

Historical seismicity of the lower Rhine and Meuse valleys from 600 to 1525: a new critical review

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Abstract

The historical seismicity of eastern Belgium, Netherlands Limburg and the northern Rhineland should be entirely revised. Going back to sources contemporaneous with the events, we have been able on the one hand to eliminate the false data appearing in traditional catalogues, and on the other hand to elaborate a new critical catalogue of 22 earthquakes which occurred in this area for the period from the earliest known records up to 1525. Special attention has been paid to the large shocks of June 11, 1395 and August 23, 1504.

State of the art and methodological problems

Historical seismicity is one of the most important sources of information for reliable seismic hazard assessment in regions with low seismicity. This paper presents part of a larger project that reviews the historical seismicity in eastern Belgium, Netherlands Limburg and the northern Rhineland. A large number of publications suggest that the subject has been studied exhaustively (Von Hoff 1840, Perrey 1847, Torfs 1862, Lancaster 1901, Sieberg 1940, Van Rummelen 1945, Houtgast 1991, Van Gils & Leydecker 1991). However, this paper illustrates the necessity of a critical review.

Our methodology aims at consistent application of the rules of historical criticism. That is: a) It must be established when and where the author of an account was writing. b) Whenever available, material from original sources must be used. Second-hand material may only be used when it was copied from original lost sources, clearly proved by a historical study. c) Reliable data from original sources (that is, the records contemporary with the events) may not be indiscriminately mixed up with data from compilations written a long time after the events.

The process that leads to the introduction of false data in numerous compilations has been studied elsewhere (Alexandre 1991). The false data mainly come from *mixtures* (two distinct earthquakes become one and the same earthquake), from *extrapolations* (an actual earthquake in some place is improperly extended to other areas), from *splittings in two* (a single tremor becomes two earthquakes, for example in two different years), or simply from *wild imaginations* (earthquakes invented by former authors, for example the 14th century chronicler Jean d'Outremeuse in Liège).

Since 1985 a reappraisal of the historical seismicity has been undertaken at the Royal Observatory of Belgium (Melchior 1985). New critical studies of early earthquake reports have been published for northwestern Europe from the years 395 to 1259 (Alexandre 1990) and for the North Sea area up to 1800 (Alexandre 1989b). Vogt (1984, 1985) has published updates of the events of 1504, 1692 and 1733.

Available documentation and studied regions

According to the extent of the available documentation, the seismic history of northwestern Europe can be divided into four periods:

- Before 700: As there are almost no records, even important earthquakes are unknown.
- From 700 to 1350: the annalistic sources of abbeys allow to establish a catalogue of major earthquakes. Most of the epicentres and intensities, however, remain unknown.
- From 1350 to 1650: the urban chronicles, more developed than the annals, provide a sufficient amount of data, allowing in some cases to draw maps of the local effects of major earthquakes.
- From 1650 onward: The profusion of local sources (chronicles, memorial books, diaries, annotations in the parochial registers, etc.) and the expansion of newspapers allow to evaluate the local intensities of all the major earthquakes and, moreover, to elaborate a more precise chronology of the minor telluric tremors and aftershocks.

The object of the present paper is to go through the historical seismicity of the Lower Rhine and Meuse valleys, northern Ardennes and northern Eifel, from the earliest known sources up to the first quarter of the 16th century. The area studied covers the zones 4 to 7 of the seismic zonation of the regions from the Lower Rhine Embayment to the North Sea as proposed by Camelbeeck (1993) on the basis of instrumental data since 1911.

The historical seismicity of the zones 1 to 3 (1. *Variscan Front, Artois-Boulonnais*, 2. *Southern Brabant fault zone*, 3. *Hainaut zone*) has been studied elsewhere (Alexandre 1989b) and is characterized by few but violent known quakes, particularly the major earthquakes of 1382, 1449 and 1580.

The historical seismicity of the zones 4 to 7 (4. *Lower Rhine Embayment*, 5. *Ardennes-Hautes Fagnes zone*, 6. *Liège-Gulpen zone*, 7. *Brabant Massif, eastern part*) is characterized by violent earthquakes too, but also by a large amount of lesser quakes (in the present state of the research, 248 known distinct tremors for the enhanced seismic activity of the years 1755–1762). The extensive documentation collected about the major earthquakes in these areas after 1525 (1554, 1640, 1666, 1673, 1692, 1714, 1755, 1756, 1760, 1828, etc.) will be published in future monographs.

Discussion and conclusions on true and false earthquakes up to 1525

This section reviews the records, true or false, of earthquakes up to 1525. A catalogue of 22 true earthquakes for the years 801–1505 and a second catalogue listing

many false records for the period 600–1525 are presented in Appendix 1.

1. The so-called earthquake of Tongeren about 600 or 615

For Belgium it is said to be the oldest earthquake of the list (Torfs 1862: 136, Van Rummelen 1945: 4). This event is a hagiographic invention of the 11th century, due to a priest of Maastricht; he wanted to justify afterwards the desertion of Tongeren as episcopal see (Alexandre 1989a). This false earthquake is still mentioned in Van Gils & Leydecker's catalogue (1991: 3), with an intensity VI MSK.

2. True and false earthquakes from 700 to 1259

In my study of earthquakes in western Europe from 394 to 1259 (Alexandre 1990) 29 false earthquakes are pointed out for the area considered in this paper; these earthquakes allegedly occurred in Liège, Maastricht, Geleen, Heerlen, Sittard, Aachen or Köln. The most extravagant one is that of Aachen on 30 May 1202 (Montandon 1953), with an intensity X. Montandon actually confused *Acconensis* (Acre in Palestine) and *Aquensis* (from Aachen)!

Having excluded the false earthquakes for this period (and the false data on true earthquakes), only 15 earthquakes remain whose epicentres must have been in the northern Rhineland (801, 803, March 823, 829, 939, 20 April 1112, 10 December 1121, 24 April 1141, 20 January 1167, 1 August 1179, 15 and 25 January 1223) or in eastern Belgium (18 November 1013, 27 March 1081 and 10 September 1095). We know nothing about the intensity of these quakes. We only know the intensity in our region (V on the MSK scale) for the earthquake that occurred on 3 January 1117. The epicentre of this earthquake is in Venetia, Italy.

3. False earthquakes from 1260 to 1360

For the period 1260–1360 all earthquakes of the Lower Rhine area mentioned in the traditional catalogues are false:

- 1289. Aachen (Van Rummelen 1945: 16). No contemporaneous source is quoted.
- 1300. Lower Rhine, Brauweiler (Sieberg 1940: 33). This reference comes from the *Chronicon Brunwilarensis*, a source from the beginning of

the 16th century, which reports around 1300 'large earthquakes at several places'. Actually, it refers to the earthquake of 1298 in central Italy.

- 11 June 1316. Münstereifel (Sieberg 1940: 35). Because of a copying error, the date 'MCCCXCV' became 'MCCCXV' in the manuscript of the *Münstereifeler Chronik*. It refers therefore to the major earthquake of 6 June 1395. Another error of Sieberg has made 1316 out of 1315.
- September 1318. Lower Rhine, Köln (Perrey 1847: 15, Sieberg 1940: 35). This is actually the earthquake of 9 November 1318 in the southern Rhineland, which is not mentioned in the Köln sources.
- 1323. Seismic swarm in Aachen (Sieberg 1940: 35). Contemporary sources do not mention anything like that.
- 1349. Lower Rhine, Jülich (Sieberg 1940: 373, Van Gils & Leydecker 1991: 6: Intensity VII MSK!). This is an excessive extrapolation, with an error of the date, of the earthquake in Villach, Austria, on 25 January 1348.
- 1350. Netherlands, Rhineland (Torfs 1862: 147, Houtgast 1991: 34). This seems to relate to the above-mentioned Carinthian cataclysm of 1348 near Villach.
- 1360. Lower Rhine, Köln (Sieberg 1940: 40). The 'motus terreni circa iacencia Reni', mentioned in 1360 in the *Chronicon rhythmicum Coloniense*, a source from the end of the 15th century which copies lost annals of Köln of the 14th century, are actually related to the quakes that occurred in the Upper Rhine valley, from Basel to Mainz, in 1356 and 1357.

4. The earthquake of 17 December 1324 in Hesbaye (Belgium)

This true earthquake is not mentioned in any catalogue. It is only known from one source, a lost chronicle of Huy (Appendix 1).

5. False data and false earthquakes from 1382 to 1393

- The earthquake of 21 May 1382, probably situated in the North Sea area, was exaggeratedly extended to the east by the compilers. Sieberg (1940: 41) gives an intensity VII–VIII (!) at Maastricht for this

event, on the basis of Maastricht chronicles which are unreliable for the 14th century. The same holds true for the so-called records from Gangelt and Sittard (Van Rummelen 1945: 17): the *Chronik von Gangelt*, which is the source, is only a compilation of the 17th century, a copy of a chronicle from Liège.

- The earthquake of 1385 in Maastricht, mentioned by Houtgast (1991: 35) who attributes an intensity VI–VII MSK to it, should absolutely be rejected; the text in which it is mentioned dates from a late chronicle from Maastricht that copies the text of a chronicle from Liège concerning the earthquake of 21 May 1382, but distorted the date of the year.
- The same conclusion holds for the pseudo-earthquake of 11 June 1393 in Maastricht (Houtgast 1991: 35, attributes an intensity VI–VII MSK); it comes from an 18th century chronicle, full of dating errors and is a metamorphosis of the actual shock of 11 June 1395.

6. The earthquake of 11 June 1395

This earthquake is known only from five original sources: from Münstereifel, Köln (two sources), Limburg an der Lahn and Liège (Appendix 1). The other data provided by Sieberg (1940: 41–42) are not original or do not come from original lost sources. The texts allegedly coming from Gangelt, Maastricht, Mechele and Antwerpen actually derive from the chronicle of Liège. The Dortmund text originates maybe in the chronicle of Köln; in any case Dietrich Westhoff's *Dortmunder Chronik* (beginning of the 16th century) does not mention any earthquake in 1395, whereas this author copied lost original chronicles which were written in Dortmund between the second half of the 14th century and the end of the 15th century. The only data that remain to be checked are those related to Laach (Sieberg 1940: 41–42; no source is quoted).

The places where the earthquake was felt according to original sources are indicated in Fig. 1. If we eliminate Dortmund (for which Sieberg proposed an intensity IV–V), we only have left Köln and Liège where the data seem to indicate an intensity V–VI on the MSK scale.

7. The earthquake of 25 March 1439

This earthquake is only known from one single original source, written in Liège.

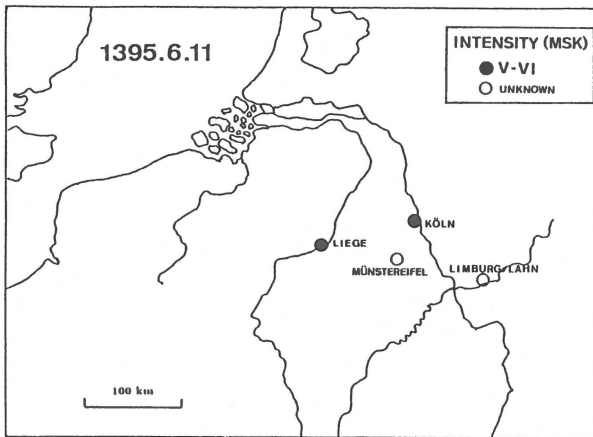


Fig. 1. The earthquake of June 11, 1395. Intensity V–VI = Intensity V or VI. Unknown intensity = felt, but without other information.

8. The earthquake of 8 December 1440

Only one source from Köln mentions this earthquake. I do not know where the ‘6 Erdstöße’ indicated by Sieberg (1940: 44) come from. Could he have read ‘6 tremors’ instead of ‘6 hours’?

9. The earthquake of 26 August 1456

This earthquake is only known through two sources from Liège. The data provided by these sources cannot justify the intensities indicated by Houtgast (1991: 37) and Van Gils & Leydecker (1991: 8): VII on the MSK scale! Sieberg’s hypothesis (1940: 45), according to which this tremor should have been felt in Gera in Thuringia (Germany), becomes a certitude for Houtgast.

10. The earthquake of 23 August 1504

A first revision of the data on this earthquake has been made by Vogt (1984). In the present state of research, the reliable data for this event are given in Appendix 1. The places where the earthquake was felt according to original sources are indicated in Fig. 2.

The traditional catalogues are putting the epicentre of this earthquake in Westphalia, near Dortmund, with an intensity VII MSK. However, the reliable sources confirm the hypothesis of Vogt (1984), who situates the epicentre in the region of Aachen (intensity VII MSK), and insists rightly on the considerable spread of the zone of perceptibility to the west, up to Picardy in

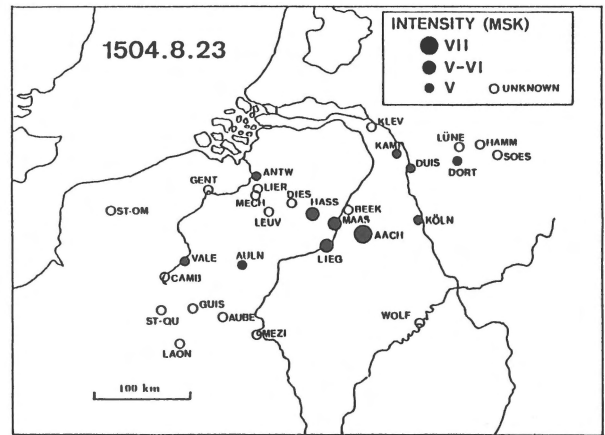


Fig. 2. The earthquake of August 23, 1504 (all locality names abbreviated to first four letters, see text). Intensity V–VI = Intensity V or VI. Unknown intensity = felt, but without other information.

France. The scarceness of local accounts in the area of the supposed epicentre is the most important problem; even the damage in Aachen itself is only known thanks to a well-informed source from Antwerpen. We hope that future research will help to fill this gap in the information.

The data concerning an earthquake on 14 May 1504 in Maastricht, mentioned by Houtgast (1991: 37), come from an unreliable chronicle of the 18th century; it is a deformation of a text on the event of 23 August 1504.

11. The earthquake of 30 June 1505

This earthquake is only known through two chronicles from Liège. Houtgast (1991: 39) places this earthquake on the 1st of June 1505 and attributes an intensity IV MSK to it; Van Gils & Leydecker (1991: 9) give an intensity VI MSK. The information contained in the two original texts does not allow such assertions.

Appendix 1

Catalogues of true and false earthquakes from 600 to 1525 in eastern Belgium, Netherlands Limburg and the northern Rhineland

1. Catalogue of true earthquakes from 700 to 1525

Original material for the studied area is only available from the 8th century onward. References to sources

and texts prior to 1260 have been published elsewhere (Alexandre 1990). The manuscript sources used for the years 1260–1525 are listed in Appendix 2. They almost all have been edited and reference to them is made by the title of the source, followed by the name of the editor and the page number.

1. 801. Earthquake in the Rhineland.
2. 803, in the beginning of the year. Earthquake in the Aachen area.
3. 823. Earthquake in Aachen.
4. 829, a few days before March 28. Earthquake felt in Aachen.
5. 939. Earthquake felt in Köln.
6. 1013, November 18. Earthquake felt in Liège.
7. 1081, March 27. Earthquake felt in Liège, Gembloux, Lobbes and Gent. Epicentral area unknown.
8. 1095, September 10. Earthquake felt in Gembloux.
9. 1112, April 20. Earthquake felt in Aachen.
10. 1121, December 10. Earthquake felt in Aachen and Gembloux.
11. 1141, April 24. Earthquake felt in Aachen.
12. 1167, January 20. Earthquake felt in Köln.
13. 1179 or 1180, August 1. Earthquake felt in Aachen, Brauweiler, Köln, Liège, Floreffe and Gent. Epicentre in the Aachen area?
14. 1223, January 11. Earthquake in the Köln area. Intensity: VI MSK?
15. 1223, about January 25. Earthquake in Aachen.
16. 1324, December 17. Earthquake in Hesbaye.
 1. *Chronicon Leodiense usque ad a. 1402* (Bacha 1900: 285) (last quarter of the 14th century), from a lost chronicle of Huy dating back to between 1258 and 1347 (Alexandre 1987: 66): '1324. . . On the 17th day of December, at noon, on a clear and windless day, there was in Hesbaye a perceptible and visible earthquake, audible almost like the sound of thunder.'
17. 1395, June 11. Earthquake felt in Müntstereifel, Köln, Limburg an der Lahn and Liège (Fig. 1). Intensity at the epicentre: VI MSK?
 1. *Müntstereifeler Chronik* (Floss 1864: 192), written in Müntstereifel and dating from 1376 to 1450: '1315 [sic]. There was a large earthquake in June, on St. Barnabas day [June 11], and everyone was astounded. This was on the Friday after Corpus Christi.'
Note: The chronological indications are correctly related to the year 1395 and not 1315: the Thursday of Corpus Christi (or of the Blessed Sacrament) was on the 10th day of June in 1395 (and the 11th day was therefore indeed a Friday), while in 1315 it was on the 22nd of May.
 2. *Cölner Jahrbücher* (Cardauns 1876: 82), Recension C, written in Köln and dating from 1391 to 1435: '1395. . . On the Friday [June 11] after the day of Corpus Christi, in the morning at 3 a.m. there was an earthquake, so that the houses were shaking and that the pots were banging together on the walls; it lasted in Köln at least the time of a Paternoster.'
 3. *Cölner Jahrbücher* (Cardauns 1876: 137), Recension D, written in Köln and original from 1395 to 1445: '1395. . . On the Friday [June 11] after Corpus Christi there was a large earthquake in Köln after midnight.'
 4. Tilemann Ehlen von Wolfhagen, *Limburger Chronik* (Wys 1883: 89) written in Limburg an der Lahn and entirely original, from 1336 to 1398: '1395. . . On St. Barnabas day [June 11], the Friday after Corpus Christi, there was a large earthquake, so that the people were very frightened and astounded.'
 5. Jean de Stavelot, *Chronicon* (Balau 1913: 97) (first half of the 15th century), from a lost chronicle of Liège which dates from the last quarter of the 14th century (Alexandre 1987: 70). '1395. . . On the 11th of June at the daybreak there was a strong earthquake in Liège and around, so strong that the pots, the plates and the cauldrons hanging on the walls were banging together with large shocks.'
18. 1439, March 25. Earthquake felt in Liège.
 1. Jean de Stavelot, *Chronique* (Borgnet 1861: 432), written in Liège and entirely original, from 1400 to 1447: '1439. . . On the 25th of March, the earth shook, about 3 hours after dinner.'
19. 1440, December 8. Earthquake felt in Köln.
 1. *Cölner Jahrbücher* (Cardauns 1876: 183), Recension D, written in Köln and original from 1395 to 1445: '1440. . . There was an earthquake on the day of Our Lady's Conception [Dec. 8] at 6 a.m. in the night.'
20. 1456, August 26. Earthquake in the Liège area.
 1. Adrien d'Oudenbosch, *Chronicon rerum Leodiensium* (de Borman 1902: 49), written in Liège and entirely original, from 1447 to 1482: '1456. . . On the day [Aug. 25] after St. Bartholomew's day there was an earthquake around Liège at 3 a.m. in the night.'
 2. Corneille de Zantfliet, *Chronica* (Martène & Durand 1729: 491), written in Liège and original from about 1428 to 1461: '1456. . . On the 26th of August at 2 a.m. in the night there was an earthquake in Liège.'
Note: The different dates (Aug. 25 and 26) are understandable because the event probably occurred in the night from the 25th to the 26th of August.
21. 1504, August 23, between 10 and 11 p.m. Earthquake in the Aachen area (Fig. 2). Intensity: VII MSK?
 1. *Chronicon Leodiense regni Johannis ab Horne* (Balau 1913: 558), written in Liège and entirely original, from 1482 to 1505.
Duration: the time of an Ave Maria.
Effects: 'Large' earthquake. Liège: The houses, the walls, the roofs and the other parts of the houses were shaking 'like a ship on the sea'. General fright. A kind of crash was accompanying the tremor.
 2. Jean de Looz, *Chronica* (de Ram 1844: 119), written in Liège and original from 1482 to 1516.
Duration: rather short.
Effects: Liège: General fright.
 3. Norbert Herset, *Chronicon Alnense* (de Give 1983: 54) (18th century), from lost original annotations of Aulne written by Gérard Bosman, abbot of Aulne from 1497 to 1529.
Effects: 'Violent' earthquake. Aulne: It seemed to the abbot of Aulne that his room was going to collapse. A big crash came with the tremor.
 4. Jean Molinet, *Chronique* (Doutrepoint & Jodogne 1935–1937: 545), written in Valenciennes and entirely original, from 1474 to 1506.
Duration: the time of an Ave Maria; at some places, half of a Paternoster.
Effects: Valenciennes: Before the tremor, great excitement of captive birds. All the wooden buildings were shaking and seemed ready to break. A noise came with the tremor. Valenciennes?: At some places, chimneys fell on the streets.
 5. *Chronique de Cambrai until 1558* (second third of the 16th century), from lost sources of Cambrai which are original for the first third of the 16th century [unpublished source, Bibliothèque Municipale de Cambrai, Ms. 739; communicated by J. Vogt].

- Felt in Cambrai.
6. Alard Tassar, *Chronica* (Lanselle 1929: 56), written in St-Omer, original from about 1499 to 1532.
Felt in St-Omer.
 7. Claude Leleu, *Histoire de Laon* (18th century), from lost sources of Laon which are original from the beginning of the 16th century [unpublished source, Bibliothèque Municipale de Laon, Ms. 551; communicated by J. Vogt]. Felt in Laon, Guise, Aubenton, St-Quentin, Mézières.
Effects: 'Large tremor.'
 8. *Memorieboek der stad Ghent* (Van der Meersch 1852: 8), written in Gent and original from the second half of the 14th century.
Felt in Gent.
Duration: the time of a Paternoster.
Effects: 'Large' earthquake.
 9. Peter van Dieve, *Jaarboeken der stad Leuven* (Van Even 1856: 361) (second half of the 16th century), from lost sources of Leuven which are original for the first half of the 16th century.
Felt in Leuven.
 10. *Nota Mechliniensis* (Bernaerts 1880: 320–321), written in Mechelen in 1504.
Felt in Mechelen.
 11. Hendrik Van Gorrichem, *Chronicon Diestense* (Raymaekers 1861: 433), written in Diest and original from the last quarter of the 15th century to 1530.
Felt in Diest and in the whole of Brabant.
 12. Josse de Weert, *Chronycke der stad Antwerpen* (Piot 1879: 83) (beginning of the 17th century), from lost sources of Antwerpen dating from the second third of the 15th century.
Felt in Antwerpen, Lier, Diest, Hasselt, Aachen, Köln.
Duration: the time of a Paternoster.
Effects: 'Large' earthquake. Antwerpen: The houses were shaking, as well as everything else in the houses. Hasselt: The bell of the town hall rings on its own. Aachen: A city gate collapsed, as well as a large piece of the 'church of the Brothers of Our Lady'.
 13. Mathieu Herben, *Chronijk van Maastricht* (Habets 1864: 87), written in Maastricht and original from 1477 to 1517.
Effects: 'Large' earthquake. Maastricht: The houses were shaking and seemed ready to fall down. General fright and panic.
 14. *Maastrichtse Aantekening* (De Maasgouw 1864: 52), written in Maastricht in 1504.
Felt in Maastricht.
 15. Peter Trecpoel, *Chronijk der landen van Overmaas* (Habets 1870: 118), written in Beek and original from 1468 to 1507.
Felt in Maastricht.
Effects: 'Rather large' earthquake.
 16. Hilbrant Suderman, *Kölner Aufzeichnungen* (Cardauns 1879: 49), written in Köln and entirely original, from 1489 to 1504.
Effects: 'Large' earthquake. Köln: The sleepers woke up.
 17. Adam Rees, *Annales Wolfenses* (Mone 1865: 81), written in Wolf on the Mosel and entirely original, from 1478 to 1507.
Felt in Wolf.
 18. Johann Wassenberch, *Chronik* (Ilgen 1895: 205), written in Duisburg and entirely original, from 1474 to 1517.
Felt in Duisburg, Kleve, Köln.
Effects: 'Large' earthquake. Duisburg: 'The houses were shaking so much that the pots on the walls were banging together.' General fright.
 19. *Chronicon monasterii Campensis* (Keussen 1870: 423), written in Kamp and original from 1464 to 1504.
Duration: 'Did not last long.'
Effects: Kamp: The houses and towers were shaking: the people in bed were frightened.
 20. Dietrich Westhoff, *Chronik* (Hansen 1887: 376), written in Dortmund and original from 1499 to 1550.
Felt in Dortmund, Lünen.
Duration: the time of a Miserere.
Effects: 'Large' earthquake. Dortmund: The pieces of bacon fell from the beams and the pots fell off the shelves.
 21. *Chronicon Dominicanorum in Tremonia* (Hansen 1887: 376 n.1), written in Dortmund and original for the first half of the 16th century.
Felt in Westphalia, Rhineland and Köln.
Also felt in Hamm, where the author of the chronicle was staying when the event occurred.
Effects: 'Large' earthquake. Rhineland?: Many buildings were shaking, towers and walls cracked.
 22. *Soester Aufzeichnungen* (Ilgen 1883: 88), written in Soest and entirely original, from 1417 to 1529.
Felt in almost the whole of Westphalia.
22. 1505, June 30. Earthquake felt in Liège.
1. Jean de Looz, *Chronica* (de Ram 1844: 120). Cfr. 1504: '1505. . . On the last day of June, at 4 a.m. in the morning, there was a very short earthquake, in only one movement.'
 2. *Chronicon Leodiense regni Johannis ab Horne* (Balau 1913: 563). Cfr. 1504: '1505. On the last day of May there was an earthquake.'
Note: This source places the event on the 31st of May and not on the 30th of June, but Jean de Looz's chronicle is more reliable as far as chronology is concerned. There must have been a copying error.

2. Catalogue of false earthquakes from 600 to 1525

A critical discussion of the data of the years 600–1259 is contained in an earlier study (Alexandre 1990). The data for the years 1260–1525 are presented in this paper.

1. About 600 or 615. Tongeren (Torfs 1862: 136, Sieberg 1940: 18, Van Rummelen 1945: 4, Van Gils & Leydecker 1991: 3).
2. 749. Aachen (Sieberg 1940: 19, Van Rummelen 1945: 5).
3. 803, at the end of the year. Aachen (Sieberg 1940: 20, Van Rummelen 1945: 6).
4. 813. Aachen (Sieberg 1940: 20, Van Rummelen 1945: 6).
5. 834. Aachen (Sieberg 1940: 21, Van Rummelen 1945: 9).
6. 857, September 15 or 25. Köln, Trier (Sieberg 1940: 21, Van Rummelen 1945: 9).
7. 878, November. Maastricht (Van Rummelen 1945: 10, Houtgast 1991: 29, Van Gils & Leydecker 1991: 3).
8. 999, December 14. Rhine valley (Perrey 1847: 11).
9. 1005, October 10. Liège (Sieberg 1940: 23, Van Rummelen 1945: 11).
10. 1007. Maastricht (Van Rummelen 1945: 11, Houtgast 1991: 30, Van Gils & Leydecker 1991: 3).
11. 1012, September 18 or October 19. Liège (Torfs 1862: 143, Sieberg 1940: 24).

12. 1013, September 18. Liège (Perrey 1847: 11, Torfs 1862: 181, Lancaster 1901: 205, Van Rummelen 1945: 11).
 13. 1070, May 11. Köln (Von Hoff 1840: 210, Perrey 1847: 12, Sieberg 1940: 25, Van Rummelen 1945: 11).
 14. 1101. Pays de Liège (Torfs 1862: 182).
 15. 1112, January 3. Liège (Von Hoff 1840: 212, Perrey 1847: 13, Lancaster 1901: 205, Van Rummelen 1945: 12).
 16. 1112. Geleen (Van Rummelen 1945: 13).
 17. 1116, January. Sittard (Van Rummelen 1945: 13).
 18. 1116, December 27. Pays de Liège (Torfs 1862: 183).
 19. 1117, May 2. Aachen, Köln, Reims, Cambrai (Sieberg 1940: 28).
 20. 1117. Heerlen (Van Rummelen 1945: 13).
 21. 1118, May 3. Pays de Liège (Torfs 1862: 184).
 22. 1120. Pays de Liège (Torfs 1862: 184).
 23. 1120. Köln (Sieberg 1940: 28).
 24. 1121. Geleen (Van Rummelen 1945: 13).
 25. 1122, January 11. Köln (Sieberg 1940: 28, Van Rummelen 1945: 14).
 26. 1141. Geleen (Van Rummelen 1945: 14).
 27. 1166, January 26. Köln (Sieberg 1940: 29).
 28. 1173 or 1174. Maastricht (Sieberg 1940: 29, Van Rummelen 1945: 15, Houtgast 1991: 33, Van Gils & Leydecker 1991: 4).
 29. 1202, May 30. Aachen (Montandon 1953: 36).
 30. 1289. Aachen (Van Rummelen 1945: 16).
 31. 1300. Lower Rhine valley, Brauweiler (Sieberg 1940: 33).
 32. 1316, June 11. Münstereifel (Sieberg 1940: 35).
 33. 1318, September. Lower Rhine valley, Köln (Perrey 1847: 15, Sieberg 1940: 35).
 34. 1323. Aachen (Sieberg 1940: 35, Van Rummelen 1945: 16).
 35. 1349. Lower Rhine valley, Jülich (Sieberg 1940: 37, Van Gils & Leydecker 1991: 6).
 36. 1350. Rhineland, Netherlands (Van Rummelen 1945: 16, Houtgast 1991: 34).
 37. 1360. Lower Rhine valley, Köln (Sieberg 1940: 40).
 38. 1382, May 21. True earthquake in North Sea, but not in Maastricht, Sittard or Gangelt (Sieberg 1940: 41, Van Rummelen 1945: 17).
 39. 1385. Maastricht (Houtgast 1991: 35).
 40. 1393, June 11. Maastricht (Van Rummelen 1945: 17–18, Houtgast 1991: 35).
 41. 1395, June 11. True earthquake, but not in Dortmund, Gangelt, Maastricht, Mechelen or Antwerpen (Sieberg 1940: 41–42).
 42. 1456, August 26. True earthquake, but not in Maastricht or in Gera (Houtgast 1991: 37).
 43. 1504, May 14. Maastricht (Van Rummelen 1945: 19, Houtgast 1991: 37).
 44. 1505, June 1 (Houtgast 1991: 39, Van Gils & Leydecker 1991: 9).
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