municipalities between November 18th and 22nd, assisted by mayors or municipal services and sometimes accompanied by the rescue brigade. Several hundred buildings of different vulnerabilities were inspected.
In most cases, many cracks, sometimes significant and open, were observed. Few of the oldest structures built mostly in the 19th century, associated to vulnerability A, partially or totally collapsed in the most affected areas such as Le Teil and Viviers. For comparable buildings, more severe damages were observed on top of hills (Saint-Thomé) or on sedimentary filling (Savasse) which attests for local site effects.

The highest intensities reach locally VIII in La Rouvière and Mélas, two neighbourhood of Le Teil, that are located the closest to the Rouvière fault. These are the highest intensities observed in mainland France since the Arette earthquake in 1967 (Rothé, 1972).

The macroseismic intensities EMS98, estimated during the GiM's field missions, are one of the major input on which is based the decision of the French commission to classify municipalities in a state of natural disasters. That decision triggers insurance coverage of damages. Over the 24 analysed by the GiM, the commission classified 19 municipalities during their meetings of November 20th and December 11th. Following commission meetings will examine the other impacted municipalities.