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⟨ 190 ⟩ **1348 January 25 Carinthia [southern Austria] and north-eastern Italy ▷landslides, obstruction of watercourses, fissures, clouding of water in wells, tsunami?◁**

sources 1 Documents

[manuscripts] ASVe, *Senato*, Misti, reg. 24, fol.71r, 23 aprile 1348; fol.74r, 8 maggio 1348; Resolution by the Chapter at Aquileia, 23 May 1351, in *Cod. dipl. istr.* (ed. Kaendler 1996, pp.1245-6); Innocent VI (pope), Letter to the patriarch of Grado, 14 March 1354, in Joppi (1895, pp.249-51); Lodovico (patriarch of Aquileia), Letter to the king of Hungary, 1362, in Joppi (1895, pp.253-54); four documents in *Monum. Hist. Duc. Carin.* (ed.Wiessner 1968): no.340, 10 January 1351; no.640, 23 August 1364; no.867, 31 March 1380; no.981, 29 November 1391

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Annals, chronicles, *Notulae* and letters

Italy BNMarcianaVe, *Mss. It.*, VII, 1275, Zancaruol, *Cron.*; BMCCorrer, Venice, *Mss. Cicogna*, 1063, *Cron.*; ASMi, *Diplomatico*, Statuti, cart.II, Statuti di Mozzanica, fol.16v., Verse composition; ASMo, Biblioteca, *Mss.*, 162, *Leggendario*, fol.42v.; Villani G., *Nuova Cron.*, vol.3, pp.562-6; Villani M., *Cron.*, vol.I, p.88; Giov. Pord., *Suppl.*, pp.56-7; De Grazia, *Chron.*, p.69; Zuvaro, *Note*, pp.109-11; *Liber Regim. Paduae*, pp.88, 164; Cortusi, *Hist.*, cols.926-7; Conf. Costoza, *Framm.*, p.11; Petrarca, Letter to Guido Sette, 1368 (ed. Bigi 1963, pp.960-3); Letter to Luigi Santo, 11 giugno 1350 (ed. Rossi, p.338); *Notae Veron.*, p.475; *Bozner Chron.*, in Schorn (1902, pp.117-8); Giov. Parma, *Cron.*, in Pezzana (1837, vol.I, Appendix, p.50); Aliprandi, *Alipran.*, p.132; Mussi Giov., *Chron.*, p.499; Nic. Ferr., *Polyst.*, col.806; Villola, *Chron.*, II, pp.583-4; *Ann. vet. Mutin.*, col.82; Levalossi-Gazata, *Chron.*, col.66

Europe ÖNB, Vienna, *Codex Vindobonensis*, 2499, fol.69v., *Hexametri;* *Ann. Frisac.*, p.67; *Ann. S.Steph. Frising.*, p.59; *Ann. Mell. cont. Mell.*, p.513; *Ann. Mell. cont. Novimont.*, pp.674-6; *Ann. Zwetl.*, p.684; *Ann. Zwetl. cont. Zwetl. IV*, p.686; Math. Neuenb., *Gesta*, pp.532-4; Math. Neuenb., *Cron.*, p.262; Andr. Regensb., *Deuts. Aufzeich.*, pp.LXV-LXVI; Konr. Megenb., *Buch der Natur*, p.109; *Nota*, in Stolz (1957, p.35); Friet. Clos., *Chron.*, p.136; *Ann. Ensdorf.*, p.7; *Ann. Matseen.*, p.829; *Ann. Mechov.*, pp.669-70; *Ann. Mell. cont. Lambac.*, p.561; *Ann. Windberg.*, p.566; *Ann. Wratisl. maior.*, p.532; *Ann. Austr. cont. Claustron. V*, p.736; *Anon. Leob. Chron. Lib. Sext.*, p.968; *Chron. S.Petri Erford. mod. Addit.*, p.385-6; *Chron. S.Petri Erford. mod. Cont. II*, p.394; *Chron. S.Petri Erford. mod. Cont. III,* p.379; *Chron. de Duc. Bav.*, p.171; *Chron. Claustro-Neob.*, p.490; *Chron. aus Kaiser*, p.349; *Kalend. Zwetl.*, p.692; *Sächs. Weltchr.*, p.340; *Versus Babenb.*, p.639; Goswin, *Chron.*, p.135; Joh. Wintert., *Chron.*, p.275; Heinr. Taube, *Chron.*, p.89

inscriptions 1. marble lunette in the entrance atrium of the former Scuola Grande della Carità, now the Venice Accademia delle Belle Arti; 2. church of St. James in Villach; 3. bell-tower of S.Mauro at Costozza; 4. inscription on the tomb of the patriarch Marquardo in the basilica at Aquileia

sources 2 BNMarcianaVe, *Mss. It.*, VII, 102, Dandolo, *Cron.*, fol.72; *Mss. It.*, VII, 2048, Morosini, *Cron.*, I, fol.81; *Mss. It.*, VII, 519, Trevisan, *Cron.*, fol.102v.; *Mss. It.*, VII, 541, *Cron. Ven.*, fols.54v.-55r.; *Mss. It.*, VII, 555, *Cron. Ven.*, fol.56; *Mss. It.*, VII, 1975-76, Caroldo, *Cron.*; *Mss. It.*, VII, 37, *Cron.*, fol.51v.; *Mss. It.*, VII, 39, *Cron. Ven.*, fol.45v.; *Mss. It.*, VII, 537, Barbaro, *Cron.*, fol.512; *Mss. It.*, VII, 2051, Vitturi, *Cron.*, fol.45; *Mss. It.*, VII, 2557-58, Dolfin, *Cron.*, fol.45; *Mss. It.*, VII, 56, Erizzo, *Cron.*; *Mss. It.*, Z.20.4746, *Cron.*, fol.78; BMCCorrer, Venice, *Mss. Cicogna*, 1232.7, *Croniche*, I, fols.228v.-229r.; *Mss. Cicogna*, 1898, *Cron.*; *Mss. Cicogna*, 590, *Hist. Ant.*; *Mss. Cicogna*, 2710, *Cron.*, fol.141v.; *Mss. Cicogna*, 1899, *Cron.*; BFGCini, Venice, reel 73, *Cron. anon.*; BAVat, *Barb. Lat.*, 4798, *Ann.*, in Lollio, *Cron.*, fol.27v; *Mss. Chig.*, I.I.6, *Cron.*, fol.6r.; BCBertolianaVi, *Mss.*, 3274, fasc.1, *Cron.*; BCPd, C.M. 548, *Cron.*; BCAriosteaFe, *Mss.*, cl.I, 105, Olivi, *Ann.*, I, fol.125; *Mss.*, cl.I, 645, Rodi, *Ann.*, I, fol.270v.; BCUd, *Mss.*, *Fon. Joppi*, 317, *Notule*; *Fon. Joppi*, 419, *Cron. Patr.*, fol.11; *Fon. Joppi*, 419, *Cron. Ant.*; *Fon. Joppi*, 491, *Mem.*, fol.4; *Mss.*, *Fon. Princ.*, 780, *Cron.*, fols.5, 8; Palmieri, *Liber*, p.115; *Addit. Pass.*, p.57; *Chron. Esten.*, p.68; *Cron. ad mem. praet. temp.*, p.14; *Cron. Bologn.*, p.589; *Cron. Varign.*, p.584; Agazzari, *Chron.*, p.44; *Cron. Ramp.*, II, pp.581-2; Monaci, *Chron.*, p.311; Belloni, *Liber*, col.56; Ghirardacci, *Hist.*, p.190; Melli, *Hist.*, p.530; Platina, *Hist.*, col.734; Pierozzi, *Chron.*, p.355a; Sanudo, *Le Vite*, cols.614-15; Pagliarino, *Cron.*, p.114; *Chron. Elwacen.*, p.40; *Oberr. Chron.*, pp.64-5; Detmar, *Detm. Chronik*, pp.508-10; Ebendorfer, *Chron. Austr.*, p.259; Ebendorfer, *Chron. Pontif.*, p.453; Wahrhaus, *Cron.*, p.246; Unrest, *Kärt.*, p.138; Stainreuter, *Österr.*, p.199; Meisterlin, *Chron.*, p.275

historiography Galesio (1571); Sardo (1587); Cavitelli (1588); Bonifaccio (1591); Giustinian (ed. 1964); Zagata (ed. 1745-47); Palladio degli Olivi (1660); Mariani (1673); *Chron. Gotwinc.* (1732); De Rubeis (1740); Corner (1749); Verci (1786-91); Gallicciolli (1795); Di Manzano (1858-79);

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Barozzi (1859); Sini (1865); Bocchi (1873); *Die Regesten* (1877); Putelli (1880); Joppi (1883); Occioni-Bonaffons (1884); Ambrosi (1887); Joppi (1895); Chini and Prati (1897); Marinelli (1898); Majonica (1903); Graësse (1909); Sbuelz (1909); Vale (1927, 1931); Saccavino (1930); Battistella (1932); Mantese (1958); Neumann (1971); Bertacchi (1973); Mahlknecht (1976); *Dehio-Handbuch* (1981); Corbanese (1983-87); Bona (1985); Andreolli *et al.* (1991); Brozzi (1993); Clonfero (1995); Rossi (1997)

literature Hoernes (1878, 1901); Hann (1903); Radics (1903a, 1903b); Reindl (1903); Radics (1904, 1908); Ambraseys (1976); Zani (1979); Drimmel (1980); Borst (1981); Giorgetti (1981); Gentile *et al.* (1984); Gentile *et al.* (1985); Borst (1988); Degasperi *et al.* (1991); Margottini and Kozák (1992); Hammerl (1994a, 1994b); Gutdeutsch and Lenhardt (1996); Guidoboni *et al.* (1997); Stucchi and Camassi (1997); Guidoboni (1999)

catalogues d. Manetti [1457]; Lycosthenes (1557); Ligorio [1570-71]; Ragor (1578); Bonito (1691); von Hoff (1840); Perrey (1848); Mallet (1853); Suess (1873); Goiran (1880); Reginus (1880); Mercalli (1883); Piovene (1888); Tommasi (1888); De Rossi (1889); Baratta (1901); Schorn (1902); Milne (1911); Zanon (1937); Sieberg (1940); Toperczer and Trapp (1950); *Boschi *et al.* (1995, 1997, 2000)

catalogues p. Giorgetti and Iaccarino (1971); Carrozzo *et al.* (1973); Shebalin *et al.* (1974); Postpischl (1985); Camassi and Stucchi (1997); Monachesi and Stucchi (1997-2004); CPTI (1999)

catalogues Ts Caputo and Faita (1984)

History of the earthquake's interpretation

Ever since the late Middle Ages, this earthquake has enjoyed considerable fame. It was interpreted as foreshadowing the famous outbreak of the Black Death which depopulated half Europe; and it was followed in Italy by other strong earthquakes in September 1349 (see below): two years of death and destruction, in other words, which remained impressed in the European collective memory for a very long time. The earthquake of 25 January 1348 came to be known in medieval sources as the "earthquake of Villach" (a town in Carinthia, Lower Austria), and our analysis confirms that the epicentral area was indeed in Carinthia. It would therefore seem to fall outside the geographical area covered by this catalogue, but has nevertheless been included because its effects involved a large part of north-east Italy, and because, in our opinion, the damage scenario can provide a partial explanation for the great demographic and social "turbulence" which makes it so difficult to analyse the earthquakes of September 1349.

A brief summary of the interesting history of the earthquake of 25 January 1348 is set out below, for we think it useful in establishing the outline of this particular case study, an understanding of which has advanced amid contradictions and agreements.

The first catalogue to record the earthquake is to be found in a treatise by Giannozzo Manetti [1457], where there are two brief references to it without a clear dating, and the only town mentioned is Villach. Then, from the 16th century onwards, there are numerous prodigy and earthquake lists in which it is mentioned: Lycosthenes (1557), Pirro Ligorio [1570-71], who records it as a "Venice earthquake", Ragor (1578) and Bonito (1691). 19th century catalogues also considered it to be a very strong earthquake, though there are mistakes as to where effects were felt, and a variety of datings. Perrey (1848), for example, dates two earthquakes at Venice to 25 January 1343 and 1347, whereas the areas he gives as having been affected by the earthquake of 25 January 1348 are Bavaria, Friuli, the Carinthian Tyrol and Carniola; and he also associates the city of Basel (Switzerland) with that event, though it was really the earthquake of 1356 which struck Basel. Perrey even added Rome and Naples to the area of effects, but he was confusing our earthquake with that of September 1349. The catalogue of von Hoff (1840) partly follows Perrey, but he adds Villach and dates the Basel earthquake correctly. The information in Mallet (1853) comes largely from Perrey; Hoernes (1878) devoted a whole study to the earthquake; Mercalli (1883) and Baratta (1901) included it in their catalogues in a much abbreviated form, suggesting that the

major area of effects was in Carinthia, at Villach and in the Veneto in general.
Later on, Hann (1903) and Radics (1903a, 1903b) published two studies in *Die Erdbebenwarte* – an important journal for seismological studies at the time (published at Laibach, now Ljubljana). It was also dealt with by Sieberg (1940) and Toperczer and Trapp (1950), who thought it was an earthquake at Villach.
The first Italian parametric catalogues, by Giorgetti and Iaccarino (1971) and Carrozzo *et al.* (1973), both of which relied on Baratta (1901), placed the earthquake between Tolmezzo and Paluzza (in the Friuli region). Within an investigation into the Friuli earthquake of 1976, Ambraseys (1976), placed the epicentre of the 1348 event in north-east Friuli. Drimmel (1980) places the epicentre at Villach, and so does Postpischl (1985). The latter relies in fact on the study by Gentile *et al.* (1985), which, however, does not provide a location for the 17 places named in the sources utilised.
As far as basic historical information is concerned, the above-mentioned studies nearly always use the same works of seismological and historical literature, but they do not clearly distinguish between early sources and later historiography.
Not until the study by the medieval historian Borst (1988) do we find a genuine critical and historical review of the event. This work is in fact an Italian translation which includes an earlier study (1981) of his, and it provides us with an accurate and extensive exegesis of the sources. Damage in Austria is contextualised by means of numerous careful references to social and cultural factors, and there are wide-ranging and well-documented references to reconstruction work.
New research within an Austrian context was carried out in the 1990s, and the first results were published by Hammerl (1994a, 1994b: the second of these studies being a summary of the first). They provide a fresh and careful review of the main sources from Germany (18) and Italy (19). The conclusions in Hammerl (1994b) suggest that there has been a substantial overstatement of effects in Austria, it being assumed, but not demonstrated, that the picture in Italy (i.e. in present-day Friuli) should be painted in darker hues. Hammerl (1994b) has provided some valid and interesting points about the way news of the earthquake spread in the German monastic environment, indicating some ways in which the seismological tradition has misinterpreted the sources. But the study somewhat neglects one aspect of the event which is central to historical seismology, namely establishing the location of the effects mentioned in the sources. Although it contains many valuable critical points, it unfortunately only partly solves the complex place name problems presented by the sources utilised. For example, one of the most important contemporary texts from Germany, that of Mathias von Neuenburg, lists 22 localities which suffered serious damage, but Hammerl has identified only 10 of them. And as regards the most reliable source from Italy, the chronicle of Giovanni Villani, which even records a letter from some Florentine merchants, Hammerl identifies only 19 of the 24 places it names.
Perhaps the only drawback to Hammerl's results (1994b) is that they are not definitive, and they have been utilised by Boschi *et al.* (1995), Gutdeutsch and Lenhardt (1996) and Camassi and Stucchi (1997). However, Boschi *et al.* (1995) have carried out a more extensive analysis of the Italian sources, which has led them to *reject* the idea that the area of greatest damage was in north-east Italy (a view which is echoed in their subsequent publications of 1997 and 2000). On the other hand, Camassi and Stucchi (1997) locate the epicentre in north-east Friuli on the sole authority of Hammerl (1994b) and that is what we find in CPTI, 1999, which takes its information from Camassi and Stucchi.

Aims of this review

The survey we offer here goes a good deal further than the research published in Boschi *et al.* (2000) and provides new parameters; but we are aware that these are no more than a few steps in the direction of a total review of the earthquake. In our opin-

ion, further research is required, particularly as regards historical place names, if a satisfactory situation is to be reached and if we are to be in a position to suggest which fault or faults were activated. This is the context in which our review of this great and complex event is placed, and the following are our aims:
(i) to make a selection of strictly contemporary sources, and to assess intensity on the sole basis of primary sources;
(ii) to solve some place name problems presented by sources from Germany and Italy;
(iii) to establish earthquake effects at individual localities, making distinctions, whenever possible, between damage to individual fortified structures (castles, guard towers and fortifications) and damage to walled villages;
(iv) to clarify the chronological parameters of the earthquake and the sequence of shocks;
(v) to analyse the substantial environmental effects recorded in the sources, distinguishing between damaged cause directly by the earthquake, and that caused by related landslides and flooding.

Criteria used in selecting basic data

In order to make intensity estimates, we used only the most reliable sources and those nearest to the earthquake in time. The selection problem became particularly apparent in relation to chronicle and annal sources: for example, we did not use the chronicle of Detmar (ed. Koppmann 1884), a Franciscan friar from Lubeck who was writing around 1395, though it was used by Hammerl (1994a and b). Nor did we use the information recorded in the *Annali del Friuli* by the count of Manzano — a work which paraphrases an unpublished text by Marcantonio Nicoletti, a 16th century author (but thought by Hammerl 1994b to be 14th century). Although this text can be considered fairly reliable, we excluded it because of our chronological limits. It is on the basis of these *Annali del Friuli* that Monachesi and Stucchi (1997-2000, DOM on the internet, site http://emidius.mi.ingv.it/DOM/) include Cividale del Friuli and Flagogna (with an intensity of grade VII-VIII MCS). We did not use Ludovico Cavitelli's work because he is a late 16th century author; but he is used by Hammerl (1994a and b) to assess the Italian localities of Cremona, Lodi and Milan. This was a case where we found two contradictory elements: Cavitelli's text (of which Hammerl gives a translation) refers explicitly to damage ("many earthquake shocks were felt, resulting in the collapse of many buildings in Cremona, where Otto de Bonis was praetor, Lodi, Milan and Venice"). The Latin text reads: *viguerunt multi terraemotus, quibus multa aedificia Cremonae ibi pr[a]etore Ottone de Bonis, Laude, Mediolani, & Venetijs corruerunt*"). However, the estimate of effects at the three Italian locations, established on the basis of this source, is given as "felt"; whereas in Monachesi and Stucchi (1997-2004 DOM, deriving from Hammerl 1994b) the intensity at these three places is given as grade IV-V MCS. We found a similar contradiction in the case of Ravenna, the information for which came from Detmar, who was writing around 1395. For the reasons explained above, we excluded that source.
Finally, we did not use the chronicle of Ghirardacci (1596-1657), which records information about the earthquake at Bologna, nor the anonymous *Cronica ad memoriam ad praeteritis temporibus* (ed. 1884) in relation to Vicenza. Although these two texts are reliable sources — especially Ghirardacci, because what he wrote is based on archive documents and early chronicles, now lost — our criterion of using only sources which were close in time to the earthquake meant that they had to be excluded.
This analysis allowed us to situate and assess 18 localities not known to the literature: 3 of them are in Italy (Monte Croce Carnico, Mestre and Noale) and 15 in Austria, Germany and France (Strassfried, Mauthen, Rain, Oberdrauburg, Freising, Gailitz, Hochwart, Krainberg, Neuhaus an der Gail, Oberdrauburg, Rain, Regensburg, Sankt Peter am Wallersberg, Munich and Strasbourg). In order to identify minor localities, we made use of two place name studies: *Dehio-Handbuch* (ed. 1981) and Graesse's *Orbis Latinus* (1909). However, 6 places mentioned by Mathias von Neuenburg are

still unidentified. It is very likely that they are castles or small villages which have now been abandoned or are even in ruins, which means that specific local studies in medieval toponymics or archaeology will be required to identify them.
The damage zone in Slovenia also remains to be clarified. It may have resulted from subsequent shocks. Italy is, of course, more strictly pertinent to this catalogue, and we think there is sufficient established evidence to allow us to *reject* the suggestion that the epicentral area was in Friuli, and to confirm that the area of maximum effects was in Lower Austria (see the map of effects in figg. 83a and b).

Chronology of the shocks

The earthquake of 25 January 1348 occurred between 15:00 and 16:00 UT (between the 16th and 17th hours, local time). This time span can be deduced from the various expressions used in the sources: in most cases the reference is to the hour of vespers (*sole lucescente et claro existente usque post pulsum vesperarum; hora fere vespertina*; *cerca ora de bespero*; *a hora de vesparo; hora vesperarum; in sull'ora del vespero*; *in vesperis*). Sunset may also be mentioned (*ad occasum die*) and in one case time is reckoned "in the Italian manner" (*alla ventitreesima ora*) — a system which was beginning to spread at that period. Almost all the contemporary sources make general reference to a single shock, but some make interesting additions, indicating a very close sequence of shocks. Giovanni da Parma, a contemporary author who was at Trento at the time of the earthquake, mentions 2 shocks, specifying that there was first a small one (*parvus*) followed almost immediately (*quasi sine intervallo aliquo*) by a very powerful one. Giovanni di Pordenone, on the other hand, records 3 consecutive shocks at Pordenone at a progressively increasing level of intensity, the first being weak (*debilis*), the second very powerful (*multum magnum*), and the third terrible (*horribilis*).
The sources also provide information as to the duration of the strongest shock, their measurements being based on the time required to recite certain prayers. According to Giovanni da Parma, who was writing at Trento, the strong tremor lasted for three *Lord's Prayers* and three *Hail Marys* (about 70 seconds). Antonio Zuvaro, a notary who experienced the earthquake at Padua, is in approximate agreement: he tells us that the shock lasted as long as it takes to recite distinctly four *Lord's Prayers* (about a minute). Obviously, this is just the human perception of the duration of the tremor, and we cannot exclude the possibility that other shocks occurred during this time span but were perceived as a continuum.
As for the shocks which followed the principal one on 25 January, the information provided by the sources allows us to arrive at relatively few quantitative conclusions, but there are a few interesting items which provide an indication of how the seismic activity proceeded. One item recorded by almost all the primary sources concerns the large number and frequency of the tremors felt immediately after the destructive one; in the terse language of medieval chronicles, the expression used in this connection is: "the earthquake lasted". When Andreas von Regensburg, who was at Villach at the time of the earthquake, stated that it lasted 8 days (*das wert acht tag*), he was probably referring to the sequence of stronger shocks. According to the contemporary *Annales Frisacenses,* tremors were felt in Carinthia for more than 80 days "uninterruptedly", and then, less frequently, for almost a year. In Italy too, and especially at Venice, there is evidence of a period (40 days) of frequently recurring shocks.
More detailed information is available for the tremors felt at Padua. Antonio Zuvaro records in fact that there were six strong shocks between February and May 1348. Austrian sources also record a strong tremor on 2 February 1349 at about 14:00 UT.

General effects of the earthquake

On 25 January 1348, between 15:00 and 16:00 UT (roughly between the 16th and 17th hours, local time) a devastating shock struck southern Carinthia (Austria), causing

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almost total destruction at many castles and fortified and other villages in the valleys of the rivers Gail, Drau and Glan and in the areas of Villach and Feldkirchen. Some settlements in eastern Carinthia were also completely destroyed. The worst damage was concentrated in the lower valley of the river Gail, where a landslide set in motion on Mount Dobratsch, near Arnoldstein, by the earthquake, caused the river to burst its banks, thereby adding to the destruction directly attributable to the earthquake itself. The chief village in the valley was Arnoldstein, which suffered the almost complete collapse of its dwellings, church buildings and fortifications. The neighbouring castles and fortified villages of Federaun, Gailitz, Krainberg, Rain, Reifnitz, Neuhaus an der Gail, Strassfried and Wasserleonburg also suffered almost total collapse; and the sources confirm the destruction of numerous other unspecified villages, many of which were probably permanently abandoned and never rebuilt.

There was extensive damage at Villach and the surrounding area at the confluence of the rivers Gail and Drau: at Villach there were extensive total collapses of houses, churches, monasteries and fortifications, including the town walls, and there may have been as many as 5,000 victims. In addition, all the houses collapsed in some hamlets situated outside the town walls, and it seems likely that here too, as in the Gail valley, they were permanently abandoned. Not far from Villach there was total collapse at the castles and fortified villages of Bad Bleiberg, Hochwart and Rosegg. There is evidence that all the houses and the Benedictine monastery collapsed at Ossiach. In the upper valley of the river Gail, Mauthen and Oberdrauburg suffered almost total collapse; and there is evidence of the collapse of the castle of Ortenburg in the upper valley of the river Drau.

The sources also record collapses at localities in the valleys east of Villach, as far as the border between Carinthia and Styria. Houses and a monastery collapsed at Feldkirchen; and farther east, the fortified village of Liemberg almost totally collapsed.

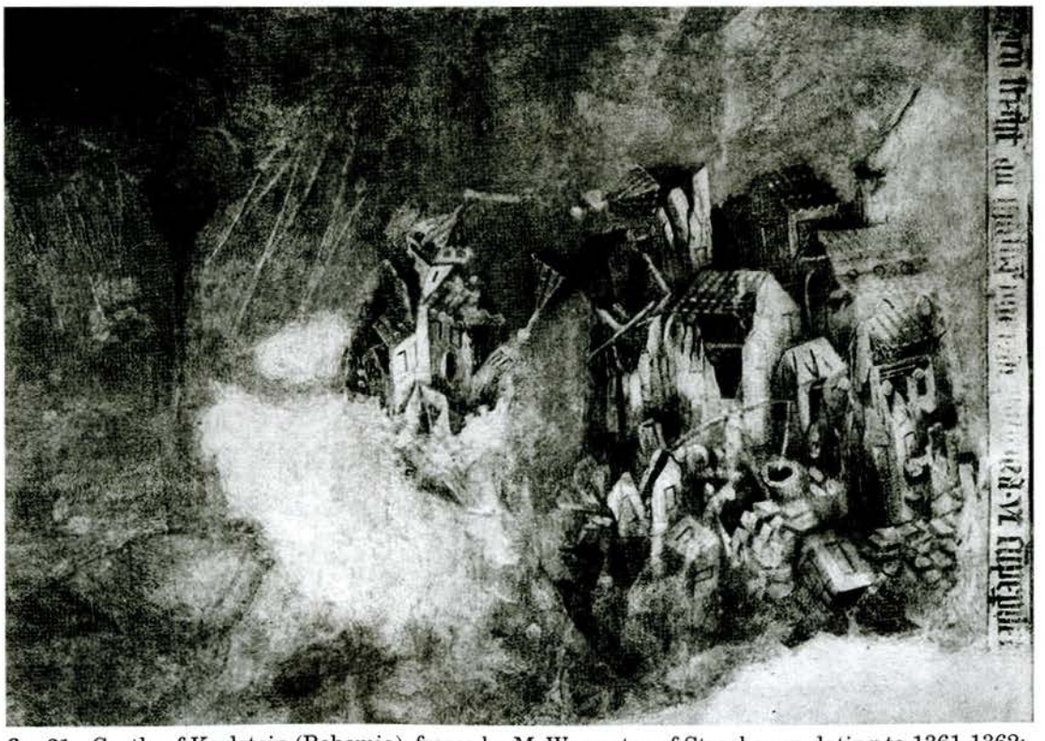

fig. 81 Castle of Karlstein (Bohemia), fresco by M. Wurmster of Strasbourg, dating to 1361-1362: it shows the castle of Arnoldstein during the strong earthquake of 25 January 1348 (from Margottini and Kozák 1992 and web site http://nisee.berkeley.edu/kozak).

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In the lower valley of the Drau, the fortified villages of Hollenburg, Wildenstein and Sankt Peter am Wallersberg all collapsed; farther to the north east, the fortified village of Waldenstein almost totally collapsed.
There is no record of damage having occurred north of Waldenstein. Many sources — especially those from Germany, emphasise how serious effects were in the north east and south east of Carinthia, in Styria and in Carniola (present-day Slovenia), claiming that they suffered as much damage as Carinthia. At the current stage of our research, however, we have not identified any place names as belonging in Styria or Carniola. The earthquake was felt as far north of the major damage zone as Munich, Freising and Regensburg in Moravia and Bavaria, and as far north west as Strasbourg in Alsace.
The worst damage in Italy occurred in the area along the line of the Alps separating Carinthia and Friuli. In this area, Paluzza and Monte Croce Carnico were almost totally destroyed. In Carnia, Tolmezzo and Gemona del Friuli suffered extensive collapses, involving most houses and some church buildings. There were widespread collapses at San Daniele del Friuli. Many houses collapsed at Venzone, and the cathedral was damaged. We are also told that houses collapsed at Udine, as well as part of the patriarch's palace. Some of the many castles and fortified villages in Friuli either completely or partly collapsed. Aquileia suffered serious damage, for much of the ancient basilica collapsed. Pordenone and Sacile were less seriously affected.
There was damage in the Trentino-Alto Adige Alps as well as in the upper Veneto: 10 houses collapsed at Bolzano, and there was damage to two towers, the roof of a church, and its bell-tower. Many houses collapsed at Trento.
The earthquake also seriously affected the area of the Veneto to the south of the major effects zone. At Venice, in particular, houses and chimneys collapsed and a number of churches were damaged; some old houses also collapsed at Padua. Damage at Treviso, Mestre and Noale can also be attributed in all probability to the earthquake.
The earthquake is also recorded as having been strongly felt, but without damage being caused, at a number of places in Italy, including Verona, where people fled in terror, Vicenza, Mantua, Bologna, Ferrara, Reggio Emilia, Piacenza and Pisa (for a more detailed description of effects at individual Italian localities, see pp.430-2 below).

Environmental effects
Environmental effects were widespread, especially in Carinthia, and, as we have seen, they sometimes aggravated the direct effects of the earthquake. In particular, the sources tell of landslides and rock falls, which caused rivers to burst their banks and lakes to be formed.
Near Arnoldstein, the earthquake activated an immense landslide: the mass of material involved descended for 600-700 m (half a mile), and produced what is described as an "enormous production of smoke" (*maximus fumus exivit*) but was probably dust. The detritus obstructed the course of the river Gail, causing the formation of an expanse of water (*lacus*) about 3 km (2 miles) long, in which 18 villages were submerged.
Wasserleonburg was swept away in another nearby landslide. In the mountains around Federaun and Rain more landslides resulted in the destruction of 50 villages (*villae*). North of Villach, along the valley of the river Afrizer, landslides obstructed the course of the river, creating an expanse of water about 16 km (10 miles) long: about 60 castles and villages were destroyed either by the landslides themselves or by being submerged in the water.
At Ossiach the lake overflowed as a result of a landslide on the nearby mountains. Near Freising (in Bavaria, Germany) the earthquake caused such turbulence in river waters that their courses were altered, and in some cases they burst their banks. Spring waters became cloudy.
In the main square at Villach, a crack appeared in the ground, out of which came sul-

phurous water and, in addition, the water in wells became cloudy and its taste so unpleasant that it was undrinkable.
At Venice, the water in the Grand Canal and other canals became so turbulent that it struck against each side of the banks, rising high enough to allow the canal bottom to be seen free of water.

Historical sources
The corpus of primary sources (sources 1) analysed and selected by us consists of 9 documents (5 from Italy and 4 from Austria), 59 texts of chronicles and annals (22 from Italy and 37 from Austria) and 2 letters (from Italy). From amongst these texts we have chosen those which in our opinion contribute most to clarifying the picture of effects in Italy. We therefore present here transcriptions of 4 documents and 14 items of evidence taken from the most reliable chronicle sources and from letters. We have also brought to light 4 inscriptions preserved in ecclesiastical buildings.

Archival documents
The four documents from Austria were first analysed by Borst (1988), and have been published in the *Monumenta Historica Ducatus Carinthiae* (ed. Wiessner 1968, nos. 340, 640, 867 and 981). Two of them concern tax exemptions granted (and twice extended: in 1351 and 1380) to the citizens of Villach, since their financial resources were taken up by the reconstruction of their city, which had been damaged in the earthquake. These provisions show that reconstruction was taking quite a long time. The other two documents are grants of ecclesiastical income to the church of Arnoldstein for the reconstruction of buildings which had been destroyed in the earthquake. Here too, the dates of the documents (1364 and 1391) show that reconstruction work in the worst affected area lasted for many years. AUSTRIA

The documentary research which we carried out at this stage was confined to Italy and carried out at the Archivio di Stato in Venice, *Senato* collection, Misti series. A large part of the area struck by the earthquake was in the Venetian hinterland and belonged to the Republic of Venice. Unfortunately, however, there are large gaps in Venetian documentation for this period; but our archive research did bring to light a number of documents which may relate to reconstruction work following the 1348 earthquake. There is unfortunately no explicit reference to the earthquake in these documents, but 24 decisions (*deliberazioni*) taken by the Venetian Senate in the period 1348-1356, provide evidence of damage and collapses affecting various buildings and military outposts in the Venetian hinterland. Because of the lack of specific reference to the earthquake, we have taken into consideration as evidence of earthquake damage only those documents which are close in time to the 1348 event, namely the following two provisions concerning Treviso, Mestre and Noale made by the Senate in April and May 1348. ITALY
On 23 April 1348, the Senate gave three *provisores* the task of carrying out a survey of the Treviso area in order to establish the extent of the damage (Archivio di Stato, Venice, *Senato*, Misti, reg.24, fol.71):
"Set out below is the advice of the noblemen Marco de Molino, Giorgio Ermolao and Leonardo Contarini, sent as *provisores* to the Treviso area by order of the doge. [...] Since some mills at Treviso have been destroyed and can therefore no longer grind, the above-mentioned noblemen advise that these mills be restored at once to working order, and that the town in which they are situated play its part in ensuring that they are better maintained in the future".

Infrascripte sunt provisiones consulte per nobiles viros dominos Marcum de Mollino, Ermolaum Georgio et Leonardum Contareno ex ducali mandato provisores missos ad partes trevisane. [...] Cum quidem pistrini qui sunt in castro predicto Tarvisii sint

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dirupti et male in acconcio nec macinare possint consulunt etiam supradicti quod statim dicti pistrini reparentur ut macinare possint et ut melius conservarentur cohoperiatur locus in quo manent [...].

On 8 May 1348, the Senate decreed that two *provisores* should establish the extent of the damage to the castles of Mestre and Noale:
"Set out below is the advice of the noblemen Giorgio Ermolao and Leonardo Contarini for the preservation and protection of the castles of Mestre and Noale.
For the castle at Mestre. One hundred larch planks to be sent to repair the missing archers' platforms at Mestre castle, [...] and any other wood or iron materials required [...] and the above-mentioned person shall salvage as far as possible anything left over from the above work. For Noale. Since urgent steps need to be taken to provide for the safety and defence of Noale castle".

Infrascripte sunt provisiones cunsulte per nobiles viros ser Hermolaum Georgio et ser Leonardum Contareno pro conservacione et defensione castrorum Mestre et Noale.
Capta. Pro castro Mestre. Quod mittantur pro aptacione et reparacione ballistreriam que deficiunt in castro Mestre tabula C de larese et [...] et si aliud lignamine et feramentum esset necessarium [...] predictus faciat recuperari deinde sicut melius poterit quod laborerium supraditam facere [...]. Capta. Pro castro Noale. Cum sit solicite providendum ad securitatem et defensionem castro Noale.

The following two additional documents, which we consulted in critical editions, concern earthquake damage to the basilica at Aquileia and matters of reconstruction.
A decision made in 1351 by the patriarchal Chapter at Aquileia (published in *Codice diplomatico istriano* ed. Kaendler 1986, pp.1245-6). The Chapter was made up of the senior prelates and Friulan dignitaries who assisted the patriarch in governing his territory. This document records the rejection by the Dean and Chapter of Aquileia of the agreement drawn up by the patriarch Nicolò and duke Albert of Austria concerning the customs post (*muda*) at Chiusa (now Chiusaforte). The agreement recognised the rights of the Archduke of Austria over that post, but the Chapter claimed that customs duty income should be returned to them because it was needed to finance restoration work at the basilica in Aquileia, which had almost completely collapsed in the earthquake:
"On the twenty-third of May [1351]
The above-mentioned patriarch in the presence of the Noble Soldier Enrico Raspone, [...] has questioned the above-mentioned Dean of Aquileia and has requested him and the Chapter of Aquileia to exhibit and append the seal of the Chapter to the agreement set out above. But the said Dean replies that having conferred with the Chapter and his colleagues about this problem, they have replied that this [agreement] seems excessively harsh and unjust, because Chiusaforte was granted to the Church of Aquileia in antiquity for the construction of Aquileia's own church, which now requires not merely repair but complete rebuilding from its foundations, having collapsed in ruins in the earthquake. But if the Lord duke were to adhere to the above-mentioned agreement concerning Chiusaforte, the church would never be rebuilt, or at least not for a long time. [...] Given in Udine, at the palace of the patriarch".

Die XXIII mensis Maii [1351]
Prefatus Dominus. Patriarcha in presentia Nobilis Militis Dni. Henrici Rasponis [...] requisivit Dominum. Decanum Aquilegensem predictum sibique precepit ut ipse ac ejus Capitulum Aquilegense consensum et sigillum ipsius Capituli exhibere et apponere deberent pactis superius expressis. Dictus vero Decanus respondit quod ipse super hujusmodi requisitione contulerat cum dicto ejus capitulo et concanonicis suis, et quod ipsi responderant quod hoc videbatur nimis durum pariter et injustum, eo quod muta Scluse [Chiusaforte] fuerat antiquitus Aquilegensi Ecclesiae concessa pro fabrica ipsius Ecclesie que ad presens indiget non solum reparatione, verum etiam totali hedificatione

a fundamento supra, cum dirupta sit et corruerit propter terremotum. Que quidem ecclesiam, si dictus Dominus Dux tenere deberet juxta pacta premissa Mutam Sclusae, numquam vel saltem temporibus suis rehedificaretur. Actum Utini, in palatio patriarchali.

A letter from pope Innocent VI sent to the patriarch of Grado in 1354 (in Joppi 1895, pp.249-51): the pope asks for information about the state of the basilica at Aquileia, which had not been used for worship since the time of the 1348 earthquake, in which it was severely damaged:
"That church itself, so noble and so solemn, and the holy relics which have for so long been stored within it lack the veneration which is due to them, and although divine worship has not been discontinued, it has suffered neglect through fear of death and danger, and the piety of the people has grown cold, just as everything there seems desolate, and about six years have now passed by since the church building collapsed because of an earthquake shock. The result has been that the said worship, veneration and prayer, have almost completely ceased, and yet there can be no hope of rebuilding it on the same spot, since that appears extremely difficult and even a waste of time for the reasons stated above [...] Given at Avignon, on 14 March, in the second year of our pontificate [1354]".

Ecclesia ipsa tam nobilis, tamque solemnis, et in ea reposite sacre Reliqui eiamdiu veneratione debita caruerunt, cultus inibi divinus non affectato defectu, sed metu mortis et periculorum hiusmodi neglectus extitit, populi devotio tepuit, ac demum, ut omnia ibidem desolatione pariter occurrere videantur, ipsius Ecclesie machina, sexennio vel circiter iam transacto, ec concussione corruit terremotus, propter quod etiam cultus, veneratio et devotio supradicti ibidem quasi totaliter cessaverunt, iis etiam adiecto, quod de reedificatione ipsius Ecclesiae in eodem loco, qui ex premissis causis nimis difficilis et demum inutilis prorsus existeret, spes nullatenus sit habenda [...] L.S. Datum Avenione II Idus Martii, Pontificatus Nostri anno secundo.

Annals and chronicles

There is evidence of the earthquake of 25 January 1348 in many chronicles and memoirs, both in Germany and Italy. In order to survey them clearly and in detail, these sources are grouped below according to their area of provenance. First come 11 sources from the Austro-German area, the most important of which, in terms of the quantity and quality of the information they provide, are monastic annals. The survey then continues with a detailed presentation of sources from Italy. These are divided into sections: the general but detailed accounts in the chronicles of Giovanni and Matteo Villani; and local chronicles, listed according to the place where they were written (and bearing in mind present-day Italian regions).

AUSTRIA AND GERMANY

Within the corpus of these sources, the following provide the most detailed information.
Monastic annals and chronicles (in order of proximity to the maximum effects area):
Annales Frisacenses (ed. Weiland 1879);
Annales Sancti Stephani Frisigenses (ed. Waitz 1881);
Annales Mellicenses. Continuatio Mellicensis (ed. W.Wattenbach 1851);
Annalium Mellicensium Continuatio Novimontensis (ed. W.Wattenbach 1851);
Annales Zwetlenses (ed. W.Wattenbach 1851);
Annales Zwetlenses. Continuatio Zwetlesis IV (ed. W.Wattenbach 1851).
The *Gesta Bertholdi* in the chronicle of Mathias von Neuenburg, bishop of Strasbourg (ed. Hofmeister 1924-40). As Hammerl (1994) suggests, he was in a position to gather detailed information about the maximum effects area since, as Grand Master of the Teutonic Order, he was in contact with members of the order at Friesach.
The memoirs of canon Andreas von Regensburg (ed. Leidinger 1903). Although he

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lived later than the earthquake (1380-1438), he managed to gather reports from merchants who were at Villach when the earthquake struck.
Contemporary evidence as to where the earthquake was no more than felt in present-day Germany and France.
The annals of the Benedictine abbey of Friesach (*Annales Frisacenses*, ed. Weiland 1879, p.67) contain this text:
"In the year of our Lord 1348, on 25 January, which is the feast of the Conversion of St.Paul and fell on the sixth day of the week [Friday], towards the hour of vespers, there occurred such a great and terrible earthquake throughout Alemannia — but especially in Carinthia and Styria — that on that same day the famous town of Villach collapsed, as did many *castles* and churches. It lasted without interruption for more than 80 days, never ceasing to shake the earth for a single night, remaining quiescent or giving an occasional shock during the day; but it then went on to last for almost a year. It was an amazing event, worth narrating down the generations. When the above-mentioned town of Villach collapsed, nearly all the inhabitants were buried, barely one in ten of them surviving. It was so powerful that in various places mountain peaks were thrown down into the valley, and rivers [*aquarum fluentium*] were obstructed. For many days they flowed in the reverse direction, hence completely submerging all the nearby villages. When the waters receded, river crossings were seen to have been cleaned out in many places, and where water had never been seen before there were now lakes of considerable size, and some springs gushed forth copiously. In that same year, great thunderclaps came from the heavens and killed many people, and there was also a plague".

Anno Domini 1348, octavo Kalendas Februarii, hoc est in die conversionis sancti Pauli, que tunc in sexta feria occurrebat, hora fere vespertina factus est terremotus tam magnus atque terribilis per totam Almaniam, maxime autem per Carinthiam et Styriam, adeo ut egregia civitas Villacensis multaque castra ac ecclesie eadem die corruerent; et duravit plus quam 80 diebus continue, ita quod una noctium movere non cessavit, in die autem semper quievit vel rare pulsavit, successive vero per annum pene duravit. Mirum autem enarrundum a progenie in progenies. Cum civitas prefata Villacensis corruit, pene omnes habitatores eius oppressit, et inter omnes incolas suos decimus homo vix remansit. Fuit itaque tam fortis, ut etiam cacumina in pluribus locis ad valles proiiceret et aquarum fluentium transitus obstrueret, et retrorsum pluribus diebus dederunt meatum, et retrorsum fluendo omnes villas ibidem adiacentes totaliter submerserunt; post recessum vero purgatis transitibus in plerisque locis, ubi nusquam ante vise sunt aque, lacus non modici remanserunt et fontes aquarum largissime effluxerunt. Eodem etiam anno tonitrua magno de celo venerunt, que homines non paucos occiderunt, factaque est illo anno pestilentia.

The annals of St.Stephen of Freising (*Annales S.Stephani Frisingenses*, ed. Waitz 1881, p.59) tell us in detail how that town was affected, though it is more than 200 kilometres from the maximum effects area:
"In the year of our Lord 1348, on the feast of the Conversion of St.Paul the Apostle, with the sun still shining brightly until after vespers was rung, the sky suddenly clouded over and there came a violent earthquake such as had not occurred or been seen or heard since the Passion of Christ. We saw tall and masonry-built houses shake violently, as did churches as well, and windows rattled very loudly because of the movement, and forest timbers, including those lying on the ground, struck against one another, and watercourses wandered in any direction, overflowing their banks because of the earth movement, and at the same time we saw very clear waters become cloudy, while men, almost out of their minds and with aching heads, wandered the streets, unable to stand still. We also heard church bells ringing of their own accord because of the earthquake".

Anno domini 1348, in die conversioni sancti Pauli apostoli, sole lucescente et claro existente usque post pulsum vesperarum, statim die facto nubilo, est factus terre motus tantus, qui a passione Christi numquam auditus vel visus est aut fuit. Vidimus domos altas et muratas pariter et ecclesias se fortissime moventes et vitra propter motum sonos maximos facientes, ligna silvestria et stancia in terra se invicem concuciencia, fluxus veros aquarum errantes et extra littora sua propter motum terre exeuntes, et aquas limpidissimas vidimus turbidas et homines hac hora quasi amentes capita dolentes, euntes in via errantes, stantes stare non valentes, Audivimus insuper ob motum talem campanulas in ecclesiis dependetes se pulsantes.

Given the richness and variety of the corpus of sources from north of Villach, our survey has inevitably paid particular attention to the principal ones relating to the damage zone, but we also thought it worth recording the above item of evidence from what was only a felt area, because of its clear and detailed reference to seismic effects.

The *Annales Mellicenses. Continuatio Mellicensis* (p.513) contain this text:
"On the day of the feast of the Conversion of St.Paul almost at the hour of vespers, there was a great earthquake, and in Carinthia the town of Villach disappeared as well as many other towns and villages with their inhabitants. And in that same year so great a plague spread in Italy and Provence that scarcely one man in twelve survived; and there were also many fires. [...] On the feast of the Purification of the Blessed Virgin [2 February 1349] there was a great earthquake.

In festo conversioni sancti Pauli, hora quasi vespertina, terremotus factus est magnus, et in Karinthia Villacum et plura civitates et castra cum hominibus perierunt. Item eodem anno tanta pestilencia invaluit in Ytalia et in Provincia, quod vix duodecimus homo remansit; incendia etiam plurima fuerunt. [...] In festo purificationis beate virginis terremotus factus est magnus valde.

The information recorded in the *Annalium Mellicensium Continuatio Novimontensis* (pp.674-6) is almost solely concerned with effects at Villach:
"1348. On the day of the feast of the Conversion of St. Paul, at the hour of vespers, there was a dreadful universal earthquake; and the one place where it was most violent and cruel and most in evidence was the city of Villach. For at the time when men had gathered in churches for prayer, the buildings collapsed in a single movement and those who were in them perished. This exceptional shock completely demolished the city wall and all the buildings, and all those people were killed who, because of their number, did not succeed in swiftly escaping the falling buildings; and it demolished sturdy fortified buildings and neighbouring villages".

1348. In die conversionis beati Pauli hora vesperarum universalis motus terre terribiliter emersit; et in uno loco vehemencior ac crudelior extitit, sicut in Villaco civitate evidencius fuit ostensum. Nam cum in ecclesiis causa devocionis homines convenissent, in uno impetu structuris corruentibus, hii qui aderant mox extincti sunt. Murum eciam civitatis et cuncta edificia concussio nimia penitus subvertit, et homines absque numero qui non poterant celeriter a ruina fugere, simul interierunt; et firmas circumiacentes municiones et villas precipitanter evertit.

The contemporary *Annales Zwetlenses* (p.684) were written in the monastery at Zwettl, north west of Vienna, and describe effects in the worst hit area:
"[1348] On the day of the feast of the Conversion of St.Paul, there came the worst earthquake known to our age. For in Carinthia, Styria and Carniola, as far as the coast, it destroyed more than 40 very strong castles and towns, and it threw one great mountain against another in an extraordinary way, and so obstructed flowing water there that several villages were submerged. [1349] In that same year, on the fourth

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day before the Nones of February, which is to say on the feast of the Purification of the Virgin [2 February], there was a great earthquake at the ninth hour".

[1348] In conversione Sancti Pauli factus est terre motus ita magnus, quem nostra etas non meminit. Nam Carinthia, Styria, Corniola usque ad mare plus quam 40 firmissima castra et civitates subvertit, et mirum modum montem magnum super alium montem proiecit, et ibi aquam fluentem obstruxit, qua eciam plures villas submersit. [...] [1349] Eodem anno 4 Nonae Februarii, hoc est in die purificacionis beate Virginis, factus est terremotus magnus hora nona.

Similar information is to be found in the *Annales Zwetlenses. Continuatio Zwetlesis IV* (p.686), which were also compiled at Zwettl:
"On the day of the feast of the Conversion of St. Paul, there occurred the greatest earthquake in living memory. For in Carinthia, Styria and Carniola, as far as the coast, it destroyed 40 very strong castles and towns, and it caused one mountain to fall on to another in a strange way, and it so obstructed the flow of water that it swept away and submerged many villages".

In conversione sancti Pauli factus est terremotus ita magnus quem quis hominum meminit. Nam in Kharinthia, Styria, Carniola, usque ad mare plus quam 40 firmissima castra et civitates subvertit, et mirum in modum mons magnus super montem cecidit, et aquam quadam fluentem obstruxit, que eciam post se villas plures subvertit et submersit.

Mathias von Neuenburg (ed. Hofmeister 1924-40) mentions the 1348 earthquake in two works – the *Gesta Bertholdi* and the *Chonica* – but it is only in the *Gesta Bertholdi* that detailed information is provided. The subject of the *Gesta* is Berthold of Bucheck, bishop of Strasbourg. Mathias says that he was provincial master of the Order of St. Mary of the Teutons in Alemannia, and a man of great erudition and mildness, being regarded as one of the finest orators in the whole of Germany for sermons in the vulgar (*comendatorem provincialem Alamannie ordinis sancte Marie Theutonicorum, qui sapiens valde et mitis in omni Germania in vulgari sermoni eloquencior dicebatur*). The *Gesta* tell us that:
"Furthermore, in the days of this bishop, in the year 1348, in January, on the feast of the Conversion of St. Paul, there was an earthquake of great power and intensity, as a result of which men seemed to be quite dazed. The earthquake struck a number of places and lasted for many days. In Carinthia, in particular, many castles were destroyed. Thus that of Osterburg in the Steintal valley collapsed, as did Lentzeburg [Mauthen], Rosach [Rosegg], Ortemberg [Ortenburg], Waldemberg [Sankt Peter am Wallersberg], Schellenburg and Schwartzenburg [Hochwart]. The famous city of Villach collapsed with all its walls, cloisters and churches, and twenty thousand people perished there. Similarly, Waldenstein, Wildenburg [Wildenstein], Hohenburg [Hollenburg], Wartemburg, Remmetze [Reifnitz], Tranburg [Oberdrauburg], Krancke [Krainberg] and Lumburg [Liemberg] all collapsed, with people and property involved. And likewise, a mountain situated in the same area — the one opposite Lowenburg [Wasserleonburg] village — collapsed and moved half a mile, causing an enormous emission of smoke, after which a lake two miles wide was formed and drowned 18 villages. Similarly the castle of Landenburg, which stands on a height in the same valley, was carried two miles by the force of the water, and first a mountain collapsed, together with the villages of Nuwenburg [Neuhaus an der Gail], Gutenowe, Gutenburg, Bemburg [Bad Bleiberg] and Geilenstein [Gailitz], and then a mountain peak collapsed bringing with it trees, stones and houses. For the same reason, incredible things also happened in many other places".

Huius eciam episcopi temporibus anno Domini MCCCXLVIII. In mense Ianuario in die conversionis sancti Pauli factus est terre motus generalis et magnus, ex quo homines

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pati syncopim putabantur. Qui terre motus et in aliquibus locis multis diebus duravit. Presertim in Karinthia multa castra subversa sunt. Nam in valle Steintal castrum Osterburg cecidit; Lentzeburg et Rosach ceciderunt; Ortemberg, Waldemberg, Schellenburg, Schwartzenburg ceciderunt; civitas magna nomine Villach cum omnibus muris, claustris et ecclesiis suis cecidit, ibique duodecim homines perierunt. Item Waldenstein, Wildemburg, Hohenburg, Wartemburg, Remmetze, Tranburg, Krancke, Lümburg omnia ceciderant cum hominibus et rebus. Item mons quidam in eadem provincia, qui iacet prope castrum Löwenburg, cecidit, transferens se per dimidium miliare a loco proprio, unde maximus fumus exivit, ibique lacus factus est per duo miliaria, qui submersit villas XVIII, item castrum Landemburg situatum super quodam monticulo in eadem valle per impetum aque portatum est per dimidium miliare, et tunc primo cecidit mons et castrum Nüwenburg, Gutenowe, Gutenburg, Bemburg, Geilenstein, ibi cecidit mons super montem cum arboribus, lapidibus et domibus. In multis eciam locis aliis ex hoc incredibilia evenerunt.

The memoirs of Andreas von Regensburg (ed. Leidinger 1903) gleaned important items of information about the effects of the earthquake at Villach from some German merchants. Here is what they had to say in the original Early New High German version:
"Villach destroyed, including the walls of the fortress, the monastery and churches and that, with the exception of 11 merlons, all walls and towers collapsed. In the middle of the town the earth split open and water stinking of sulphur broke forth and flowed off again. In Carniola and Carinthia, the fortress of Kellerberg, the monastery of Arnoldstein and 36 other *castles* were destroyed. There were landslides and the dammed up water devastated an area of more than ten miles. The earthquake lasted for 8 days and created crevasses deep enough to swallow a man up to his belt".

daz Villach dy stat, purchmaur, chloster und chirchen und all maur und turn uncz an 11 zinne auf di erde vielen, und das sich das ertreich enmitten in der stat enzway spielt und ein wasser daraus vran recht als der swebel und prast wider in dy löcher in das ertreich. Und in Chrayen und in Chärten niderviel Chelerberch dy vest und Arnoldstain und darzu 36 vest, und die perg vielen zesamme in die teler, das sich das wasser verswelt, das es verdirbt lant und laüt und gut 10 meil lanch. Das wert acht tag, das sich das ertreich erscharant und spielt, das ein man darein viel uncz an dy gürtel, als ob er versinkchen wolt.

There is contemporary evidence of the earthquake in what is now Germany and France. The first-hand evidence of a Florentine merchant (published in Stolz 1957, p.35) who was in Munich (Lower Bavaria) at the time shows that the earthquake was felt there. He records having felt the shock as he was making a payment:
"1348 – 4 florins which I paid in Munich in front of the city while there was an earthquake".

1348 – 4 florenos, quos dedi in Monaco ante urbem, quando terre motus erat.

Konrad von Megenberg (ed. Pfeiffer, p.109) records that the earthquake was felt at Regensburg:
"Of the earthquake in Carinthia around the city of Villach: it was during the year 1348 since the birth of Christ, on the day of the feast of the Conversion of St.Paul, when a great many people in that city died and churches and houses collapsed, and even a mountain fell against another; the earthquake occurred towards evening and was so powerful that it went beyond the Danube as far as Moravia and also towards Bavaria as far as Regensburg, and it lasted for more than 40 days, by which I mean that after the first shock, progressively smaller ones kept coming for many days and weeks".

von wârhait geschâhen grôzeu dinch von dem ertpidem in Kärnden ze der stat Villach, dô man zalt von Christi gepürt dreuzehenhundert jâr, dar nâch in dem aht und vierzigistem jâr an sant Pauls tag als er bekêrt wart, wan gar vil läut verdurben in der vorgenanten stat und vieln diu münster nider und diu häuser und etswâ ain perg auf den andern, wan der ertpidem was umb vesperzeit und was sô stark und sô grôz, daz er sich raicht unz über die Tuonawe in Märhern und auf gên Paiern unz über Regenspurch und werte mê dann vierzig tag, alsô daz nâch dem êrsten ie ain klainr kom dar nâch über etswie vil tag oder wochen.

The earthquake was personally experienced at Strasbourg by Frietsche Closener, who declares in his *Chronik* (ed. Hegel, p.136):
"In the year 1348, on the day of the feast of St.Paul [25 January], as night approached there came an earthquake which was felt at Strasbourg, but did no damage. But we are told that it caused great damage in other towns".

Do man zalt 1348 jar, an sant Paules dage noch winnahtenn, do kam ein ertbidem der zu Strosburg merkelich waz und doch nüt schedelich. Aber doch in andern landen det er grossen schaden alfe man seite.

ITALY There are many references to the earthquake in Italian sources. Above all, there are the chronicles of Giovanni and Matteo Villani. Important detailed information is also preserved in reliable local chronicles, which we have grouped below according to their regions of provenance, which can be identified with the following present-day regions Friuli, Veneto, Trentino-Alto Adige, Lombardy and Emilia-Romagna.

In his *Nuova cronica* (ed. Porta, vol.3, pp.562-6), Giovanni Villani records important information which he had obtained, he tells us, from some merchants who had been travelling at the time of the earthquake between Sacile and Carinthian villages to the north of Villach. The long passage in his chronicle which deals with the earthquake must therefore be considered a very important piece of evidence for establishing the effects of the seismic events of 1348:
"Of the great earthquakes which occurred in Venice, Padua, Bologna and Pisa
In that year, on the night of Friday 25 January, there were numerous very severe earthquakes in Italy: in the cities of Pisa, Bologna, Padua, and especially in Venice, where a great many of its numerous beautiful chimneys collapsed; and church towers and other buildings in these cities split open, some of them collapsing. And these things brought damage and plague to these areas, as you will find if you read on. But the most dangerous shocks were felt that night in Friuli and in the city of Aquileia, as well as in parts of Germany. They were of such a kind and so destructive that they would seem incredible if described in spoken or written words; but to provide a true and accurate account in this treatise, we will set out a copy of a letter which certain reliable Florentine merchants sent from there, and we will explain the tenor of their letter, written as it was and dated at Udine in the month of February 1347 [Incarnation style 1348].
Of great earthquakes which occurred in Friuli and Bavaria
You will have heard of the various dangerous earthquakes which occurred in these countries, causing very severe damage. In the year of our Lord 1348 according to the church calendar, but still 1347 in our Annunciation calendar, on Wednesday 25 January, the feast of the Conversion of St.Paul, at eight and a quarter hours towards vespers, which is the fifth hour of the night, there was a tremendous earthquake lasting for more than two hours, unlike any known to living memory.
First of all in Sancille [Sacile] the gate towards Friuli collapsed completely. Part of the patriarch's palace in Udine collapsed, together with other houses. The castle of Santo Daniello in Frioli [San Daniele del Friuli] collapsed, and a number of men and

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women were killed. Two towers of the castle of Ragogna collapsed and slid down to the river called the Tagliamento, and a number of people were killed. More than half the houses in Gelmona [Gemona del Friuli] collapsed in ruins, and the tower of the principal church cracked and broke open, and the stone figure of St.Christopher split from top to bottom. Spurred by these miraculous events and by fear, the moneylenders of the place repented and announced that everyone to whom they had lent money at interest should go to them to get it back; and they continued giving it back for more than a week. Half the town bell-tower at Vencione [Venzone] cracked, and a number of houses collapsed. The castle of Tornezzo [Tolmezzo] and those of Dorestagno [Arnoldstein] and Destrafitto [Stassfried] almost completely collapsed in ruins, and many people were killed there. The castle of Lemborgo [Wasserleonburg], which is in the mountains, was shaken. As it collapsed, it was moved ten miles from its original position by the earthquake, and was completely destroyed. A very large mountain, near the road leading to Lake Dorestagno [Arnoldstein], split open and half of it completely collapsed, blocking the road in question. And the two castles of Ragni [Rain] and Vedrone [Federaun], with more than fifty villages, situated by the *contado* of Gorizia, on either side of the river Gieglia [Gail], were reduced to ruins and buried under two mountains, and almost all the inhabitants perished. In the town of Villach in Friuli, all the houses collapsed, except for that of a virtuous and just man, full of Christian charity. And in the surrounding area, more than 60 castles and villages above the river Atri [Afritz] were similarly reduced to ruins and buried under two mountains, and the valley where the river ran for more than 10 miles was filled in; and the monastery of Orestano [Arnoldstein] was reduced to ruins and submerged, and many people died there. And since this river had lost its exit and usual course, a large new lake formed on top. Many strange things happened in the town of Villach. A cross-shaped crack appeared in the main square, and out of the crack there came first blood and then a great quantity of water. And in the town church of S.Jacopo 500 men who had taken refuge there were found dead, and there were many other victims in the town, amounting to more than three quarters of the inhabitants; but by a miracle, Latins, people from other parts and the poor escaped with their lives. In Carnia, more than 25,000 people were killed in the earthquake; and all the churches in Carnia collapsed, and the houses and the monastery of Osgalche [Ossiach] and Verchir [Feldkirchen] were all reduced to ruins.
In Bavaria, in the town of Trasborgo [Oberdrauburg], as well as at Paluzia [Paluzza], La Muda [Mauthen] and La Croce [Monte Croce Carnico] beyond the mountains, most houses collapsed, and many people were killed. And the reader should note that all the above earthquake damage and danger is a great sign and judgement from God. Its great cause lies in God and in the prediction provided by those miracles and signs which Jesus Christ, as he preached the gospel, gave to his disciples as due to appear at the end of time".

Di grandi tremuoti che furono in Vinegia, Padova e Bologna e Pisa
Nel detto anno, venerdì notte XXV di gennaio, furono diversi e grandissimi tremuoti in Italia nella città di Pisa, e di Bologna, e di Padova, maggiori nella città di Vinegia, nella quale ruvinarono infiniti fummaiuoli, che ve ne avea assai e belli; e più campanili di chiese e altre case nelle dette città s'apersono, e tali rovinarono. E significarono alle dette terre danni e pestilenze, come leggendo inanzi si potrà trovare. Ma i pericolosi furono la detta notte in Frioli, e inn-Aquilea, e in parte della Magna, sì fatti e per tale modo e con tanto danno, che dicendolo o scrivendolo parranno incredibili; ma per dirne il vero e non errare nel nostro trattato, sì.cci metteremo la copia della lettera che di là ne mandaro certi nostri Fiorentini mercatanti e degni di fede, il tinore delle quali diremo qui apresso, scritte e date inn-Udine del mese di febraio MCCCXLVII.
Di grandi tremuoti che furono in Friuli e in Baviera

1348

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Avrete udito di diversi e pericolosi tremuoti che sono stati in questi paesi, i quali hanno fatto grandissimo danno. Correndo gli anni del nostro Signore, secondo il corso della chiesa MCCCXLVIII, indizione prima, ma secondo il nostro corso dell'Anunziazione, ancora del MCCCXLVII, a dì XXV di gennaio, il dì di venerdì, il dì della conversione di san Paolo, ad ore VIII e quarta appresso vespro, che viene ore V infra la notte, fu grandissimo tremuoto, e durò per più ore, il quale non si ricorda per niuno vivente il simile.

In prima in Sancille la porta di verso Friole tutta cadde. Inn-Udine [sic] cadde parte del palazzo di meser lo patriarca, e più altre case; cadde il castello di Santo Daniello in Frioli, e morìvi più uomini e femmine; caddono due torri del castello di Ragogna, ed iscorsono infino al Tagliamento, cioè uno fiume così nomato, e morìvi più gente. In Gelmona la metà e più delle case sono rovinate e cadute, e 'l campanile della maggiore chiesa è tutto fesso e aperto, e.lla figura di san Cristofano intagliato in pietra viva si fesse tutta per lungo. Per li quali miracoli e paura i prestatori a usura della detta terra, convertiti a penitenzia, feciono bandire che ogni persona ch'avessono loro dato merito e usura andasse a.lloro per essa; e più d'otto dì continuarono di renderla. A Vencione il campanile della terra si fese per mezzo, e più case rovinarono. Il castello di Tornezzo e quello di Dorestagno e quello di Destrafitto caddono e rovinarono quasi tutti, ove morirono molte genti. Il castello di Lemborgo, ch'era in montagna, si scommosse; rovinando fu trasportato per lo tremuoto da X miglia del luogo dov'era in prima, tutto disfatto. Uno monte grandissimo, ov'era la via ch'andava al lago Dorestagno, si fesse e partissi per mezzo con grande rovina, rompendo il detto cammino. E Ragni e Vedrone, due castella, con più di L ville, che sono sotto il contado da Gurizia, intorno al fiume di Gieglia, sono rovinate e coperte da due monti, e quasi tutte le genti di quelle perite. La città di Villaco in Frioli vi rovinarono tutte le case, se non fu una d'un buono uomo, e giusto, e caritatevole per Dio. E poi del suo contado più di LX sue tra castella e ville sopra il fiume d'Atri per simile modo detto di sopra sono tutte rovinate e somerse da due montagne, e ripiena la valle onde correa il detto fiume per più di X miglia; e 'l monastero d'Orestano rovinato e somerso, e mortavi molta gente. E 'l detto fiume non avendo sua uscita e corso usato, al di sopra ha fatto uno nuovo e grande lago. Nella detta città di Villaco molte maraviglie v'apariro, che lla grande piazza di quella si fesse a modo di croce, della quale fessura prima uscì sangue e poi acqua in grande quantità. E nella chiesa di Santo Iacopo di quella città si trovarono morti D uomini che v'erano fuggiti, sanza gli altri morti per la terra, più delle tre parti degli abitanti; iscamparono per divino miracolo i Latini e' forestieri e' poveri. Per Carnia più di XV M[ila] uomini sono trovati muorti per lo tremuoto; e tutte le chiese di Carnia sono cadute, e.lle case e 'l monistero d'Osgalche e quello di Verchir tutti sobbissati.

In Baviera la città di Trasborgo, e Paluzia, e lla Muda; e.lla Croce oltramonti, la maggior parte delle case cadute, e morta molta gente. E nota, lettore, che.lle sopradette rovine e pericoli di tremuoti sono grandi segni e giudici di Dio, e non sanza gran cagione e premessione divina, e di quelli miracoli e segni che Gesù Cristo vangelizzando predisse a' suoi discepoli che dovieno apparire alla fine del secolo.

The *Cronaca* of Matteo Villani (ed. Porta, vol.I, p.88) supplements the information provided by his brother Giovanni in the *Nuova Cronica*:

"At this same time [1348], there was a town called Villacco [Villach] on the German border in a pass above a valley, with villages and castles having as many as 12,000 inhabitants. It is on the border with Slavonia, and this town with its villages and castles collapsed into the valley in the earth shocks, and many inhabitants were killed. And since the place is in the pass leading from Friuli to Slavonia, and is fertile country, and its dwellings are all made of wood, which is in great abundance there, it was quickly rebuilt and occupied again. And within a year of its being rebuilt, the whole place was

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burned, which suggests that no small punishment was being meted out to its inhabitants. But because the place is fertile and useful for the pass, it was quickly rebuilt and made more handsome than before".

In questo medesimo tempo, essendo a l'entrare della Magna sopra una valle una città ch'ha nome Villacco, in sul passo, con alquante villate e castello che tenieno bene XII miglia, a' confini della Schiavonia, questa terra colle sue ville e castella per li terremuoti s'atuffò nella valle, con grande danno di morte di suoi abitanti. E però che il luogo è sul passo del Frioli e Schiavonia, e pase ubertoso, e i suoi alberghi tutti si fanno di legname, che ve n'ha grande abondanza, fu tosto rifatto e adabitato. E inanzi che l'anno fosse compiuto dal suo rifacimento, per fuoco arse tutta la terra, che.ffu a pensare non piccolo giudicio di suoi abitanti. Ma per lo fertile luogo e utole per lo passo, in brieve tempo fu redificata la terra più bella che prima.

Friuli

An important source for the effects of the earthquake at Pordenone is the *Supplemento di Giovanni figlio di Odorico di Pordenone* in Bianchi (1844, pp.56-7). This 19th century scholar was a canon at Udine. In his *Documenti per la storia del Friuli* (1844) he published a *Memoriale di Odorico notajo e Maestro di Pordenone*, covering the years 1292-1332, together with a *Supplemento*, which is a continuation for the years 1347-1350. The *Supplemento* records:
"1348. On 25 January, the feast of the Conversion of St.Paul, after the ninth hour, an earthquake struck three times in succession. The first shock was weak, the second was very strong, and the third was dreadful. In fact, four large capitals on our bell-tower fell down, and a child was killed. Everybody was astonished and disturbed. Eight naves collapsed, and most were swallowed up. Its effects were felt from towns on the coast to towns near the mountains, and it affected the whole of Italy. The earthquake also struck Alemannia, but I say nothing of that because I know little about it".

MCCCXLVIII. Die xxv. Januarii, in conversione Divi Pauli post Nonam. Regnavit subcessive terremotus tribus vicibus. Prius fuit debilis, secundo fuit multum magnum, horribilis tertius subsecutus. Nam quatuor capitella grandia nostri Campanilis fuerunt submissa, et mortuus fuit quidam pupillus. Omnes persone stupuerunt et conturbate fuerunt. Naves octo demisse, et majori parte ingulate fuerunt. Tantum in civitatibus sitis juxta mare regnavit, tandem in Civitatibus sitis juxta montes, et hoc fuit in tota Italia. In Alemania regnavit multum dictus terremotus, sed taceo quia non bene novi.

Veneto

Detailed information appears in the *Cronaca Veneziana* attributed to Gasparo Zancaruol (Biblioteca Nazionale Marciana, Venice, class VII, codex 1275=9275/1-2), whose text may have been used and translated into Latin by Lorenzo Monaci, a Venetian citizen living in Crete in the late 14th century, who wrote a *Chronicon de rebus Venetiis ab urbe condita ad annum MCCCLIV* (ed. Corner 1758). In the chronicle attributed to Zancaruol, we read:
"at the hour of vespers a terrible earthquake shook the whole place very severely, so that men and women flung themselves to the ground, and it seemed intent on killing them. At that time the bells of S.Marco rang of their own accord. The north side and the middle part of the roof of the church of S.Basilio collapsed in ruins, as did the top of the bell-towers of S.Silvestro, S.Vitale and S.Giacomo dell'Orio. The bell-tower of S.Angelo leaned to one side and remained in that position. And from then on, the earth shook for many days and nights. [...] This experience demonstrated that earthquakes do less damage in Venice than in other cities.

a hora de vesparo uno teribile moto comosse senza exemplo tutta la terra, intanto che l'uno e l'altro sexo per paura putato a terra pareva che li volesse morir. alora le

campane de San Marcho per sé sonarono. Cascharono insulita rovina el sinistro lato et tuta la sumità del mezo della chiesa di S.Basilio et de la sumità di campanili de San Silvestro et de San Vitale et de S.Iacomo de l'Orio. El campanele de Sancto Anzolo se piegò incanto et cusì romase. Et da poi per molti dì et note la terra tremò. [...] La experientia demonstrò che li teramoti manco nocero in la città de Venexia che in le altre città.

The 14th century manuscript *Cronaca di Venezia* preserved in the Biblioteca del Museo Civico Correr in Venice (*Manoscritti Cicogna*, 1063) records:
"1347 [Venetian style; 1348 modern style]. When Andrea Dandolo was doge, on 25 January, there was a very great earthquake which lasted for approximately 15 days and almost all the pregnant women miscarried. In the same year a severe plague occurred"

1347. Dogando messer Andrea Dandolo adì 25 zenaro, fu uno terremoto grandissimo che durete per 15 zorni o pocho o assai et quasi tutte le donne si dispersero che erano gravide. Successe nel medesimo anno una crudel peste.

An interesting contemporary source is the *Chronicon Monasterii Sancti Salvatoris Venetianarum* (p.69) by Francesco de Grazia, who records earthquake effects at Venice in some detail:
"In January 1348, on the day of the feast of the Conversion of St.Paul, at the twenty-first hour, there was so great and terrible and incredible an earthquake that many houses and countless chimneys collapsed, bells rang of their own accord, and the earthquake travelled from south to north. The great dome of the church of S.Marco was cracked. The church of S.Silvestro collapsed, together with its bell-tower and bells. The bell-tower of S.Giovanni di Rialto collapsed, as did the new church of the Franciscans, the oculus of the church of the Carmelite friars, the pinnacle or small dome of the bell-tower of S.Angelo, S.Vitale, and two arches of the arsenal, and one of its walls was cracked. And the water in the Grand Canal and small canals was so amazingly disturbed that one could see the waterless bottom because the water flowed to each side. And the earthquake lasted for a good half hour. A certain town in Germany called Villach was completely destroyed, and now a great lake is to be found there. And at the same place a castle was taken from one mountain to another almost three miles away".

M.CCC.XLVIII. XXV. Jan. in die conversionis s.pauli, hora XXI. diei, fuit terremotus magnus et teribbilis, et incredibilis, in tantum quod multe domus et camini innumerabilles corruerunt, campane a se ipsis sonaverunt, et ibat terremotus de austro versus tramontana. Chuva magna ecclesie s.marci scissa est. Ecclesia s.Silvestri cum campanille et campanis corruit. Campanile S.iohannis de rivoalto, ecclesia nova fratrum minorum, occulus ecclesie fratrum carmelitarum, pigna seu cuva campanilis s.angeli, s.Vitalis, duo archi arsenatis [arsenalis?] corruerunt, et murus ipsius scissus est. Et aqua fuit ita mirabiliter exagitata in chanali magno et in rivis, quod visus fuit fundus in medio eorum sine aqua, quia aqua ibat modo ad unam partem. Et duravit terremotus bene per dimidiam horam. Quedam civitas alemanie que vocabatur vilach funditus est submersa, et modo est ibi lacus magnus. Ibi prope, unum castrum de uno monte fuit transportatum super alium montem qui distat fere per tria millaria.

Evidence of particular importance for the city of Padua is provided by the notary Antonio Zuvaro (or Zupario). Zuvaro was a cleric, a notary and, from 1343 onwards, a *mansionario* at the bishop's *curia* in Padua. As the editor of his work, Paolo Sambin (1959), suggests, his death was probably caused by the plague of 1348. The evidence he provides about Paduan affairs in the first half of the 14th century consists of a series

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of notes found by his editor amongst the notarial deeds which he had drawn up. In other words, this is not a complete chronicle, but a number of scattered notes gathered together by Sambin. The importance of the text lies in its detailed description of the earthquake of 25 January 1348 and effects at Padua, and in the record it provides of the subsequent shocks. Zuvaro writes:

"In 1348, in the first indiction, on Friday 25 January, the feast of the Conversion of St.Paul, at the hour of vespers, while the psalm *O Lord, thou hast searched me and known me* was being sung in the church of Padua, at the line *Surely thou wilt slay the wicked, O God*, there came a tremendous earthquake which lasted so long that it would have been possible to recite the Lord's Prayer four times quite distinctly. It was more powerful than any other earthquake at any time and in human memory, and all the priests fled from the choir into the cloister, and the lord bishop of Padua and his family took refuge in his garden. After almost half an hour there was another minor shock, which many reliable witnesses claim to have felt and which lasted as long as a Hail Mary, but I did not feel it myself. During the earthquake, a piece of marble a cubit long and nearly as wide, situated at the top of the church of Padua above the roof, over the altar of S.Daniele, fell down and, because of its rounded shape, it rolled down the tiles and fell on to the upper roof of the principal sacristy, after which it rolled on to the lower roof of the same sacristy, breaking many tiles, and then fell and thrust itself into the ground on the threshold of the house of canon Venturino, which is opposite the said sacristy; and there it came to rest. Similarly, the lower part

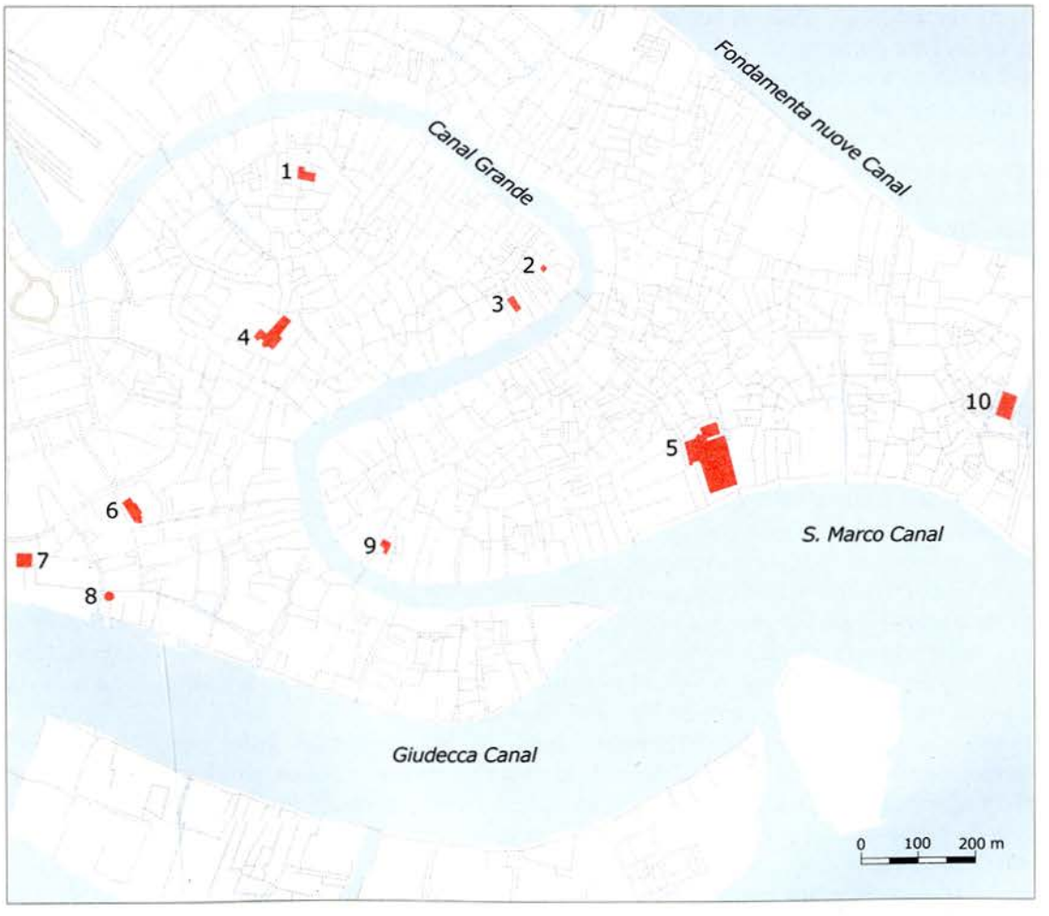

fig. 82

VENICE
monuments damaged by the earthquake of 25 January 1348

Churches
1. S.Giacomo dell'Orio
2. S.Maria dei Frari
3. Carmini
4. S.Angelo Raffaele
5. S.Basilio
6. S.Giovanni Elemosinario
7. S.Silvestro
8. S.Vidal
9. S.Marco

Building
10. Arsenal

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of the red tower of the commune of Padua [the tower of the *palazzo consiliare*] was severely damaged and left leaning heavily to one side, with the result that, on expert technical advice, it was demolished and arrangements made to rebuild it immediately. Similarly, the central part of the church of Ss.Ermagora e Fortunato in Aquileia collapsed and was destroyed. Likewise in Venice the tops of many church towers collapsed, as did a number of chimneys. In the city of Padua itself, some chimneys collapsed, as did also some old houses with poor foundations. May God be blessed for all these things, for he is mindful of the earth and makes it shake. In the same year, during the night between Thursday 7 February and Friday 7 [8?] of the same month, there was a strong but brief earthquake after the fifth hour, and at the same hour there was another long but weak earthquake, and again towards the sixth hour there was a brief and weak earthquake. The following night at about the ninth hour there was another weak and brief earthquake. On the following Saturday, therefore, a meeting of clergy was called, and the bishop of Padua ordered that prayers should be said during mass, such as [blank space]. Similarly, on Tuesday 12 of the same month, in the morning, towards the end of the thirteenth hour, there was another weak and brief earthquake. And so all peoples and kings were in fear of the glory of God, who alone is capable of producing wonders. In the same year, on Monday 2 May, at the end of the twenty-fourth hour, there was a brief earthquake lasting as long as it takes to recite half a *Hail Mary*".

MCCCXLVIII, indictione prima, die veneris XXV ianuarii in festo conversionis S.Pauli hora vesperarum, dum in ecclesia Paduana canatarentur vespere et in psalmo: Domine probasti me cantaretur versus: "Si occideris Deus peccatores", fuit maximus terremotus per tantum tempus, quo possent bene legi distincte quatuor "Pater noster", et fuit maior quam fuerint unquam temporibus, de quibus extat memoria. Fugeruntque omnes sacerdotes de coro in claustrum et dominus episcopus Paduanus cum familia fugit in ortum suum. Post mediam quasi horam fuit alius terremotus parvus, quae multi fidedigni dixerunt se sensisse, et duravit per unum "Ave Maria", quem ego non sensi. In quo terremotu quidam lapis marmoreus longus uno cubito et paulo minus latus, qui erat in capite ecclesie Paduane super tectum, super altare S.Danielis cecidit et propter sui rotunditatem descendit per tegulas et cecidit super superiorem tectum sacristie maioris deindeque super inferiorem tectm eiusdem sacristie et, fractis tegulis multis, cadens in terra intravit hostium domus domini Venturini canonici, que est ex opposito dicte sacristie, et ii quievit. Item scissa est turris rubea comunis Padue in parte inferiori et aliquantulum obliquata, ita quod consilio phisico destructa est, reparanda statim. Item ecclesia Aquilegensis Sanctorum Hermacore et Fortunati pro medietate corruit et destructa fuit.
Item in civitate Venetiarum multe summitates campaniliorum et plurima camina ceciderunt. In civitate quoque Paduana aliqua camina corruerunt et alique domus male fundate et vetuste ceciderunt. Per omnia benedictus Deus qui respicit terram et facit eam tremere. Eodem anno in nocte veniente post diem iovis 7 februarii et ante diem veneris 7 ipsius mensis post quintam horam fuit terremotus magnus et brevis et in eadem hora fuit alius terremotus longus et parvus fuit quoque infra eandem horam sextam tertius terremotus brevis et parvus. In nocte vero proxima sequenti circa nonam horam noctis fuit alius parvus brevisque terremotus.
Propter quod in die sabbati proxime sequenti per dominum episcopum Paduanum, convocato clero, ordinatum fuit, quod dicerentur orationes in missa, videlicet [blank space].
Item die martis 12 eiusdem mensis in mane, circa finem 13 hore fuit alius parvus et brevis terremotus. Et sic timebant gentes et omnes reges gloriam Dei, qui facit mirabilia solus.
Millesimo eodem, die lune 2 maii in fine vigesime quarte hore fuit terremotus brevis quantum diceretur medium "Ave Maria".

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Zuvaro provides better details of damage effects, for they are only partly recorded in the *Liber regiminum Paduae* (in "Miscellanea di storia veneta", s.II, tomo 6, 1899, pp.88, 164) and not mentioned at all in the contemporary chronicle of Guglielmo Cortusi (*Historia de novitatibus Padue et Lombardie*, cols.926-7).
In the *Liber regiminum Padue* we read as follows:
"But the said tower of the commune, because of a very great earthquake at Padua and other places in 1248 [1348], on Friday 25 January during vespers, was so badly damaged that it had to be completely rebuilt. [...]
And in that year a terrible plague spread across the whole of the East, killing countless people, and neither Italy nor any of the West succeeded in avoiding this evil, and in the year 1348, on 25 January at the twenty-third hour there was a great earthquake which lasted for half an hour, after which a terrible plague came across the sea".

Sed dicta turris comunis propter maximum terremotum factum in Padua et aliis locis MCCXLVIII die veneris XXV ianuarii in vesperas adeo concussa fuit quod oportuit totam rehedificare. [...]
Cum in dicto anno pestis horrenda totum orientem invasisset cum innumerabili mortalium cede; et ne Italia, ac universum Occidens hoc malum fugeret, in annis MCCCXLVIII die XXV ianuarii hora XXIII fuit ingens terraemotus qui duravit per dimidium horae, post quem pestis inaudita mare transivit.

Conforto da Costoza (ed. Steiner, p.11) provides evidence of the earthquake having affected Vicenza:
"In the year 1376, as the night approached Wednesday 12 March, towards morning, there was such a great earthquake that everyone thought it no less powerful than the one on the feast of St.Paul in 1348".

MCCCLXXVI, nocte veniente ad diem mercurii 12 marcii, circa matutinum diei, increpuit tam admirabilis teremotus, quod ab omnibus creditus fuit non minor qui in die sancti Pauli 1348.

That the earthquake was felt in Verona is recorded by an exceptional witness, the humanist Francesco Petrarca (Letter to Guido Sette, archbishop of Genoa, ed. Bigi 1963, pp.960-3), who wrote as follows in a letter which, although dating to twenty years after the earthquake, displays his usual accurate memory:
"Twenty years have now gone by since 1348 (two scourges began in that single year) when, on 25 January, towards evening, our Alps, which Virgil says are not accustomed to shake, and the whole of Italy and much of Germany shook so violently that the inexpert, for whom this was a completely new and unimagined experience, thought the end of the world had come.
At the time, I was sitting alone in my library in Verona, and although I was not entirely ignorant of such things, I was taken by surprise, and when the earth shook beneath my feet and then books came tumbling down and fell apart, I was amazed, and when I came out of my room I saw my servants and everybody else fleeing in panic, their faces deathly pale".

Vigesimus annus est nunc (unum enim mali utriusque principium fuit) ex quo Alpes nostre, quarum motus insolitos ait Maro, octavo die Kalendas Februarias tremuere, inclinata iam parumper ad occasum die, Italieque simul ac Germanie pars magna contremuit tam vehementer, ut adesse mundi finem inesperti quidam crederent, quibus insueta prorsus et numquam cogitata res erat. Verone tunc in bibliotheca mea solus sedens, quamquam non in totum rei nescius, repentina tamen et nova re perculsus, solo tremente sub pedibus et undique concursantibus ac ruentibus libellis, obstupui, et egressus thalamo familiam moxque populum trepidissime fluctuantem vidi. Omnium in ore funereus pallor erat.

The effects of the earthquake at Verona are also recorded in the *Notae Veronenses* (ed. Cipolla 1890, p.475), though with a slight mistake in the month:
"1348. In the month of February in that year, on the day of the feast of St.Paul, there was a great earthquake at Verona and throughout the world, at the conjunction of the two planets Mars and Saturn".

M.CCC.XLVIIJ. Illo anno in mense februarij, in festo sancti Pauli, fuit terremotus magnus in civitate Veronense. Et per totum universum orbem, et fuit coniunctio duorom planetarum, scilicet Martis et Saturnj.

Trentino-Alto Adige

There is a contemporary Tyrolean chronicle from Bolzano, the *Bozner Chronik* (in Schorn 1902, pp.117-8) which records earthquake effects in the worst affected area and describes damage at Bolzano:
"On the evening of Friday, 25 January, the feast of the Conversion of St.Paul, at the sunset hour, around vespers, there was an earthquake throughout the world, and in some towns it was so powerful that it cut both mountain and valley, and so great was it that I am unable to narrate or describe in writing one thousandth part of it. In particular, the earthquake reduced to ruins the town of Villach in Carinthia, destroying its surrounding walls and all its buildings and churches and killing five hundred people there, and in particular many people were killed as they listened to a friar's sermon; and the same earthquake which caused houses to collapse in Villach turned the water black in the wells and the water had such a bad taste that nobody could remain there, and a mountain collapsed near the town of Villach, falling into an expanse of water which overflowed and many people were drowned, and villages, people and property were submerged and people fled into the mountains, taking their possessions with them. The same earthquake caused the collapse of the walls of the fortress of the count of Ortnburg together with the mountain.
The same earthquake also caused the collapse of ten houses at Bolzano as well as the tower at Wagnergasse which opened up with a crack as wide as a Bolzano *braccio*, as hundreds of people saw, and after the earthquake the crack in the tower closed up so much that one could only insert two fingers into the space. And an unstable block of stone fell on to the church at Bolzano, which cracked from top to bottom, as far down as a string course. And the tower of my lord Conrad cracked on the tomb side. And the earthquake happened while vespers was being sung and as the bright sun was setting. In the year of Our Lord 1348, in January".

Item es kam ein epignn VII tag in den ianarii am freytag vom sannd pauls abent der pekerung umb vesper zeit über ale die welt unnd was an etlichen stettn also gross, das er perg unnd tal zu samen schnet das ich hie nicht den tausenttn tail gesagn mag nach geschribn sunderlich warf denn erdpign nyder villach ain stat ist gelegen in Kärnder rinkhmaur und alles gemeur unnd alle Kichn unnd verfiellen V hundert menschen in der selben stat und besunderlich verfiel grose volkh zu dem parfüssern an einer predig unnd der selb erd pign der warff in der selben stat villach auff zwen hays prunen schwarzes waser und schmachten so fast das niemandt kain weil dapey möcht peleibn unnd fiel ain perg auch danider pey der stat fillach unnd fiel in ain wasser das die geyl unnd üswalt das wasser das ess hinter sych gie und ertrenkh vil leut unnd dörfer unnd etwan volck flach auff dy perg mit leib und mit guett der selb erpign der warff nider deun graffn von ortnburg ir festen ettliche mit deu pergn etliche dem gemeur.
Item der selbig erpign warff nider zu Botzn X heuser unnd den turn in wagnergasn der erklab sych von ainer gueten potzner elln weit das sachn über hundert menschn und nach dem erpidn gieng der turn wider zusamen das man kem zween finger darein möcht legn und der wendl stain zu der pfar kirchn zu Botzn der klob sych von oben herab untzt auf das vierd gaden unnd hern Chunrats thurn auff dem graben klab sych an zwayen euden und geschach dy weil man vesper sanng und dy weyl es erpydnns da was es finster pey scheinnder sunen. Anno rev. dm. MCCCXLVIII jarn.

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Damage caused by the earthquake at Trento is recorded in the reliable *Cronaca* of Giovanni da Parma (in Pezzana 1837, vol.1, appendix, p.50), who was in the city when the earthquake struck. He records:
"All those willing to listen should know that in the year of our Lord 1348, in the first indiction, on 25 January, which is the feast of the Conversion of St.Paul, at the hour of vespers, there was a minor earthquake, and almost immediately afterwards there was another so powerful that the tower of S.Maria [in Trento] leaned at such an angle that the bells at the top rang of their own accord; and the water in the baptismal fonts overflowed for a while. Many "episastors" [a corruption of the word *epicaustoria*, i.e. chimneys] in houses collapsed, as did many whole houses, and this earthquake lasted long enough for me to have recited carefully three Lord's Prayers and three Hail Marys.
In this connection some people from other parts have said that the palace in Udine of the patriarch of Aquileia half collapsed, and that a river in Alemannia flowed backwards because its course was obstructed by a mountain landslide, and that many people were killed in other places. All these things happened because of the earthquake, and it is said that many even more disastrous things occurred, but I am not in a position to write about them".

Notum sit omnibus, qui audire voluerint, quod anno Nativitatis Domini 1348 indictione prima, die 25 januarii, scilicet in die conversiones S.Pauli, hora vespertina fuit unus terraemotus parvus, et quasi sine intervallo aliquo, fuit alius tantae vehementiae, quod campanille de S.Maria hinc inde taliter plicatum fuit, quod campanae quae super ipso sunt a se ipsis pulsatae fuerunt; aquae quae erant in baptisterii pro certo fusae fuerunt. Multa Episastoria domorum ruerunt, sic et multae domus, et duravit iste terraemotus per tantum horae spacium, quod morose dixissem ter pater et ter Ave Maria.
Adhuc majora dicebantur ab illis, qui de extraneis partibus veniebant, quod palatium de Utino Domini Patriarchae Aquilejen. per medium ruit, et unus fluvius, qui est in Alemania, retrogressus est propter impletionem cujusdam montis, qui in dicto fluvio ruit, et in aliis partibus multae personae mortuae fuerunt, et haec omnia propter terraemotum, et multa alia dicebantur multo majora, quae scribere non potui.

Lombardy

In relation to Mantua, Aliprandi Bonamente (p.132) records:
"Before going on, I must mention / that on the feast of St.Paul [25 January 1348] at the twenty-first hour there came / an earthquake, greater than any experienced since then".

Innanzi che più passi, voio dir aloe / lo dì di san Polo a vintiuna ora vene / un terremoto, non fu mazor dopoe.

In the *Statuti di Mozzanica* (Mozzanica is in the present-day province of Bergamo) there is a verse composition by Giovanni di Leve which records the earthquake (Archivio di Stato, Milan, *Diplomatico*, Statuti, cartella II, fol.16v.):
"In the year of the Incarnation 1347 [1348, modern style], in the month of January on Friday 25 / at the hour of vespers the earth shook with great rage / and towers and buildings trembled throughout the world / and men prostrated themselves on the ground in great fear. I, Giovanni di Leve, from my own knowledge, when the earth / shook, composed these verses and wrote them in my own hand".

Ab incarnatione Anno M septem cum trecentum / quatragessimo de mense Ianuarii die veneris vigessimo quinto / In hora vespere terra tremuit cum furore pleno / Turres et casamenta tremuerunt In orbe toto / Homines In Terra cadebant expauriti de timore magno.
Ego Iohannes de Leve ex mea propria siencia quando terra / tremuit dictos carminos feci et ex mea propria manu scripsi.

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The *Chronicon Placentinum* by Giovanni Mussi (p.499) records:
"In 1348, during the night following Saturday 24 January, there was an earthquake at Piacenza".

Anno Christi MCCCLVIII, die sabbati XXIV Januarii, nocte sequenti fuit terraemotus in Civitate Placentiae.

The chronicle *Polyhistoria* is traditionally but wrongly attributed to Bartolomeo da Ferrara (col.806): the text records earthquake effects at Ferrara. The author was in fact Nicolò da Ferrara (Andreolli *et al.* 1991, pp.183-4), who wrote:
"In that same year 1348 on 25 January at about the hour of vespers there was a very great earthquake in Ferrara. It was also felt at the same time and on the same day in many other areas, especially in Carinthia, where it completely destroyed the town of Villach".

Nel medesimo anno MCCCXLVIII a dì 25 gennaio circa l'ora di vespro fu in Ferrara un grandissimo tremuoto, che fu sentito a dì e ora suddetti in molte altre parti, e massimamente in quelle di Carentana, dove la città di Villach tutta fu pel detto tremuoto sommersa.

At Bologna, there is evidence for the earthquake in the contemporary chronicle of Pietro and Floriano Villola (vol.II, pp.583-4):
"In the said year [1348], on 25 January, the day of the feast of the Conversion of St. Paul, very near the hour of vespers, there occurred so great and fierce an earthquake that expressions of horror appeared on people's faces; at that same time the earthquake was very strong in Venice, where houses and the church of S.Marco were badly damaged".

In lo dito millesimo [1348], dì XXV de genaro lo dì de conversio' San Polo, e fo in vegniri su l'ora del vespro, vene [a Bologna] lo teramoto grande e fero; e plu che quaxe tute le persone se cambiono forte in volto, e grandiximo fo in quell'ora in Vinexia e grande nuvità gle fo in le loro caxe et in San Marcho.

The *Leggendario del Monastero di Santa Chiara* at Modena (Archivio di Stato, Modena, *Manoscritti della Biblioteca,* 162, fol.42v.) there is a manuscript compiled by different authors in the 14th-16th centuries, containing information about monastery property and certain events thought to be worth recording. In it the Poor Clares have left a slightly fanciful and generic record of the earthquake, no damage in their town being mentioned:
"In the year of Our Lord 1348, in the month of January, on the day of the feast of the Conversion of St.Paul, at the hour of Vespers, in good weather, there came a very great earthquake and in many towns it caused the collapse of houses and palaces and towers, and similarly at various places in the mountains it moved castles from one position to another".

Anno Domini M.CCC.XL.VIII de mense Ianuarii in conversione sancti Pauli hora vespertina, sereno tempore venit quidam maximum terremotus et in multis civitatibus domos ac palatia et turres obruit similiter et castra in montibus in pluribus partibus de loco ad locum movit.

At Modena, there is evidence for the earthquake in the *Annales veteres Mutinenses* (col.82), but with a slight mistake in the date:
"In the year 1348, on Thursday 26 January, there was a great and general earthquake, and on Thursday 7 February, at night, there was another great earthquake. And there came the disease which they call "inguinal".

De anno MCCCXLVIII die XXVI Ianuarii die Jovis fuit magnus et generalis terraemotus et die VII februariii die Jovis de nocte fuit etiam magnus terraemotus. Et fuit morbus, quem inguinariam appellant.

The *Chronicon Regiense* (col.66), compiled by Sagacino Levalossi and Pietro Gazata, men-

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tions the earthquake at Reggio Emilia, where there was evidently no damage:
"1348, 25 January, There was an exceptional earthquake throughout the world at Vespers. [...] The earthquake destroyed many towns".

MCCCXLVIII. die XXV. Januarii factus est terraemotus in Vesperis ultra modum per totum Mundum. [...] Terraemotus multae Urbes deiecit.

Inscriptions

There is evidence of this earthquake in four inscriptions, one of which is at Villach and the other three in Italy: at Venice, Costozza and Aquileia. Quite the most interesting and detailed is the one in Venice, in which the record of the earthquake of 1348 is followed by a description of the Plague. AUSTRIA

■ 1 – Villach, church of James (published in Hoernes 1901, p.69). The inscription refers to Villach and the city of Basel, but confuses two earthquakes (it was in 1356 that Basel was struck):
"I tell you that in 1348 there was an earthquake on the day of the Conversion of St.Paul which damaged the city of Basel and the castles of Villach"

Sub M. C. triplo quadraginta octo tibi dico
Tunc fuit terrae motus conversio Pauli
Subvertit urbes Basileanum castra Villaci

■ 2 – Venice, lunette of an internal portal in the former Scuola Grande della Carità: inscription in gold letters which was placed there in the years immediately following the earthquake. It records both the earthquake itself and the serious outbreak of the plague which came a few months later. The effects of the earthquake are recorded in these terms: ITALY
"In the name of Almighty God and the Blessed Virgin Mary. In the year of the Incarnation of our Lord Jesus Christ 1347 [Venetian style; 1348 modern style] on 25 January on the feast of the Conversion of St.Paul at about the hour of vespers there was a great earthquake in Venice and almost throughout the world and the tops of many bell-towers and houses and chimneys collapsed, as well as the church of S.Basilio; and so great was the fear that almost everybody thought they were going to die, and the earth continued to shake for about 40 days; and after this a great plague began and people died of various diseases and from various causes; some spat blood from their mouths and some had swellings under their armpits and ears, while the skin of others became dark, and it seemed that these diseases passed from one person to another, that is to say from the sick to the healthy. And people were so frightened that fathers did not want to be with their sons, nor sons with their fathers; and these deaths continued for about six months and it was commonly said that two thirds of the people of Venice had died "

In nome de Dio eterno e de la Biada Vergene Maria. In l'ano de la Incarnacion del nostro signor miser Iesu Christo MCCCXLVII a dì XXV de çener lo dì de la conversion de Sen Polo, cerca ora de bespero fo gran taramoto in Veniexia e quasi per tuto el mondo e caçe molte cime de canpanili e case e camini e la glesia de Sen Baseio, e fo sì gran spavento che quaxi tuta la çente pensava de morir, e non stete, la tera de tremar cerca dì XL; e può driedo questo començà una gran mortalitade e mori'a la çente de diverse malatie e rasion; alguni spudava sangue per la boca e alguni vegniva glanduxe soto li scaii e a le lençene, e alguni vegniva lo mal de carbon per le carne, e pareva che questi mali se pi'ase l'un da l'oltro, çoè li sani da l'infermi. Et era la çente in tanto spavento, che 'l pare no' voleva andar dal fio, né 'l fio dal pare; e durà questa mortalitade cerca mexi VI, e si se diseva comunamente che li era morto ben le do parte de la çente de Veniexia.

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■ 3 – Costozza (Vicenza), bell-tower at the church of S.Mauro. This inscription records the date of 1348 earthquake, as well of the earthquakes of 1117 and 1222. It is reasonable to suppose that the reference is to damage to the bell-tower itself, for it can be seen to have gone through various stages of construction (see fig. 18, p.106):
"[...] 1348 Earthquakes".

[...] MCCCXLVIII Teremoti.

■ 4 – Aquileia, choir of the Basilica, inscription on the tomb of the patriarch Marquardo recording the rebuilding of the church.
"1381, 3 January, the patriarch Marquardo, an outstanding man, renowned throughout the world for justice, reputation, virtue and excellence of conduct, born of Randech blood, lies in this splendid marble as used in the roof of the Aquileian building, towards whose construction he contributed beautiful Suabian things [Marquardo was Suabian]; he was count and vicar of Charles IV the former prince, and he was consul and justest of guardians of the empire, and the first thing this man did was to raise the needy church from its ruins, a work of the greatest piety; you, then, who read of the destiny of so great a man, weep with me and remember his great example".

M°CCC°LXXXI die III / ianuarii / notus ad extremos mundi vir maximus axes iustitia, fama, virtutum, culmi/ne morum, Marquardus Patriar/cha natus de sanguine Randech hoc Aquileiensis inest generoso marmore tect/us, ortus cui iunxit dilecta su/evia primos, qui Caroli quarti comes atque vicarius olim principis / et consul fuit ac iustiss/imus omnis imperii tutor, vir primitus iste ruinis fundatam gravibus praesentem struxit egenam ecclesiam, sacratus opum moderamine nulla, haec igitur tanti d/omini qui fata legetis / mecum flete simul memoranda exempla tenete.

ITALY **Earthquake's effects by locality based on historical sources**
(in alphabetical order)
The table below provides a summary of effects, as recorded in primary sources, and confined to Italian localities (in alphabetical order) within the geographical limits of this catalogue.
Our survey shows that the area of major effects is in Austria: for an overall assessment, see the section entitled 'General effects of the earthquake' and the Austrian and German localities in the list on pp.433-4, as well as the comprehensive map of effects.

locality	effects	sources
Aquileia	Almost total collapse of the ancient basilica of Ss.Ermagora e Fortunato (which dated to a Romanesque reconstruction carried out in the first half of the 11th century). The bell-tower, whose small dome at the very top collapsed, was probably damaged almost in its entirety, for there is evidence of restoration work from the first string course upwards. There was other serious but unspecified damage.	Resolution, 1351; Innocent VI, Letter, 14 marzo 1354; Patriarch of Aquileia, Letter, 1362; Villani G., *Nuova Cron.*, pp.562-6; Aquileia, inscription on the tomb of the patriarch Marquardo
Bologna	The earthquake was so "great and fierce" that everybody was frightened.	Villola, *Cron.*, II, pp.583-4
Bolzano	Ten houses collapsed. In the Wagnergasse tower, longitudinal damage split it into two. In an otherwise unidentified church, a piece of stone became detached from the roof and the upper part of the bell-tower was damaged. The tower belonging to a certain "dominus Conrad" was damaged.	*Bozner Chronik*, pp.117-118

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Costozza	An inscription reports the dates of three earthquakes, including that of 1348. It seems likely that this refers to damage suffered by the bell-tower itself.	Costozza, inscription on the bell-tower of the church of S.Mauro
Ferrara	The earthquake was "very great"; no damage is mentioned.	*Chron. Est.*, p.68; Nic. Ferr., *Polys.*, col.806
Gemona del Friuli	More than half its houses collapsed. The cathedral bell-tower was badly damaged and in danger of collapse; the stone statue of St.Christopher on the façade cracked from top to bottom.	Villani G., *N. Cron.*, pp.562-6
Mantua	The earthquake was felt; no damage is mentioned.	Alipr. Bonam., *Alipr.*, p.132
Mestre	Damaged probably occurred. A document of 8 May 1348 records repairs to a loophole.	ASVe, *Senato,* Misti, reg.24, fol.74r.
Modena	The earthquake was very strong here. No damage is mentioned.	ASMo, *Mss. Bibl.*, 162, *Legg.*, fol.42v.; *Ann. Vet. Mut.*, col.82
Mozzanica	The earthquake was strongly felt. No damage is mentioned.	ASMi, *Diplomatico*, Statuti, cartella II, fol.16v.
Noale	Damage probably occurred: a document of 8 May 1348 records the need for defensive works to be repaired.	ASVe, *Senato,* Misti, reg.24, fol.74r.
Padua	Some old houses with poor foundations collapsed; some chimneys fell down. In the cathedral, a large marble slab from the roof became detached and damaged the roof of the sacristy. The lower part of the tower of the *palazzo consiliare*, known as the Torre Rossa, was badly damaged and leaned at an angle; on technical advice it was subsequently demolished and rebuilt.	Zuvaro, *Note*, pp.109-111; *Liber regim. Padue*, pp.88,164; Cortusi, *Hist.*, cols.926-7
Paluzza	The inhabited area almost completely collapsed, and there were many victims.	Villani G., *N. Cron.*, pp.562-6
Monte Croce	Most of its houses collapsed.	Villani G., *N. Cron.*, pp.562-6
Piacenza	The earthquake was felt; no damage is mentioned.	Mussi, *Chron.*, col.499
Pisa	The earthquake was felt.	Villani G., *N. Cron.*, pp.562-6
Pordenone	Four large capitals fell from a bell-tower, probably that of the cathedral.	Giov. Pord., *Suppl.*, pp.56-7
Ragogna	Two of the castle towers collapsed into the river Tagliamento. There were many victims.	Villani G., *N. Cron.*, pp.562-6
Sacile	The north-east town gate collapsed.	Villani G., *N. Cron.*, pp.562-6
S.Daniele Fr.	Widespread collapses and many victims.	Villani G., *N. Cron.*, pp.562-6
Tolmezzo	Widespread collapses and many victims.	Villani G., *N. Cron.*, pp.562-6
Trento	Many houses and chimneys collapsed; the bell-tower of the church of S.Maria swayed and caused the bells to ring; water overflowed from the baptismal fonts.	Giov. Parma, *Cron.*, p.50
Treviso	Damage probably occurred. Repairs to some mills.	ASVe, *Senato,* Misti, reg.24, fol.71r.
Udine	A number of houses collapsed. Part, or half, of the patriarch's palace collapsed.	Villani G., *N. Cron.*, pp.562-6; Giov. Parma, *Cron.*, p.50

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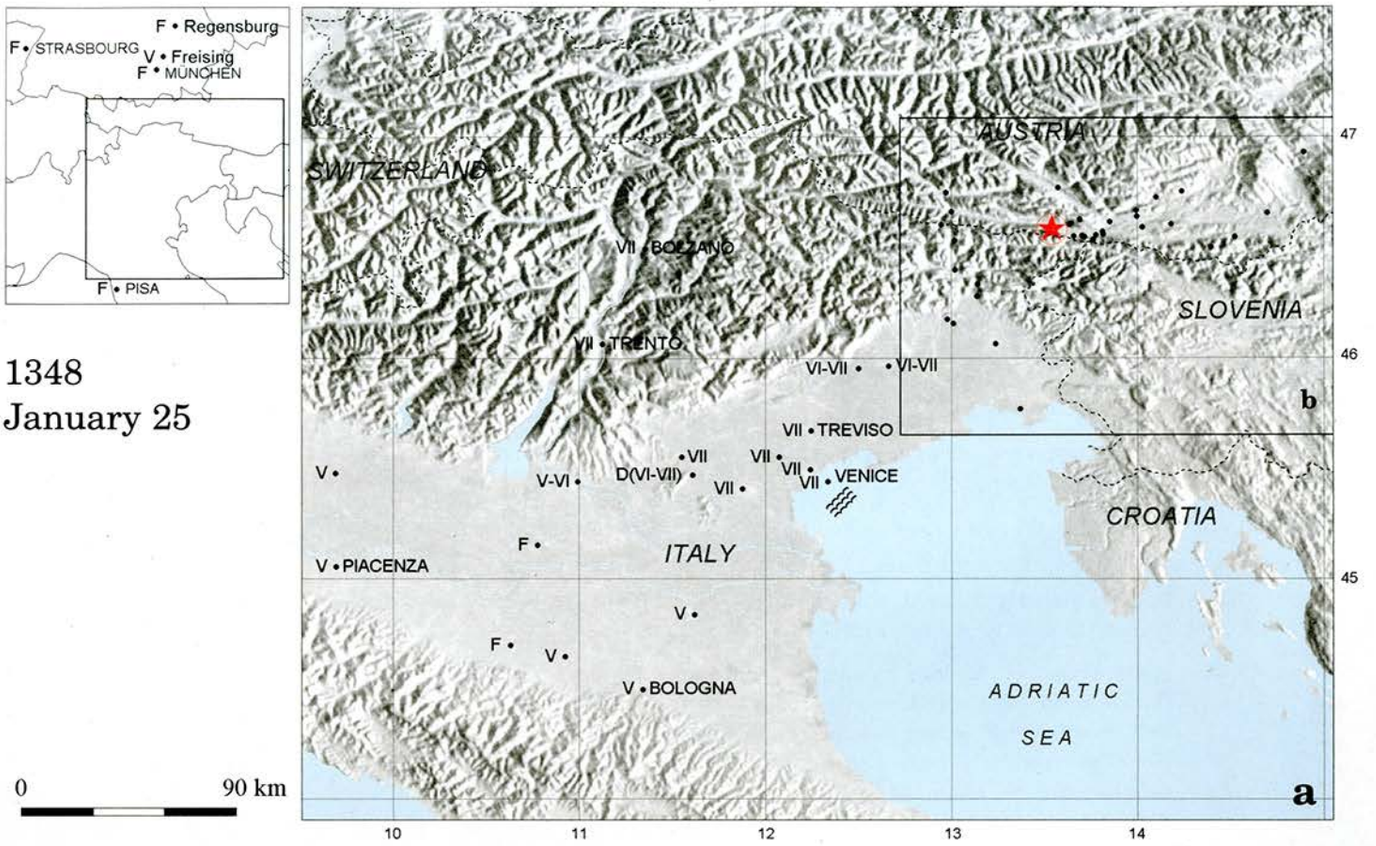

fig. 83a

☞

Venice Houses, the tops of some bell-towers, and chimneys collapsed. The dome of the basilica of S.Marco was damaged; the adjacent bell-tower swayed so much that the bells rang of their own accord. The left-hand side and the top of the church of S.Basilio collapsed. There were collapses and damage at the church of S.Maria dei Frari, described as the "new church of the Franciscans" (construction had in fact begun in 1340) as well as at the church of S.Vidal and S.Silvestro, the tops of whose respective bell-towers collapsed. There were collapses and damage to the bell-tower of S.Giovanni di Rialto (now S.Giovanni Elemosinario). Collapse of the bell-tower at the church of S.Angelo Raffaele as well as of the top of the church; collapse of the top of the bell-tower of S.Giacomo dell'Orio. At the Carmini church (S.Maria del Carmelo), collapse of the oculus above the church door; a segment still survives in the façade. Two arches collapsed at the Arsenal, and a wall was damaged.

Venice, lunette of an internal portal in the former Scuola della Carità; De Grazia, *Chron.*, p.69; Zuvaro, *Note*, pp.109-11; BNMarcianaVe, Mss. It. Classe VII, 1275, Zancaruol, *Cron.*; Villani G., *N. Cron.*, pp.562-6

Venzone Many houses collapsed; damage to the cathedral, whose bell-tower was badly affected.

Villani G., *N. Cron.*, pp.562-6

Verona The earthquake was strongly felt; objects fell from shelves; people fled into the open. No damage is mentioned.

Petrarca F., *Letter*, 1368; Letter, 1350; *Notae Ver.*, p.475

Vicenza The earthquake was strongly felt; no damage is mentioned.

Conf. Costoza, *Framm.*, p.11

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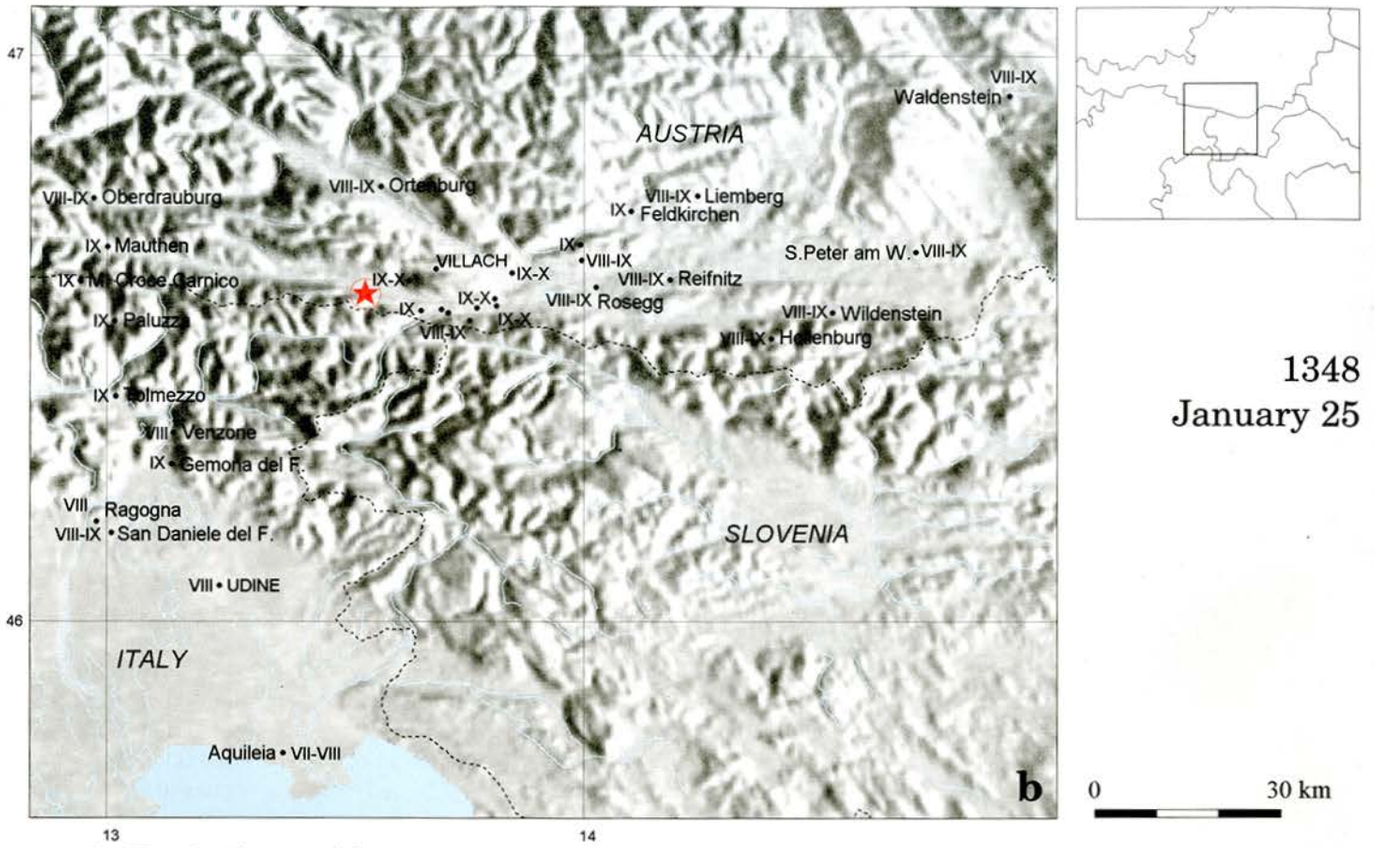

fig. 83b The identification of the epicentre is at present considerably hampered by the lack of data for the Slovenia area.

▲ 1348 01 25 15:00-16:00 UT ✪ = 46 35 13 32 I_0 = IX-X Me = 7.3 Sites: 56 EE: 6 Ts?

location	lat.	long.	I	location	lat.	long.	I
Federaun A	46 34	13 49	IX-X EE	Oberdrauburg A	46 45	12 58	VIII-IX
Rain A	46 33	13 49	IX-X EE	Ortenburg A	46 46	13 34	VIII-IX
Villach A	46 37	13 51	IX-X EE	Reifnitz A	46 36	14 11	VIII-IX
Wasserleonburg A	46 36	13 38	IX-X EE	Rosegg A	46 36	14 01	VIII-IX
Arnoldstein A	46 33	13 43	IX EE	San Daniele del Fr. I	46 09	13 01	VIII-IX
Feldkirchen A	46 44	14 06	IX	S.Peter am Wallersb. A	46 39	14 42	VIII-IX
Gemona del Friuli I	46 17	13 08	IX	Waldenstein A	46 56	14 54	VIII-IX
Mauthen A	46 40	13 00	IX	Wildenstein A	46 33	14 31	VIII-IX
Ossiach A	46 40	13 60	IX	Ragogna I	46 11	12 59	VIII
Paluzza I	46 32	13 01	IX	Udine I	46 04	13 14	VIII
Monte Croce Carnico I	46 36	12 57	IX	Venzone I	46 20	13 08	VIII
Strassfried A	46 33	13 39	IX	Aquileia I	45 46	13 22	VII-VIII
Tolmezzo I	46 24	13 01	IX	Bolzano I	46 30	11 21	VII
Bad Bleiberg A	46 38	13 41	VIII-IX	Mestre I	45 30	12 14	VII
Gailitz A	46 33	13 42	VIII-IX	Noale I	45 33	12 04	VII
Hochwart A	46 38	13 60	VIII-IX	Padua I	45 24	11 53	VII
Hollenburg A	46 30	14 24	VIII-IX	Trento I	46 04	11 07	VII
Krainberg A	46 32	13 46	VIII-IX	Treviso I	45 40	12 15	VII
Liemberg A	46 45	14 14	VIII-IX	Venice I	45 26	12 20	VII Ts?
Neuhaus an der Gail A	46 33	13 47	VIII-IX	Vicenza I	45 33	11 33	VII

Guidoboni E. e Comastri A., *Catalogue of earthquakes and tsunamis in the Mediterranean area from the 11th to the 15th century.* Roma-Bologna 2005

location	lat.	long.	I	location	lat.	long.	I
Pordenone I	45 58	12 40	VI-VII	Piacenza I	45 03	09 42	V
Sacile I	45 57	12 30	VI-VII	Verona I	45 26	11 00	V
Costozza I	45 28	11 36	D (VI-VII)	Mantua I	45 09	10 47	F
Bologna I	44 30	11 20	V	Munich D	48 08	11 34	F
Ferrara I	44 50	11 37	V	Pisa I	43 43	10 24	F
Freising D	48 24	11 45	V EE	Regensburg D	49 01	12 07	F
Modena I	44 39	10 56	V	Reggio nell'Emilia I	44 42	10 38	F
Mozzanica I	45 29	09 42	V	Strasbourg F	48 34	07 45	F