

SHALLOW GEOPHYSICAL IMAGING OF SLOW ACTIVE FAULTS IN SOUTH-EASTERN FRANCE: CASE STUDIES AND DEVELOPMENTS OF METHODS.

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In regions of low to moderate seismicity, such as Western Europe, seismic hazard is relatively low compared to more active countries such as peninsular Italy or Greece. However, the associated risk is not negligible given the population density and hazardous industries and infrastructures (nuclear power plant, chemical industries, tunnels, bridges,...). In such regions of low to moderate seismicity, tectonic geomorphic markers, which are clear diagnostic features of past surface ruptures in high seismicity regions, are masked by erosion, vegetation cover, and human activities. In this context, geophysical methods are the only imaging tools available to provide insights of underground tectonic deformation, and are essential to target paleoseismological studies, to quantify key parameters such as fault offsets, and to characterize active fault zones.

This presentation focus on the development and applications of near-surface geophysical methods to identify, image and quantify active fault zones in low to moderate seismicity regions. In a first step, we developed (1) new and existing methods analyzing seismic surface waves with the help of signal processing tools (such as Fourier and Hilbert transforms, f-k analysis, semblance filters or deconvolution techniques) to provide robust and accurate identification of anomalies (lateral and thickness variations), linked to the presence of a fault in the shallow layers. In a second stage, we applied the developed tools, as well as conventional geophysical methods, such as 2D and 3D electrical tomography, EM profiling or seismic refraction tomography, and innovative tools such as seismic noise methods H/V to detect and image the surface expressions of two main active faults in Provence (SE France): the Trévaresse thrust, source of the 1909 Lambesc earthquake (strongest instrumental event recorded in France) and the Moyenne Durance fault, a major tectonic structure of SE France.