

The Danube Floods and Their Human Response and Perception (14th to 17th C)

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Introduction

There are hardly any studies on floods in Late Medieval, Early Modern and Modern Austria, except some case studies¹ and concise surveys on natural disasters in general². All studies on climate history only deal with the times from the beginning of systematic measurement of temperature and water level during the second half of the 18th century.³ Therefore, contrary to some neighbour countries, such as Germany,⁴ Switzerland,⁵ and the Czech lands,⁶ any major and more general publication on the history of floods before the 18th century is still missing. This paper will, therefore, also show some major lacunae to be filled by future studies. My habilitation study *People and Natural Disasters at the End of the Middle Ages and in Early Modern Times (13th to 16th c.)*, to be concluded in early 2006, will try to cover the history of the floods prior than 1600 from the perspective of cultural history. The analysis is based on a comparative study of different natural hazards: floods, earthquakes, other natural hazards and risks, including animal plagues, but excluding diseases and epidemics. In this way it may be carved out, which hazards had been experienced as disasters and which had not.

In this paper, emphasis will be given to a “mentality bound approach”, which asks for the perception, interpretation, management and cultural responses to floods. It will be shown that these aspects are influenced rather more by the expectation of floods than by religious beliefs. Contrary to many other natural hazards, such as earthquakes, floods were almost common to people living near the riverside. Towns, located on the banks of a river, were confronted repeatedly with two different “faces” of the water way: the axis of trade and wealth could turn into a threatening enemy, causing enormous or, at least, some damage to their property and their lives.

This study will examine in particular the reactions of the people living close to the Danube River and its catchment area in “Austria” between the 14th and 17th centuries. As climate and weather history of pre-modern times is based on non-objective measurement, it is not easy to get proxy data from records such as “This year happened an extraordinary flood”. So, the following questions have to be answered to contextualize non-objective records:

How did the people experience these floods? How did the specific interpretations of these days look like? Can they be called “irrational” or had the people built up a “culture of flood management”?⁷ How did they manage the floods with the available means? Did the strategies of perception, interpretation and management change within the period from the Late Middle Ages to the 17th century? Were “public reactions”, such as the legislations of city councils, the landlords and the modern state, always equivalent to “individual reactions”? Did people in the cities and in the countryside learn from experience and change their living and working attitudes in the course of consecutive flood events?

Due to the lack of good sources for the 14th to 17th centuries it is necessary to use a combination of methods: I take over results from natural sciences, such as historical meteorology and hydrography, and results from archaeological and geological studies. Then I combine them with an historical analysis of written and pictorial sources, such as narrative sources, charters, economic records, early drawings, and flood marks.

It is also important to define, what has been perceived as a disaster, a question to be solved in historical anthropology. Nature knows only natural events, only human perception makes them disasters. Important determinants for the perception as disaster are:

- the helplessness of people trying to cope with the damage with the available means
- people’s helplessness not only in coping with the events but also in explaining them
- the direct or indirect affliction
- the unexpectedness of the event

One of the central aspects for interpretation is the “mentalities” of the people. I would like to define them as follows: “Mentalities are 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.”⁸

Firstly I will examine the sources concerning the “millennium flood” of 1501. Secondly I try to show that, at least from the end of the Middle Ages, a “culture of flood management” already existed among the people living along the Danube River and its catchment area in Austria. Thirdly, I will focus on the daily life along the riverside by analysing the accounts of the bridge master of Wels (1441-1520). Finally, I try to answer the question, whether the perceptions and interpretations have changed during the Struggle of Confessions in the 16th and 17th centuries.

The “millennium flood” of 1501

In a first step of my examination I will try to find out how people perceived, interpreted and managed the extraordinary flood of 1501. It has been far the largest flood of the Danube River and its catchment area East of Regensburg (Bavaria) during the second millennium. It happened in the middle of August and lasted for about ten days; the flood was mainly caused by heavy rainfall in the whole catchment area of the Danube River.

The sources I use reflect the perception of people who had really been eyewitnesses, for instance the monks in the monasteries of Melk, Göttweig and Klosterneuburg along the Danube River in Lower Austria, but also the municipal accounts from Wels. The sources mostly tell about the damage, but hardly anything about the reactions of the people. One of the few

exceptions is the report of the Annals of Melk on the devastating flood of 1501. The annalist, obviously an eyewitness, wrote:⁹

Hoc anno maxima fuit aquarum inundacio, in vigilia assumptionis Marie inchoans, et durans fere per dies decem. Huiuscemodi gurgitis habundatia in centum annis vix visa fuit similis, quod testatur femina forensis centum et septem etatis habens annos. Frumentum ac fenum a quibusdam reconditum Hystro periit, in agris iam secatum pluvia computruit. Per cunctas urbium opidorumque iuxta Danubium sic largiter gurges aquarum transiit, ut navigabiles existerent. Domos funditus evertit, duas cum familia Mellicum pretereundo versus orientem asportavit. Prata atque pomeria vestivit arena, arboresque deiecit et vineas eradicavit, integra cum horreis stabula, omnisque generis supellectilis substantia defluxit noctuque dieque. Magna denique opida cum villis in tantum debachatus est Danubius, ut unam domum vix vidisses integram. Pars una populi ridebat, pars altera flebat. Hic et in partibus Bohemie innumeris ruptis lacunis, noctu magna pars periit hominum et facti sunt iuxta Abacuk vaticinium homines velud pisces maris. In ecclesiam quoque beate Virginis forensem gurges aquarum introiens, cubitum unum ultra altaria per idem tempus stabat, et sedes cum tumulis subvertendo.

In this year, a very heavy flood happened, which started on the day before the Ascension of Mary and lasted for nearly ten days. Within 100 years, hardly anyone could remember such a high flood, as a 107-year-old woman has testified. The grain and hay, which was just going to be harvested, was destroyed by the Danube, and the just cut grain mouldered after heavy rain. The water streamed through all parts of the cities and fortified places along the Danube River so copiously that they seemed to be navigable. The flood destroyed houses thoroughly, and when it passed at Melk, it carried away eastwards two houses together with their inhabitants. The flood covered the meadows and pastures with sand, threw down trees and uprooted the vines; strong farmsteads with their barns and all kinds of household effects were swept away during the nights and days. Finally the Danube River destroyed so much inside the major towns and villages that hardly any house remained undamaged. One part of the people laughed, one part cried. In Austria and also in some parts of Bohemia a large number of people died in the slough during the night, and they became fish according to the prophecy of Habakkuk. The flood also entered the parish church of the Virgin Mary at Melk and rose to a level one inch higher than the altar; it also destroyed the banks inside and the graveyard.

Besides the reports on the damage of buildings and fields, and besides the reports on people who were killed, two remarks seem particularly interesting: On the one hand, we frequently read that no one, even the oldest people, could remember a disaster like that. On the other hand, what does this unique remark “a part of the people laughed” mean? May we consider a conflict between landlords or a social conflict between peasants and landlords? Was it a kind of gloating? Was it gallows humour that people had to go to church by boat? In antique tragedy, for

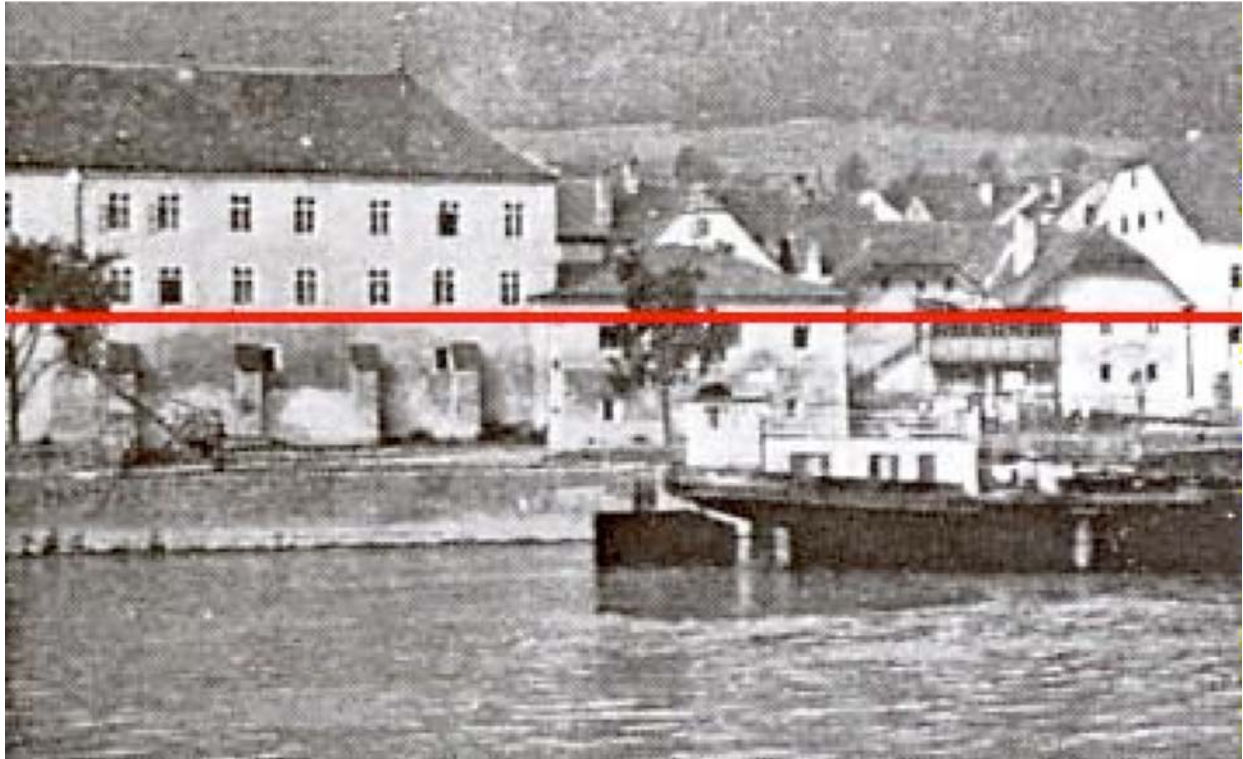
instance, crying and laughing, ridiculous and tragic emotions, were sometimes close together. So, this may be an expression for extreme emotional reactions of the people.

The sources do not contain any rational or irrational interpretations and explanations as to why the flood had happened. On the one hand, we have quite a lot of evidence that people knew well about the different ways a flood could grow. On the other hand, the flood of 1501 was definitely not set into connection with comets or other astronomic signs, such as eclipses.

It is remarkable that these combinations were restricted to only few authors, mostly dating from the 14th century, such as the author of the Bohemian “*Chronica Aulae Regiae*”, who presumably had not been an eye-witness of the floods of the Danube River in the second decade of the 14th century.¹⁰ In the Continuation of the Annals of Zwettl, this explanation is emphasized with reference to Bede the Venerable and other medieval scholars: “The star called comet had been seen for 80 days without interruption. ... It announces either famine or a big disease or high mortality or a change of reign or a corruption of the air or heavy storms”.¹¹ In 1316 and 1317 a large flood, diseases and great famine followed. It is remarkable that in only some of these sources from the beginning of the 14th century floods were compared with the biblical deluge.¹² Reading the Book of Genesis and its report on the great deluge properly, it is remarkable that at the end God promises not to send such a deluge again. Maybe the people living in the 15th century remembered this promise well. Nevertheless, these connections between floods and astronomical signs were quite rare and did not occur frequently in the 15th century. Floods did not need a supernatural explanation, because they were obviously part of nature.

Let me also turn to the management of the floods. We have to distinguish between the economic impact, the impact on settlement, and the mental impact. If we look at the example of Wels, situated along the Traun River in Upper Austria, the flood of 1501 was the only one which changed the economic and social life of the town. Numerous landowners and peasants left their meadows, woods and orchards located near the river after they had been totally destroyed. Some of them were given up, most of them were sold to other people, but the flood also built new islands in the river, which became cultivated quickly. Although the repairs must have been enormous – we have records about expenses for the craftsmen between August 1501 and March 1502 – the reserve of timber must have been at least sufficient. Only after some consecutive disastrous floods in 1503 and 1508, did good timber become extremely rare and far more expensive.¹³

During the devastating flood of 1501 the water level rose far higher than at any time in the second millennium, i.e. about 2 meters higher than in 1954 and in 2002. So, the authorities started to build their tax houses and other buildings for administration on higher ground. The first floor did not contain any windows, as the example of Engelhartzell in Upper Austria shows. The old toll house bears a historical flood mark from 1501 close under the roof. The new toll house, however, built in the 16th century, would have survived even the flood of 1501 without major problems.



Fig, 1. Engelhartzell, Upper Austria, photography, 1954 (taken from Siegfried Schwarzl, *Die Hochwasserbedrohung Wiens. Elementarereignisse an der Donau im Rahmen der Klimaentwicklung (Wetter und Leben, Sonderheft 4), Österreichische Gesellschaft für Meteorologie, Vienna, 1956, 2*). The red line shows the water level of 1501 according to the flood mark under the roof of the old toll house (in the middle). The new toll house, built after 1501, is on the right.

Finally, is there any possibility to get a view of the mental management of the floods? It is remarkable that after the big flood of 1501 people started to mark the level of the water. These flood marks can be found mostly on toll houses and other buildings of public administration, on town gates near the riverside, and also on private houses. In some cases, such as in Passau and in Linz, these water level marks are quite elaborate. The still-existing marble slab of Linz tells in Early Modern German and in humanistic Latin about the flood. Only the birds have been eyewitnesses, sitting on top of the roofs.¹⁴

*Hiermit disen stain beczzeichene stat
wie hach die Donaw geraichet hat
Das ist beschiehen im Monet Augusti
bey Regirung Römischen kunig Maximiliani
Da von Cristi gepurde ergangen war
Tawsennt funfhundert und ain Jar*

The place, which is marked with this stone, shows how high the level of the Danube River had been. This has happened in the month of August under the reign of the Holy Roman king Maximilian, in the year 1501 after Jesus Christ was born.

*SVM NOTA QVANTA FVIT VNDARVM CONSPICE MOLES
PALVSTRIS VATES CVIVS AVIS FVERAT
QVE TANTO SEDIT MESTISSIMA TEMPORE TECTIS
DILVIVM QVANTO TEMPORE TRISTE FVIT*

Look, I am the sign, how much the flood has been,
whose witness has been a bird from the swamp,
which sat just in this very sad time on the roofs,
when the sorrowful flood happened.

We have to consider that a kind of memory culture helped the people to cope with the disaster. On the one hand, any new flood mark lower than the maximum of 1501 could give the feeling that it had been even worse some time ago. On the other hand, the knowledge that nobody could remember a similar flood could serve as consolation.

In addition to that, it is maybe no surprise that one of the oldest views of Linz, a pen-and-ink-drawing (Figure 2), shows the city during a big flood. The drawing must have been made between 1497 (the privilege for a bridge) and 1509 (a great fire).¹⁵ So, it is very likely that it depicts one of the major floods around 1500, maybe the one from 1501, 1503 or 1508.

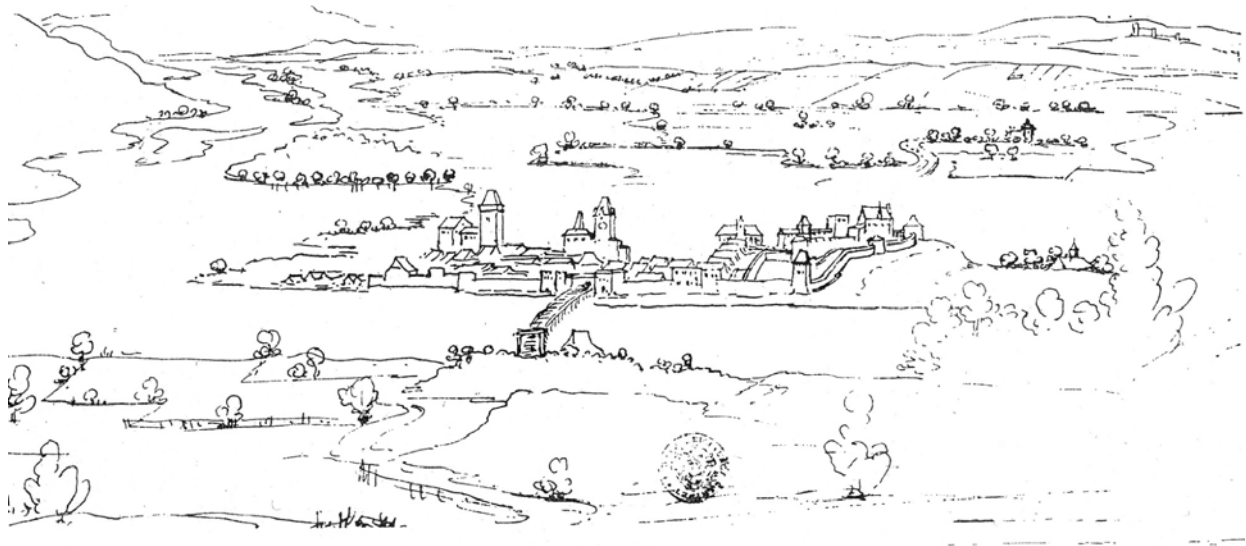


Fig. 2. Linz, Upper Austria, during a flood of the Danube River, pen-and-ink-drawing by Wolf Huber (?), around 1500/1510. Mayrhofer and Katzinger date the drawing to about 1550.¹⁶

At the End of the Middle Ages: a Culture of Flood Management

The question still remains: is it possible to reconstruct and contextualize “natural disasters” without reconstructing the “normal”. Which natural hazards have been experienced as disasters, and which not? Has there been a “culture of flood management” or did people only experience a flood as a disaster if the warning and prevention system did not work?

Nearly all floods happened either in February and March during the snow-melt or in summer between June and August after heavy or continuous rain. It was, therefore, worth reporting, if a flood hit the people unexpectedly. It seems to me that remarks like “*inopinata inundatio*” (an unexpected flood) meant that a doubtlessly existing system of warning and prevention did not work. I suppose that there had existed such a system especially among the monasteries along the Danube River, but also via merchants. People knew that a flood on the Danube in Lower Austria could also be caused by heavy rain in Tyrol or Salzburg. It is remarkable that records about men and animals killed mostly occur in connection with the remark that the flood came unexpectedly. We may presume that in case of a warning in time, only buildings and fields were destroyed, but not people. It also seems that a specific constellation of the stars had been rather felt as a disaster (= Greek: corruption of the stars) than a major flood.

The city of Wels, a town with Roman origins, is situated on the Traun River, one of the major affluents of the Danube River in Austria. The river is widely branched out, an ideal place for a bridge, as the copperplate print by Matthäus Merian from 1649 shows. In the 5th century AD floods have been presumably jointly responsible for the decline of the town. A bridge across the Traun River had existed in Roman times, whereas the medieval bridge is testified from the 12th century onwards.



Fig. 3. Wels, Upper Austria, copperplate print by Matthäus Merian (*Topographia Austriae*, Frankfurt 1649)

Looking for a history of the floods of the Traun River, there is much evidence from the charters: Six charters dating from 1352 to 1469 are extant. They were granted by the Habsburgian dukes of Austria, who were also the sovereigns of the city of Wels. To prevent damage from floods and to accelerate the repairs, several privileges were given to the citizens of Wels:¹⁷

- The taxes at the toll house in Wels on salt, wine and textiles were dedicated to the construction of water defenses.
- The tax interests of the citizens of Wels were reduced by the Habsburgian dukes. More money should be spent for dikes and other water defenses.
- The landowners had to admit the construction of water defenses on their properties.
- The landowners, their bondsmen and two large monasteries in the neighbourhood had to assist if damage after a flood had to be removed.

So, normative sources tell us quite a lot about the collective management of floods, but nothing about individual reactions or about the mentalities of the people. The charters can be seen as reactions to presumably disastrous floods, which could not be coped with by available means; regional solidarity was necessary. But one question still remains: is it possible to reconstruct all major floods of the Traun River by analysing the charters of the later Middle Ages? Let me, therefore, turn to another type of source.

The accounts of the bridge master of Wels¹⁸

From the 13th century onwards the office of a bridge master had been established, who was responsible for any repair. According to a series of charters, he received his annual budget from a nearby church. The oldest accounts of the bridge master date from 1350, but a close series of accounts has survived only from 1441 onwards. The accounts contain detailed information about the timber purchase for the bridge and about the expenses for craftsmen to repair the bridge after floods and other damage.

In my recent study from 2004 my main purpose was to carve out the economic impact of the floods between 1441 and 1520 and to ask, how a “culture of flood management” could have worked. The results have been multifarious: Firstly, it shows that the consumption of timber and the expenses for the bridge was enormous. Secondly, I was able to reconstruct how often floods hit the bridge and the city of Wels. I could find records even on major floods, which have not yet been documented through annals, chronicles or other administrative sources. For these results it was rather more necessary to look at the expenses for craftsmen than on the ones for timber.

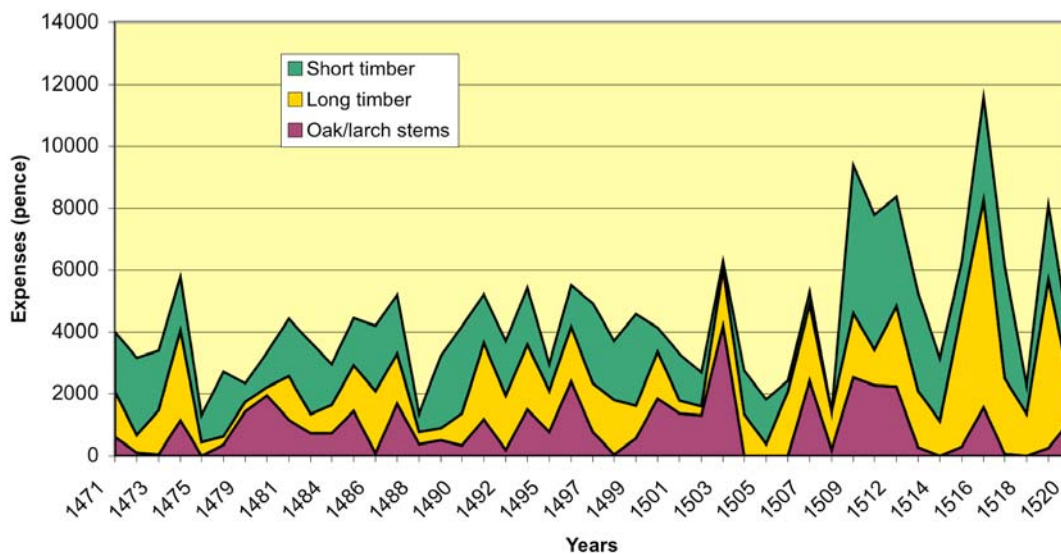


Fig. 4. Expenses of the bridge master of Wels for timber (1471-1520), based on Rohr, 2004, op. cit.

Thirdly, it came clear that the bridge master bought high amounts of timber every year. Due to the frequent repetition of the floods (at least two major ones within a decade), he must have had large dumps, because in the times of a major flood timber was hard to acquire. After a series of tremendous floods in 1501, 1503 and 1508, no oak stems for the piles were available any longer; therefore, larch stems were substituted.

Table 1. Floods of the Traun River, 1441-1520, according to the accounts of the bridge master (Bruckamtsrechnungen) of Wels. Source: Rohr, 2004, op. cit., 310-312.

Year	Month	Floods	Intensity
1441		no flood	
1442	<i>no accounts survived</i>		
1443	June/July	flood with ravages, hail?	strong
1444	June/July	flood?	little
1445	April/May	flood with ravages	strong
1446-1458	<i>no accounts survived</i>		
1459		no flood	
1460	April/May	flood	little
1461	end of August	flood with ravages	moderate
1462	August	flood	little
1463	March / August	ice blocks? flood?	little
1464-1470	<i>no accounts survived</i>		
1469 ¹⁹	February, March	flood with severe ravages	strong
1471	summer	flood?	little
1472	summer	flood?	little
1473	summer	flood?	little
1474	June/July	flood	moderate
1475		no flood	
1476-1477	<i>no accounts survived</i>		
1478	summer?	flood with severe ravages	very strong
1479	April/May	flood	moderate
1480	May/June	flood	little
1481	February	ice blocks?	moderate
1482	January	ice blocks?	moderate
1483		no flood	
1484	June? August?	flood	little
1485	June to September	four floods with ravages	strong
1486	February, May	two floods	moderate
1487	July	flood?	little
1488		no flood	
1489	November	flood with ravages	strong
1490	July	flood	moderate
1491	May/June	flood	little
1492	May	flood with severe ravages	very strong
1493	July	flood	little
1494	<i>no accounts survived</i>		
1495	March	flood?	little
1496	August	flood	moderate
1497	May, June	two floods with ravages	strong
1498	March, August?	flood	moderate
1499	June	flood with severe ravages	very strong
1500	April, May	two? flood with ravages	moderate/strong
1501	July?, August	disastrous flood	extremely strong
1502		no flood	
1503	September	flood with severe ravages	very strong
1504	May	flood	moderate
1505	May/June, August	two floods	moderate
1506	July	flood?	little

1507	August?	flood?	moderate
1508	July, August	two floods with ravages	very strong
1509	fall?	flood?	little
1510	<i>no accounts survived</i>		
1511	July	flood with ravages	strong
1512		no flood?	
1513		no flood	
1514	June, August	zwei floods	little/moderate
1515	summer	flood with ravages	strong
1516	June	flood	little/moderate
1517	July	flood	little/moderate
1518		no flood	
1519	April, June, September	three floods with ravages	strong
1520	August	flood with severe ravages	very strong

The economic impact of the “millennium flood” of 1501 can be reconstructed in great detail: Carpenters and other craftsmen worked from August to December 1501, and again several months in 1502 to repair the bridge. Numerous meadows and orchards along the riverside were destroyed and their owners changed. Perhaps the former owners were killed or moved away. From 1502 onwards, taxes for land on the new banks of the Traun River were paid. Timber, especially oak stems, became rare and expensive

Besides some interesting information on daily life, such as on the butchers huts located on the bridge or on the expenses when the king entered the town, the accounts also provide an insight into a “culture of living with the flood”. When the flood arrived, everybody tried to participate in the restoration of the bridge. If the bridge was interrupted, several carpenters, dozens of servants, and numerous fishermen, who saved the driftwood, tried to construct a provisional bridge within only a few days. In many years, these repairs constituted about 10 to 20 percent of the carpenters’ annual work.

It is worth noting that there are absolutely no records about religious donations or the like, a remarkable detail, because the accounts also contain the income of the nearby church. I could also not find records showing desperation, anger, fear or similar emotions.

A Change of Interpretations during the Struggle of Confessions?

It is hard to get an homogenous idea of the perception, interpretation and management of floods in Early Modern times. On the one hand, numerous private or “official” chronicles and diaries have survived, containing partly detailed records about the weather and natural hazards. On the other hand, we know more about the impact of natural hazards on the religious behaviour of the people. Nevertheless, we have to be cautious to assume that people now perceived disasters more through a religious way than at the end of the Middle Ages. As I have shown before, the prejudice that people in the Middle Ages interpreted floods mostly as a divine punishment cannot be confirmed by most of the sources. We are still influenced too much by the perception of Black Death, which is documented best in the sources. In many cases, if people were living along the riverside, cosmic signs, such as comets, would frighten them, but not floods.²⁰ So we have to look to see if this assumption can also be falsified for Early Modern Times.

In addition to that, as I have pointed out in my introduction, there are hardly any satisfying studies on natural disasters in Early Modern Austria, even though among the authors

of sources with an interest in weather and climate there are also very prominent ones, such as Johannes Kepler, who had lived in Linz for many years at the begin of the 17th century. In his marginal notes he provides detailed comments on the weather in Linz between 1617 and 1626.²¹ Besides Kepler, there are numerous other late Renaissance and Early Modern scientists from the 16th and 17th centuries, who documented both the daily weather and the floods. They were mostly living in the major towns, such as Linz and Vienna, or in the big monasteries along the Danube River and its catchment area.²²

Let me therefore show two different examples for the perception, interpretation and management of floods in Early Modern Times. On the one hand, the case of the city of Laufen and its bridge across the Salzach River, may confirm that most of the structures of a “culture of flood management” did not change within the 16th century.

The wooden bridge of Laufen existed since the 13th century and had been destroyed for many times since 1316; the disastrous floods of 1567, 1572 and 1598 are well documented in the municipal sources. Like in Wels, timber was extremely rare in the time of major floods. Therefore, the citizens of Laufen invested much money and effort to restore the piles and other timber after the bridge had been destroyed. In 1572 the peasants were severely forbidden to take the drifting timber for their own purposes. The city also received 2.500 guilders from the archbishop of Salzburg as an immediate support to rebuild the bridge. Nevertheless, even with this loan, it became extremely difficult to find specialized craftsmen for the reconstruction, because these master builders were needed in the neighbour towns also.²³

The consequences of major floods did not only concern the reconstruction of the bridge, but also the toll to be paid by the passing ships. In “normal” years, about 2500 to 3000 ships passed the dangerous loop near Laufen, mostly carrying salt from the mountains to the Danube area. In 1572, however, when one of the highest floods took place, only 1553 ships came along. 28 ships sank at the local landing stage, whereas in quiet years an average of only two ships were lost.²⁴

The major floods also caused hygienic problems, not only because the streets and the lower floors of the houses were flooded, but also because the supply of drinking water had been interrupted. In 1540, the city authorities of Laufen had built a water-pipe from the village of Oberndorf at the opposite riverside, which led across the Salzach River along the bridge. For emergencies, they had also built up a storage dump for 150 water pipes made of pinewood; the flood of 1572, however, hit this location as well.²⁵ So, we may define the flood of 1572 as a disaster, because all kinds of prevention did not work.

On the other hand, the catholic Counter Reformation was responsible for a thoroughly religious interpretation and management of floods in Austria and Bavaria. The Bohemian saint John of Nepomuk (Jan Nepomucky), who died at the end of the 14th century, became more and more popular not only as the patron of the bridges, but also as a protector against floods. Statues of Saint John of Nepomuk were erected on nearly every bridge, along the riversides and even on rocks inside the river. The boatmen wore amulets of John of Nepomuk, which they bought in Bohemia. Although the statues had been frequently destroyed, they were erected again and again. Only after the disastrous flood of 1899, was the statue of the saint on the rock near the so-called “Vornbacher Innenge” not restored for a long time. In a time of lay culture and industrialisation, the protector against the flood was not popular enough any longer.²⁶ Nevertheless, it is remarkable that the people of the 16th, 17th and 18th centuries looked for the help of a saint against the flood rather than to explain the flood as a divine punishment or the like. Contrary to other natural hazards, the explanations for a flood were clear.

Conclusion

The accounts of the bridge master of Wels give us a detailed insight into the history of floods and their management during the 15th and 16th centuries. Through the expenses for the craftsmen many more floods can be reconstructed than through annalistic or normative sources. Religious explanations and responses for floods are hardly documented. The “normality” of frequent floods is an important explanation, as to why there are hardly any religious interpretations necessary within a “culture of flood management” and why most of the floods are not documented in annalistic sources.

Endnotes

¹ Cf. for example Wacha, Georg, 1959, Zur Wetterchronik des Linzer Raumes, in *Witterung und Klima von Linz*, eds. Friedrich Lauscher, Georg Wacha (Wetter und Leben, Sonderheft 6), Österreichische Gesellschaft für Meteorologie, Vienna, 3-86; Friedrich Lauscher, 1996, Unwetterchronik des Pinzgau, Land Salzburg, seit 1501, *Wetter und Leben, Zeitschrift für angewandte Meteorologie*, Österreichische Gesellschaft für Meteorologie, Vienna, 38, 26-36; Helmut Kretschmer, Herbert Tschulk, 1993, *Brände und Naturkatastrophen in Wien* (Wiener Geschichtsblätter, Beiheft 1), Verein für Geschichte der Stadt Wien, Vienna; Elisabeth Strömmer, 1993, *Studien zur Klimageschichte Österreichs in der frühen Neuzeit, Die Quellen des Stadtarchives Klosterneuburg* (unprinted M.A. thesis), University of Vienna, Vienna; Hans Roth, 1997, Die alte Laufener Salzachbrücke. Das Hochwasser als ständige Gefahr für Brücke und Stadt, *Das Salzfas, Heimatkundliche Zeitschrift des Historischen Vereins Rupertiwinkel*, Historischer Verein Rupertiwinkel e.V, Tittmoning, 31,1, 5-32; Anna Gugerbauer, Ernst Dürr, 1999, *Vom Zorn des Inn, Hochwasserkatastrophen in Schärding und den bayerischen Nachbargemeinden*, Verlag Wiesner, Wernstein; Horst Hieble, Herbert Lämmermeyer, Heinz Schmidbauer, 2003, *Die Salzachbrücke zwischen Laufen und Oberndorf, Von der ersten Erwähnung eines Salzachüberganges im Jahre 1278 bis zur Gegenwart*, Zeitdokumente Horst Hieble, Laufen.

² Lehner, Martina, 1995, *Und das Unglück ist von Gott gemacht ..., Geschichte der Naturkatastrophen in Österreich*, Edition Präsens, Vienna. The chapter on floods between the High Middle Ages and the 20th century covers only 22 pages (57-78); similarly Josef Nussbaumer, 1996, *Die Gewalt der Natur. Eine Chronik der Naturkatastrophen von 1500 bis heute*, Edition Sandkorn, Grünbach; Franz Fliri, 1998, *Naturchronik von Tirol. Tirol – Oberpinzgau – Vorarlberg – Trentino. Beiträge zur Klimatographie von Tirol*, Verlag Wagner, Innsbruck; Frederick Watzik, 1994, Hochwasser, in *Die Donau. Facetten eines europäischen Stromes, Katalog zur oberösterreichischen Landesausstellung 1994 in Engelhartzell*, Amt der Oberösterreichischen Landesregierung, Linz, 63-68.

³ Zisser, Helmut, 1989, *Die Hochwässer der Donau* (unprinted M.A. thesis Vienna), Technical University of Vienna, Vienna; Ingeborg Auer, 1993, *Niederschlagsschwankungen in Österreich seit Beginn der instrumentellen Beobachtungen durch die Zentralanstalt für Meteorologie und Geodynamik* (Österreichische Beiträge zu Meteorologie und Geophysik 7), Zentralanstalt für Meteorologie und Geodynamik, Vienna; Ingeborg Auer, 2001, Reinhard Böhm, Wolfgang Schöner, *Austrian Long-Term Climate 1767-2000. Multiple Instrumental Climate Time Series from Central Europe*, (Österreichische Beiträge zu Meteorologie und Geophysik 25), Zentralanstalt für Meteorologie und Geodynamik, Vienna; Elisabeth Strömmer, 2003, *Klima-Geschichte. Methoden der Rekonstruktion und historische Perspektive. Ostösterreich 1700 bis 1830* (Forschungen und Beiträge zur Wiener Stadtgeschichte 39), Verlag Deuticke, Vienna.

⁴ Glaser, Rüdiger, 2001, *Klimageschichte Mitteleuropas. 1000 Jahre Wetter, Klima, Katastrophen*, Wissenschaftliche Buchgesellschaft, Darmstadt; generally for central Europe cf. for example Christian Pfister, Rudolf Brázdil, Rüdiger Glaser (eds.), 1999, *Climatic Variability in Sixteenth-Century Europe and its Social Dimension* (Special Issue of Climatic Change 43,1), Kluwer, Dordrecht, Boston, London.

5 Pfister, Christian, 2002, *Wetternachhersage. 500 Jahre Klimavariationen und Naturkatastrophen (1496-1995)*, Verlag Paul Haupt, Berne, Stuttgart, Vienna, 1999; Christian Pfister (ed.), *Am Tag danach. Zur Bewältigung von Naturkatastrophen in der Schweiz 1500-2000*, Verlag Paul Haupt, Berne, Stuttgart, Vienna, and many of his other studies.

⁶ Brázdil, Rudolf, 1995, Oldřich Kotyza, *History of Weather and Climate in the Czech Lands, Vol. 1: Period 1000-1500* (Zürcher Geographische Schriften 62), Geographisches Institut ETH, Zurich; 1996, Vol. 2: *The Earliest Daily Weather Records in the Czech Lands*, Masaryk University, Brno; 1999, Vol. 3: *Daily Weather Records in the Czech Lands in the Sixteenth Century II*, Masaryk University, Brno; 2000, Vol. 4: *Utilisation of Economic Sources for the Study of Climate Fluctuation in the Louny Region in the Fifteenth-Seventeenth Centuries*, Masaryk University, Brno; 2004, Vol. 5: *Instrumental Meteorological Measurement in Moravia up to the End of the Eighteenth Century*, Masaryk University, Brno, 2002; Vol. 6: *Strong Winds*, Masaryk University, Brno, and many of their other studies.

7 The term “culture of flood management” follows the term “cultures of disasters” introduced by Greg Bankoff, 2003, *Cultures of Disaster. Society and Natural Hazard in the Philippines*, Routledge Curzon, London, New York.

⁸ Rohr, Christian, 2003, “Man and Natural Disaster in the Late Middle Ages. The Earthquake in Carinthia and Northern Italy on January 25th 1348 and its Perception, in *Coping with the Unexpected. Natural Disasters and their Perception*, Michael Kempe, Christian Rohr, eds., (*Environment & History*, Special Issue 9,2), The White Horse Press, Stroud, Isle of Harris, 127-149 [= Rohr, 2003a].

⁹ *Annales Mellicenses*, 1851, *Continuatio Mellicensis ad a. 1501* (ed. Wilhelm Wattenbach, *Monumenta Germaniae Historica, Scriptores 9*, Hanover, reprint Stuttgart 1983, 501-535), 528. On this record see Rohr, Christian, 2004, *Überschwemmungen an der Traun zwischen Alltag und Katastrophe. Die Welser Traunbrücke im Spiegel der Bruckamtsrechnungen des 15. und 16. Jahrhunderts*, *Jahrbuch des Musealvereins Wels*, Musealverein Wels, Wels, 33, 281-328.

¹⁰ *Chronica Aulae Regiae, Pars prima 128*, 1875, ed. Johann Loserth, *Fontes Rerum Austriacarum 1,8*, Vienna, p. 379: *Iste annus Domini 1316 tot in se pestilentias et miseras continet, quod eas audire auris refugit, mens stupescit; in hoc anno, ut supra diximus, cometa quaedam in parte aquiloni apparuit, quae disponente deo plurima pericula nuntiavit, aestatis facta est ex continuatis imbribus tam copiosa aquarum habundantia, quod more diluvii in locis pluribus subverteret aedificia, muros et castra*. See also Pautsch, Eveline, 1953, *Elementarereignisse in den erzählenden österreichischen Geschichtsquellen des 14. und 15. Jh.* (unprinted PhD thesis), University of Vienna, Vienna, 31.

¹¹ *Annales Mellicenses, Continuatio Zwetlensis ad a. 1316*, 1851, ed. Wilhelm Wattenbach, *Monumenta Germaniae Historica, Scriptores 9*, Hanover reprint Stuttgart 1983, 654-669), 659: *Stella que cometa dicitur visa est per continuos LXXX dies; que secundum Bedam et alios doctores ostendat verl famem aut pestilenciam vel mortalitatem vel mutacionem regni vel aeris intemperiem aut ventorum immanitatem*. See also Pautsch, 1953, op. cit., 31.

¹² *Chronica Aulae Regiae* (see note 10); *Annales Sancti Rudberti Salisburgensis, Continuatio Canonicorum Sancti Rudberti Salisburgensis ad a. 1316*, 1851, ed. Wilhelm Wattenbach, *Monumenta Germaniae Historica, Scriptores 9*, Hanover reprint Stuttgart 1983, 819-823, 822: *Item eodem anno ante festum Iohannis baptiste [24th June] et in vigilia eiusdem et*

in vigilia apostolorum Petri et Pauli [28th June] *triplex inundatio tanta aquarum facta fuit, quod quasi particulare diluvium videretur.*

¹³ See in detail Rohr, 2004, op. cit., 308-310 and below.,

¹⁴ On this marble slab see also Werner Kresser, 1957, *Die Hochwässer der Donau*, Schriftenreihe des österreichischen Wasserwirtschaftsverbandes 32-33, Springer-Verlag, Vienna, 11.

¹⁵ Pfeffer, Franz, 1954, Eine Linzer Stadtansicht aus dem Beginn des 16. Jahrhunderts, *Historisches Jahrbuch der Stadt Linz*, Magistrat der Stadt Linz, Linz, 1953, LXXIV-LXXXIX.

¹⁶ Drawing taken from Fritz Mayrhofer/Willibald Katzinger, *Geschichte der Stadt Linz, Volume 1: Von den Anfängen zum Barock*, Verlag J. Wimmer, Linz, 1990, 110). Mayrhofer and Katzinger, however, presume that the drawing was made only around 1550.

¹⁷ On these charters dating from 1352 to 1469 see in detail Rohr, 2004, op. cit., 287-293.

¹⁸ See in detail Rohr, 2004, op. cit.

¹⁹ Flood reconstructed through a charter by the emperor Frederic III (29th March 1469) to the community of citizens in Wels. The flood must be either caused by very much melting water or dates, in fact, from 1468. In September or October 1468 floods are documented for central Germany and the area of Lake Constance, in March 1469 floods also happened in Lorraine and Thuringia. See Curt Weikinn, 1958, *Quellentexte zur Witterungsgeschichte Europas von der Zeitwende bis zum Jahre 1850, Vol. 1: Hydrographie, Part 1,1: Zeitwende-1500* (Quellensammlung zur Hydrographie und Meteorologie 1), Akademie-Verlag, Berlin, 406-407.

²⁰ Rohr, Christian, 2001, Mensch und Naturkatastrophe im Mittelalter. Tendenzen und Probleme einer mentalitätsbezogenen Umweltgeschichte des Mittelalters, in *Umweltgeschichte. Arbeitsfelder – Forschungsansätze – Perspektiven*, eds. Sylvia Hahn, Reinhold Reith (Querschnitte. Einführungstexte zur Sozial-, Wirtschafts- und Kulturgeschichte 8), Verlag für Geschichte und Politik, Oldenbourg Verlag, Vienna, Munich, 13-31; Rohr, Christian, 2003, Der Fluss als Ernährer und Zerstörer. Zur Wahrnehmung, Deutung und Bewältigung von Überschwemmungen an den Flüssen Salzach und Inn (13.–16. Jahrhundert) in *Naturkatastrophen / Catastrophes naturelles*, eds. Monika Gisler, Katja Hürlimann, Agnes Nienhaus (Special Issue of *Traverse. Zeitschrift für Geschichte / Revue d'Histoire* 10, 3), Chronos Verlag, Zurich, 37-49 [= Rohr, 2003b], and Rohr, 2003a, op. cit., 128-129, (focussing on the perception of earthquakes and floods).

²¹ See for example Wacha, 1959, op. cit., 47-62 (with an edition and translation for a part of Kepler's marginal notes) and Strömmer, 2003, op. cit., 12-16, who pointed out, what should be done in research for the future.

²² See Wacha 1959, op. cit., 12-27.

²³ See in detail Roth, 1997, op. cit.; Rohr, 2003b, op. cit., 43-44.

²⁴ Koller, Fritz, 1983, Die Salzachschiffahrt bis zum 16. Jahrhundert, *Mitteilungen der Gesellschaft für Salzburger Landeskunde*, Gesellschaft für Salzburger Landeskunde, Salzburg 123, 1-126, in particular 21-23 with table 2.

²⁵ See in detail Roth, Hans, 1996, Die Anfänge der Laufener Wasserversorgung. Der Bau einer Wasserleitung von Oberndorf in die Stadt im Jahr 1540 und die Zeit bis 1600, *Das Salzfass. Heimatkundliche Zeitschrift des Historischen Vereins Rupertiwinkel*, Historischer Verein Rupertiwinkel e.V., Tittmoning, 30,2, 81-104, in particular 94-100.

²⁶ Dürr, Gugerbauer 1999, op. cit., 176-183.