Modelling the palaeotopography of the Brabant Massif: a necessity to understand the site effects of the 2008-2011 seismic activity in the Brabant Walloon

Session 12

64

Van Noten K., Lecocq T., Verbeeck K., Vanneste K., Camelbeeck T.

→ koen.vannoten@oma.be

Royal Observatory of Belgium, Department of Geodynamics, Seismology Section, Belgium

In the region of Ottignies and Court-Saint-Etienne a seismic earthquake swarm took place between July 2008 and January 2011. The sequence started on the 12th of July 2008 with a M_L = 2.2 event and was followed the day after on the 13th of July 2008 by the largest event in the sequence which had a calculated magnitude of M_L = 3.2. The permanently installed seismic stations in Belgium did only record these moderate events. However, thanks to a locally installed temporary seismic monitoring system, more than 300 low magnitude events, with events as low as M_L = -0.7, have been detected. Preliminary results of the relocation of the different hypocenters and analysis of the focal mechanisms show that all these earthquakes took place along a (possibly blind) NW-SE fault (zone) at several km's depth (4 to 7 km) situated a few kilometer south of Court-Saint-Etienne.

Surprisingly, also the very low magnitude earthquakes were felt/heard by the local population. This was for instance deduced by analysing the macroseismic inquiries on the seismology website (e.g. 15 responses for a M_L = 0.7 event). Apart from the seismological research, also all geological and geomorphological information of the Brabant Massif and overlying Cretaceous, Cenozoic and Quaternary deposits have to be investigated in order to estimate and calculate the local site effects. To evaluate the attenuation of seismic waves through the Brabant Massif and to estimate the impact of the earthquakes at the surface, i.e. the seismic hazard, the thickness of the cover is calculated and the palaeotopography of the Brabant Massif in the Court-Saint-Etienne - Ottignies region is reconstructed. Such a reconstruction is primarily based on the availability and interpretation of outcrops and boreholes (DOV, BGS) in the region. Preliminary modelling results show that the Dyle/Thyle river valleys and their tributaries have cut into the Brabant Massif and dominate the model. Below the valley sides and tops, the top of the Brabant Massif gently dips to the NNW, however with the presence of several anomalies. The significance of these anomalies is currently unclear and needs to be evaluated with respect to the geological structure of the Brabant Massif. Due to a lack of drillholes in the direct environment of the fault, refinement of the model will be done by future geophysical surveying (e.g. H/V measurements, electrical resistivity tomography) allowing to determine the thickness of the cover accurately. Our results may furthermore also be compared to the palaeotopography of the Brabant Massif modelled in the Halle - Brussels region (Matthijs *et al.* 2005).

Matthijs *et al*. 2005. Anomalous topography of the Lower Palaeozoic basement in the Brussels regions, Belgium. *Geologica Belgica* 8/4, 69-77.