

Werk

Jahr: 1979

Kollektion: fid.geo

Signatur: 8 Z NAT 2148:46

Digitalisiert: Niedersächsische Staats- und Universitätsbibliothek Göttingen

Werk Id: PPN1015067948_0046

PURL: http://resolver.sub.uni-goettingen.de/purl?PPN1015067948_0046

LOG Id: LOG_0035

LOG Titel: Macroseismic field of the earthquake of September 3, 1978, in the Swabian Jura

LOG Typ: article

Übergeordnetes Werk

Werk Id: PPN1015067948

PURL: <http://resolver.sub.uni-goettingen.de/purl?PPN1015067948>

OPAC: <http://opac.sub.uni-goettingen.de/DB=1/PPN?PPN=1015067948>

Terms and Conditions

The Goettingen State and University Library provides access to digitized documents strictly for noncommercial educational, research and private purposes and makes no warranty with regard to their use for other purposes. Some of our collections are protected by copyright. Publication and/or broadcast in any form (including electronic) requires prior written permission from the Goettingen State- and University Library.

Each copy of any part of this document must contain these Terms and Conditions. With the usage of the library's online system to access or download a digitized document you accept the Terms and Conditions.

Reproductions of material on the web site may not be made for or donated to other repositories, nor may be further reproduced without written permission from the Goettingen State- and University Library.

For reproduction requests and permissions, please contact us. If citing materials, please give proper attribution of the source.

Contact

Niedersächsische Staats- und Universitätsbibliothek Göttingen
Georg-August-Universität Göttingen
Platz der Göttinger Sieben 1
37073 Göttingen
Germany
Email: gdz@sub.uni-goettingen.de

Short Communication

**Macroseismic Field of the Earthquake
of September 3, 1978, in the Swabian Jura**

D. Procházková¹, G. Schneider², E. Schmedes³, J. Drimmel,
E. Fiegweil, G. Lukeschitz⁴, J. Vogt, P. Courtot, P. Godefroy⁵,
G. Grünthal⁶, D. Mayer-Rosa, R. Berger⁷

¹ Geophysical Institute of Czechosl. Acad. Sci., 141 31 Praha 4 – Spořilov, Czechoslovakia

² Institut für Geophysik der Universität Stuttgart,

Richard-Wagner-Str. 44, D-7000 Stuttgart, Federal Republic of Germany

³ Inst. für Allgemeine und Angewandte Geophysik der Universität, Theresienstr. 41, D-8000 München, Federal Republic of Germany

⁴ Zentralanstalt für Meteorologie und Geodynamik, Hohe Warte 38, A-1190 Wien, Austria

⁵ Bureau de Recherches Géologiques et Minières, F-450 18 Orléans, Cédex, France

⁶ Zentralinstitut für Physik der Erde, Telegrafenberg, Potsdam, German Democratic Republic

⁷ Institute of Geophysics, E.T.H. Hönggerberg, Zürich, Switzerland

Key words: Seismology – Swabian Jura – Macroseismic observations.

1. Introduction

The earthquake of September 3, 1978, 05 h 08 m 32 s UT in the region of the Western Swabian Jura was felt in the Federal Republic of Germany, Austria, Czechoslovakia, France, German Democratic Republic, Switzerland and only weakly in Northern Italy. The parameters of the main shock are as follows:

Geographic latitude:	48, 29° N
Geographic longitude:	8, 94° E
Origin time:	05 h 08 m 31.8 s UT
Focal depth:	9 km
Surface wave magnitude:	5,4

(All data after CSEM = Centre Séismologique Europeo-Mediterranéen, Strasbourg)

Epicentral macroseismic intensity: 7–8

(On the macroseismic scale after MEDVEDEV, SPONHEUER, KÁRNÍK = MSK-64: All 'intensity' data in this paper are related to this scale).

Seismic focal moment: $3.35 \cdot 10^{16}$ Nm

(This value is based on the broad-band record of the Central Seismological

Observatory, Erlangen-Gräfenberg, assuming a P -velocity of $7.35 \cdot 10^3$ m/s along the propagation path).

At the seismic station Mössingen (MSG) about 340 aftershocks with a local magnitude larger than 1.0 have been recorded until the end of 1978. The strongest aftershock took place on September 3, 1978, 10 h 02 m 43,3 s. Its surface magnitude reached 4.4 (after CSEM).

2. Description of the Macroseismic Field

Austria. In order to increase the number of reports 649 additional inquiries were sent to police stations, post offices and schools. From 179 districts or points in Austria (besides 8 reports from abroad) 377 reports and 539 negative answers could be used in working out the macroseismic map. As Fig. 1 shows, a maximum intensity of 5 was experienced in the northwestern part of Vorarlberg. The isoseismal intensity 3, being practically the limit of perceptibility, extends to epicentral distances of 350 km near Kötschach-Mauthen in Carinthia and 550 km near Vienna. In Austria 48,000 km², about 58% of the whole country felt a minimum intensity of 3, 9,600 km² an intensity 4 and 450 km² an intensity 5. No damage was reported in Austria.

Czechoslovakia. Czechoslovakia is situated at the border of the macroseismic field, and, therefore, only singular observations have been collected. The intensities determined on the basis of these observations show values of 3 to 4.

The intensity 4 was observed in the south-western part of Bohemia at isolated places. In view of the small number of observations, (15 reports from 10 localities) the isoseismal was marked by a dashed line (Fig. 1). An intensity 3 was not felt by higher percentage of the population because the shock occurred early in the morning when people slept still.

Federal Republic of Germany. The epicentral area of the shock is situated in Baden-Württemberg. The pleistoseismal area is characterized by an epicentral intensity of 7–8, restricted to two suburbs Onstmettingen and Tailfingen of Albstadt (Fig. 2). The most damage in these areas was situated above the focal line of a unilateral fracture running from the hypocenter towards the South. The macroseismic ‘islands’, North and Northeast of Stuttgart correspond to communities with many tall buildings in the industrialized environs of the capital of Baden-Württemberg (Fig. 1). The greater part of Baden-Württemberg, outside of the epicentral area, felt an intensity of 4–5. In Bavaria the shock was felt with intensities between 3 and 5. Reports came from 70 localities. No observations were available from the central and the northern parts of the Federal Republic of Germany and, therefore, the isoseismal for intensity 4 was extrapolated by a dotted line.

France. The intensities observed in the French regions of Alsace, Vosges, Lorraine and N.E. of Franche-Comté ranged from 2 to 6; an intensity 6 was

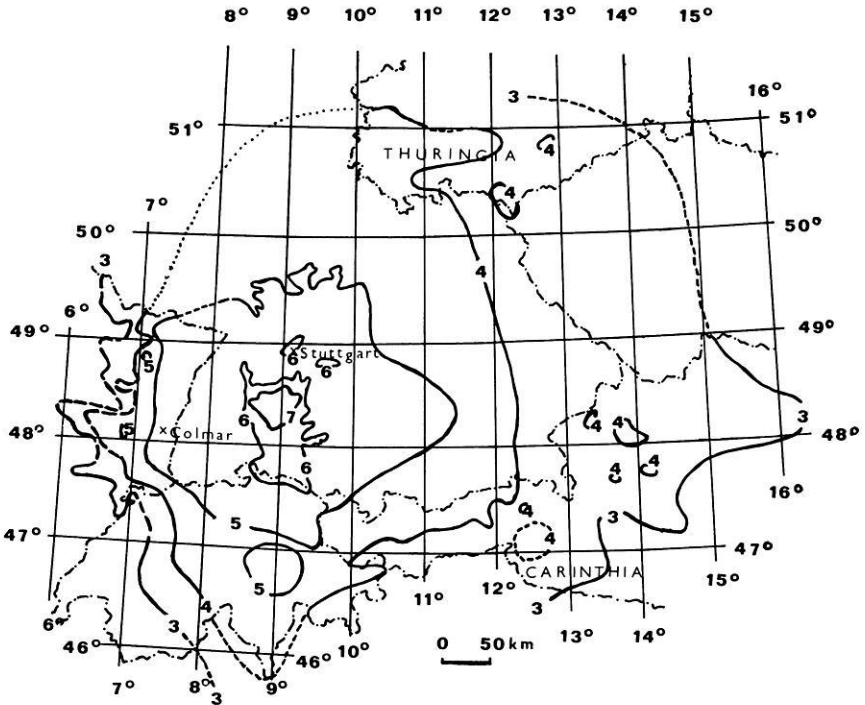


Fig. 1. Isoseismal map

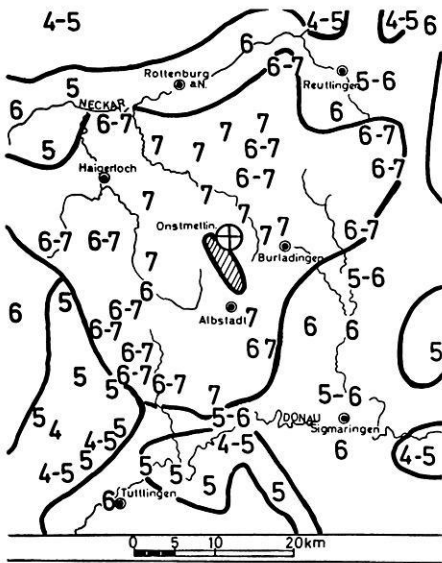


Fig. 2. Macroseismic intensity in the epicentral area

observed in a small area south of the city of Colmar (with regard to the small size of this area, this isoseismal is not marked in Fig. 1). Altogether 400 reports were obtained. The macroseismic field in France extended to some 30,000 km². The shock was also felt by most participants of the European Seismological Commission in Strasbourg.

German Democratic Republic. For collection of the macroseismic observations in the German Democratic Republic a questionnaire-inquiry was carried out. From 54 towns or villages detailed reports were obtained while from 93 localities no replies were received. Most localities observed an intensity 4, smaller intensities were observed rarely, because the shock occurred early in the morning and small intensities as a rule do not wake people. Intensities of 4 were observed in the southwestern part of the German Democratic Republic, in the western part of Thuringia and to the north as far as to the line Mühlhausen-Erfurt-Weimar-Jena-Gera. South of the line Gera-Suhl and in Southeastern Thuringia the shock was not felt. This lack of perceptions is well verified. Some further reports of intensity 4 were obtained from the Vogtland.

Switzerland. 600 reports from 320 villages all over the country were evaluated. According to these data, the earthquake was strongly felt in the northern, central and southern part of Switzerland. On the other hand, it was not felt in the west, such as in the Jura Mountains and in the Lake Geneva area. The strongest effects were observed in north-eastern Switzerland along the borderline to the Federal Republic of Germany particularly in the Lake of Constance area and Kanton Schaffhausen.

In this region maximum intensity was 6 and many reports contained descriptions of moving objects and displaced furniture. In the Kanton of Zürich and Schaffhausen more than 100 cases of slight damage (mainly cracked walls), were reported to the insurance companies. But not more than 20% of these cracks could be proved of recent nature. In many descriptions, the duration of the strong shaking was estimated between 5 and 30 s. A significant number of people independently reported earthquake-generated noise, comparable to 'trucks passing by'. In general the earthquake was felt more as a 'rocking or rolling' movement with relatively low frequency, and was especially marked in high-rise buildings. This caused some problems in using the MSK-64 scale, since the observations had to be corrected subjectively in intensity by a certain factor.

3. Remarks

On the basis of the observations described in paragraph 2 the isoseismal map in Fig. 1 was compiled. From this map follows:

1. For the macroseismic determination of the focal depth, the mean radii of isoseismals were calculated using the surfaces encircled by the isoseismals. The results are as follows: $r_7=20$ km, $r_6=41$ km, $r_5=135$ km, $r_4=230$ km and $r_3=ca. 330$ km. Using the formulae of Kövesligethy and Blake with the

parameters $k=3,4$ and $\alpha=0,001$ (Procházková, 1979) a focal depth of about 10 km, was determined. This value is of the same order of magnitude as the value given by CSEM.

2. A comparison with the effects caused by the famous 1911 earthquake (Hiller, 1960, Procházková and Kárník, 1978) in the same area shows, that the intensities outside of the epicentral area for the 1978 earthquake were half to one degree lower than in 1911.

3. On the isoseismal map (Fig. 1) the islands of greater intensity may be caused by differences in the local geological foundations. For example the old shields, to which the Bohemian Massif belongs, are characterized by small absorption of seismic energy (e. g., a great distance between isoseismals is observed, Procházková, 1979). In Thuringia the course of the isoseismals shows a conspicuous form. The zone without macroseismic observations in southeastern Thuringia corresponds well with an area of Paleozoic basement, while north of the line Gera-Suhl on a Mesozoic foundation the shock was felt with an intensity 4. This zone in southeastern Thuringia where no effects were observed, was reported previously in macroseismic investigations of other Swabian Jura earthquakes and so seems to be a typical effect in the case of these earthquakes.

Acknowledgement. The authors are indebted to Dr. V. Kárník for discussion and critical comments.

References

- Hiller, W.: Die Erdbeben der Zollernalb. Der Landkreis Balingen, **1**, 27–37, 1960
Procházková, D., Kárník, V. (editors): Atlas of Isoseismal Maps for Central and Eastern Europe. Geoph. Inst. of the Czechosl. Acad. Sci., Prague, 1978
Procházková, D.: Parameters of the Macroseismic Fields in Central and Eastern Europe. (in Czech.). Geophysical Conference in Liblice in 1979, in press 1979

Received June 18, 1979; Revised Version September 7, 1979; Accepted September 13, 1979

