FIRST APPRAISAL TO DEFINE POSSIBLE SEISMOGENIC SOURCES FROM HISTORICAL EARTHQUAKE DAMAGES IN S UPPER RHINE GRABEN

This work represents an implementation of the procedure to (re)locate historical earthquakes employing felt reports and its inferred macroseismic field. While such aims were successfully targeted and achieved in regions with moderate to high seismicity (Valensise and Pantosti, 2001), this attempt concentrates in the southern portion of the Upper Rhine Graben, an area known for a steady yet modest seismic behaviour (Bonjer et al., 1984; Bonjer, 1987; Plenefisch and Bonjer, 1987). Indeed, while an active seismogenic imprint is detected in this region (Fig. 1), surface expression as potential output of such ongoing deformation is neither straightforward nor unambiguous.

Fig. 1 - Framework of research area, historical events with $E_i > VI$, focal solutions for instrumental events such as $2.0 < M_w < 3.0$ and $M_w > 3.0$.

We selected all historical events recorded since AD 800 yielding an epicentral intensity ($E_i$) > VI. As per Fig. 1, they mostly concentrate on the E border of the URG. This fact is somewhat consistent with the interpretations provided by Brun et al. (1992) (Fig. 2, lower right), highlighting the half-graben that currently develops towards the German flank.

However (Fig. 2), we individuate a prominent and systematic perturbation in the
course of a major river (the Rhine itself) and a very minor tributary (the Ill), both being collinearly bent and redirected to and from the W border. Their course is remarkably parallel even during the switch in directions. This information, especially at a regional scale, tends to suggest a longer-term influence exerted by the E flank of the graben setup, although no relevant seismicity is to be found here, neither historical nor instrumental.

![Fig. 2](image-url)

Fig. 2 - Paleosurface encased within the Rhine and Ill rivers course. Notice the relationship between river course switch and surface slope. On lower right, the basin arrangement as highlighted by the DEKORP-ECORS deep seismic reflection experiments (after Brun et al., 1992).

Only 5 events proved to yield $M_e > 5.0$. One specific earthquake (Rastatt, 08/02/1933), computed via the BOXER code (Gasperini et al., 1999), provided us with $M_e = 5.5$, the highest in the region. The box computed by the code is located exactly on a strand of the German border fault. Fig. 3 shows the interesting relationship between the fault system in the area, the thickness of the Quaternary cover (after Bartz, 1974), the landscape rupture in the pre-Quaternary isopachs and the potential seismogenic source.
Fig. 3 - Location of the source computed via BOXER (Gasperini et al., 1999) for the Rastatt, 1933, M$_e$ 5.5 event.

This work aims at acting as a prospective platform for exploitation of historical felt reports in the foreland of NW Europe. While the seismic signature of this region does not yield remarkable events, this area poses serious concerns about its seismic hazard, being home to a major concentration in population and, most prominently, to a nuclear power plant.

BIBLIOGRAFIA

BONJER K.-P., 1997, Seismicity pattern and style of seismic faulting at the eastern borderfault of the southern Rhine Graben, Tectonophysics, 275, 1, 41-69
GASPERINI P., BERNARDINI F., VALENSISE G. and BOSCHI E., 1999, Defining Seismogenic Sources from Historical Earthquake Felt Reports, Bulletin of the Seismological Society of America, 89, 1, 94-110
VALENSISE G. and PANTOSTI D. (eds.), 2001b, Database of Potential Sources for Earthquakes Larger than M 5.5 in Italy, Annali di Geofisica, 44, Supplemento 1, with CD-ROM