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The 1895 Ljubljana earthquake: can the intensity data points discriminate which one of the nearby faults was the causative one?

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The earthquake (Mw 6) that occurred in the central part of Slovenia on the 14th of April, 1895, affected a broad region, causing deaths, injuries and destruction. This event was much studied but not fully explained, in particular its causative source model.

The aim of this work is to contribute to the identification of the seismogenetic source of this destructive event, computing a series of ground motion scenarios based on various fault models and nucleation points in the surroundings of Ljubljana: Vič, Borovnica and Želimplje faults. The synthetic seismograms, at the basis of our computations, are calculated using the multi-modal summation technique and a kinematic approach for extended sources. In particular, we compute the maximum peak ground velocity value at 1 Hz.

The qualitative and quantitative comparison of these simulations with the intensity field allows us to discriminate between various sources and configurations. The quantitative validation of the seismic source is done using an appropriate regression law, expressly calculated for this study. The main strong earthquakes used for this calculation are the two Bovec earthquakes (1998, 2004), the Aquila event of 2009 and the two Emilia ones of 20th and 29th of May, 2012.

This study allows us to identify the most probable causative source model of this event, contributing to the improvement of the seismotectonic knowledge of this region.