

Environment and History



Natural Disasters and their Perception

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Edited by MARTIN KEMPE AND CHRISTIAN ROHR

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Man and Natural Disaster in the Late Middle Ages: The Earthquake in Carinthia and Northern Italy on 25 January 1348 and its Perception¹

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ABSTRACT

How did people react to natural abnormalities such as earthquakes and floods in the Middle Ages? Why did they experience them as disasters? How did they explain them? Did they really see them as a divine punishment? Reports of the earthquake of 1348, which was followed by a landslide and a flood destroying the city of Villach, were often combined with accounts of the Black Death, which arose in these regions just a few weeks later.

There are still only a few studies of natural disasters in the Middle Ages, and for the eastern Alpine regions only the earthquake of 25 January 1348 has been examined in detail, albeit using a variety of approaches. This study tries to provide a mentality-bound approach, searching for the mentalities of the people, but without claiming to write a 'history of mentalities'. Nevertheless, it seems easier to examine mentalities in extreme situations than in normal times, though the records concerning natural disasters in the Late Middle Ages are mostly brief.

By re-visiting the sources for the 1348 earthquake following the studies of Borst (1981) and Hammerl (1992) and looking at aspects of its perception, management and explanation, this article calls into question the supposed 'medieval' equation of natural disaster and divine punishment. In spite of the fact that the natural disasters and Black Death were mixed up in the sources, there is little evidence that the earthquake itself was experienced as anything other than something tremendous and unexpected, but which also belonged to daily life.

KEYWORDS

Austria, northern Italy, natural disasters (perception, management), earthquake of 1348, Black Death, Late Middle Ages

According to a model elaborated by Rolf Sprandel in 1972, there are three steps in perceiving and interpreting nature.² In the first one, man introduces myths, supernatural beings and divine impact to excuse human weakness in the face of nature. In the second one, man perceives nature as wild and unpredictable, but lives and copes with it by using technical knowledge. In a third step he discovers nature as an aesthetic world of its own, which is made for enjoyment. Two or even all three steps were often mixed up in the Middle Ages. In this article it will be argued that not the first, but the second, step dominated contemporary reactions to the earthquake of 1348. In particular it will be suggested that contrary to the assumptions of older research, natural disasters were not necessarily perceived as the wrath of God, but rather were often seen as being tremendous events which, nevertheless, constituted an exceptional and unexpected part of everyday life.

It is the nature of numerous narrative sources, especially those produced in the Middle Ages, to find only the unusual worth reporting. Therefore, the question of how people in the Middle Ages coped with natural disasters is necessarily linked to very extreme situations – but because of this, it may be answered more easily than that concerning the relationship between man and nature in general. In this study I shall first deal with some methodological problems concerning the theme of ‘man and natural disaster in the Late Middle Ages’. Then I want to focus on the earthquake of 1348 in Carinthia and Friuli, now in the territory of today’s Republics of Austria and Italy.

DEFINITION OF CENTRAL TERMS

This study explores the perception, interpretation and management of natural disasters. These aspects subjective responses are always based on specific patterns of ‘mentalities’ or attitudes. This term was introduced by the French *Annales* school.³ I would suggest defining mentalities as horizons of experience, and the sum of all the factors determining the possibilities (and also the impossibilities) of thinking and acting in a given society or in parts of that society. In our case this mainly concerns the perception of natural disasters, the explanations and the strategies used to handle them, and any ideas about disasters more generally. Fully reconstructing the mentalities of people in the Middle Ages is almost impossible due to the lack of good sources; therefore, I would like to introduce the term ‘mentality bound’ for my approach, because I shall only be able to focus on a few aspects of medieval mentalities.

Due to the great number of lacunae in research on natural disasters, a generally accepted definition of what was a disaster and what was not is still lacking.⁴ For instance, it was seen as a disaster when wolves invaded the city of Paris in the severe winter of 1448/9: according to the so-called *Journal de Paris* around 30 people were killed.⁵ It seems to me that with this event the perceived

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difference between the city as place of culture and nature as a place of wilderness and danger has been nullified. On the other hand, an abnormal natural event was not automatically a disaster, if people were not hurt. So, only the perception and interpretation of man is responsible for 'creating' a disaster.

In the search for a definition of the term 'disaster', further aspects of the perception, interpretation and management of disasters should be highlighted:

1. *The helplessness of people trying to cope with the damage using the available means.* This criterion is still one of the most relevant ones for the emergency forces when declaring an event a disaster.
2. *People's helplessness, not only in coping with the events, but also in explaining them.* Even nowadays something might be perceived as a catastrophe if there is no proper explanation.
3. *The unexpectedness of the event.* Extraordinary natural events, which people are in some case used to, are seldom perceived as disasters – or only if the number of victims is enormous. There are, for example, regions in southern Italy with several earthquakes a year and a tremendous one once in a person's lifetime. So the people there have developed a very specific way to deal with the earthquakes. The same happens in all of the cultures situated along big rivers: the river is both a guarantee of fertility and prosperity, and a threatening enemy.
4. *The direct or indirect affliction.* This aspect probably plays a more important role nowadays than it did in the Middle Ages, when it seemingly hardly mattered, whether the disaster happened in the neighbourhood or far away (see also map 2 on the origin of the written sources referring to the earthquake of 1348). The reason for this may lie in the symbolic meaning of such events.

METHODS OF APPROACH TO NATURAL DISASTERS IN THE MIDDLE AGES

Research concerning man and natural disasters is still in its infancy. Recently, a few studies of disasters in Antiquity⁶ and the Early Modern⁷ periods have been published, but there are hardly any for the Middle Ages. The only major work, except for a few case studies,⁸ is that of Jacques Berlioz on the French Alpine regions.⁹ Other work on medieval natural disasters (in a wider sense) has focused on cosmic and apocalyptic signs,¹⁰ on epidemics,¹¹ and on climatic changes,¹² although these were sometimes, at least, partially responsible for natural disasters.

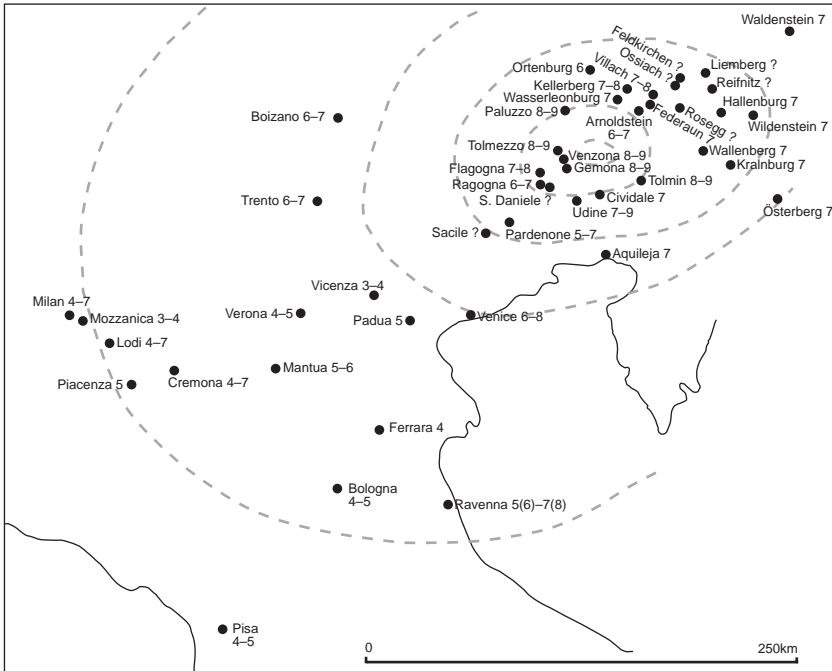
Among natural disasters, earthquakes are far the best recorded in written sources, presumably because they are something absolutely unexpected, even in regions with high seismic activity. According to the Bible they were a sign

accompanying the death of Jesus Christ¹³ and announcing the apocalypse.¹⁴ Thus, beginning in seventeenth-century Italy, work began to catalogue them.¹⁵ This work continues today. Some of these catalogues of historical earthquakes also contain large scientific and historical commentaries, and a collection of the extant written sources, but mostly, the main focus was the earthquake itself or the damage to buildings and nature. This approach may be characterised as reconstructive historical seismology.¹⁶

The early historical studies of the earthquake of 1348 were based on local history or even patriotic interests. They do not really incorporate either the results of seismological and other natural scientific research or new trends in historiography.¹⁷ In the last 20 years two challenging new studies of the earthquake of 1348 have been published, using very different approaches. In 1981 the German historian Arno Borst took a partly mentality-bound approach to the disaster:¹⁸ influenced by the French *Annales* school, he read the written sources ‘the other way round’, focusing not on the records of damages, but rather pointing out the behaviour of the people when faced by the earthquake, subsequent landslide and flood. However, as a historian he could not base his study on modern seismological studies and he failed to build up a ‘system’ for his new and extraordinarily interesting observations; but he himself encouraged others to examine Alpine mentalities by analysing natural disasters.¹⁹ In 1992 Christa Hammerl’s Viennese Ph.D. thesis tried to reconstruct the earthquake, based on the numerous reports concerning the tremors in the epicentre and in the periphery.²⁰ Comparing these results with similar earthquakes in recent years – such as the destructive earthquake in Friuli in 1976 – Hammerl tried to compose a macroseismic map to reconstruct the intensity and the epicentre of the earthquake (see Map 1).

An analysis of the perception, interpretation and management of natural disasters – and in this case of earthquakes in particular – has to proceed in several steps. Firstly, it is necessary to gather some basic information about the disaster. For this the results of Hammerl’s study will be used. Secondly, these results need to be compared with people’s perceptions and interpretations as they were mentioned (or only implicitly recorded) in the sources. In the search for a mentality-bound approach it will also be important to ascertain why and how an author wanted to present the disaster and its surroundings. Finally, we have to consider different horizons of consciousness and experience.

The earthquake of 1348 is extremely well documented, mostly because it was connected with reports concerning the Black Death. Hammerl compiled more than 170 sources,²¹ and there might be others, which she did not know about. The connection with the Black Death is, therefore, an advantage; but it has also caused several problems of interpretation, particularly because the information concerning one event was mixed up with the information concerning the other. We shall have to ask if, in this case at least, the assertion that natural disasters were perceived as a divine punishment simply derives from this coincidence. We



MAP 1. Macroseismic reconstruction of the earthquake of 1348 according to Hammerl 1992, 100 (Fig. 17). The damage reported in the sources allows classification of the approximate intensity of the earthquake in the epicentre and in the periphery according to the Mercalli-Sieberg scale.

shall also have to ask if fear – as a social and socially constructed phenomenon²² – was really the crucial element of the perception, interpretation and management of the disaster.

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Hammerl's study reconstructed the specific events connected with the earthquake of 25 January 1348: according to her findings the epicentre was not near Villach in Austria, but in Friuli in Italy, east of Tolmezzo and Gemona. The intensity could have been around 9 or 10 on the Mercalli-Sieberg scale, meaning that the vibrations caused extreme damage to the buildings and put the people in a state of panic.²³

The tremors of the main earthquake and the numerous smaller ones that followed were felt in all parts of northern Italy and in the whole of Austria, as well as in Bavaria, Bohemia and Slovenia (see Map 1). They began in the early afternoon of 25 January and lasted for about two minutes. We know this detail from a remark of Giovanni da Parma, a prebendary of Trent: he was able to pray three Our Fathers and three Ave Marias without any hurry.²⁴ The earthquake also caused some fires in Villach and a tremendous landslide of the nearby Dobratsch mountain, temporarily blocking the Gail river between Arnoldstein and Villach until the new 'dam' broke flooding and partially destroying several villages and the town of Villach itself.²⁵

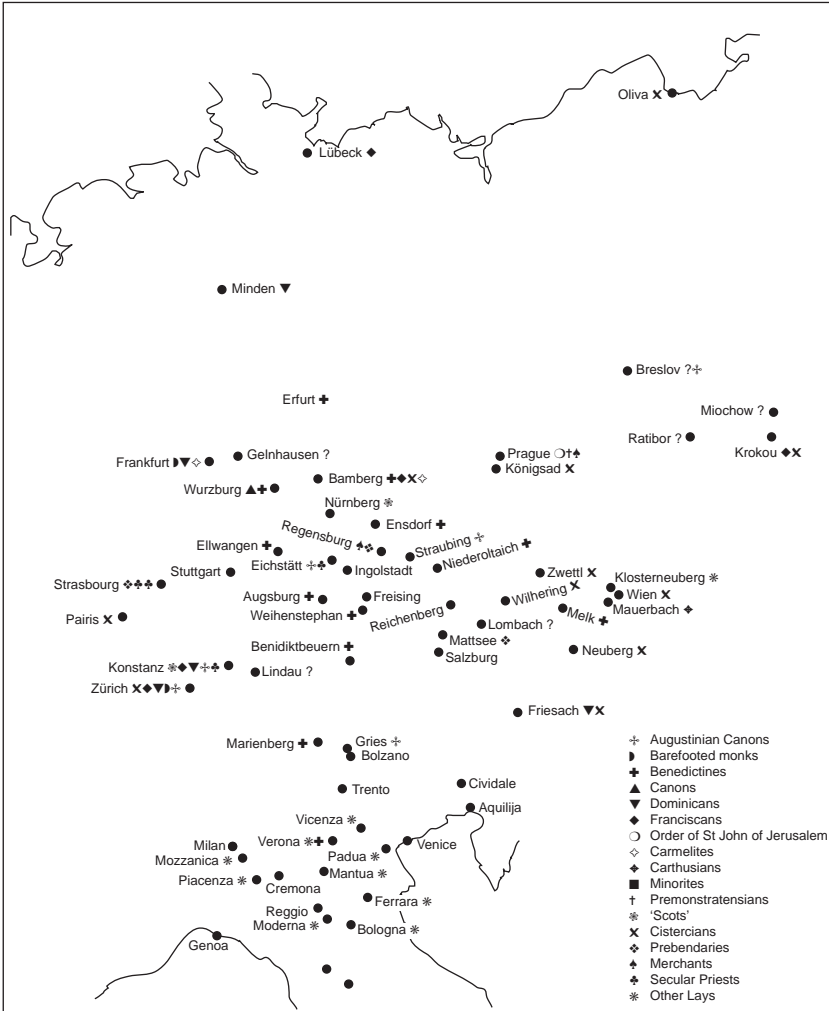
At this point the possibilities for, and interests of, scholars focusing on reconstructing historical seismology peter out. The source criticism used for this approach aims to prove the credibility of accounts concerning the damage and number of victims and so to classify the intensity of the earthquake. If we are to examine the perception, interpretation and management of this event by the victims or by outside observers, we must ask for more.

First of all it is necessary to distinguish between different groups of sources and authors. Annals or chronicles were seldom written by eye-witnesses. So, a major part of the recorded information comes from second-hand or third-hand reports transmitted by merchants or between monasteries of the same order, such as the 'mobile' Cistercians and, more rarely, the Benedictines (see Map 2 on the dissemination of the sources).²⁶ In this way the reports became distorted or embroidered, not least because of the different horizons of experience. Thus, we have to look at how close the author was to the events, whether he perceived them personally and whether he reported more than one perspective. For instance, Giovanni da Parma reported on the moderate concussions in Trent as an eye-witness, but on the destructions in Friuli and in the area of Villach as an outside chronicler. Referring to the landslide of the Dobratsch mountain, and the destructive flood that followed, he only knew that it took place somewhere in Germany (*Alemania*), but was not able to place it more accurately.²⁷ For a study of people's attitudes towards the earthquake of 1348 the report on Trent is much more helpful, though less spectacular.

Other reports were written from a greater distance of space or time so, in these cases, the quality of the accounts always depended on the sources. The German chronicler Andreas von Regensburg (1380–1438) wrote his 'Chronica pontificum et imperatorum Romanorum' (Chronicle of the Roman popes/bishops and emperors) more than 70 years after the earthquake, but one of the manuscripts of this text also preserves the presumed source of his reports, citing some merchants from Regensburg as eye-witnesses.²⁸

Another problem when evaluating the sources for the earthquake of 1348 arises from the fact that the Black Death came to central Europe just a few weeks later. Indeed, there may be a link between the natural disaster and the disease: the disastrous hygiene situation after the earthquake, landslide and flood could have

favoured the spread of the Black Death. Both events would inevitably be mixed up if a chronicler living far away from Carinthia only got to know of them months later. Thus, reports concerning the number of victims cannot be accurately attributed to the earthquake itself, and how many people were killed or injured



MAP 2. Dissemination of the sources reporting on the earthquake, distinguished between the different orders and non-clerical origin according to Hammerl 1992, 43 (fig. 9). There are quite a lot of sources from far outside the earthquake zone due to the exchange of information among the orders and among the merchants. It is also remarkable that there are hardly any sources from the epicentre regions.

by the earthquake, by the flood or by the Black Death cannot now be determined. The reported number of people killed by the earthquake in Villach, for instance, varies from five to five thousand or even more.

Let me now turn to the contemporary reports themselves when focusing on the perception, interpretation and management of the disaster. Due to the limited space I can only look at a small selection of sources and aspects, so in this study the term 'perception' mainly refers to what was individually or commonly experienced and less to what damage was perceived. Observations of people's physical behaviour are only rarely found: Albert von Strassburg (Count Albert V of Hohenburg, 1303–59) mentions that the people suffered from 'vertigo, the shivers or lumbago'.²⁹ Similarly the 'Annales S. Stephani Frisingenses' (Annals of Weihestephan near Freising/Bavaria) noted that they 'wandered through the streets and seemed to be out of their mind; others had difficulties standing on their feet'. Unfortunately it is not clear if the author was describing the human reactions in the epicentre itself or in Freising, which was part of the wider periphery.³⁰

A very detailed and interesting report was given by the Florentine citizen Giovanni Villani, who died of Black Death in 1348, although his extremely rich chronicle was continued after his death by his brother Matteo. Regarding the earthquake he cites a letter from Florentine merchants written in February 1348. They had been in the Friulian capital of Udine during the earthquake. According to them the bankers of Udine were frightened by such tremendous miracles and as a sign of remorse they forgave the interest of their debtors for eight days.³¹ The interpretation of the disaster as a *memento mori*, as a sign to turn back, was obviously very common.

Some twenty years after the earthquake the Italian humanist Francesco Petrarch mentioned his experiences of the earthquake in a letter directed to the archbishop of Genoa, Guido Sette. Petrarch had been in his library in Verona when the earthquake took place:

... the day had nearly come to dusk, when vibrations arose so tremendously in large parts of Italy and Germany that a lot of people, who did not know about such tremors, thought the end of the world would be near. I was just sitting in my library in Verona at this time; although I knew something about such things I was dismayed at this sudden and unusual event. The pavement trembled under my feet; when the books crashed into each other and fell down I was frightened and hurried to leave the room. Outside I saw the servants and many other people running anxiously to and fro. All faces were pale.³²

It seems that Petrarch coped well with the earthquake – in contrast to the common people of Verona. But on the other hand his report is difficult to interpret: about two decades had passed since the disaster when he wrote the letter. So, he had much time to digest and reflect on the information. In addition Petrarch's attitude represents a new way dealing with nature during the early humanistic period. We

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have to ask, therefore, how representative and, in fact, how applicable to common mentalities Petrarch's memory was.³³

It was also noted by a few writers that the bells started to ring in several towns situated in the periphery of the earthquake without any human interference. All of the reports, which concerned the Bavarian monastery of Weihenstephan near Freising, and churches in Venice and Trent, seem to have been totally independent of each other and were written by eye-witnesses.³⁴ But why did the unintentional ringing of the bells cause so much attention? Bells had several different functions during the Middle Ages and Early Modern period: they were rung to call people to prayer, to warn them against danger or to drive the danger away. If we bear in mind the widespread idea that the apocalypse would be introduced by an earthquake, the ringing of the bell could have triggered such associations.³⁵ On the other hand this interpretation is not found in many of the sources, although – or perhaps because? – all authors, both clergy and lay people, knew about the omens of the apocalypse. Did the authors leave out this people's view in their reports, even because they interpreted the disaster as divine punishment?

So, the perception of the disaster is also influenced by the specific interpretations of it (and vice versa), which constitute the second important aspect of a mentality bound approach. Giovanni Villani, himself a victim of Black Death in 1348, interpreted the earthquake as an omen for misfortune, pestilence and the end of the world. Relying on the letter from the Florentine merchants, he emphatically referred to the remorse of the bankers in Udine.³⁶ But it is noteworthy that this sole explicit reference to the end of the world originates from merchants, that is from lay people rather than the clergy. Guglielmo Cortusi of Padua in his chronicle, composed between 1315 and 1356, also construed the earthquake as a trial and a sign to turn back, but he may have mixed up the disaster and the pestilence. God would intend, not the death of the sinner, but his conversion. Therefore He would threaten and beat the human race, but He would not exterminate it.³⁷ In his 'Chronicon Mutinense' (Chronicle of Modena) Giovanni da Bazzano echoed the opinion of three Augustinian eremites from Germany, who had been travelling through the disaster area. According to them, the earthquake had been caused by the sinful lives of people there.³⁸ Aside from these sources, however, the interpretation that God wanted to try or to punish the people is rarely found – in spite of the repeated references to the Black Death. It is remarkable that the motif of God's rage is found more frequently in sources on the earthquake of 1348 dating from the Early Modern period.³⁹ Therefore we have to doubt that the interpretation of natural disasters as a sign of divine punishment was always present during the Late Middle Ages, especially as there was much uncertainty among the populace because both good and bad people were killed in the earthquake.

This ambiguity about how to interpret the disaster is reflected in numerous reports on the destruction of the parish church in Villach. During the sermon

many people, allegedly 500, were killed.⁴⁰ This experience obviously upset other people in a special way, because even a pious life apparently did not protect them from death during a disaster. At this point the usual concepts of interpretation also collapsed. During the Black Death this problem returned: did God punish both the good and the bad? It is remarkable that we do not find any moralising commentaries except for one: the seemingly unique assertion of Giovanni Villani and the Florentine merchants respectively that in the town of Villach all buildings were destroyed except the house of a righteous and charitable man.⁴¹ However, despite the general lack of moralising commentaries, we may not conclude that there had been no such interpretations at all, but in any case we may consider a special meaning of it. Was it a sign of general desperateness or even bad consciousness?

In the fourteenth century the horizons of 'rational' interpretation of events such as earthquakes ranged from the reference to specific constellations of the stars to Aristotelian and scholastic concepts. All of these can be seen clearly in the 'Buch der Natur' (Book of Nature), the first natural history in middle high German, written in 1349 by Konrad von Megenberg (1309–74). The author refers to the earthquake of 1348 in great detail and provides several explanations.

You should also know that the earthquake causes many miraculous things: a vapour coming out from the earth by the earthquake is responsible for transforming human beings and other animals into stone and in particular into pillars of salt. This mostly happens in the mountains, where the people are digging for salt. ... This miracle is taught by the masters Avicenna and Albertus [Magnus]. I was told by master Pitrolf, the chancellor of Duke Friedrich in Austria, that on some alpine meadows, situated in the higher mountains of Carinthia, about 50 petrified men and cattle had been found. Even the milkers sat beside the cows, both transformed into pillars of salt. Another miracle: due to the earthquake fires may come out of the earth, so that towns and villages will be consumed by it. This fact is caused by the fires inside the earth. A third miracle: during the earthquake sand and dust will come to the surface, so that a whole village becomes absorbed in it.⁴²

His theories were based on the concepts of Aristotle and other Greek philosophers, whose doctrines were newly disseminated at the occidental universities by the scholastic scholars Albertus Magnus and Thomas of Aquinas in the thirteenth century. Konrad proceeded from the assumption that vapours, the so-called *πνεύμα* in the works of Aristotle, would thicken and putrefy in the interior of the earth. During an earthquake these vapours would rise via rifts to the surface and cause death. The strange report on the transformation into pillars of salt is presumably based on the story about the transmutation of Lot into a pillar of salt, preserved in the Old Testament. As this is unlikely to have really happened in 1348, perhaps the author intended to describe the tremendous anxiety of the people during the events.

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In another treatise Konrad dealt with the connection between the natural and the political or historical causes of earthquakes and pestilence. In addition to the natural processes, he supposed the rage of God to be present because of the incompetence of the sovereigns and the general moral decline. The disaster, therefore, would be a challenge from God to manage it through truthfulness and righteousness.⁴³ In his revised 'Chronica Boemorum regum' (Chronicle of the Bohemian Kings) Franz von Prag argued in a similar way, but he took the argument the other way round: Bohemia remained mainly unaffected by the disasters because of the wise government of King Charles IV.⁴⁴

Among the common people, however, there was another wide-spread belief, disseminated by 'babbling old women, who presume to be very wise', as Konrad critically remarked:⁴⁵ they believed that there was a big fish called Celebrant under the earth's crust. This fish was supposed to put his tail in his mouth, and when he did this the earth trembled.

The interpretation that the disaster had been caused by the Jews is rarely found. When Konrad von Megenberg discussed the earthquake in his 'Buch der Natur', he only mentioned in general terms that the Jews were 'the enemies of our wives and all Christian'.⁴⁶ In his so-called 'Österreichische Chronik von den 95 Herrschaften' (Austrian Chronicle of the 95 Reigns), Leopold Stainreuther imputed the poisoning of the wells to them; he also reported pogroms in the Rhine region.⁴⁷ Both accounts, however, can be linked with the Black Death and with anti-Semitism respectively, but not with the earthquake as much.

We might also ask if we should attribute some of the reported facts to the earthquake or to the Black Death. According to the early modern 'Historia di Bologna' (History of Bologna) by Cherubino Ghirardacci, the people fled from the towns to the countryside.⁴⁸ Perhaps the earthquake and Black Death were mixed up here, as we know from the 'Decamerone', the master-work by Giovanni Boccaccio, that the upper-class citizens left the towns to find shelter and to be safe from the epidemic in the countryside.⁴⁹

A unique account concerning acts of penance poses a similar problem: in the so called *Kleinen Klosterneuburger Chronik* (Little Chronicle of Klosterneuburg) dating from 1428 we read about self-flagellation among the common people, but even in this case we may have to presume that the people's reactions towards the natural disaster and towards the pestilence were mixed up.⁵⁰ Collective penance and flagellation were quite common in all accounts of the Black Death, because the flagellants' movements became a general European phenomenon within a very short time, but presumably this had nothing to do with the earthquake as such.

Charters relating to the situation after 1348 in the area of Villach show that the earthquake, fire, landslide, flood and pestilence were experienced as tremendous calamities, but people tried to rebuild their lives as far as possible. The reconstruction proceeded very slowly, partly because of the Black Death and its

big demographic upheaval, and partly because Carinthia was not a well-organised, homogeneous territory at that time. The city of Villach belonged to the bishop of Bamberg in Bavaria, whereas the patriarch of Aquileia, situated in northern Italy, was responsible for the spiritual affairs of the region. Both were far away from the epicentre of the earthquake. They granted some privileges, such as an indulgence to be acquired in the destroyed Benedictine monastery of Arnoldstein,⁵¹ and the citizens of Villach repeatedly got an exemption from taxes, provided that they restored the destroyed city walls.⁵² These sources do not contain any judgement, interpretation or attribution of guilt. Only the 'tremendous might of God and damage, which occurred to the city of Villach by the earthquake and the following fire' is mentioned.⁵³ However, the damage of the earthquake to the buildings remained visible even 20 years later.⁵⁴

Thus we do not know very much about the management of the disaster and there are absolutely no reports on its mental management. Nevertheless we may suppose that the disaster was remembered for generations, because it has been inserted in general reports about earthquakes even in the sixteenth and seventeenth centuries.

CONCLUSION

This analysis of the well-documented earthquake of 1348 has shown that the question of how people dealt with natural disasters in the Late Middle Ages is much more complex than suggested by earlier studies. The experience of the tremors led to very different observations and to numerous interpretations. It only partly depended on the social background of the author or the sort of sources as to how these experiences were perceived. Therefore it is difficult to ascertain whether the earthquake – and connected with it the Black Death – was interpreted as a trial, as a punishment by God, or as part of imponderable nature. The extant sources do not really favour the assertion of an interpretation the earthquake as divine punishment, but rather suggest that this terrible event constituted, nevertheless, an exceptional and unexpected part of everyday life.

NOTES

¹ Enlarged and annotated version of a paper entitled 'Man and natural disaster in late medieval Austria and northern Italy: Divine punishment or part of life?', presented at the First Conference of the European Society of Environmental History: 'Environmental History. Potential and Perspectives', St. Andrew's, Scotland, 5–8 September 2001. This article will be part of a major study on 'Man and Natural Disasters in the Late Middle Ages' focusing on the eastern Alpine regions. Many thanks to Carol Davidson-Cragoe, London for many useful comments on the language, style and structure of this article.

² Sprandel 1972, 24–35 and 57–74.

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³ See for instance LeRoy Ladurie 1967/1983; Berlioz 1998, but also Sprandel 1972; Borst 1974/1988. In some studies the term 'mentalities' is used very inaccurately. Most of the German researchers, however, tend to avoid the term. Cf. Groh and Groh 1991, Groh and Groh 1996.

⁴ For first systematic considerations, based on the discussions at a conference in Constance in November 2000 see Groh, Kempe and Mauelshagen 2003 (introduction).

⁵ *Journal d'un bourgeois de Paris*, 1448; see also Berlioz 1990; Berlioz 1998, 27–9; Siemer 2003.

⁶ See Olshausen and Sonnabend 1998; Sonnabend 1999; Meier 2000; Sonnabend 2003; Meier 2003.

⁷ See, for instance, Groh and Groh 1991; Jakubowski-Tiessen 1992; Groh and Groh 1996; Kempe 1996; Esser 1997; Kempe 2000; Walter 2003.

⁸ Borst 1981; Hammerl 1992; Hammerl 1995; Rohr 2001; Siemer 2003.

⁹ Berlioz 1987a; Berlioz 1987b; Berlioz 1998.

¹⁰ Sperl 1994; Smoller 2000; Wurster 2000; Rohr 2003. For Early Modern Times see also Mauelshagen 1998.

¹¹ The literature on the Black Death has become extremely extensive and sometimes difficult to survey. See summing up Bulst 1979; Bulst 2003. On the rise of the 'French disease', syphilis, see Walter 2003.

¹² Most of the studies on climatic change focus on Modern Times, but also contain some basic information on the Middle Ages. See Fliri 1998; Pfister 1999; Pfister, Brázdil and Glaser 1999; Glaser 2001. For studies on climate history in particular on the Middle Ages see LeRoy Ladurie 1967/1983; Alexandre 1987; Pfister, Kleinogel, Schwarz-Zanetti and Wegmann 1996; Pfister, Luterbacher, Schwarz-Zanetti and Wegmann 1998; Schwarz-Zanetti 1998.

¹³ Matthew 27, 51. In the *Annales S. Stephani Frisingenses* (*Annals of Freising/Bavaria*) the earthquake of 1348 is described as 'the largest since the passion of Jesus Christ' ('est factus terre motus tantus, qui a passione Christi numquam auditus vel visus est aut fuit').

¹⁴ Book of Revelation 6, 12; 12, 19; 16, 18.

¹⁵ Bonito 1691 and others.

¹⁶ For general literature see Berlioz 1998, 9–11 and 197–8 (with numerous references in his footnotes). For the regions of Austria and northern Italy see Postpischl 1985 (for Italy); Pautsch 1953 and Eisinger 1987 (both collections of the written sources); Gutdeutsch, Hammerl, Mayer and Vocolka 1987; Berg 1990; Lehner 1995, Hammerl and Lenhardt 1997 (all for Austria). At the Eidgenössische Technische Hochschule Zürich (Swiss Federal Institute of Technology Zurich) the compilation of seismological catalogues is sponsored by the Schweizerische Erdbebendienst (Swiss Earthquake Prevention Service). See Wechsler 1987 on the tremendous Basel earthquake of 1356 and the forthcoming studies by Gabriela Schwarz-Zanetti (Middle Ages) and Monika Gisler (Early Modern Times).

¹⁷ Hann 1892 (historical study); Till 1907 (geo-morphological study); Görlich, Tauscher and Wurzer 1948 (historical study); but also Neumann W. 1971/1985, 1987/1995, 1988/1995 (all historical studies); Neumann D. 1988 (geo-morphological study).

¹⁸ Borst 1981. For his mentality-bound approach to environmental history see also Borst 1974/1988. In some cases, but unfortunately not strictly enough, Lehner 1995 also tried a similar approach (on natural disasters in general).

¹⁹ Borst 1974/1988, 477.

²⁰ Hammerl 1992. Her subtitle is 'reconstruction of a natural event'.

²¹ Hammerl 1992: 154-246.

²² On fear in history see Delumeau 1978 (for the Late Middle Ages and Early Modern Times), but also Naphy and Roberts 1997 (for Early Modern Times) and Angel 1996.

²³ Only the Mercalli-Sieberg scale (or one of its modifications) can be used for historical seismology: this 12-step-scale classifies the damage to buildings and nature, and people's reactions, whereas the Richter scale, which is mostly used nowadays, measures the energy of the earthquake.

²⁴ Giovanni da Parma I, 12–13: 'duravit iste terraemotus per tantum horae spacium, quod morose dixissem ter Pater et ter Ave Maria'. On the author and his chronicle, concerning the years from 1348 to 1377, see in general Curzel, Pamato and Varanini 2001, including a new critical edition of the text. On the other hand, the author of the *Liber regiminum Padue*, Appendice III (the 'Book of the Reigns in/of Padova', Appendix III) felt that the earthquake lasted about half an hour ('duravit per dimidium horae'), a fact which is also testified to by Guglielmo Cortusi, *Chronica de novitatibus Paduae et Lombardiae* 8, 14.

²⁵ Hammerl 1992, 47–99.

²⁶ Hammerl 1992, 40–46 (including three illustrative maps). Heinrich von Herford, a Dominican monk from Minden in northern Germany, may serve as an illustrative example of how dissemination worked. His report in the *Liber de rebus memorabilioribus* (The Book of Really Memorable Things) is based on a letter, written by the Dominican convent of Friesach in Carinthia to the prior of the Dominican province of Germany.

²⁷ Giovanni da Parma I, 16.

²⁸ The anonymous notes on natural disasters in the years between 1348 and 1356 are preserved in MS Munich, Bayerische Staatsbibliothek clm 903, fol. 9. The report on the earthquake of Villach is based on the accounts of three merchants staying in Villach, including the remark that four of their journey-men had died ('und daz hat gesagt her Heinrich der Sterner, der dieweil in der stat vervallen was, er und der Stokcher von Prag, und ir gesellen starben vier pey in, und Hainrich Pawmburger'). Andreas von Regensburg leaves out the names of the eye-witnesses, but his report follows these accounts without any doubt.

²⁹ Albert von Strassburg: 'am tag S. Pauls bekerung ist ein allgemainer grosser erdbide geschehen, von welchem her die leut den schwindel, schuettel oder schueß im kopff litten'. On the author see also Hammerl 1992, 154–5.

³⁰ *Annales S. Stephani Frisingenses ad a. 1348*: 'Vidimus ... homines hac hora quasi amentes capita dolentes, euntes in via errantes, stantes stare non valentes'. The verb 'vidimus' favours the interpretation that the author refers to the situation in Bavaria. Hammerl 1992, 83, however, thinks of a record concerning the epicentre. On the other hand, a marginal note of Johannes de Lene to the 'Statuti di Mozzanica' (the 'Statutes of Mozzanica in Lombardy') may serve as another proof of panicked reactions both in the epicentre and in the periphery: men fell down on the floor, shivered by tremendous fear ('homines in terra cadebant expauriti de timore magno'). See also Petrarch's observations in note 32 below.

³¹ Giovanni Villani, *Cronaca* 12, 123-124: 'ma per dire il vero e non errare nel nostro trattato, si ci metteremo la copia della lettera che di la ne mandarono certi nostri mercatanti, degni di fede, il tenore della quale diremo quo appresso, scritta e data in Udine del mese di Fabbraio 1347 [= 1348 according to the Roman calendar] ... per gli quali miracoli e paura, i prestatori a usura della detta terra convertiti a penitenza, decidono bandire, che ogni persona ch'avesse loro dato merito e usura, annessa a loro per essa; e

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piu d'otto di continuarono di renderla'. The chronicle had been begun by Giovanni Villani, After his death in 1348 it was finished by his brother Matteo.

³² Francesco Petrarca, *Rerum senilium* 9 (10, 2): '... inclinata iam parumper ad occasum die, Italieque simul ac Germanie pars magna contremuit tam vehementer, ut adesse mundi finem inexperti quidam crederent, quibus insueta prorsus, et nunquam cogitata res erat. Verone tunc in bibliotheca mea solus sedens, quanquam non in totum rei nescius, repentina tamen et nova re percussus, 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.'

³³ On the problem of categorizing Petrarch's view of nature, especially when interpreting Petrarch's (fictive?) report on his ascent on Mont Ventoux, see Groh and Groh 1996, 17–77.

³⁴ *Annales S. Stephani Frisingenses* ad a. 1348: 'Audivimus in super ob motum talem campanulas in ecclesiis dependentes se pulsantes'. Giovanni da Parma 1, 8-11: 'fuit unus terraemotus ... tante vehementiae, quod campanille de Sancta Maria hinc inde taliter plicatum fuit, quod campanae quae super ipso sunt a se ipsae pusatae fuerunt'. The records concerning Venice derive from the sixteenth and seventeenth centuries, but seem to be based on medieval sources. On the reports, written by Sanità (sixteenth century) and Gian Carlos Sivos (seventeenth century), see Hammerl 1992, 236 and 238.

³⁵ On this question see also Borst 1981, 537–8 (without any attempt to answer it).

³⁶ Giovanni Villani, *Cronaca* 12, 124: 'E nota lettore, che la sopraddette rovine e pericoli di tremoti sono grandi segni e diudicii di Dio, e non senza gran cagione e permissione di Dio; e sono di quelli miracoli e segni, che Gesu Cristo vangelizando predissa a'suoi discepoli, che doveano apparire alla fine del secolo'. On the remorse of the bankers see note 31 above.

³⁷ Guglielmo Cortusi, *Chronica de novitatibus Paduae et Lombardiae* 8, 14: 'Deus omnipotens, qui non vult mortem peccatoris, sed ut convertatur et vivat, primo miniatur, secundo vero percutit ad correctionem humani generis, non interitum. Volens affligere humanum genus plagis maximis, inauditis, primò in extremis partibus mundi, in orientis plaga cœpit suum iudicium horrendum. Cum vero iam percussisset Tartaros, Turcos, et genus infidelium universum in MCCCXLVIII, die XXV Januarii hora XXIII fuit maximus terræmotus per horam mediam ad terrorem Christianorum'.

³⁸ Giovanni da Bazzano, *Chronicon Mutinense*: 'Dicto millesimo ultima septimana aprilis venerunt Mutinae tres fratres heremitani ordinis sancti Augustini de partibus Alemaniae, qui dixerunt fratribus suis dicti conventus Mutinae et pluribus hominibus civitatis Mutinae quod quaedam civitas quae vocatur Vilach cum XXXX. castellis in partibus Alemaniae et Bavariae omnino dirutae remanserunt et remansit in dictis locis pessumdatis sabulum aquae mixtum [lacuna] et quod pauci in dicto puteo evaserant, et hoc fuit de mense ianuarii proxime elapsi circa finem, et affirmabant ipsi fratres, quia personae dictorum locorum parvam reverentiam focabant (?) sacrae Eucarestiae corporis Jesu Christi et qui in peccato luxuriae maxime et publice morabantur, et aliqui dicebant quod causa dictae roversionis fuerat terremotus qui dicto tempore fuerat sentitus et quasi ab omnibus auditus'.

³⁹ See as one example among others *Die erschreckliche Warnungs-Glocke* from 1690. The large baroque title explains the intention of the book: The tremendous earthquake of 1690 should be seen as a 'warning bell' to turn back from a sinful life. To strengthen his

theory the anonymous author cites several historical examples, amongst them the earthquake of 1348.

⁴⁰ Giovanni Villani, *Cronaca* 12, 124: 'E nella chiesa di San Iacopo di quella citta vi si trovarone morte cinquecento persone che v'erano fuggite, senza gli altri morti della terra, che furono piu delle tre parti degli abitanti'. See also *Continuatio Novimontensis* ad a. 1348 (Continuation of the Annals of Neuberg an der Mürz/Styria). The so-called 'Bozner Chronik' (Chronicle of Bozen/southern Tyrol – Alto Adige) mentions the death of many people during a preacher in the church of the 'parfüsser' (the 'barefooted' or Franciscan monks). On this chronicle, originally deriving from the mid-fourteenth century, see Außerer 1929; Mahlknecht 1996/1997; Riedmann 1999. In the so-called 'Grieser Chronik' (the 'Chronicle of Gries/Tyrol'), which depends on the 'Bozner Chronik' without any doubt, the note on the victims is even specified: there was killed 'a big crowd of women' ('ain hauffen volcks von frauen').

⁴¹ Giovanni Villani, *Cronaca* 12, 124: 'Alla citta di Villacco nell'entrare della Magna vi rovinarono tutte le case, se non una d'uno buono uomo, giusto e caritevole per Dio'.

⁴² Konrad von Megenberg, *Buch der Natur* 2, 33: 'wizz auch, daz der ertpidem vil wunderleicher werch würkt. daz ain ist, daz dike von dem dunst, der auf gêt von dem ertpidem, läut und andreu tier ze stainen werdent und allermaist zu salzstainen und allermaist auf dem gepirg und dâ pei, dâ man salzerz grebt. daz ist dâ von, daz derlai dunst und kraft so stark ist und sô überswenkig, daz si diu tier alsô verkêrt. alsô lêrent die maister von der nâtur, Avicenna und Albertus. alsô sait mir auch maister Pitrolf herzog Fridreichts canzlær in Oesterreich, daz auf ainr hôhen alben in Kärnden wol fünfzig haupt menschen und rinder hie vor ze stainen worden wærn, und daz diu mait noch under dem rind sæz mit ainem hantschuoch, reht als si saz, ê si paideu ze stainen wurden. daz ander ist, daz oft mit dem ertpidem auz der erden varnt üeseln und flammen, die etswâ ain stat oder dörfer und stet verprennent. daz geschihd dâ von, daz daz ertreich inwendig prinnet. daz dritt ist, daz dik in dem ertpidem auz der erden vert vil sandes und staubes, alsô daz er ain ganz dorf versenkt ...'. The story about the transmutation of the milkers into salt pillars became very popular in Early Modern Times via the 'Bayerische Chronik' of the Bavarian Renaissance chronicler Johann Turmair von Abensberg, called Aventin. On the explanations for the earthquake and consequently for the Black Death see also Konrad von Megenberg, *Tractatus de mortalitate in Alamannia* p. 878 (revised version in Latin).

⁴³ Konrad von Megenberg, *Tractatus de mortalitate in Alamannia*, p. 878. On this aspect see also Borst 1981, 543.

⁴⁴ Franz von Prag, *Cronica Boemorum regum* 3, 26; see also Borst 1981, 543.

⁴⁵ Konrad von Megenberg, *Buch der Natur* 2, 33: 'tichtent alt weip, die sich vil weishait an nement'.

⁴⁶ Konrad von Megenberg, *Buch der Natur* 2, 33: 'iedoch will ich der juden poshait nicht värben, wan si sint unser frawen veint und allen christen'.

⁴⁷ Leopold Stainreuther, *Österreichische Chronik von den 95 Herrschaften* ad a. 1348.

⁴⁸ Cherubino Ghirardacci, *Historia di Bologna* 2, 190, but this report should be referred rather to the Black Death than to the earthquake.

⁴⁹ Giovanni Boccaccio, *Decamerone* (introduction and framing story).

⁵⁰ *Kleine Klosterneuburger Chronik* ad a. 1348. The record, possibly compiled by the urban judge Niklas Teim, has been misinterpreted by Borst 1981, 554–5.

⁵¹ *Charters from 1350* (N. 322); 23 June 1353 (N. 394); 9 November 1354 (N. 429); 23 August 1364 (N. 640); 14 May 1376 (N. 809a); 19, 21 and 29 November 1391 (Ns. 978,

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979 and 981). According to a fragment of an estate register ('Urbar') from Bamberg (written before 1358) some domains near Villach remained deserted after the earthquake and Black Death for a longer time. See Neumann 1971/1985, 72-74.

⁵² Charters from 10 January 1351 (N. 340); 1 April 1359 (N. 515); 6 March 1362 (N.590); 30 August 1364 (N. 642); 31 March 1380 (N. 867); 5 May 1392 (N. 986); 8 August 1394 (N. 1008).

⁵³ Charter from 10 January 1351 (N. 340): '... grozzen gotes gewalt und schaden, der an uns und an seiner stat ze Villach von erdpiden und von fewr geschehen ist ...'.

⁵⁴ Goswin, *Chronica monasterii Montis S. Mariae*, p. 135: 'in anno domini MCCCXLVIII [sic!] tanti fuerunt terremotus et tam validi, quod castra, civitates subverterunt, sicut in hodierna die cernitur'. See also *Kleine Klosterneuburger Chronik* ad a. 1348: 'Anno 1348 nach weinacht geschach ain grosser erdpidn in Carnndten in ainer statt, haist Villach. Die zerfiel überal, die rinckmaur leit noch heut des tags im graben' (written around 1428, presumably based on older reports).

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