EGU21-13044, updated on 27 Jan 2022
https://doi.org/10.5194/egusphere-egu21-13044
EGU General Assembly 2021

Analyzing the paleoseismic history of the La Rouvière fault, unexpected source of the 11-11-2019, Mw4.9 Le Teil surface rupturing earthquake (Cévennes fault system, France)

Jean-François Ritz[1], Stéphane Baize[2], Matthieu Ferry[1], Estelle Hannouz[3], Magali Riesner[4], Laurent Bollinger[4], Christophe Larroque[5], Laurence Audin[3], Kevin Manchuel[6], Magali Rizza[7], Hervé Jomard[2], Christian Sue[3], Pierre Arroucau[6], and Jérémy Billant[5]

[1]CNRS, Geosciences Montpellier, Montpellier, France (jean-francois.ritz@gm.univ-montp2.fr)
[2]IRSN, Institute of Radiological protection and Nuclear Safety, Fontenay-aux-roses, France
[3]ISTerre, Univ. Grenoble Alpes, CNRS, IRD, Grenoble, France
[4]CEA, Laboratoire Etudes Géophysiques et Aléas, Bruyeres le Chatel, 91297 Arpajon, France
[5]Géoazur, Univ. Côte d'Azur, CNRS, Observatoire de la Côte d'Azur, IRD, Valbonne, France
[6]EDF - DIPNN, 905 av. du Camp de Menthe, 13097 Aix en Provence - Cedex 02, France
[7]CEREGE, Bâtiment Pasteur Europole Mediterraneen de l'Arbois, BP80 13545 Aix-en-Provence cedex 4, France

The 11-11-2019 Le Teil earthquake (Mw4.9), located in the Rhône river valley occurred along the La Rouvière fault (LRF) within the NE termination of the Cévennes faults system (CFS). This very shallow moderate magnitude and reverse-faulting event inverted an Oligocene normal fault which was not assessed to be potentially active, causing surface rupture and strong ground shaking. Its morphology shows no evidence of cumulative reverse faulting during the Quaternary. All of this information raises the question of whether the fault was reactivated for the first time since the Oligocene during the Teil earthquake, or if it had broken the surface before, during the Quaternary period, but could not be detected. In addition, it poses the question of the potential reactivation of other faults of the CFS and other faults in metropolitan France as well.

To tackle those issues, we launched paleoseismic investigations along the LRF to analyze and characterize evidences of paleo-ruptures in Quaternary deposits. Twelve trenches were dug along the section that broke in 2019. The trenches were dug in aeolian deposits and slope colluvium lying against the ancient LRF normal fault mirror carved in the Barremian limestones. Five trenches yielded favorable Quaternary deposits to document deformation suggesting that one paleo-event, maybe more, occurred with kinematic characteristics (sense of movement, amount of displacement) similar to the 2019 event. The radiocarbon dating of the deformed units (“bulks” collected from the colluvium clayey-silty matrix) suggests, in particular, that at least one event occurred in the past 13 Ka (i.e. penultimate event prior to the Teil earthquake) . The fact that these events are not preserved in the morphology is explained by the small amount of displacement and a long return period, consistent with the low strain rate measured by GPS in this region (~10^{-9} yrs^{-1}). Our study shows that it is therefore fundamental to carry out more detailed paleoseismological investigations in metropolitan France, especially along ancient faults favorably

oriented with respect to the present stress field. Those are already planned in the next coming months along other segments of the CFS.