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Macroseismology in Finland from the 1730s to the 2000s. Part 1: History of the Macroseismic Questionnaire

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Abstract

The present article is the first part of a snapshot of macroseismology in Finland from the 1730s to the 2000s. In the 1730s, more numerous and informative earthquake reports began to appear. Continuing up until the early 1880s, these reports were often by-products of compilations of statistics and weather conditions; afterwards, felt earthquake observations were the objective of specific macroseismic surveys.

During the Swedish era until 1808, earthquake reports are attributed to the developing press, the Royal Swedish Academy of Sciences and the Statistical Office. In the Grand Duchy of Finland, learned societies collected data on different natural phenomena. In the Republic of Finland since 1917, the designing and use of macroseismic questionnaires shifted to the established seismological units.

The designing and dissemination of macroseismic questionnaires constitute the core of macroseismic surveys in Finland. This part focuses on the design. Seven generations of printed macroseismic questionnaires are identified. The first questionnaire in 1882 was designed by a geologist. The second-generation questionnaire was produced by the Geological Commission. In the 1900s, the third-generation questionnaire was owned by the Geographical Society of Finland, the fourth by the seismological station of the University of Helsinki, the fifth by the Sodankylä Geophysical Observatory of the Finnish Academy of Science and Letters, the sixth by the Department of Geophysics of the University of Oulu and the seventh of the Institute of Seismology of the University of Helsinki. At the turn of the 2000s the questionnaire was placed on the Internet.

Keywords: Earthquake, history, macroseismology, questionnaire, Finland

1 Introduction

Macroseismology is defined as the study of any effects of earthquakes that are observable without instruments, such as felt by people, landslides, fissures, knocked-down chimneys (*Aki and Lee*, 2003). Seismologists and civil engineers investigate and document the effects in the immediate aftermath of an earthquake. The macroseismic data obtained make an important contribution to loss modelling by the communities.

Historical macroseismology studies various written documentary materials testifying of the effects of local and regional earthquakes in the past. Many important earthquakes were not captured by strong-motion instruments, but the effects were documented in writing. The textual and contextual information can be utilized in seismicity and seismic-hazard analyses using the rigorous rules of historical research (e.g. *Guidoboni and Ebel*, 2009). Ignoring the written materials would mean a significant loss of infor-

mation. The more extensive seismicity record covering the pre-instrumental era may be helpful in the search for rare earthquakes that have no modern counterparts. In particular, there can be large earthquakes that occur far more seldom than small ones.

The accumulation of macroseismic documentation in a given country is constrained by the literary tradition and level of seismicity. In Finnish conditions, historical macroseismic materials span a few hundred years and are in most cases related to non-damaging earthquakes. Macroseismic activities throughout centuries can be seen as part of collective national heritage; the history of all branches of scientific pursuit should be properly documented. Moreover, knowing how the data were collected leads to better quality control. Also, understanding the circumstances that led to the accumulation and collection of earthquake reports is helpful when assessing the completeness of the non-instrumental seismicity record (e.g. *Stucchi et al*., 2004). Knowledge of the level of data completeness is a prerequisite for analysis of seismic hazard.

Simojoki (1978) reviewed geophysical activities conducted in Finland between 1828 and 1918. The monograph was part of a larger initiative covering several disciplines. *Simojoki* (1978) devoted two pages to seismology and managed to include pre-instrumental data collection following *Renqvist* (1930a), placing emphasis on the seismological compilations in the latter half of the 1800s, as well as the initiative launched to join international seismological monitoring in the early 1900s, and the establishment of the first seismograph station in 1924. *Vesanen* (1952) described the Mainka seismograph in operation in Helsinki. *Korhonen* (1987) summarized sixty years of instrumental seismology in Finland, and *Pirhonen* (1996) reviewed how the seismograph network was improved over a seventy-year period. Detailed information on seismograph maintenance can be found in annual technical reports of the Institute of Seismology (e.g. *Teikari and Suvilinna*, 1989, 1994). *Markkanen* (2000) focused on the beginning of the seismograph station network and the discipline of seismology, and mentioned that the published studies in the non-instrumental era were based on the earthquake data gathering efforts of the Geographical Society of Finland and the Finnish Society of Sciences and Letters.

A special issue of the journal Geophysica in 2001 was dedicated to geophysics in Finland during the 1900s. *Luosto and Hyvönen* (2001) reviewed research on earthquakes and Earth structure as well as development of seismological instrumentation in the country. They gave credit to the descriptive earthquake catalogue of *Renqvist* (1930a). They mentioned the macroseismic studies on the earthquakes of 10 April 1902 (*Rosberg*, 1904) and 1 August 1963 (*Talvitie*, 1971), and a summary of earthquake observations in the Finnish territory between 1904 and 1911 (*Rosberg*, 1912). *Kozlovskaya et al*. (2016) discussed seismic instrumentation maintained at the Sodankylä Geophysical Observatory of the Finnish Academy of Science and Letters, since August 1997 of the University of Oulu.

Thus, information on instrumental seismology in Finland is readily available from several sources, whereas the non-instrumental part is covered less systematically. The published articles on local and regional earthquakes in the 1800s and early 1900s have been catalogued, but no previous comprehensive and consistent history of macroseis-

mology is available. The two-page review of earlier works by *Renqvist* (1930a) has been the master source reference. *Mäntyniemi et al*. (2004) reviewed the scope and practices of macroseismology in northern Europe. They listed many published historical articles in Fennoscandia and the Baltic countries, but did not provide detailed information on any country. *Mäntyniemi* (2009, 2011, 2013) used literature, newspaper clippings and archived documents to learn about data collection efforts in the 1700s and the first macroseismic questionnaires in Finland in the 1800s, but reported in Finnish. The present study largely relies on these three works to describe macroseismic activities until the end of the 1800s. The collected macroseismic materials, scattered in the archives and storerooms in Helsinki, Oulu and Sodankylä, are the basis for the narrative of the 1900s. Background information given in the annual reports of seismological units is also utilized.

The present work attempts to provide a snapshot of macroseismology in Finland from the 1730s to the 2000s. In the 1730s, more numerous, systematic and informative earthquake reports began to appear. Earlier reporting was very sporadic, and the writer typically reported ground shaking at his place of residence. The *Regia Academia Aboensis* in Turku (Fig. 1), at that time the only institution of higher education on Finnish territory, was getting over the stagnation caused by the Great Northern War between 1700 and 1721 and the Russian occupation of Finland from 1714 to 1721. *Gustafsson and Rydén* (2010) regard the year of 1732 as an important turning point in Swedish press history, after which newspapers and magazines made great strides. The Royal Swedish Academy of Sciences was established in 1739 and started publishing its *Proceedings*. Empirical methods gradually became prevalent in scientific activities.

Systematic collection of information on earthquake effects constitutes the core of macroseismology. Seismologists distribute questionnaires and conduct field studies following an earthquake to obtain a comprehensive view of its consequences. Thus, the history of macroseismology in a given country is in essence concerned with the macroseismic surveys carried out at different times. This part of the snapshot focuses on the design of macroseismic questionnaires in Finland. However, first the history of the press is outlined (section 2). The newspaper press was not created to serve scientific purposes, but it provides a very important means of communication. Contemporary newspaper reports are valuable sources of information, especially for earthquakes for which no systematic macroseismic surveys were conducted. They may also augment the information obtained using questionnaires. Appeals for earthquake observations can be distributed to the general public with the help of newspapers. Section 3 describes the questionnaires, and section 4 discusses how the collected macroseismic data benefit seismicity and seismic-hazard analyses. The second part of the history of macroseismology in Finland focuses on the dissemination of macroseismic questionnaires and their respondents.

Fig. 1. Location of places mentioned in the text. Thin lines denote present-day national borders.

2 Features of the newspaper press in the different eras

This section outlines the development of the number, language and circulation of newspapers as well as the geographical distribution of towns publishing newspapers during the time period under study. Before domestic newspapers, Fennoscandian earthquakes were typically attested to by a single written source. Earthquake reporting bene-

fitted from an increasing press, as several descriptions of one earthquake could be published. A drawback is that the identity of the reporter became more complicated to trace.

2.1 Newspaper press in the Kingdom of Sweden until 1809

The year 1645 marked the beginning of the press in the Kingdom of Sweden (including Finland), but for a long time the newspapers almost exclusively reported on foreign affairs. The year 1732 was a turning point, as the number of newspapers started to increase and the quality of reporting improved. The 1730s were dominated by essay papers, some of them short-lived. However, the closing of some publications did not pose a threat to the existing Swedish press (*Gustafsson and Rydén*, 2010). Local newspapers began to be established outside the capital, Stockholm, in the 1750s. The first of them were published in important towns in the south, such as Gothenburg, Karlskrona and Norrköping. They sometimes included local news stories.

A landmark in the reporting of earthquake effects was the newspaper *Inrikes Tidningar* ("Domestic Papers"). The first issue on 26 November 1760 included the first editorial agenda of a Swedish newspaper. It consisted of ten items to be covered. The fifth item is of particular interest for seismology. It included fortunate and unfortunate incidents to people, unusual weather affecting farming and other livelihoods, unbearable cold or heat, flooding or lack of water or snow, fires and shipwrecks, effects of thunder, hail and severe storms and whatever else noteworthy may occur in nature (*"...samt hwad mera märkwärdigt i Naturen förekomma kan"*). Earthquakes were not specifically mentioned, but attention was paid to a wide range of natural phenomena.

Many letters inspired by the fifth item of the agenda began to be sent from the countryside to *Inrikes Tidningar*. For example, a report on local earthquake effects was published on 9 March 1761. It originated from the town of Härnösand on the Gulf of Bothnia where the earthquake was felt on 24 January. Many earthquake reports followed over the years.

Inrikes Tidningar held the leading position of domestic news coverage and also managed to cover distant parts of the country in its reporting (*Gustafsson and Rydén*, 2010). In 1791, the Swedish Academy, established in 1786, became the sole owner and publisher of the newspaper. *Inrikes Tidningar* was merged with *Stockholms Post-Tidningar*, the other newspaper of the Academy, in 1821.

Figure 2 shows the number of new publications in Stockholm and elsewhere in the Kingdom of Sweden each decade between 1732 and 1809. Many newspaper titles did not survive long. Limitations on the freedom of the press diminished the number of publications after the age of Enlightenment came to an abrupt end in 1772.

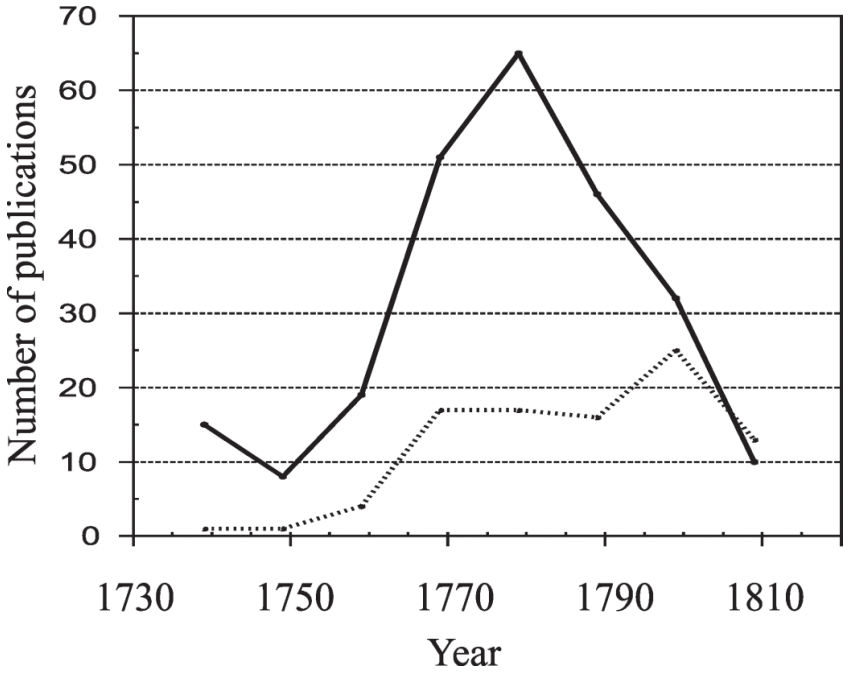

Fig. 2. The number of newly established publications in the Kingdom of Sweden (including present-day Finland) per decade between 1732 and 1809. The solid line shows the number of publications in Stockholm and the dotted line publications elsewhere in the country. Data source: *Gustafsson and Rydén* (2010, p. 33, 47).

2.2 Newspaper press in the Grand Duchy and Republic of Finland

As a consequence of the war of 1808–1809, the eastern part of the Kingdom of Sweden, Finland, became an autonomous Grand Duchy under the Russian tsar. A transformation of the press in Finland began, because state affairs could no longer be published in Stockholm. A newspaper was established in Turku during the Swedish era in 1771, and Turku remained the only town publishing newspapers in Finland throughout the 1810s. It was devastated by fire in 1827, which contributed to its losing the leading position as a press town. Helsinki became the national capital in 1812 and gradually the capital of the press as well. The university was moved to the new capital in 1828 and was renamed the Imperial Alexander University.

The 1860s were the first flourishing decade for the Finnish-language press with 15 established titles (*Stark*, 2013). In the latter half of the 1800s, typical sources of earthquake reports were the columns Letters from the countryside and domestic news sections. The Letters columns served macroseismology well, because ground shaking provided something out of ordinary to report. The motivation of the writers was to inform contemporaries and to tell them that no damage was sustained (*Mäntyniemi et al.*, 2011).

In the Republic of Finland, independent since 1917, the local press started to grow significantly in the latter half of the 1920s (*Aalto*, 1985). A local newspaper has a circulation within one to two municipalities, or part of a municipality. The news desk was often situated in the church village, and the publication threshold relatively low, so the local press was almost tailored for observations of lesser ground tremors. However,

large national newspapers could also cover interesting local news, contributed by correspondents.

Figure 3 illustrates how the numbers of Finnish- and Swedish-language newspapers and issues per week changed in the Grand Duchy and Republic of Finland until the mid-1900s. Many newspaper titles were short-lived, but new ones were established. Obviously, not all newspapers were equally likely to publish earthquake reports.

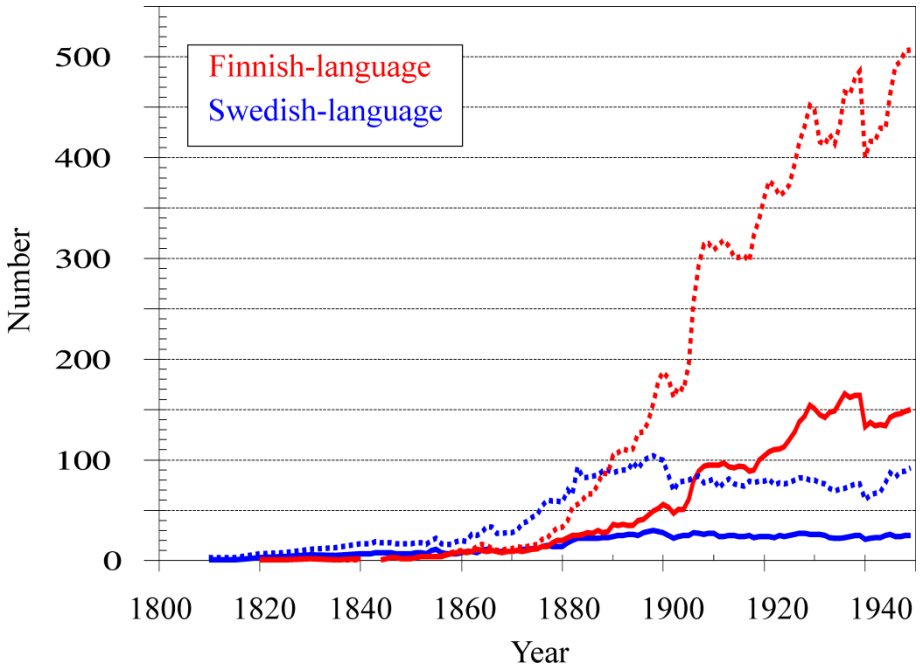

Fig. 3. The Finnish- and Swedish-language press in the Grand Duchy of Finland between 1810 and 1917 and in the Republic of Finland between 1917 and 1949. Solid lines denote numbers of newspaper titles and dotted lines issues per week. Until 1840 the numbers are given for every five years, from then on for every year. Data sources: *Tommila* (1988, p. 215) for the years 1810–1859, *Landgren* (1988, p. 282) for 1860–1889, *Leino-Kaukiainen* (1988, p. 445) for 1890–1905, *Nygård* (1987, p. 17) for 1906–1917, *Salokangas* (1987, p. 204, 205) for 1917–1939 and *Perko* (1988, p. 75) for 1940–1949.

Figure 4 shows the towns publishing newspapers that yielded initial accounts of the earthquake of 5 November 1898 (local time) that was felt widely in northern Sweden and Finland (reproduced from *Mäntyniemi*, 2008). Initial accounts were published in 21 newspapers in 13 towns. All newspapers inside the area of perceptibility as well as some large national newspapers in the capitals and some regional newspapers published them. The figure does not illustrate how the initial accounts were copied and repeated from one newspaper to another.

3 History of the macroseismic questionnaire

This section focuses on systematic macroseismic data collection involving an authority and/or a questionnaire format. The investigated time interval can be divided into

two parts: earthquake reports that appeared as by-products of statistics compilations and natural scientific observations until the 1880s, and, from then on, earthquake reports that were the objective of specific macroseismic surveys.

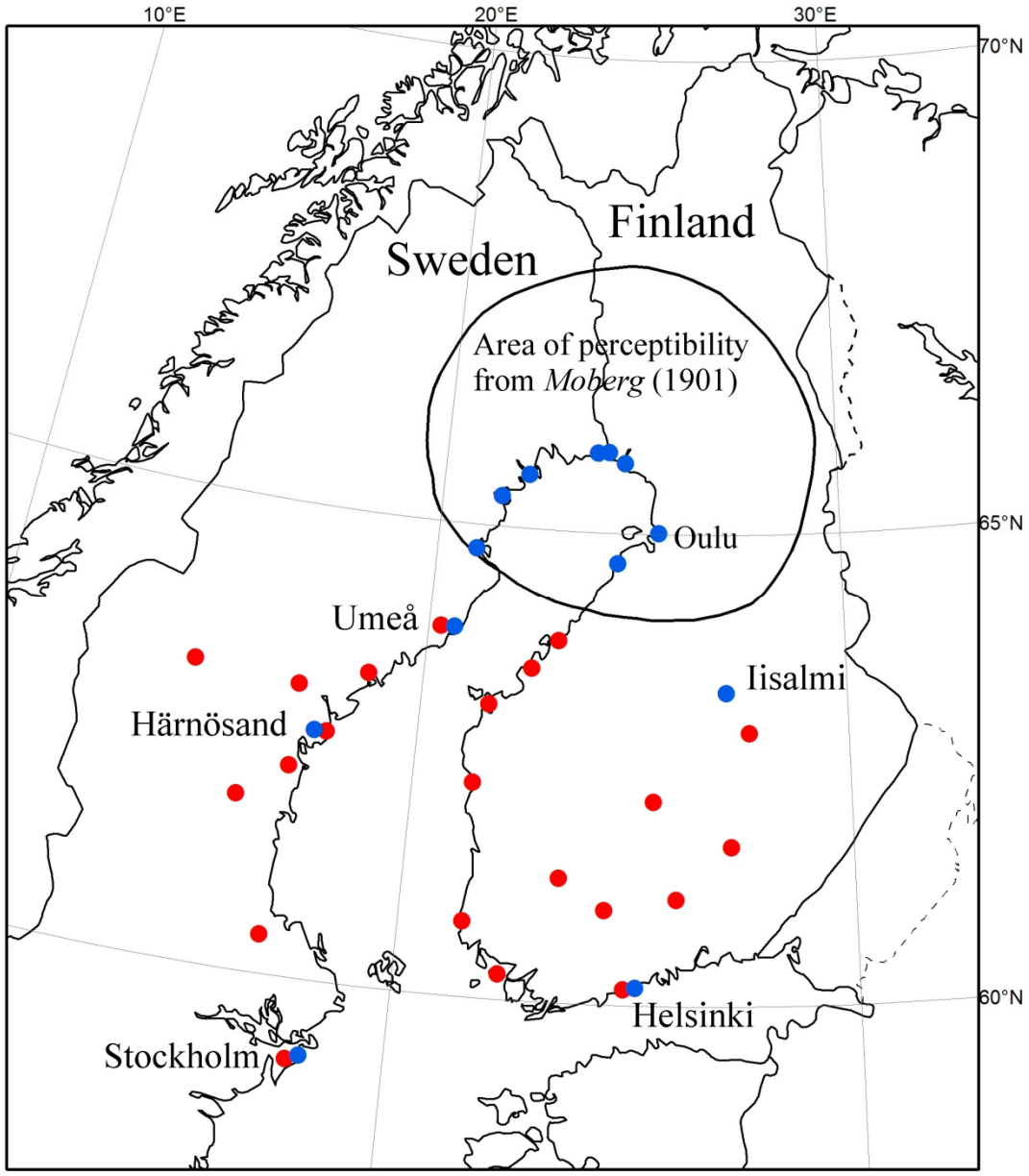

Fig. 4. Towns that published newspapers in Finland and northern Sweden at the end of 1898. The blue circles denote towns where newspapers published initial accounts of the earthquake of 5 November 1898 (local time), and the red circles denote towns where newspapers did not publish them. The area of perceptibility according to *Moberg* (1901) is shown. The solid lines are present borders, and the dashed lines indicate borders at the time of the earthquake. The figure does not illustrate how the initial accounts were copied and repeated from one newspaper to another. Reproduced from *Mäntyniemi* (2008).

3.1 Early systematic data gathering efforts

The law on the church enacted in 1686 by the Swedish parliament (*Riksdagen*) provided that rare incidents taking place in the parishes should be included in the annual

bookkeeping. Vicars were obliged to attend to the reporting. The requirement was particularly beneficial to seismology in the following century, when the Statistical Office (*Tabellverket*, a predecessor of Statistics Sweden) was established in 1749. The first version of a questionnaire format was introduced shortly thereafter, and included an item for unusual natural phenomena. *Sidenbladh* (1908) found over one hundred notifications of earthquakes among the information obtained with the help of the questionnaire in Sweden, including Finland, from 1749 to 1801 and in Sweden from 1821 to 1859.

The Royal Finnish Economic Society (*Kungliga Finska Hushållningssällskapet*) was established in Turku in 1797. *Renqvist* (1930b) vividly described the Society's secretary Carl Christian Böcker (1786–1841) and his attempts to collect useful information about the Finnish territory. He designed a questionnaire having a total of 361 items to be covered; among them was also a question about observed earthquakes (*Renqvist*, 1930a). The questionnaire was distributed to the bailiffs in different parts of the country in October 1834. The ambitious survey did not proceed as planned, and no usable seismological results were obtained.

The Finnish Society of Sciences and Letters (*Societas Scientiarum Fennica*) was established in 1838. In the 1840s it organized an observational network to collect information on different geophysical phenomena such as weather, Earth magnetism, the aurora borealis and changes in sea levels (*Markkanen*, 2000). The responses contained information on other natural phenomena as well: *A. Moberg* (1855) extracted several notifications of earthquakes between 1842 and 1850 from the collected documentation.

3.2 Introduction and established use of macroseismic questionnaires

The macroseismic questionnaires in use in Finland from 1882 until the beginning of the 2000s are reviewed. The questionnaire designs are grouped into distinct generations according to the responsible institute. The generations do not cover equal time periods, and may include different modifications of the design. They may be successive or in parallel with each other. The institutes have both material and immaterial ownership of the macroseismic surveys they conducted.

3.2.1. Geologists in the service of macroseismology

The beginning of systematic macroseismic surveys in Finland can understandably be attributed to strong earthquakes. Two earthquakes were felt widely at the northern end of the Gulf of Bothnia on 15 and 23 June 1882. They came as surprises in the province of Ostrobothnia, and were for a time suspected to be unprecedented events.

The earthquakes inspired geologist Hjalmar Gylling (1858–1889) to collect firsthand observations using a macroseismic questionnaire. Gylling acted on his own initiative, and may or may have not been aware of the efforts of the Geological Society of Sweden to intensify the collecting of information on earthquake effects in that country. An appeal for more data collection was published in the Swedish press at the beginning of the year (*Mäntyniemi and Wahlström*, 2013).

The questionnaire Gylling designed included four items (Fig. A1 in the Appendix). Gylling emphasized describing in detail the sensation of shaking and roaring (item I). He wanted to estimate the strength of the events on the basis of the effects observed (item II), which corresponds to the idea of macroseismic intensity (see Discussion). The duration of the phenomenon was inquired about, and it was urged that the clock used be compared with the one in the town square or telegraph office (item III). Particular characteristics of cracks and fallen objects, as well as the swinging of lamps and similar objects, were seen as indicative of the direction of the ground movement (item IV).

Swedish terminology existed at the time, but Hjalmar Gylling had to create translations into Finnish to have the questionnaire in both languages. The two versions were not entirely alike. He asked newspaper editors to find space for the survey, and in August 1882 the questionnaire was printed in six Finnish- and eight Swedish-language newspapers (listed by *Mäntyniemi*, 2009). The respondents could send their reports to Gylling in Helsinki postage free. Gylling also had questionnaires printed, and distributed them to affected areas. With a few dozen replies the survey could be considered a success.

The second-generation questionnaire is linked to the first in terms of responsible persons. It is attributed to the Geological Commission, established in 1885 (a predecessor of the Geological Survey of Finland), when its first director Karl Adolf Moberg was in charge of macroseismology. He had a personal interest in the matter, even a sense of duty: his father Adolf Moberg had prepared a list of earthquakes in Finland between 1842 and 1850 (*A. Moberg*, 1855; section 3.1), and geologist Hjalmar Gylling was an employee of the Geological Commission for about four years before passing away early in life. Director Moberg completed a publication on the 1882 earthquakes using the data collected by Gylling (*K.A. Moberg*, 1891). He was also keen to follow geological activities in Scandinavia and wanted the Geological Commission to systematically collect information on earthquake occurrences in Finland, because similar work had been undertaken in neighbouring Sweden and Norway. The ultimate aim was to gain insight into the reasons behind earthquake occurrences in the north (Fig. A2).

The design of the second-generation questionnaire was influenced by its Swedish counterpart (described by *Svedmark*, 1889). The Swedish questionnaire included fourteen questions, but Moberg grouped the items differently and ended up with seven. The first four questions dealing with background information were identical to the Swedish ones. The first question concerned the time of observation and its accuracy, the second concerned the province, municipality, village and house where the observation was made, the third asked about the more specific location of the respondent (outdoors or indoors, which floor of the building), and the fourth was a geological addition about the type of soil at the site.

The fifth question concerned the character and duration of the tremor, the number of jolts felt and ground movement direction. The sixth question concerned effects, such as the swinging of objects, pendulums stalling, ground fissures, wall cracks and their direction, and other damage. The seventh question addressed the roar accompanying the tremor. The questionnaire was bilingual. It was successfully used after the earthquake

felt widely in northern Finland and Sweden in the early hours of 5 November 1898 local time (*K.A. Moberg*, 1861, 1898, 1901). Macroseismology at the Geological Commission came to an end in 1901 when Karl Adolf Moberg passed away.

3.2.2 Macroseismic efforts of the Geographical Society of Finland

The Geographical Society of Finland became the next organization responsible for collecting reports of local and regional earthquakes. In 1891, the Senate had exempted the Society from postage to facilitate the collection of information on natural phenomena using questionnaires (Letter 28.10.1891/35). A decision of the Council in 1921 continued the practice (29.6.1921/191). The Geographical Society of Finland used questionnaires to collect information on a wide range of phenomena, among others the thickness of snow and frequency of frost, so macroseismic surveys fit well.

The questionnaire of the Geographical Society of Finland defines the third generation. The questionnaire typically consisted of one sheet in either Finnish or Swedish that was folded twice before mailing, but there was also a small stock of two-sheet bilingual questionnaires. The content of the questionnaire was copied from that of the Geological Commission, thus the first version included seven questions. The content was changed once: the second version included eight questions. The eighth question asked about anything else related to the occurrence. Also, the sixth question was lengthened to obtain a wider range of earthquake effects noticed (Fig. A3). It also asked about people awakened or frightened by the earthquake. The additions made sense, because seismologists need many effects to infer the strength of the ground shaking.

The second version of the questionnaire probably dates from the early 1930s. Both versions were used to collect felt-observations of the earthquakes in central Finland on 16 November 1931. The second version was used more widely: 55.6% of the confirmative observations available for the main shock and 50.5% of those for the aftershock were obtained with it, whereas the respective proportions for the shorter version were 20.0% and 29.3%. Other sources of observations were free-form letters, interviews and the newspaper press (*Mäntyniemi*, 2004). The survey was part of diligent data collection: the Finnish seismicity record includes more earthquakes in the 1930s than in any previous decade.

The Finnish Post and Telecommunications Administration withdrew the Geographical Society's postage exemption at the beginning of 1943 (*Ölander*, 1943). However, one macroseismic survey was carried out postage-free in 1946. The supply of third-generation questionnaires was exhausted mainly during the 1950s by the seismological institutes, but some sheets can be found among the macroseismic questionnaire collections from the early 1960s.

3.2.3 Macroseismology at the seismological stations in Helsinki and Sodankylä

Macroseismic activities were reorganized between 1954 and 1957. It was decided that the seismological station of the University of Helsinki and occasionally the station

at Sodankylä should collect felt observations of earthquakes (*Vesanen*, 1957). There was no new questionnaire at first.

The Ranua earthquakes of 24 December 1956 provide an example of the co-operation between the two stations. The director at Sodankylä had an appeal for observations published in the northern newspapers *Kaleva*, *Lapin Kansa*, *Pohjois-Suomi* and *Pohjolan Sanomat* on 28 December. Many respondents wrote their observations on ordinary sheets of paper fully free-form, or following the numbered questions published in *Pohjolan Sanomat*. A few dozen copies of the remaining third-generation questionnaires were used as well. One school class followed the format of the questionnaire sent to the teacher. The obtained documents were forwarded from Sodankylä to Helsinki for analysis (*Porkka and Vesanen*, 1958).

The fourth-generation questionnaire was designed at the seismological station in Helsinki possibly at the end of the 1950s. It was also in use in Sodankylä, where two earthquakes were felt on 2 and 20 February 1960, and *A. Kataja* (1961) carried out the macroseismic surveys. The new questionnaire included thirteen questions (Fig. A4). The first four questions resembled generations two and three (time and place of the observation), and questions five to eight were concerned with the sensations of tremor and sound. Question nine focused on the effects on people. New aspects were if the phenomenon was noticed by many persons and if the observers were stationary or moving. Also, the behaviour of animals was included. Questions ten to twelve were concerned with effects on objects and the environment, including the rattling of windowpanes and dishes. The last question was about anything else related to the occurrence, such as light phenomena. The older generations of questionnaires had been composed of open-ended questions, but now multiple choices were provided for the soil type (question 4): it could be underlined on a list of alternatives.

The fourth-generation questionnaire did not remain in solitary use for long, because the seismological station in Sodankylä began to use its own questionnaire. The Sodankylä Geophysical Observatory (SGO) is situated about 5 km south of the village of Sodankylä on the eastern bank of the river Kitinen in Lapland (Fig. 1). It was owned by the Finnish Academy of Science and Letters, which was founded in 1908 to provide support to Finnish-speaking researchers. The seismological observatory practice at the SGO dates back to the International Geophysical Year of 1957–1958. Seismograph maintenance began at the end of 1956, and the seismological station was officially established in 1960 (*A. Kataja*, 1962). However, geophysical work had commenced there already at the turn of 1914 (*Halila*, 1987; *E. Kataja*, 1999).

The macroseismic questionnaires of the SGO constitute the fifth generation. They were in use from the mid-1960s to the early 1990s. The first version comprised seven questions on one page (Fig. A5a). It had a new type of design with boxes to tick, but the seventh question about the earthquake effects was open-ended. More attention was paid to the number of observers and level of being frightened by the event. The second version in the 1970s comprised eighteen questions on two pages (Fig. A5b). The change in the number of questions resulted mainly from numbering each item separately instead of

grouping several items into one question. The two versions were also in use in parallel with each other.

3.2.4 From three units to one

Up to three institutes were involved with macroseismology at the same time. Data were collected provincially (*Korhonen and Talvitie*, 1964), and many earthquakes were analysed in co-operation with seismologists from the different units (e.g. *A. Kataja et al.*, 1968). The Geophysical Section (later Department) of the Department of Physics of the University of Oulu, established in 1959, was also involved in the study of seismology. A specific questionnaire was prepared there following an accidental explosion of up to 10 tonnes of ammonium nitrate in the town centre on 9 January 1963. The shock wave broke a high number of windowpanes and otherwise damaged buildings.

The sixth generation of printed questionnaires was owned by the University of Oulu. The macroseismic questionnaire comprised eight questions on one page (Fig. A6a). The respondent could tick the suitable alternatives on lines. The questionnaire bore a resemblance to the concurrent questionnaire of the SGO (Fig. A5a), but the effects on objects were judged to warrant a separate question (number 7). It included rattling of windowpanes, china and glassware as well as creaking of walls, floors and ceilings.

It is understandable that the three seismological units preferred to use uniform questionnaires. There was little new in the content of the new design in the 1970s; the only addition was the type of construction of the building in which the observation was made. The number of questions increased, because many items were treated as separate questions instead of grouping them together. Both the SGO and University of Oulu shifted to the longer questionnaire (Figs. A5b, A6b). The number of questions ranged between 14 and 16. For example, a question about possible recollections of earlier earthquakes was added to the questionnaire in Oulu. The Institute of Seismology of the University of Helsinki used this questionnaire, for example, in the macroseismic survey following the Lappajärvi earthquake in western Finland on 17 February 1979 (Fig. A7a).

The seventh generation of printed questionnaires had the ownership of the Institute of Seismology of the University of Helsinki, which succeeded the seismological station in 1961. The questionnaire stems from the 1980s and included forty-four questions (Fig. A7b). Macroseismic activities came to an end in Oulu in the mid-1980s, which may have had an influence on the new questionnaire. The beginning of the new design was divided in three parts to define the location of observation, type and age of building, and soil type at the site. The fourth part included detailed questions about the observations, and answers could be ticked “yes” or “no” (Fig. A7b). Some of the questions were written differently over the years. The seventh-generation questionnaire was in use almost until the end of the millennium. Macroseismology at the SGO concluded in the early 1990s, so the Institute of Seismology became the only unit responsible for these activities in the country. Observations collected between 1991 and 1997 were pub-

lished in a macroseismic bulletin that also included the last macroseismic surveys of the SGO (*Mäntyniemi and Mustila*, 1998).

A revision of the questionnaire was considered necessary in 1998. The European Macroseismic Scale (EMS98) had been in preparation under the auspices of the European Seismological Commission, and was finally published (*Grünthal*, 1998). The new questionnaire aimed at assessing intensity on the EMS98; therefore, classification factors of the different intensity degrees were emphasized. The focus was on the effects of an earthquake on people and objects (Fig. A8). The questionnaire was in Finnish and Swedish. A new era began at the turn of the 2000s when the questionnaire was placed on the Internet. Prints were distributed after the Kuusamo earthquake of 15 September 2000, but gradually the arena for macroseismic surveys shifted entirely to the Internet. Traditional macroseismic surveys and manual processing of observations into maps and earthquake parameters can be time-consuming. Rapid collection and processing of macroseismic observations were becoming a priority by the end of the millennium because of electronic media (e.g. *Wald et al.*, 1999).

4 Discussion

Information on earthquakes in a given region can typically be found in the respective Parametric Earthquake Catalogue (PEC). The PEC entries include the determined earthquake parameters, such as origin time, location coordinates and earthquake size (magnitude). The end users of PECs may be unaware that determining parameters for earthquakes stemming from the non-instrumental and instrumental eras entail entirely different procedures.

For historical earthquakes, (macro)seismic intensity values are estimated on the basis of documented evidence, and the earthquake parameters are determined using intensity data. The intensities are integers that summarize the effects of a given earthquake observed in different places – the bigger the integer, the more severe the consequences. Intensities are not true numerical data with well-defined properties, which suggests that they can be taken to be ordinal (e.g. *Mäntyniemi et al.*, 2014). Any intensity degree subsumes all degrees beneath it in the hierarchy, and the hierarchy between the levels of an ordinal variable makes it possible to construct an intensity scale. It is a yardstick for classifying the entire range of earthquake effects. They typically have about ten levels. A brief history of intensity scales can be found in *Musson* (2002).

The intensity in a given place is estimated by comparing the actual observations with the criteria for the degrees according to an intensity scale and trying to find a good match between them. Critical textual analysis is needed to extract the relevant earthquake effects from the documentation (such as letters, official compilations, newspaper clippings, macroseismic questionnaires). The seismic intensity does not follow from an instrumental measurement, which may be a reason for the rather pervasive claim of its subjectivity. However, a given earthquake has only one total effect on a given place. The intensity may remain uncertain, if the available documentary material is sparse and lacks detail. For example, it is difficult to infer the strength of ground shaking if the

seismic vulnerability of the damaged structures is unknown. *Musson* (1998) defined the uncertainty of intensity as a measure of how well the data fit the scale, and the quality of an intensity assigned to a historical earthquake as the degree of its correctness. Knowing how the data were collected leads to better quality control of the estimated intensities.

The area of perceptibility of an earthquake can be constructed on the basis of a good geographical distribution of intensity assignments. Its logarithm is related to the magnitude. This is one reason behind the success of magnitude as a measure of earthquake size: it provides a way to quantify past earthquakes. Pre-instrumental magnitudes are based on macroseismic data, and they can be improved by calibrating them against instrumental magnitudes for which the corresponding areas of perceptibility are known. They are important inputs for seismicity and seismic-hazard analyses. More information on the determination of earthquake parameters using seismic intensities can be found in *Bakun and Wentworth* (1997, 1999) and *Gasperini et al.* (2010), among others. The steps in using the felt-earthquake observations collected on the Internet are similar, except that the manual work of times past has been replaced by algorithms and high-speed computers. It is obviously an advantage to be able to rapidly show where an earthquake was felt and caused damage.

Acknowledgements

Airi Kataja shared her reminiscences of macroseismology in the Sodankylä Geophysical Observatory. Pirkko Kaukonen located the macroseismic materials archived there. Riitta Hurskainen and Hanna Silvennoinen uncovered macroseismic materials of the University of Oulu. The library of Parliament assisted in finding the administrative documents related to the Geographical Society of Finland. Kati Oinonen plotted figures 1 and 4. David Whipp made thoughtful remarks on an earlier version of the manuscript. The comments by Björn Lund and an anonymous reviewer greatly improved the submitted manuscript. Lisa Muszynski at the Language Centre of the University of Helsinki revised the English of an earlier version of the manuscript, and John Gage revised sections 3 and 4 of the final version.

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Macroseismic Questionnaires in Use in Finland Since 1882

I. Ilmiön muoto.

a). Järistyksen laatu: hawaittiinko äkkinäisiä katkaistuneita kolauksia, wai jatkautuiko tärähdys yhtämittaa koko ilmiön kestäessä, tai tuntuiko maan liikunto kenties aaltoilewan meren kaltaiselta.

b). Jyrinän laatu: mihinkä sitä lähinnä saattaisi wertailla? Kestikö jyrinää koko järistyksen aikana? Oliwatko jyrinä ja järistys samanaikuiset wai ei?

II. Ilmiön pontewuus.

Löytyykö joitakuita tapahtumia, joidenka mukaan tätä seikkaa woisi arwata. Onko esim. esineitä kaatunut tahi järistyksen kautta joutunut paikoiltaan; onko wahinkoa ja tapaturmaa syntynyt?

III. Ilmiön kestäwäisyys

määrättäköön tarkan punnitsemisen mukaan minuuteissa ja sekunneissa mainitsemalla sitä hetkeä, jolloin järistystä ensin huomattiin. (Tarkkojen asianmääräysten saamiseksi olisi tarpeellista, että aikaa määrättäisiin lähinnä oleman kaupungin tahi sähkölennätin konttorin kellon mukaan. Luonnollisesti on myöskin päiwä, jolloin järistys tapahtui, mainittawa).

IIII. Järistyksen liikunnon suunta

määrätään 1) sen suunnan mukaan, jonka kaatuneet esineet, siellä tai täällä syntyneet halkeamat y. m. owat saaneet; 2) merkitsemällä sitä suuntaa, jota käymästä lakkaneiden seinäkellojen lerkut ennen järistystä heiluiwat; sekä 3) mainitsemalla sen suunnan, johon kattolamput ja ruunut järistyksen kautta joutuiwat liikuntoon.

Toiwoen suosiollista osanottoa olen kiitollinen pienimmästäkin tarkasta ja luotettawasta ilmoituksesta.

Hjalmar Gylling,
Fil. maisteri.
Osoite: Helsinki.

Huom.! Kirjeitä saattaa lähettää kuletusmaksoa suorittamatta.

I. Fenomenets form.

a) Rörelsens beskaffenhet: Förnummos afbrutna stötar, eller yttrade sig fenomenet såsom en jemn skakning eller darrning, eller föreföll det möjligen såsom en wåglik swallning?

b) Ljudets beskaffenhet: Hwad har det närmast liknat? (Är stället, der iakttagelsen skedde, beläget å fast anstående berggrund eller å mäktigare jorbbetäckning?) Har ljudet hörts lika starkt under hela tiden för skalfwets fortgång? Hafwa ljudet och skakningen warit samtidiga eller ej?

II. Fenomenets styrka.

Hafwa några omständigheter förekommit, som kunna gifwa begrepp om denna egenskap: hafwa några föremål omkullslagits eller bragts i rörelse, har någon skada å ett eller annat sätt åsamkats?

III. Fenomenets waraktighet

angifwes i minuter och sekunder med noggrann uppgift om tiden för skalfwets början. (För erhållande af tillförlitliga tidsbestämningar wore en collation af uret med det i närmaste stad eller å närmaste jernwägs- eller telegrafstation nödwändig).

IV. Rörelsens riktning

angifwes genom den riktning kullfallna föremål tagit, genom riktningen hos uppkomna remnor, genom uppgift om swängningsplanets riktning hos pendelur, som stannat, samt hos taklampor och kronor, som kommit i rörelse.

Äfwen den minsta notis, som kan lända till upplysning af det intressanta fenomenet, emottages med tacksamhet.

Hjalmar Gylling,
fil magister
Adr. Helsingfors.

P. S. Brefwen kunna sändas ofrankerade.

1 A

1. The questionnaire designed by geologist Hjalmar Gylling in 1882

Because of the earthquake in western Finland at the end of last June I would like to, in order to obtain a more detailed compilation and possibly a scientific study of its manifestations, turn to the respected general public in the affected localities, request for notifications about it. The circumstances the respondent should mainly pay attention to are as follows:

I. The form of the phenomenon

a) The character of the quake: were sudden separate knocks observed, or did the phenomenon manifest itself as even shaking or trembling, or did the ground movement possibly feel as wavelike heaving?
b) The character of the roar: What could it best be compared to? (Is the site where the observation was made located on rock or a massive layer of soil?) Was the roar heard equally loudly during the quake? Were the roar and quake simultaneous or not?

II. The strength of the phenomenon

Were there any occurrences that would help to infer this aspect? Did, for example, objects tip over or were they shifted, was any damage sustained or did an accident occur?

III. The duration of the phenomenon

is to be given in minutes and seconds with a careful consideration about the onset of the earthquake. (In order to have reliable timings, it would be necessary to compare the clock in the closest town or railway or telegraph station. The day of earthquake occurrence should understandably be given as well.)

IV. The direction of the movement

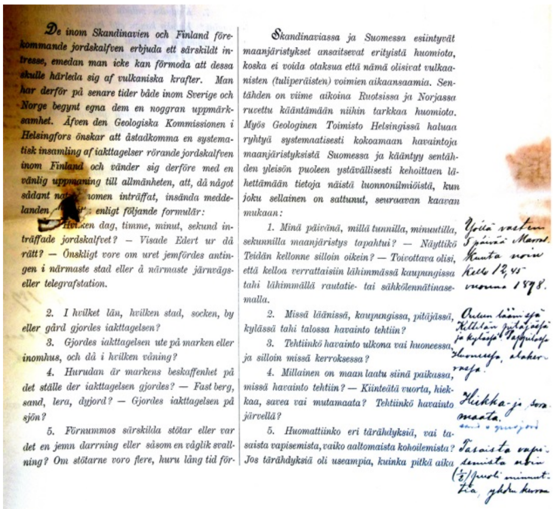
is estimated on the basis of the direction in which objects tipped over, cracks appeared, the pendulums of clocks were oriented before stopping, lamps and chandeliers swung.

Even the smallest notification throwing light on the interesting phenomenon will be received with gratitude.

Hjalmar Gylling, MSc, address: Helsinki

P. S. The letters can be sent without postage.

[Note. The Finnish and Swedish questionnaires designed by Hjalmar Gylling were not phrased entirely identically. The translation combines the two versions.]



De inom Skandinavien och Finland förekommande jordskalfven erbjuda ett särskildt intresse, emedan man icke kan förmoda att dessa skulle härleda sig af vulkaniska krafter. Man har derför på senare tider både inom Sverige och Norge begynt egna dem en noggran uppmärksamhet. Äfven den Geologiska Kommissionen i Helsingfors önskar att åstadkomma en systematisk insamling af iakttagelser rörande jordskalfven inom Finland och vänder sig derföre med en vänlig uppmaning till allmänheten, att, då något sådant na[illegible]omen inträffat, insända meddelanden [illegible] enligt följande formulär:

[illegible] Hvilken dag, timme, minut, sekund inträffade jordskalfvet? — Visade Edert ur då rätt? — Önskligt vore om uret jemfördes antingen i närmaste stad eller å närmaste järnvägs- eller telegrafstation.

2. I hvilket län, hvilken stad, socken, by eller gård gjordes iakttagelsen?

3. Gjordes iakttagelsen ute på marken eller inomhus, och då i hvilken våning?

4. Hurudan är markens beskaffenhet på det ställe der iakttagelsen gjordes? — Fast berg, sand, lera, dyjord? — Gjordes iakttagelsen på sjön?

5. Förnummos särskilda stötar eller var det en jemn darrning eller såsom en våglik svallning? Om stötarne voro flere, huru lång tid för-

Skandinaviassa ja Suomessa esiintyvät maanjäristykset ansaitsevat erityistä huomiota, koska ei voida otaksua että nämä olisivat vulkaanisten (tuliperäisten) voimien aikaansaamia. Sentähden on viime aikoina Ruotsissa ja Norjassa ruvettu kääntämään niihin tarkkaa huomiota. Myös Geologinen Toimisto Helsingissä haluaa ryhtyä systemaatisesti kokoamaan havaintoja maanjäristyksistä Suomessa ja kääntyy sentähden yleisön puoleen ystävällisesti kehoittaen lähettämään tietoja näistä luonnonilmiöistä, kun joku sellainen on sattunut, seuraavan kaavan mukaan:

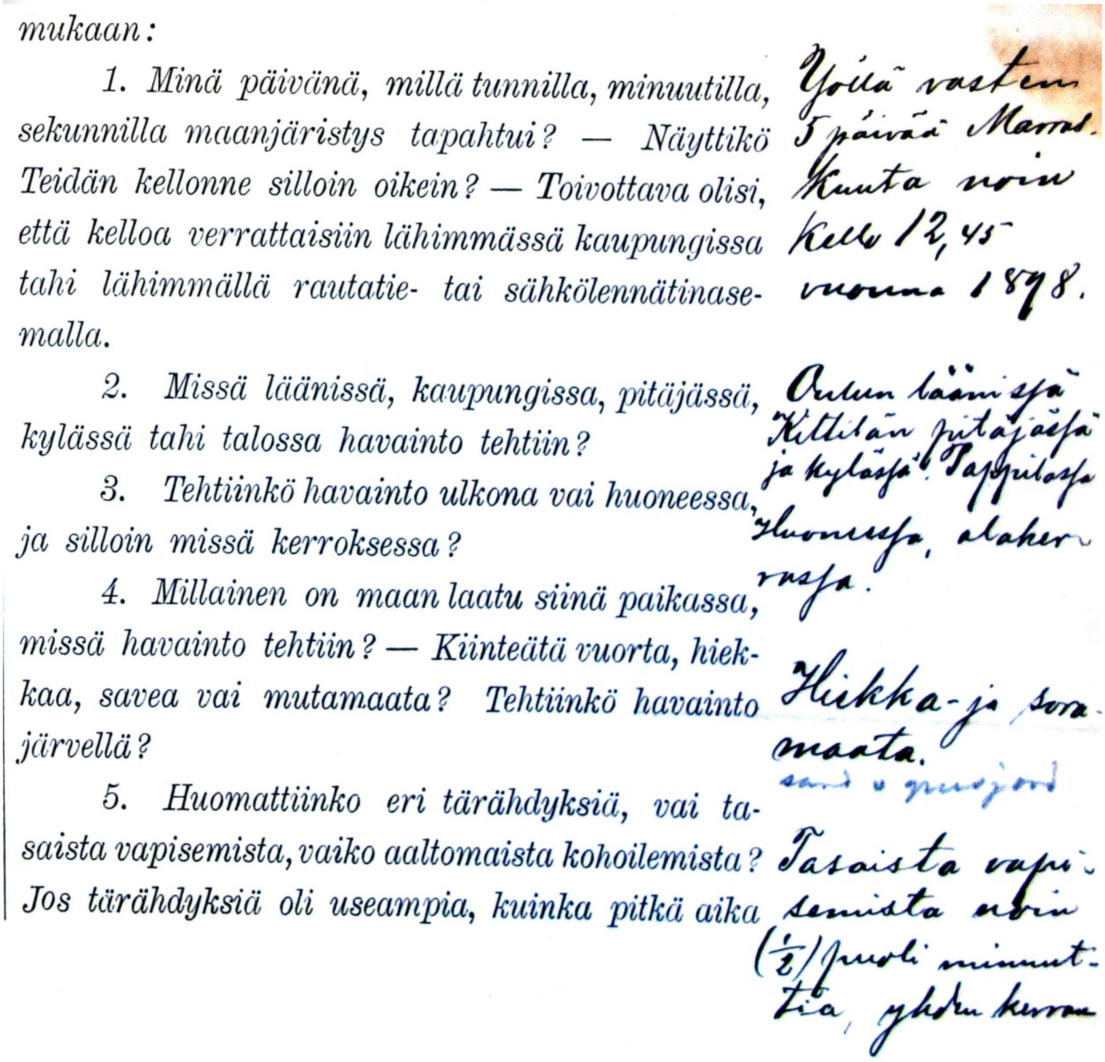
1. Minä päivänä, millä tunnilla, minuutilla, sekunnilla maanjäristys tapahtui? — Näyttikö Teidän kellonne silloin oikein? — Toivottava olisi, että kelloa verrattaisiin lähimmässä kaupungissa tahi lähimmällä rautatie- tai sähkölennätinasemalla.

2. Missä läänissä, kaupungissa, pitäjässä, kylässä tahi talossa havainto tehtiin?

3. Tehtiinkö havainto ulkona vai huoneessa, ja silloin missä kerroksessa?

4. Millainen on maan laatu siinä paikassa, missä havainto tehtiin? — Kiinteätä vuorta, hiekkaa, savea vai mutamaata? Tehtiinkö havainto järvellä?

5. Huomattiinko eri tärähdyksiä, vai tasaista vapisemista, vaiko aaltomaista kohoilemista? Jos tärähdyksiä oli useampia, kuinka pitkä aika



mukaan:

1. Minä päivänä, millä tunnilla, minuutilla, sekunnilla maanjäristys tapahtui? — Näyttikö Teidän kellonne silloin oikein? — Toivottava olisi, että kelloa verrattaisiin lähimmässä kaupungissa tahi lähimmällä rautatie- tai sähkölennätinasemalla.

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3. Tehtiinkö havainto ulkona vai huoneessa, ja silloin missä kerroksessa?

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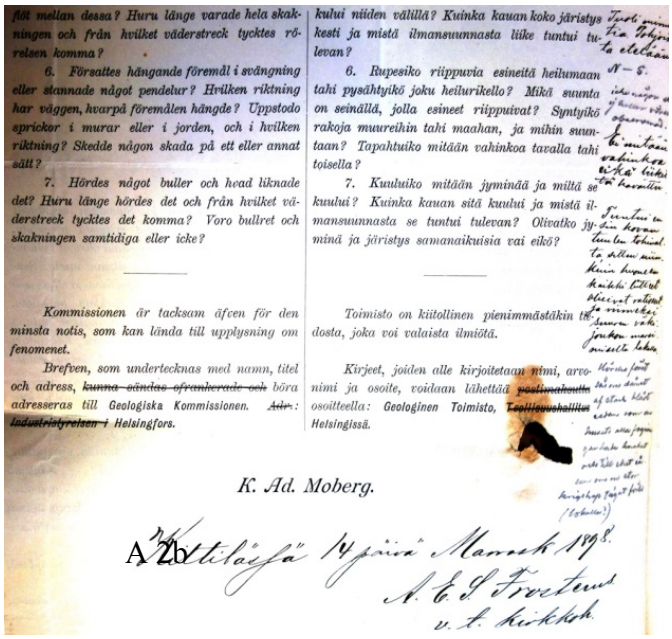
Yöllä vasten 5 päivää Maarisk. Kuuta noin Kello 12,45 vuonna 1898.

Oulun läänissä Kittilän pitäjässä ja kylässä. Pappilassa huoneessa, alakerrassa.

Hiekka- ja soramaata.
sand o grusjord

Tasaista vapisemista noin (½) puoli minuuttia, yhden kerran

A 2



fot mellan dessa? Huru länge varade hela skakningen och från hvilket väderstreck tycktes rörelsen komma?

6. Försattes hängande föremål i svängning eller stannade något pendelur? Hvilken riktning har väggen, hvarpå föremålen hängde? Uppstodo sprickor i murar eller i jorden, och i hvilken riktning? Skedde någon skada på ett eller annat sätt?

7. Hördes något buller och head åtknade det? Huru länge hördes det och från hvilket väderstreck tycktes det komma? Voro bullret och skakningen samtidiga eller icke?

Kommissionen är tacksam äfven för den minsta notis, som kan lända till upplysning om fenomenet.

Brefven, som undertecknas med namn, titel och adress, kunna sändas ofrankerade och böra adresseras till Geologiska Kommissionen. Adr.: Industristyrelsen i Helsingfors.

kului näiden välillä? Kuinka kauan koko järistys kesti ja mistä ilmansuunnasta liike tuntui tulevan?

6. Riepesiko riippuvia esineitä heilumaan tahi pysähtyikö joku heilurikello? Mikä suunta on seinällä, jolla esineet riippuivat? Syntyikö rakoja muureihin tahi maahan, ja mihin suuntaan? Tapahtuiko mitään vahinkoa tavalla tahi toisella?

7. Kuuluiko mitään jyminää ja miltä se kuului? Kuinka kauan sitä kuului ja mistä ilmansuunnasta se tuntui tulevan? Olivatko jyminä ja järistys samanaikuisia vai eikö?

Toimisto on kiitollinen pienimmästäkin tiedosta, joka voi valaista ilmiötä.

Kirjeet, joiden alle kirjoitetaan nimi, arvonimi ja osoite, voidaan lähettää postimaksutta osoitteella: Geologinen Toimisto, Teollisuushallitus Helsingissä.

K. Ad. Moberg.

A Zottilässä 14 päivä Maaliskk 1898.

A. E. J. Forsten
v. t. kirjeksk.

2. The macroseismic questionnaire of the Geological Commission in the 1890s

Earthquakes occurring in Scandinavia and Finland are worthy of special attention, because it cannot be assumed that they are caused by volcanic forces. Therefore in recent times close examination has began to be given them in Sweden and Norway. Also the Geological Commission in Helsinki wants to begin to systematically collect observations about earthquakes in Finland, and therefore approaches the general public, kindly encouraging it to send notifications of these phenomena, when one of them has occurred, according to the following formula:

1. On which day, hour, minute, second did the earthquake happen? – Did your clock show right then? – It is desirable that the clock should be compared in the nearest town or at the nearest railway or telegram station.

2. In which province, town, municipality, village or house was the observation made?

3. Was the observation made outdoors or in a room, and in that case on which floor?

4. What is the soil like at the site where the observation was made? – Compact soil, sand, clay, or mud? Was the observation made on a lake?

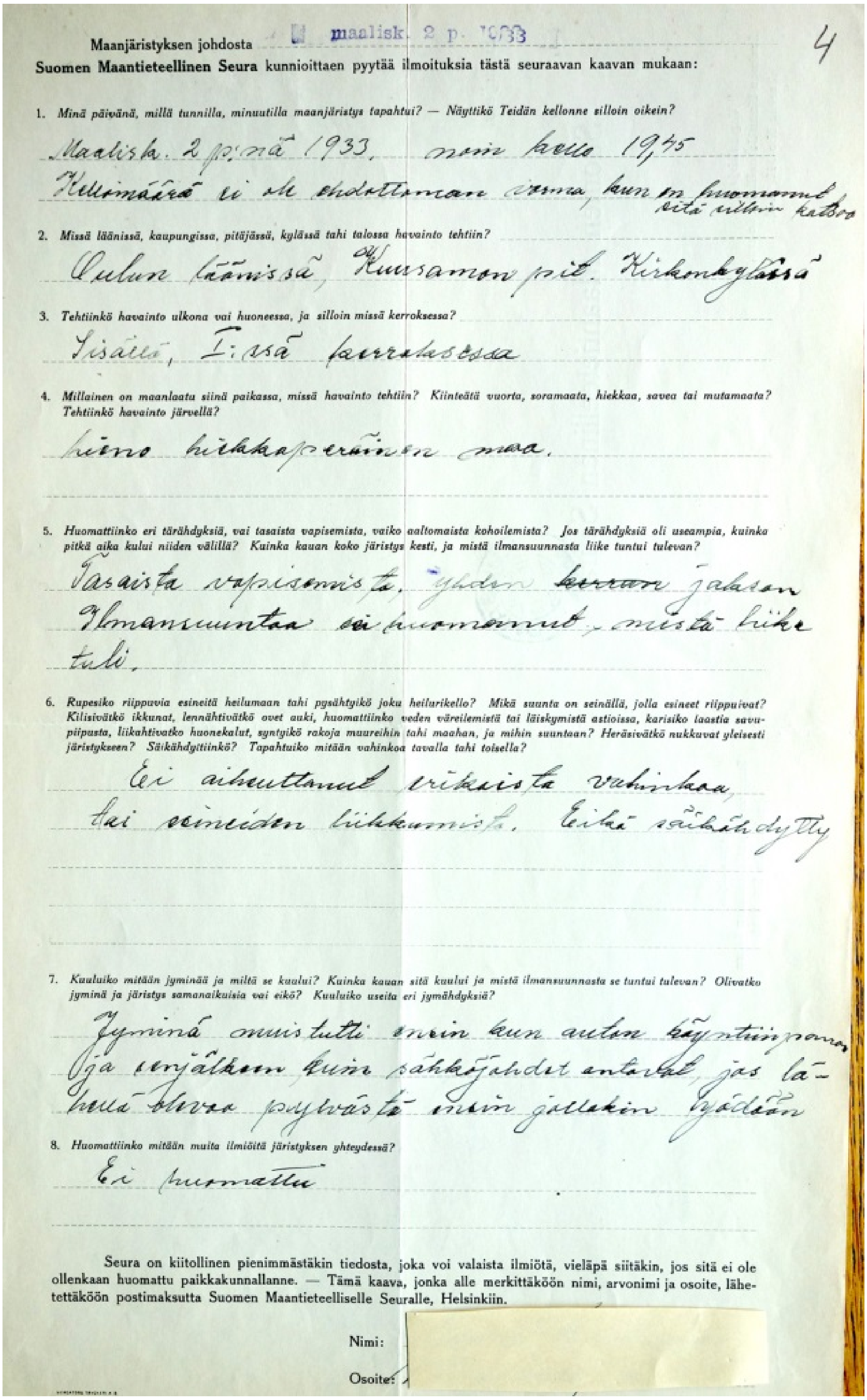
5. Were separate quakes noticed, or even shaking, or wavelike heaving? If separate quakes were noticed, how long was the interval between them? How long did the whole quake last and from which direction did the movement seem to come?

6. Did hanging objects begin to swing or did any pendulum clock stop? In which direction is the wall where the objects were hung? Did stoves or the ground crack, and in which direction? Did any damage occur in one way or another?

7. Was any roar heard and what did it sound like? How long did it last and from which direction did it seem to come? Were the roar and quake simultaneous or not?

The Commission is grateful for the smallest piece of information that may throw light on the phenomenon. Letters duly signed by the name, occupation and address can be sent postage-free to the address: The Geological Commission, Helsinki.

K. Ad. Moberg



Maanjäristyksen johdosta maalisk. 2 p. 1933 4

Suomen Maantieteellinen Seura kunnioittaen pyytää ilmoituksia tästä seuraavan kaavan mukaan:

1. *Minä päivänä, millä tunnilla, minuutilla maanjäristys tapahtui? — Näyttikö Teidän kellonne silloin oikein?*

Maalisk. 2 p:nä 1933, noin kello 19,45
Kellomäärä ei ole ehdottoman varma, kun en huomannut sitä silloin katsoa

2. *Missä läänissä, kaupungissa, pitäjässä, kylässä tahi talossa havainto tehtiin?*

Oulun läänissä, Kuusamon pit. Kirkonkylässä

3. *Tehtiinkö havainto ulkona vai huoneessa, ja silloin missä kerroksessa?*

Sisällä, I:ssä kerroksessa

4. *Millainen on maanlaatu siinä paikassa, missä havainto tehtiin? Kiinteätä vuorta, soramaata, hiekkaa, savea tai mutamaata? Tehtiinkö havainto järvellä?*

hieno hiekkaperäinen maa.

5. *Huomattiinko eri tärähdyksiä, vai tasaista vapisemista, vaiko aaltomaista kohoilemista? Jos tärähdyksiä oli useampia, kuinka pitkä aika kului niiden välillä? Kuinka kauan koko järistys kesti, ja mistä ilmansuunnasta liike tuntui tulevan?*

Tasaista vapisemista, yhden ~~kerran~~ jakson
Ilmansuuntaa ei huomannut, mistä liike tuli.

6. *Rupesiko riippuvia esineitä heilumaan tahi pysähtyikö joku heilurikello? Mikä suunta on seinällä, jolla esineet riippuivat? Kilisivätkö ikkunat, lennähtivätkö ovet auki, huomattiinko veden väreilemistä tai läiskymistä astioissa, karisiko laastia savupiipusta, liikahtivatko huonekalut, syntyikö rakoja muureihin tahi maahan, ja mihin suuntaan? Heräsivätkö nukkuvat yleisesti järistykseen? Säikähdyttiinkö? Tapahtuiko mitään vahinkoa tavalla tahi toisella?*

Ei aiheuttanut erikoista vahinkoa,
tai esineiden liikkumista. Eikä säikähdytty

7. *Kuuluiko mitään jyminää ja miltä se kuului? Kuinka kauan sitä kuului ja mistä ilmansuunnasta se tuntui tulevan? Olivatko jyminä ja järistys samanaikuisia vai eikö? Kuuluiko useita eri jymähdyksiä?*

Jyminä muistutti enin kun auton käyntiinpanoa
ja enemmän kuin sähköjohdot antavat, jos lähellä olevaa pylvästä isein jollakin lyödään

8. *Huomattiinko mitään muita ilmiöitä järistyksen yhteydessä?*

Ei huomattu

Seura on kiitollinen pienimmästäkin tiedosta, joka voi valaista ilmiötä, vieläpä siitäkin, jos sitä ei ole ollenkaan huomattu paikkakunnallanne. — Tämä kaava, jonka alle merkittäköön nimi, arvonimi ja osoite, lähetettäköön postimaksutta Suomen Maantieteelliselle Seuralle, Helsinkiin.

Nimi:

Osoite:

A 3

3. The macroseismic questionnaire of the Geographical Society of Finland since the 1930s

Because of the earthquake of < *date* > in < *place* > the **Geographical Society of Finland** respectfully asks for notices of it according to the following formula:

1. On which day, hour, minute did the earthquake happen? – Did your clock show right then?

2. In which province, town, municipality, village or house was the observation made?

3. Was the observation made outdoors or indoors, and in that case on which floor?

4. What is the soil like at the site where the observation was made? Compact soil, gravel, sand, clay or mud? Was the observation made on a lake?

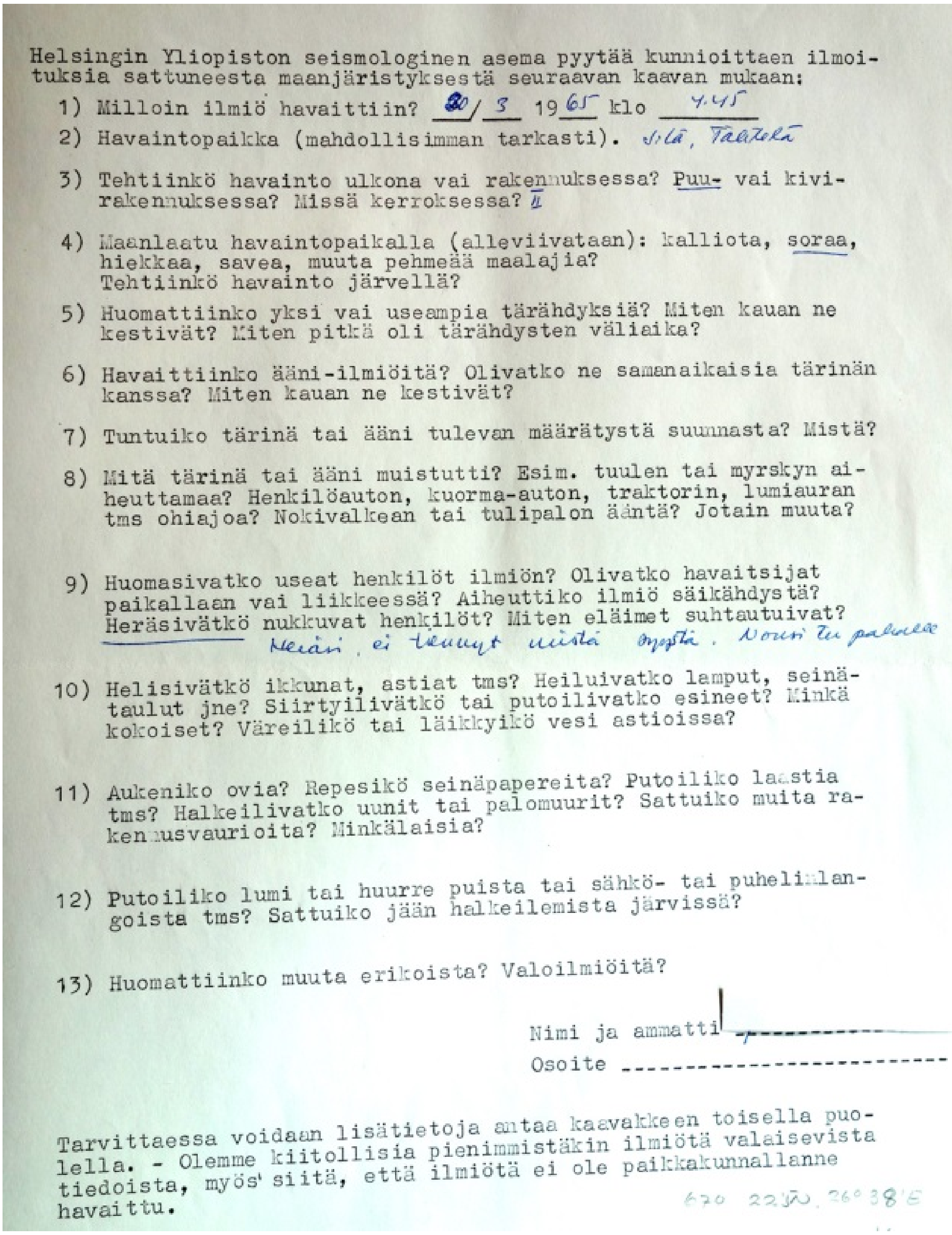
5. Were separate quakes noticed, or even shaking, or wavelike heaving? If separate quakes were noticed, how long was the interval between them? How long did the whole quake last and from which direction did the movement seem to come?

6. Did hanging objects begin to swing or did any pendulum clock stop? In which direction is the wall where the objects were hung? Did windows rattle, doors swing open, was vibration or spilling of liquids from containers noticed, did plaster fall from the chimney stack, was furniture shifted, did stoves or the ground crack, and in which direction? Were sleeping people largely awakened by the quake? Frightened? Did any damage occur in one way or another?

7. Was any roar heard and what did it sound like? How long did it last and from which direction did it seem to come? Were the roar and the quake simultaneous or not? Were many separate thuds heard?

8. Was anything else related to the quake noticed?

The Society is grateful for the smallest piece of information that may throw light on the phenomenon, even if it was not noticed at all in your locality. – The name, occupation and address [of the respondent] is to be entered below and the questionnaire returned postage-free to the Geographical Society of Finland, to Helsinki.



Helsingin Yliopiston seismologinen asema pyytää kunnioittaen ilmoituksia sattuneesta maanjäristyksestä seuraavan kaavan mukaan:

1) Milloin ilmiö havaittiin? 20/3 1965 klo 4.45
2) Havaintopaikka (mahdollisimman tarkasti). Sälä, Taatela
3) Tehtiinkö havainto ulkona vai rakennuksessa? Puu- vai kivirakennuksessa? Missä kerroksessa? II
4) Maanlaatu havaintopaikalla (alleviivataan): kalliota, soraa, hiekkaa, savea, muuta pehmeää maalajia? Tehtiinkö havainto järvellä?
5) Huomattiinko yksi vai useampia tärähdyksiä? Miten kauan ne kestivät? Miten pitkä oli tärähdysten väliaika?
6) Havaittiinko ääni-ilmiöitä? Olivatko ne samanaikaisia tärinän kanssa? Miten kauan ne kestivät?
7) Tuntuiko tärinä tai ääni tulevan määrätystä suunnasta? Mistä?
8) Mitä tärinä tai ääni muistutti? Esim. tuulen tai myrskyn aiheuttamaa? Henkilöauton, kuorma-auton, traktorin, lumiauran tms ohiajoa? Nokivalkean tai tulipalon ääntä? Jotain muuta?
9) Huomasivatko useat henkilöt ilmiön? Olivatko havaitsijat paikallaan vai liikkeessä? Aiheuttiko ilmiö säikähdystä? Heräsivätkö nukkuvat henkilöt? Miten eläimet suhtautuivat?
Heräsi, ei tiennyt mistä syystä. Nousi [illegible]
10) Helisivätkö ikkunat, astiat tms? Heiluivatko lamput, seinätaulut jne? Siirtyilivätkö tai putoilivatko esineet? Minkä kokoiset? Väreilikö tai läikkyikö vesi astioissa?
11) Aukeniko ovia? Repesikö seinäpapereita? Putoiliko laastia tms? Halkeilivatko uunit tai palomuurit? Sattuiko muita rakennusvaurioita? Minkälaisia?
12) Putoiliko lumi tai huurre puista tai sähkö- tai puhelinlangoista tms? Sattuiko jään halkeilemista järvissä?
13) Huomattiinko muuta erikoista? Valoilmiöitä?

Nimi ja ammatti ------------

Osoite ---------------------------

Tarvittaessa voidaan lisätietoja antaa kaavakkeen toisella puolella. - Olemme kiitollisia pienimmistäkin ilmiötä valaisevista tiedoista, myös siitä, että ilmiötä ei ole paikkakunnallanne havaittu.

A 4

4. The macroseismic questionnaire of the seismological station in Helsinki at the turn of the 1960s

The Seismological station of the University of Helsinki respectfully asks for notifications of the earthquake occurrence according to the following formula:

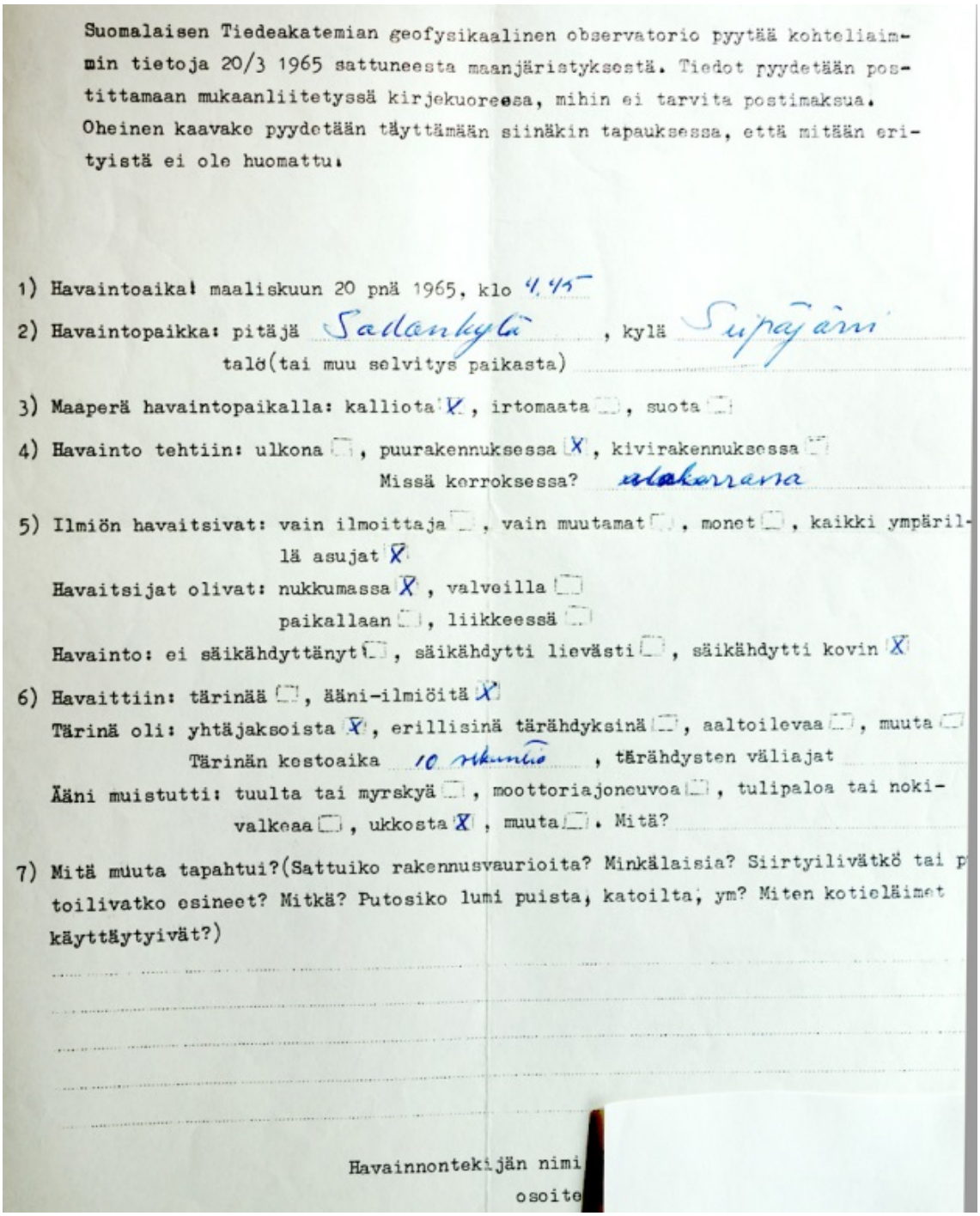
1) When was the phenomenon observed? _____/_____ 19_____ at _____ o'clock
2) Place of observation (as accurately as possible).
3) Was the observation made outdoors or indoors? In a timber or stone building? Which floor?
4) Type of ground at the observation site (underline): rock, gravel, sand, clay, other soft soil? Was the observation made on a lake?
5) Was one or more than one shock noticed? How long did they last? How long was the interval between them?
6) Were sound phenomena observed? Were they simultaneous with the shaking? How long did they last?
7) Did the tremor or sound seem to come from a specific direction? From where?
8) What did the tremor or sound resemble? E.g. wind or storm? Car, truck, tractor, snowplough passing by? Chimney fire or fire? Something else?
9) Did many persons notice the phenomenon? Were the observers stationary or moving? Was the phenomenon frightening? Were sleeping people awakened? How did animals react?
10) Did windows, dishes etc. rattle? Did lamps, pictures on the walls etc. swing? Were objects shifted or did they fall down? What size were they? Did water vibrate or spill from containers?
11) Did doors swing open? Was wallpaper torn? Did plaster etc. fall? Were stoves or firewalls cracked? Was other damage to buildings sustained? What kind?
12) Did snow or frost fall from trees or electric or telephone lines etc.? Was ice on lakes cracked?
13) Was anything else unusual noticed? Light phenomena?

Name and occupation _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
Address _

Additional information can be given on the reverse side, if necessary. – We are grateful for the smallest pieces of information throwing light on the phenomenon, also if it was not noticed in your locality.

PTO

[The reverse side was left blank for possible additional information.]



Suomalaisen Tiedeakatemian geofysikaalinen observatorio pyytää kohteliaimmin tietoja 20/3 1965 sattuneesta maanjäristyksestä. Tiedot pyydetään postittamaan mukaanliitetyssä kirjekuoressa, mihin ei tarvita postimaksua. Oheinen kaavake pyydetään täyttämään siinäkin tapauksessa, että mitään erityistä ei ole huomattu.

1) Havaintoaika: maaliskuun 20 pnä 1965, klo 4.45

2) Havaintopaikka: pitäjä Sallankylä, kylä Supajärvi
talo(tai muu selvitys paikasta)

3) Maaperä havaintopaikalla: kalliota [X], irtomaata [ ], suota [ ]

4) Havainto tehtiin: ulkona [ ], puurakennuksessa [X], kivirakennuksessa [ ]
Missä kerroksessa? alakerrassa

5) Ilmiön havaitsivat: vain ilmoittaja [ ], vain muutamat [ ], monet [ ], kaikki ympärillä asujat [X]
Havaitsijat olivat: nukkumassa [X], valveilla [ ]
paikallaan [ ], liikkeessä [ ]
Havainto: ei säikähdyttänyt [ ], säikähdytti lievästi [ ], säikähdytti kovin [X]

6) Havaittiin: tärinää [ ], ääni-ilmiöitä [X]
Tärinä oli: yhtäjaksoista [X], erillisinä tärähdyksinä [ ], aaltoilevaa [ ], muuta [ ]
Tärinän kestoaika 10 sekuntia, tärähdysten väliajat
Ääni muistutti: tuulta tai myrskyä [ ], moottoriajoneuvoa [ ], tulipaloa tai nokivalkeaa [ ], ukkosta [X], muuta [ ]. Mitä?

7) Mitä muuta tapahtui?(Sattuiko rakennusvaurioita? Minkälaisia? Siirtyilivätkö tai p
toilivatko esineet? Mitkä? Putosiko lumi puista, katoilta, ym? Miten kotieläimet
käyttäytyivät?)

Havainnontekijän nimi
osoite

A 5a

5. a) The macroseismic questionnaire of the Sodankylä Geophysical Observatory in the 1960s

The Geophysical Observatory of the Finnish Academy of Science and Letters kindly asks for notifications of the earthquake of <*date*>. The information can be returned in the enclosed envelope postage-free. Please fill in this questionnaire also in the case that nothing unusual was observed.

1. Time of observation: <*month, day, year*>, at ..... o'clock

2. Place of observation: municipality ....., village .....
   house (or other description of the site) .....

3. Type of ground where the observation was made: rock , loose soil , swamp

4. The observation was made: outdoors , in a wooden building , in a stone building
   On which floor? ……

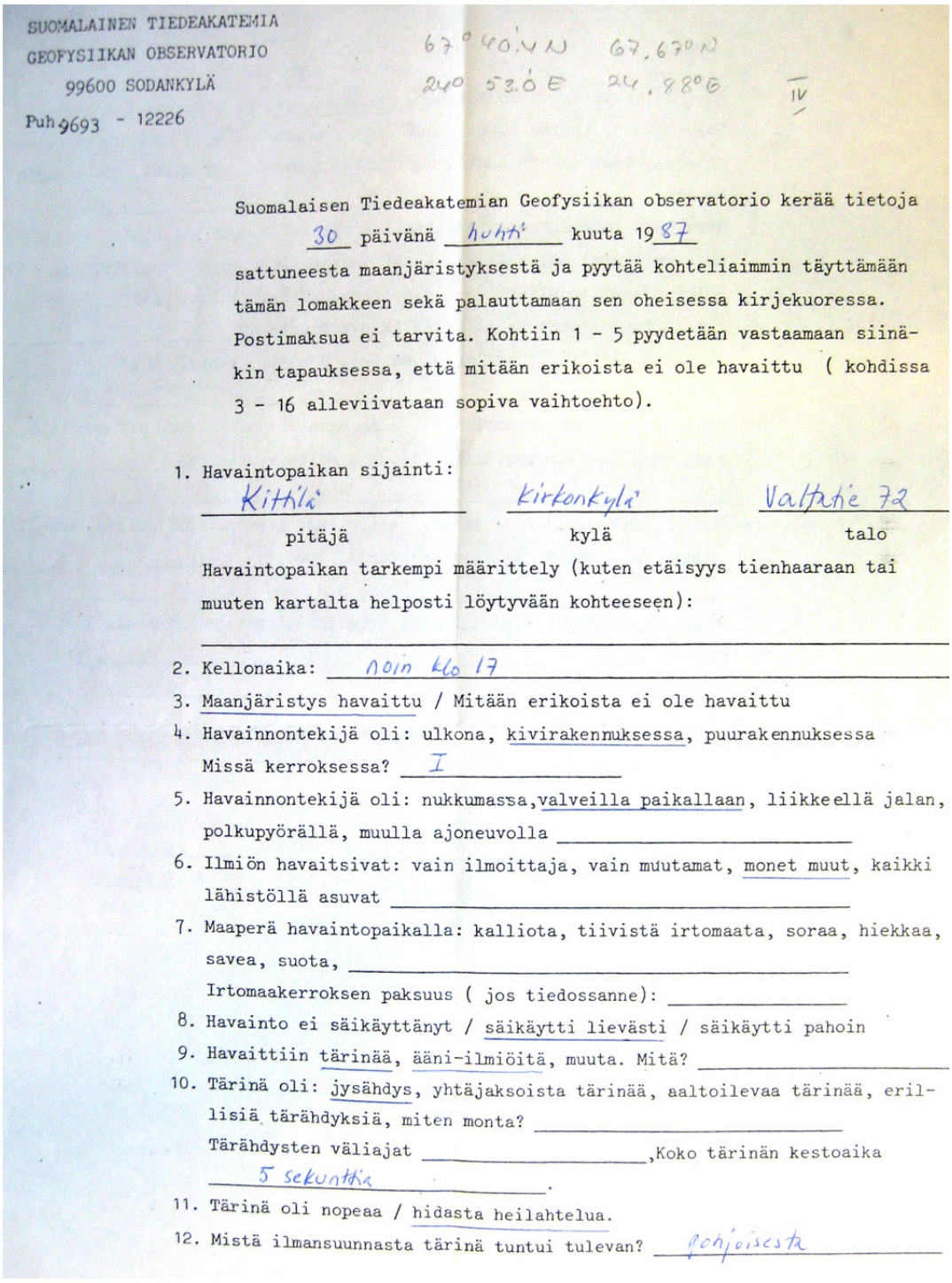
5. The phenomenon was noticed by: only the respondent , only a few , many ,
   everybody living about
   The observers were: asleep , awake
   stationary , moving
   The observation: was not frightening , was slightly frightening , was very frightening

6. What was observed: tremor , roar phenomena
   The tremor was: continuous , separate jolts , wavelike , other
   The duration of the tremor ……., intervals between the jolts ……..
   The sound resembled: wind or storm , motor vehicle , fire or chimney fire ,
   thunder , other . What? ……..

7. Did anything else occur? (Was damage to buildings sustained? What kind? Were objects shifted or did they fall down? Which ones? Did snow fall from the trees, roofs, etc.? How did domestic animals react?)

……..
……
……
……
……

Name of the observer……
address…….



SUOMALAINEN TIEDEAKATEMIA
GEOFYSIIKAN OBSERVATORIO
99600 SODANKYLÄ
Puh 9693 - 12226

67° 40.4 N 67,67° N
24° 53.0 E 24,88° E
IV

Suomalaisen Tiedeakatemian Geofysiikan observatorio kerää tietoja 30 päivänä huhti kuuta 1987 sattuneesta maanjäristyksestä ja pyytää kohteliaimmin täyttämään tämän lomakkeen sekä palauttamaan sen oheisessa kirjekuoressa. Postimaksua ei tarvita. Kohtiin 1 - 5 pyydetään vastaamaan siinäkin tapauksessa, että mitään erikoista ei ole havaittu (kohdissa 3 - 16 alleviivataan sopiva vaihtoehto).

1. Havaintopaikan sijainti:
Kittilä (pitäjä) kirkonkylä (kylä) Valtatie 72 (talo)
Havaintopaikan tarkempi määrittely (kuten etäisyys tienhaaraan tai muuten kartalta helposti löytyvään kohteeseen):
2. Kellonaika: noin klo 17
3. Maanjäristys havaittu / Mitään erikoista ei ole havaittu
4. Havainnontekijä oli: ulkona, kivirakennuksessa, puurakennuksessa
Missä kerroksessa? I
5. Havainnontekijä oli: nukkumassa, valveilla paikallaan, liikkeellä jalan, polkupyörällä, muulla ajoneuvolla
6. Ilmiön havaitsivat: vain ilmoittaja, vain muutamat, monet muut, kaikki lähistöllä asuvat
7. Maaperä havaintopaikalla: kalliota, tiivistä irtomaata, soraa, hiekkaa, savea, suota,
Irtomaakerroksen paksuus (jos tiedossanne):
8. Havainto ei säikäyttänyt / säikäytti lievästi / säikäytti pahoin
9. Havaittiin tärinää, ääni-ilmiöitä, muuta. Mitä?
10. Tärinä oli: jysähdys, yhtäjaksoista tärinää, aaltoilevaa tärinää, erillisiä tärähdyksiä, miten monta?
Tärähdysten väliajat , Koko tärinän kestoaika 5 sekuntia.
11. Tärinä oli nopeaa / hidasta heilahtelua.
12. Mistä ilmansuunnasta tärinä tuntui tulevan? Pohjoisesta

A 5b1

13. Ääni muistutti: tuulen huminaa, ukkosta, myrskyn kohinaa, öljykaminan tms huminaa, kevyen auton ääntä, rekka-auton tai muun raskaan kulkuneuvon ohiajoa, lentokoneen ääntä, moottoriajoneuvojen törmäystä, muuta ääntä. Mitä? _____

14. Havainnot rakennuksessa tapahtumahetkellä: Ikkunat helisivät, kattolamput heiluivat, seinät, lattiat, katot narahtelivat, ovet avautuivat ja / tai sulkeutuivat, posliini- ja lasitavara helisi, taulut, peilit ym seinille ripustetut esineet heilahtivat. Mihin suuntaan? _____
Esineitä siirtyi paikoiltaan, kaatui, putoili, särkyi. Mitä? _____
_____

15. Havaintoja rakennusvaurioista: Halkeamia savupiipuissa, palomuurissa, seinissä, laastin kappaleita tippui. Muita vaurioita: _____
_____

16. Muita havaintoja: Vesi läikkyi astioissa, lumi putoili puista, katoilta, maahan tai jäähän ilmestyi halkeamia. Muuta: _____
_____

17. Käyttäytyivätkö kotieläimet tai lemmikkieläimet poikkeuksellisesti? Miten? _____

18. Lisätietoja: _____
_____
_____

A 5b2

5. b) The macroseismic questionnaire of the Sodankylä Geophysical Observatory in the 1970s

FINNISH ACADEMY OF SCIENCE AND LETTERS
GEOPHYSICAL OBSERVATORY
99600 SODANKYLÄ
Tel. 9693-12226

The Geophysical Observatory of the Finnish Academy of Science and Letters is collecting information about the earthquake of <*day*> <*month*> 19____ and kindly asks to fill in this questionnaire and return it in the enclosed envelope. No postage is needed. Please reply to questions 1–5 also in the case that nothing unusual was observed (underline the suitable alternative of questions 3–16).

1. Location of the observation site:

_____ _____ _____
municipality village house

A more detailed description of the place (such as the distance to a crossroads or another target easily found on a map):

_____

2. Time by the clock: _____

3. The earthquake was noticed. / Nothing unusual was noticed.

4. The observer was: outdoors, in a stone building, in a wooden building
   On which floor? _____

5. The observer was: asleep, awake and stationary, walking, riding a bicycle, driving a vehicle _____

6. The phenomenon was noticed by: only the respondent, only a few, many others, everybody living about _____

7. The soil at the site of observation: rock, compact soil, gravel, sand, clay, swamp,
   _____
   Thickness of the soil layer (if known): _____

8. The observation was: not frightening / slightly frightening / very frightening

9. What was observed: tremor, roar phenomena, other. What?_____

10. The tremor was: a thump, continuous shaking, wavelike shaking, separate jolts, how many?_____
    Intervals between the jolts_____ The duration of the entire tremor
    _____

11. The tremor was fast / slow swinging.

12. From which direction did the shaking seem to come? _____

13. The sound resembled: wind soughing, thunder, roar of a storm, soughing of an oil heater or similar, a light vehicle, truck or other heavy vehicle passing by, jet plane, motor vehicles colliding, something else. What?
    _____

14. Observations in a building at the time of the event: windows rattled, lamps swung, walls, floors, ceilings creaked, doors opened and/or shut, china and glassware rattled, paintings, mirrors and other objects hanging on the walls swung. In which direction? _____
    Objects were shifted, tipped over, fell, broke. What? _____
    _____

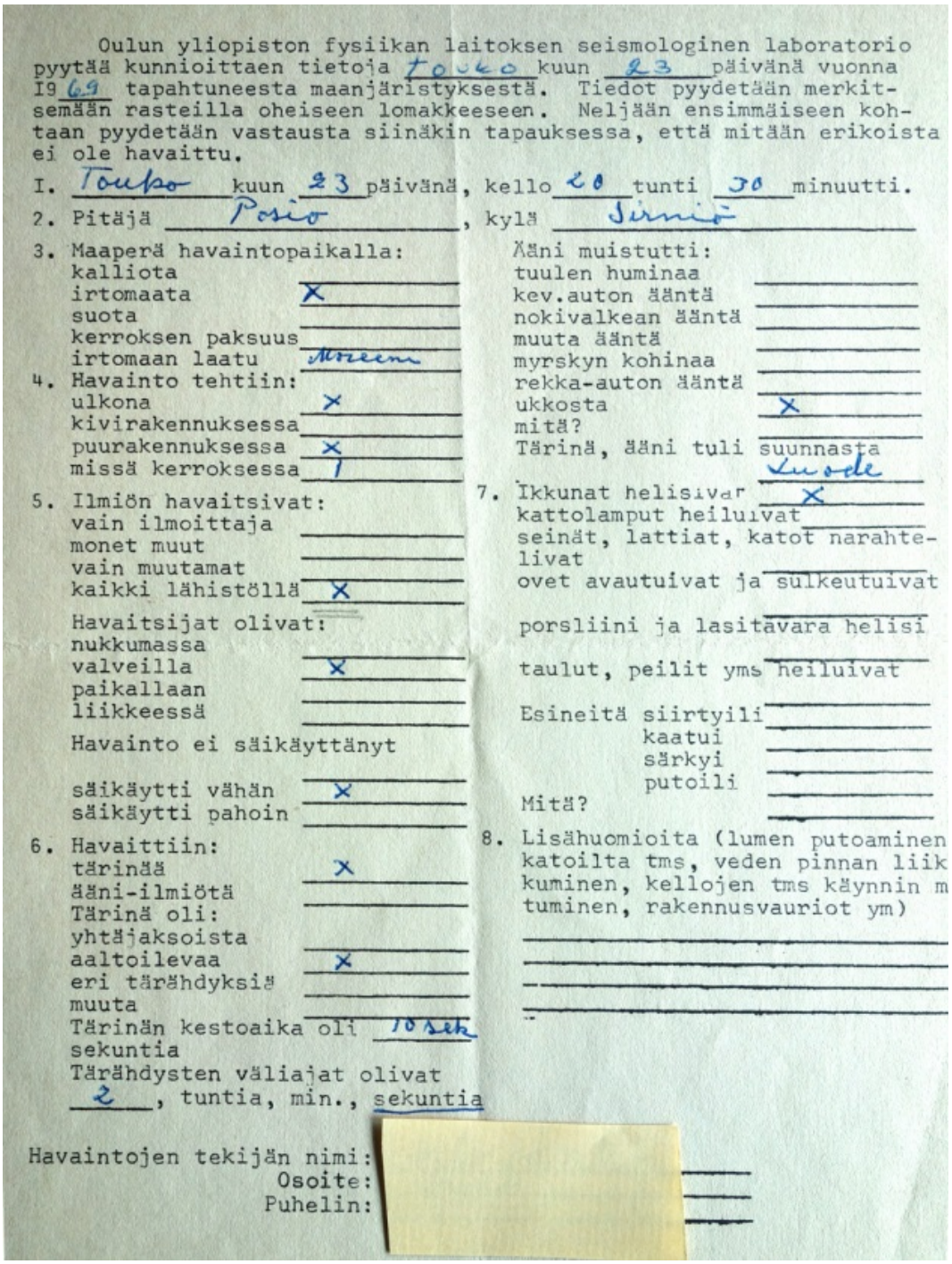
15. Observed building damage: Cracks in chimneystacks, firewall, walls, pieces of plaster fell. Other damages: _____
    _____

16. Other observations: water spilled from containers, snow fell from the trees, roofs or ice was cracked. Anything else: _____
    _____

17. Did domestic or pet animals behave in an unusual way?
    How? _____

18. Additional information: _____
    _____
    _____

    The respondent: Name _____
    Address _____
    Telephone _____



Oulun yliopiston fysiikan laitoksen seismologinen laboratorio pyytää kunnioittaen tietoja Touko kuun 23 päivänä vuonna 1969 tapahtuneesta maanjäristyksestä. Tiedot pyydetään merkitsemään rasteilla oheiseen lomakkeeseen. Neljään ensimmäiseen kohtaan pyydetään vastausta siinäkin tapauksessa, että mitään erikoista ei ole havaittu.

I. Toukso kuun 23 päivänä, kello 20 tunti 30 minuutti.

2. Pitäjä Posio, kylä Sirniö

3. Maaperä havaintopaikalla:
kalliota
irtomaata X
suota
kerroksen paksuus
irtomaan laatu Moreeni

4. Havainto tehtiin:
ulkona X
kivirakennuksessa
puurakennuksessa X
missä kerroksessa 1

5. Ilmiön havaitsivat:
vain ilmoittaja
monet muut
vain muutamat
kaikki lähistöllä X

Havaitsijat olivat:
nukkumassa
valveilla X
paikallaan
liikkeessä

Havainto ei säikäyttänyt
säikäytti vähän X
säikäytti pahoin

6. Havaittiin:
tärinää X
ääni-ilmiötä
Tärinä oli:
yhtäjaksoista
aaltoilevaa X
eri tärähdyksiä
muuta
Tärinän kestoaika oli 10 sek sekuntia
Tärähdysten väliajat olivat
2, tuntia, min., sekuntia

Havaintojen tekijän nimi:
Osoite:
Puhelin:

Ääni muistutti:
tuulen huminaa
kev.auton ääntä
nokivalkean ääntä
muuta ääntä
myrskyn kohinaa
rekka-auton ääntä
ukkosta X
mitä?
Tärinä, ääni tuli suunnasta Luode

7. Ikkunat helisivat X
kattolamput heiluivat
seinät, lattiat, katot narahtelivat
ovet avautuivat ja sulkeutuivat
porsliini ja lasitavara helisi
taulut, peilit yms heiluivat
Esineitä siirtyili
kaatui
särkyi
putoili
Mitä?

8. Lisähuomioita (lumen putoaminen katoilta tms, veden pinnan liikkuminen, kellojen tms käynnin muuttuminen, rakennusvauriot ym)

A 6a

6. a) The macroseismic questionnaire of the University of Oulu in the 1960s

The Seismological laboratory of the Department of Physics, University of Oulu, respectfully asks for notifications of the earthquake of _____ <*month*> _____<*day*> year 19____. Please tick the appropriate line below. It is requested to answer the first four questions even if nothing unusual was observed.

1. _____month _____ day, _____hour, _____minute

2. Municipality _____, village _____

3. Ground type at the site:
   rock _____
   loose soil _____
   swamp _____
   thickness of layer _____
   type of loose soil _____

4. The observation was made:
   outdoors _____
   in a stone building _____
   in a wooden building _____
   on which floor _____

5. The phenomenon was noticed:
   only by the respondent _____
   by many others _____
   only by a few _____
   by everyone about _____
   The observers were:
   asleep _____
   awake _____
   stationary _____
   moving _____
   The observation was not frightening _____
   was slightly frightening _____
   was very frightening _____

6. Type of observation:
   tremor _____
   sound _____
   The tremor was:
   continuous _____
   undulating _____
   separate jolts _____
   other _____
   Duration of the tremor was _____ seconds
   The intervals between the jolts were _____, hours, min., seconds
   The sound resembled:
   wind soughing _____
   a light vehicle _____
   chimney fire _____
   another sound _____
   roar of storm _____
   a truck _____
   thunder _____
   what ? _____
   The tremor, sound came from direction _____

7. Windows rattled _____
   lamps swung _____
   walls, floors, ceilings creaked _____
   doors opened and shut _____
   china and glassware rattled _____
   paintings, mirrors etc. swung _____
   Objects were shifted _____
   tipped over _____
   were broken _____
   fell _____
   What? _____

8. Additional observations (snow falling from the roofs etc., water vibrating, clocks altered, building damage, etc.)
   _____
   _____
   _____
   _____

Name of the observer: _____

Address: _____

Telephone:_____

GEOFYSIIKAN LAITOS
Oulun yliopisto
90570 OULU 57

Oulun yliopiston geofysiikan laitos pyytää kunnioittaen tietoja Perämeren alueella marraskuun 14 pnä n. klo 12.46 tapahtuneesta maanjäristyksestä. Tiedot pyydetään merkitsemään oheiseen lomakkeeseen. Kohtiin 1-5 pyydetään vastaamaan siinäkin tapauksessa, että mitään erikoista ei ole havaittu. (Kohdissa 3-13 alleviivataan sopiva vaihtoehto.)

1. Havaintopaikan sijainti:
Pitäjä Alavieska Kylä Kähtävä Talo [redacted]
Havaintopaikan tarkempi määrittely (kuten etäisyys tienhaaraan tai muuten kartalta helposti löytyvään kohteeseen): Alavieskan kirkonkylältä 4 km Rautiaan suuntaan karttapiirros:

2. Aika: kesäkuun 1 päivänä klo ____________.

3. Maanjäristys havaittiin
Mitään erikoista ei havaittu

4. Havainnon tekijä oli:
ulkona, kivirakennuksessa, puurakennuksessa, missä kerroksessa?
____

5. Havainnon tekijä oli:
nukkumassa, valveilla paikallaan, liikkeellä jalan, polkupyörällä, muulla ajoneuvolla.

6. Ilmiön havaitsivat:
vain ilmoittaja, vain muutamat, monet muut, kaikki lähistöllä.

7. Maaperä havaintopaikalla on:
kalliota, tiivistä irtomaata, soraa, hiekkaa, savea, suota.
Irtomaakerroksen paksuus? useita metrejä

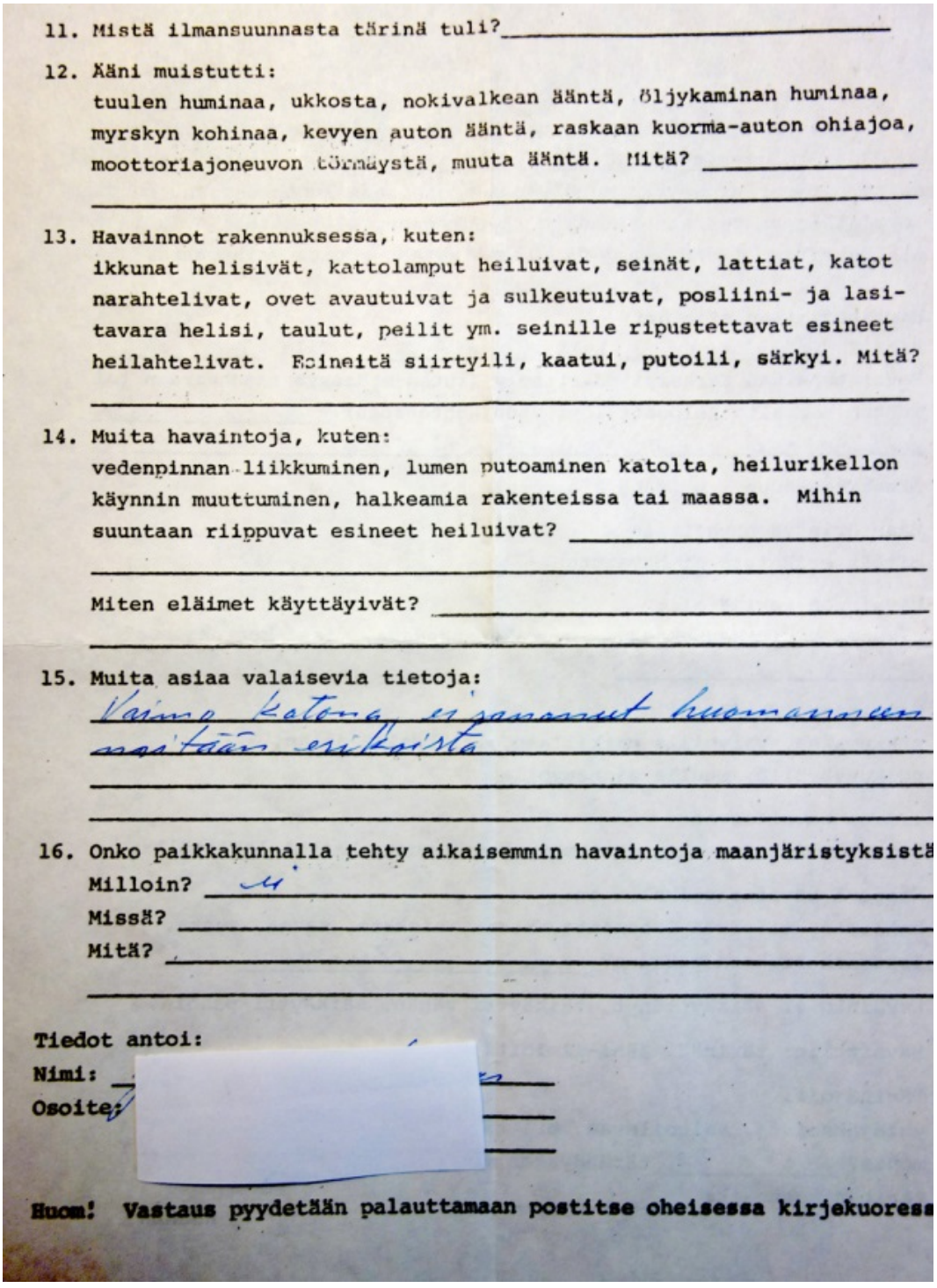
8. Havainto ei säikäyttänyt, säikäytti vähän, säikäytti pahoin.

9. Havaittiin: tärinää, ääni-ilmiöitä

10. Tärinä oli:
yhtäjaksoista, aaltoilevaa, eri tärähdyksiä, kuinka monta? ____________, tärähdysten väliajat ________________,
tärinän kestoaika ____________________

Käännä!

A 6b 1



11. Mistä ilmansuunnasta tärinä tuli?_____

12. Ääni muistutti:
tuulen huminaa, ukkosta, nokivalkean ääntä, öljykaminan huminaa, myrskyn kohinaa, kevyen auton ääntä, raskaan kuorma-auton ohiajoa, moottoriajoneuvon törmäystä, muuta ääntä. Mitä? _____
_____

13. Havainnot rakennuksessa, kuten:
ikkunat helisivät, kattolamput heiluivat, seinät, lattiat, katot narahtelivat, ovet avautuivat ja sulkeutuivat, posliini- ja lasitavara helisi, taulut, peilit ym. seinille ripustettavat esineet heilahtelivat. Esineitä siirtyili, kaatui, putoili, särkyi. Mitä?
_____

14. Muita havaintoja, kuten:
vedenpinnan liikkuminen, lumen putoaminen katolta, heilurikellon käynnin muuttuminen, halkeamia rakenteissa tai maassa. Mihin suuntaan riippuvat esineet heiluivat? _____
_____

Miten eläimet käyttäytyivät? _____
_____

15. Muita asiaa valaisevia tietoja:
Vaimo kotona ei jaksanut huomauttaa asiasta enempää
_____
_____

16. Onko paikkakunnalla tehty aikaisemmin havaintoja maanjäristyksistä
Milloin? 44
Missä? _____
Mitä? _____
_____

Tiedot antoi:
Nimi: _____
Osoite: _____
_____

Huom! Vastaus pyydetään palauttamaan postitse oheisessa kirjekuoress

A 6b 2

6. b) The macroseismic questionnaire of the University of Oulu in the 1970s

DEPARTMENT OF GEOPHYSICS
University of Oulu

The Department of Geophysics, University of Oulu respectfully asks for notifications of the earthquake in <*place*> in <*year*> <*month*> <*day*> at about <*time*> o'clock. Please use the questionnaire below. It is requested to fill in items 1–5 even if nothing unusual was observed. (Underline the suitable alternative of items 3–13).

1. Location of the observation site:
Municipality _____ Village _____ House _____
A more detailed description of the place: _____
_____

2. Time:
<*year*> <*month*> <*day*> at _____ o'clock

3. The earthquake was noticed.
Nothing unusual was noticed.

4. The observer was:
outdoors, in a stone building, in a wooden building, on which floor? _____

5. The observer was:
asleep , awake and stationary, walking, riding a bicycle, driving a vehicle.

6. The phenomenon was noticed by:
only the respondent , only a few, many others, everybody about

7. The ground type at the observation site is:
rock, compact soil, gravel, sand, clay, swamp
The thickness of the soil layer? _____

8. The observation was not frightening , slightly frightening , very frightening.

9. What was observed: tremor, roar phenomena

10. The tremor was:
continuous, undulating, separate jolts, how many? _____ , intervals between the jolts _____, duration of the tremor _____

PTO!

11. From which direction did the sound come?
    _____

12. The sound resembled:
    wind soughing, thunder, chimney fire, oil heater, roar of storm, light vehicle, heavy truck passing by, colliding motor vehicles, another sound. What? _____
    _____

13. Observations in a building:
    windows rattled, lamps swung, walls, floors, ceilings creaked, doors opened and shut, china and glassware rattled, paintings, mirrors and other objects hanging on the walls swung.
    Objects were shifted, tipped over, fell down, broke. What?_____
    _____

14. Other observations such as:
    vibration of water surface, snow falling from the roof, pendulum clocks altered, cracks in masonry _____
    _____
    How did domestic animals behave? _____
    _____
    _____
    _____

15. Additional information related to the observation:
    _____
    _____
    _____
    _____
    _____
    _____
    _____
    _____

The information was given by:
name: _____
address: _____

Note: Please return the questionnaire in the enclosed envelope.

Helsingin yliopiston seismologian laitos pyytää kunnioittaen tietoja POHJANMAALLA

.17.. päivänä .HELMI.... kuuta 1979 klo 19.31 JA 19.41 tapahtuneesta maanjäristyksestä. Tiedot pyydetään merkitsemään tähän lomakkeeseen. Kohtiin 1-5 pyydetään vastaamaan siinäkin tapauksessa, että mitään erikoista ei ole havaittu (kohdissa 3-13 alleviivataan sopiva vaihtoehto).

1. Havaintopaikan sijainti:

Alajärvi (pitäjä) Kurejoki (kylä) _____ (talo)

Havaintopaikan tarkempi määrittely (kuten etäisyys tienhaaraan tai muuten kartalta helposti löytyvään kohteeseen):

Sillanpään risteyksestä noin: 800 m

2. Aika: klo n: 19,30

3. Maanjäristys havaittu/ Mitään erikoista ei havaittu.

4. Havainnon tekijä oli:

ulkona, kivirakennuksessa, puurakennuksessa. missä kerroksessa?

ensimäinen kerros

5. Havainnon tekijä oli: nukkumassa, valveilla paikallaan, liikkeellä jalan, polkupyörällä, muulla ajoneuvolla, _____

6. Ilmiön havaitsivat: vain ilmoittaja, vain muutamat, monet muut, kaikki lähistöllä, _____

7. Maaperä havaintopaikalla on: kalliota, tiivistä irtomaata, soraa, hiekkaa, savea, suota, _____

Irtomaakerroksen paksuus? _____

A 7a 1

8. Havainto ei säikäyttänyt/säikäytti vähän/säikäytti pahoin.
9. Havaittiin: tärinää, ääni-ilmiöitä, _____
10. Tärinä oli: yhtäjaksoista, aaltoilevaa, eri tärähdyksiä - kuinka monta? _____, tärähdysten väliajat _____ tärinän kesto-aika 15-20 sk. _____
11. Mistä ilmansuunnasta tärinä tuli? _____
12. Ääni muistutti: tuulen huminaa, ukkosta, nokivalkean ääntä, öljykaminan huminaa, myrskyn kohinaa, kevyen auton ääntä, raskaan kuorma-auton ohiajoa, moottoriajoneuvon törmäystä, muuta ääntä. Mitä? _____
13. Havainnot rakennuksessa, kuten: ikkunat helisivät, kattolamput heiluivat, seinät, lattiat, katot narahtelivat, ovet avautuivat ja/tai sulkeutuivat, riippuvat esineet heiluivat, posliini- ja lasitavara helisi, heilurikello helähti tai pysähtyi, taulut, peilit ym. seinille ripustetut esineet heilahtivat. Mihin suuntaan? _____ Esineitä siirtyili, kaatui, putoili, särkyi. Mitä? _____ _____
14. Havaintoja rakennuksissa: pieniä halkeamia rakennuksen osissa: rappauksissa, palomuurissa, savupiipussa tai muissa rakenteissa, laastin kappaleita tippui. Muita vaurioita? _____ _____
15. Muita havaintoja kuten: veden läikkyminen, lumen putoaminen katolta, halkeamia maassa. jäässä tai lumessa, kotieläinten käyttäytyminen ja muita asiaa valaisevia tietoja _____ _____ koira säikähti _____

Huom. Vastaus pyydetään lähettämään postitse oheisessa kuoressa.

Tiedot antoi: Nimi _____

Osoite _____

A 7a 2

7. a) The questionnaire of the 1970s at the Institute of Seismology, University of Helsinki

The Institute of Seismology, University of Helsinki, respectfully asks for notifications of the earthquakes in the province of OSTROBOTHNIA
on 17 February 1979 at 19.31 and 19.41 o'clock.
Please fill in the questionnaire below. It is requested to fill in items 1–5 even if nothing unusual was observed. (Underline the suitable alternative of items 3–13).

1. Location of the observation site:

   _____ _____ _____
   municipality village house
   A more detailed description of the place (such as the distance to a crossroads or another target easily found on a map): _____
   _____

2. Time: _____ o'clock
3. The earthquake was noticed. / Nothing unusual was noticed.
4. The observer was:
   outdoors, in a stone building, in a wooden building, on which floor? _____
5. The observer was: asleep , awake and stationary, walking, riding a bicycle, driving a vehicle, _____
6. The phenomenon was noticed by: only the respondent , only a few, many others, everybody about, _____
7. The ground type at the observation site is: rock, compact soil, gravel, sand, clay, swamp, _____
   The thickness of the soil layer? _____
8. The observation was not frightening / slightly frightening / very frightening.
9. What was observed: tremor , roar phenomena, _____
10. The tremor was: continuous, undulating, separate jolts – how many? _____ , intervals between the jolts _____, duration of the tremor _____
11. From which direction did the tremor come? _____
12. The sound resembled: wind soughing, thunder, chimney fire, oil heater, roar of storm, a light vehicle, a heavy truck passing by, colliding motor vehicle, another sound, what? _____
13. Observations in a building, such as: windows rattled, lamps swung, walls, floors, ceilings creaked, doors opened and/or shut, hanging objects swung, china and glassware rattled, a pendulum clock made a sound or stopped, paintings, mirrors and other objects hanging on the walls swung. In which direction?
    _____

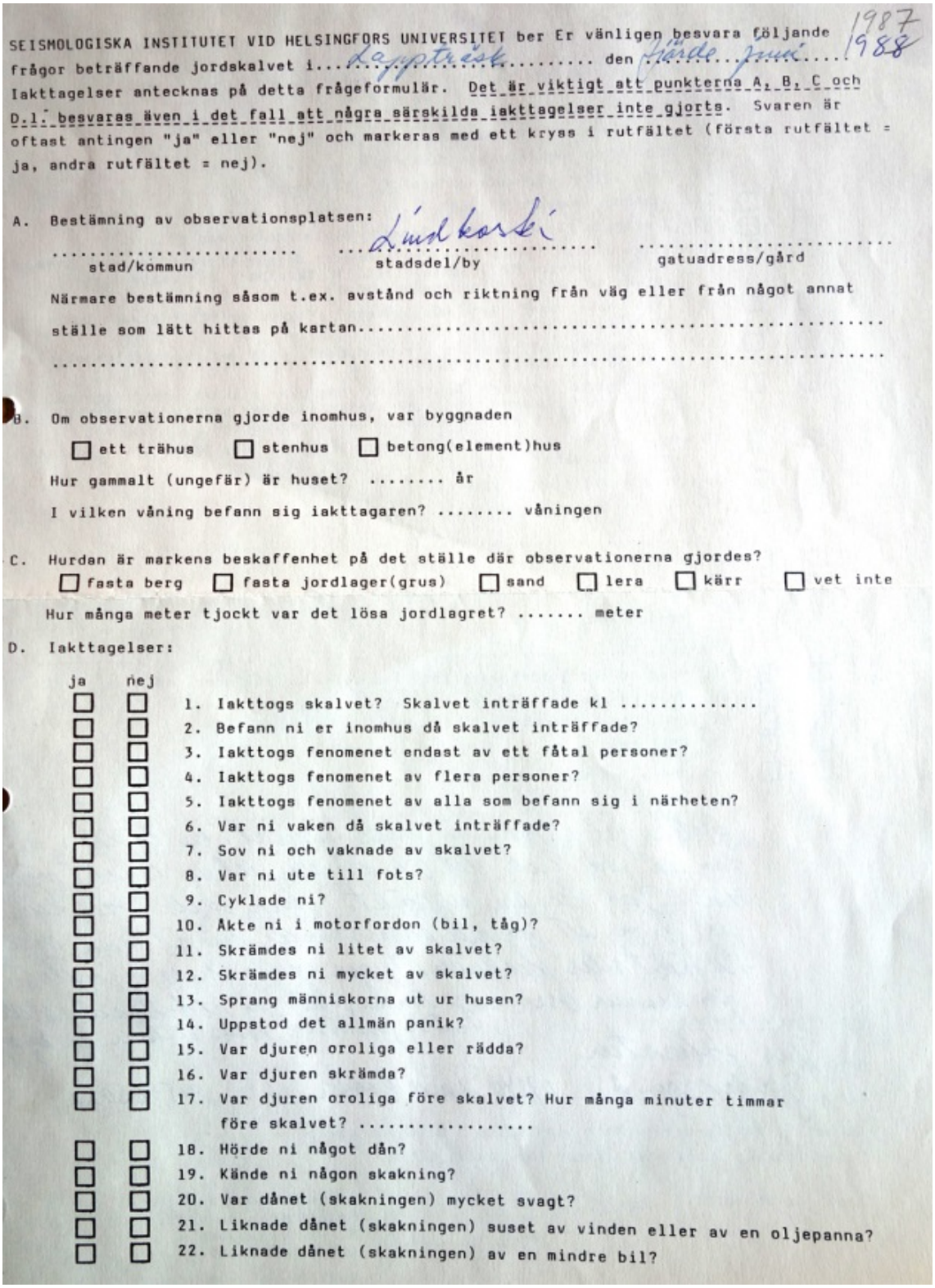
Objects were shifted, tipped over, fell down, broke.
What?_____
_____

14. Effects on buildings: small cracks in: plaster, fire wall, chimney stack or other structures, pieces of plaster fell. Other damages? _____
_____

15. Other observations such as: spilling of water, snow falling from the roof, cracks in the ground, ice or snow, the behavior of domestic animals and other related information
_____
_____
_____

Note: Please return the questionnaire in the enclosed envelope. Postage-free

The respondent:
name _____
address _____
tel. _____



SEISMOLOGISKA INSTITUTET VID HELSINGFORS UNIVERSITET ber Er vänligen besvara följande frågor beträffande jordskalvet i Lappträsk den fjärde juni 1987/1988. Iakttagelser antecknas på detta frågeformulär. Det är viktigt att punkterna A, B, C och D.1. besvaras även i det fall att några särskilda iakttagelser inte gjorts. Svaren är oftast antingen "ja" eller "nej" och markeras med ett kryss i rutfältet (första rutfältet = ja, andra rutfältet = nej).

A. Bestämning av observationsplatsen:

Lindkorski

..... stad/kommun ... stadsdel/by ..... gatuadress/gård

Närmare bestämning såsom t.ex. avstånd och riktning från väg eller från något annat ställe som lätt hittas på kartan.....

.....

B. Om observationerna gjorde inomhus, var byggnaden

☐ ett trähus ☐ stenhus ☐ betong(element)hus

Hur gammalt (ungefär) är huset? ..... år

I vilken våning befann sig iakttagaren? ..... våningen

C. Hurdan är markens beskaffenhet på det ställe där observationerna gjordes?

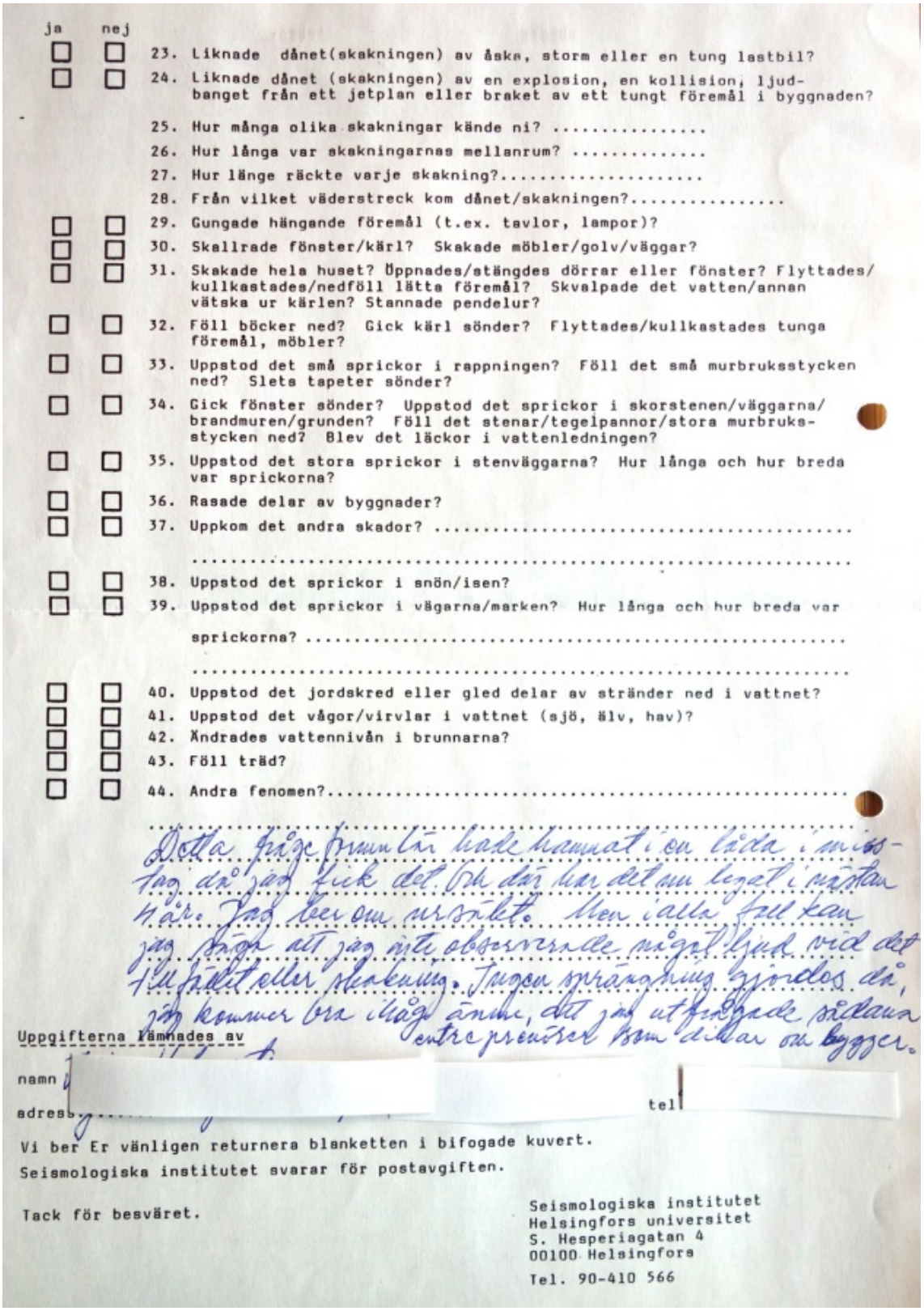
☐ fasta berg ☐ fasta jordlager(grus) ☐ sand ☐ lera ☐ kärr ☐ vet inte

Hur många meter tjockt var det lösa jordlagret? ..... meter

D. Iakttagelser:

ja	nej	
☐	☐	1. Iakttogs skalvet? Skalvet inträffade kl .....
☐	☐	2. Befann ni er inomhus då skalvet inträffade?
☐	☐	3. Iakttogs fenomenet endast av ett fåtal personer?
☐	☐	4. Iakttogs fenomenet av flera personer?
☐	☐	5. Iakttogs fenomenet av alla som befann sig i närheten?
☐	☐	6. Var ni vaken då skalvet inträffade?
☐	☐	7. Sov ni och vaknade av skalvet?
☐	☐	8. Var ni ute till fots?
☐	☐	9. Cyklade ni?
☐	☐	10. Åkte ni i motorfordon (bil, tåg)?
☐	☐	11. Skrämdes ni litet av skalvet?
☐	☐	12. Skrämdes ni mycket av skalvet?
☐	☐	13. Sprang människorna ut ur husen?
☐	☐	14. Uppstod det allmän panik?
☐	☐	15. Var djuren oroliga eller rädda?
☐	☐	16. Var djuren skrämda?
☐	☐	17. Var djuren oroliga före skalvet? Hur många minuter timmar före skalvet? .....
☐	☐	18. Hörde ni något dån?
☐	☐	19. Kände ni någon skakning?
☐	☐	20. Var dånet (skakningen) mycket svagt?
☐	☐	21. Liknade dånet (skakningen) suset av vinden eller av en oljepanna?
☐	☐	22. Liknade dånet (skakningen) av en mindre bil?

A 7b 1



ja nej

23. Liknade dånet(skakningen) av åska, storm eller en tung lastbil?
24. Liknade dånet (skakningen) av en explosion, en kollision; ljudbanget från ett jetplan eller braket av ett tungt föremål i byggnaden?
25. Hur många olika skakningar kände ni? .....
26. Hur långa var skakningarnas mellanrum? .....
27. Hur länge räckte varje skakning?.....
28. Från vilket väderstreck kom dånet/skakningen?.....
29. Gungade hängande föremål (t.ex. tavlor, lampor)?
30. Skallrade fönster/kärl? Skakade möbler/golv/väggar?
31. Skakade hela huset? Öppnades/stängdes dörrar eller fönster? Flyttades/kullkastades/nedföll lätta föremål? Skvalpade det vatten/annan vätska ur kärlen? Stannade pendelur?
32. Föll böcker ned? Gick kärl sönder? Flyttades/kullkastades tunga föremål, möbler?
33. Uppstod det små sprickor i rappningen? Föll det små murbruksstycken ned? Slets tapeter sönder?
34. Gick fönster sönder? Uppstod det sprickor i skorstenen/väggarna/brandmuren/grunden? Föll det stenar/tegelpannor/stora murbruksstycken ned? Blev det läckor i vattenledningen?
35. Uppstod det stora sprickor i stenväggarna? Hur långa och hur breda var sprickorna?
36. Rasade delar av byggnader?
37. Uppkom det andra skador? .....
38. Uppstod det sprickor i snön/isen?
39. Uppstod det sprickor i vägarna/marken? Hur långa och hur breda var sprickorna? .....
40. Uppstod det jordskred eller gled delar av stränder ned i vattnet?
41. Uppstod det vågor/virvlar i vattnet (sjö, älv, hav)?
42. Ändrades vattennivån i brunnarna?
43. Föll träd?
44. Andra fenomen?.....

Detta hörde grannen hade hammat i en låda i mellandag då jag fick det. Och där har det ju legat i nästan två år. Jag tror om mig själv. Men i alla fall kan jag säga att jag inte observerade något ljud vid det tillfället eller skakning. Ingen sprängning gjordes då, jag kommer bra ihåg ännu, det jag utförde sådana entre prenörer som dikar och bygger.

Uppgifterna lämnades av

namn

adress tel

Vi ber Er vänligen returnera blanketten i bifogade kuvert.
Seismologiska institutet svarar för postavgiften.

Tack för besväret.

Seismologiska institutet
Helsingfors universitet
S. Hesperiagatan 4
00100 Helsingfors
Tel. 90-410 566

A 7b 2

7. b) The questionnaire of the Institute of Seismology, University of Helsinki from the 1980s to 1998

The INSTITUTE OF SEISMOLOGY, UNIVERSITY OF HELSINKI, respectfully asks for notifications of the earthquake in …..<*place*>….. on ….<*day*> …..<*month*> 19……. Please fill in this questionnaire. It is requested to fill in items A, B, C and question 1 of item D even if nothing unusual was observed. Most answers are of type yes or no and are indicated by ticking the appropriate box (box on the left: yes, on the right: no).

A. Location of the observation site:

....
town / municipality district / village street address / house

A more detailed description of the place, such as the distance to a road or another place easily found on a map):

.....

.....

B. If the observation was made in a building, the building was wooden, made of stone, prefabricated? The approximate age of the building ..... years? On which floor was the observer? .....

C. The soil at the observation site is rock, compact soil (gravel), sand, clay, swamp, unknown? How thick is the soil layer? .....

D. Observations

yes no

1. Was the earthquake observed? Time of observation was .....
2. Were you indoors at the time of the earthquake?
3. Was the earthquake observed only by a few persons?
4. Was the earthquake observed by many persons?
5. Was the earthquake observed by everybody about?
6. Were you awake (stationary) at the time of the earthquake?
7. Were you asleep and awakened?
8. Were you walking?
9. Were you riding a bicycle?
10. Were you in a motor vehicle (car, train)?
11. Was the earthquake slightly frightening?
12. Was the earthquake very frightening?
13. Did people run out of buildings?
14. Did people panic?
15. Were animals restless or frightened?
16. Were animals very frightened?
17. Were animals restless before the earthquake? How many minutes/hours earlier? .....
18. Was any roar heard?
19. Was ground shaking felt?
20. Was the roar/tremor very weak?

21. Did the roar/tremor resemble soughing of wind or an oil heater?
22. Did the roar/tremor resemble a light vehicle passing by?
23. Did the roar/tremor resemble thunder, storm or a heavy vehicle passing by?
24. Did the tremor resemble an explosion, collision, a jet plane or a heavy object whamming inside the building?
25. How many separate jolts did you feel? .....
26. How long were the intervals between them? ....
27. How long did the jolts last? ....
28. From which direction did the roar/ tremor come? .....
29. Did hanging objects swing (e.g. lamps, paintings)?
30. Did windows / dishes rattle? Did furniture / floors / walls shake?
31. Did the whole house shake? Did doors or windows open /shut? Were light objects shifted / tipped over / did they fall? Did water or other liquids spill from containers? Did pendulum clocks stop?
32. Did books fall? Were dishes broken? Was heavy furniture shifted / tipped over?
33. Was plaster cracked? Did small pieces of plaster fall? Was wallpaper split?
34. Were windowpanes broken? Were there cracks in the chimneystacks/walls/ firewalls/ stone foundations? Did stones/tiles/large pieces of plaster fall? Did water pipes start to leak?
35. Did large cracks appear on stone walls? How long and wide were they? .....
36. Did parts of buildings collapse?
37. Other damages? .....
38. Were there cracks in the show/ice?
39. Were there cracks in the roads/the ground? How long and wide were they? .....
40. Did ground (such as river banks) collapse?
41. Were the water disturbances (in lakes/ rivers/ the sea)?
42. Was the water level altered in the well?
43. Did any trees break/fall?
44. Any other observations? .....

.....

.....

.....

.....

.....

The respondent: name ..... tel. .....
address .....
Please return the questionnaire in the enclosed envelope. The postage is covered by the Institute of Seismology.

Thank you for your time

Institute of Seismology, University of Helsinki
Et. Hesperiankatu 4, 00100 Helsinki 10
Tel. 90-410 566

HELSINGIN YLIOPISTON SEISMOLOGIAN LAITOS kerää tietoja
Kuusamossa aamuyöllä 15. syyskuuta 2000
tapahtuneesta maanjäristyksestä ja pyytää kohteliaimmin täyttämään tämän lomakkeen ja palauttamaan sen oheisessa kirjekuoressa mahdollisimman pian. Postimaksu on maksettu. Kohtiin **A** ja **D** on tärkeätä vastata siinäkin tapauksessa, että mitään erityistä ei ole havaittu. Olkaa hyvä ja täydentäkää puuttuva tieto viivalle tai alleviivatkaa sopiva vaihtoehto.

A. Havainto-olosuhteet

KUUSAMO OIVANKI

kaupunki tai kunta | kaupunginosa tai kylä | katuosoite tai talo

Paikan tarkempi sijainti, esim. etäisyys ja suunta lähimpään tiehen, kylään, kaupunkiin tai muuhun kartalta helposti löytyvään kohteeseen:

Maanjäristys ~~havaittiin~~ / ei havaittu. Kellonaika _____ Kesto _____
Havaittiin vain tärinää / tärinää ja ääntä / vain ääntä / ei mitään erikoista.

Jos havaitsitte ääntä, miltä se kuulosti? _____

Ilmoittaja oli tapahtumahetkellä ulkona / puurakennuksessa / kivirakennuksessa /
/ betoni(elementti)rakennuksessa / muussa, missä? _____

Rakennuksen ikä (suunnilleen): 16,5 vuotta. Kuinka monta kerrosta siinä on? 1
Monennessako kerroksessa ilmoittaja oli? 1

Ilmoittaja nukkui eikä herännyt / nukkui ja heräsi järistykseen / oli valveilla paikallaan /
/ oli liikkeellä jalan / polkupyörällä / moottoriajoneuvolla, millä? _____

Maaperä havaintopaikalla on kalliota / tiivistä irtomaata / soraa / hiekkaa / savea /
/ suota / tuntematon. Maakerroksen paksuus (jos tiedossanne): _____

B. Havainnot tapahtumahetkellä

1. Sisällä ilmiön havaitsivat vain ilmoittaja / muutamat henkilöt / monet muut /
/ kaikki lähistöllä olleet. Havaitsijoiden lukumäärä sisällä: _____

2. Ulkona ilmiön havaitsivat vain ilmoittaja / muutamat henkilöt / monet muut /
/ kaikki lähistöllä olleet. Havaitsijoiden lukumäärä ulkona: _____

3. Maanjäristys herätti vain ilmoittajan / muutamia henkilöitä / monia muita /
/ kaikki lähistöllä olleet.

Käännä

A 8 1

4. Maanjäristys ei säikäyttänyt ketään / säikäytti muutamia henkilöitä / säikäytti monia henkilöitä / säikäytti kaikki lähistöllä olleet.

5. Riippuvat esineet heiluivat hiukan / heiluivat / heiluivat voimakkaasti.
Riippuvia esineita olivat lamput / taulut / kukat / muut, mitkä? _____

6. Ikkunat helisivät heikosti / helisivät / helisivät hyvin kuuluvasti.

7. Astiat ja/tai lasit helisivät heikosti / helisivät / helisivät toisiaan vasten sivusuunnassa.

8. Kevyet huonekalut / painavat huonekalut tärisivät.

9. Kevyitä esineitä / painavia esineitä siirtyi paikoiltaan / putosi.

10. Ovet / ikkunat avautuivat / sulkeutuivat.

11. Koko huone / rakennus tärisi lievästi / tärisi / tärisi voimakkaasti.

12. Kattoparrut / hirret / muut puurakenteet / huonekalut narisivat tai vinkuivat.

13. Vesi tai muu neste väreili astioissa / läikkyi täysistä astioista.

14. Sisätiloissa eläimet eivät olleet levottomia / olivat levottomia.

15. Maatilan eläimet, myös ulkona olevat, eivät olleet levottomia / olivat levottomia.

16. Kevyet huonekalut / painavat huonekalut siirtyivät paikoiltaan / kaatuivat kumoon.

17. Rakennukseen aiheutui halkeamia savupiippuun / palomuuriin / seiniin.
Muita vaurioita: _____

C. Lisähavaintoja maanjäristyksestä

_____

_____

_____

D. Tiedot antoi: _____

Osoite: _____ Puh.: _____

_____

Kiitos vastauksesta !

Seismologian laitos, PL 26, 00014 Helsingin yliopisto, puh. 09-191 44443

A 8 2

8. The questionnaire in use at the Institute of Seismology, University of Helsinki since 1998

The Institute of Seismology, University of Helsinki, collects information about the earthquake in *Kuusamo in the early hours of 15 September 2000*
and kindly asks to fill in this questionnaire and return it in the enclosed envelope at the earliest convenience. The postage is covered. It is important to fill in items **A** and **D** even if nothing unusual was observed. Please fill in the missing information or underline the suitable alternative.

A. Circumstances of observation

_____

town / municipality district / village street address / house

A more precise location, for example the distance and direction to the nearest road, village, town or another target easily found on a map:

_____

The earthquake was observed / was not observed. Time by the clock _____ Duration _____
Only tremor / tremor and sound / only sound / nothing unusual was observed.

If you observed sound, what did it resemble? _____

During the observation, the respondent was outdoors / in a wooden building / in a stone building / in a prefabricated building, other, what? _____

The (approximate) age of the building: _____ years. How many floors does it have? _____

On which floor was the respondent? _____

The respondent was asleep and not awakened / asleep and awakened / awake and stationary / walking / riding a bicycle / driving a motor vehicle, what? _____

The soil type at the observation site is rock / compact soil / gravel / sand / clay / swamp / unknown. The thickness of the soil layer (if known): _____

B. Observations at the time of the earthquake

1. Indoors the phenomenon was noticed by only the respondent / a few persons / many others / everybody about. The number of observers indoors: _____
2. Outdoors the phenomenon was noticed by only the respondent / a few persons / many others / everybody about. The number of observers outdoors: _____
3. Only the respondent / a few persons / many others / everybody about was awakened by the earthquake.

PTO

4. The earthquake frightened nobody / a few persons / many persons / everybody about.

5. Hanging objects swung lightly / swung / swung considerably.

The objects were lamps / paintings / flowers / other, what? _____

6. The windows rattled slightly / rattled / rattled considerably.
7. Dishes and/or glassware rattled slightly / rattled / clattered together.
8. Light / heavy furniture shook.
9. Light / heavy objects were shifted / fell.
10. Doors / windows opened /shut.
11. The whole room / building shook slightly / shook / shook considerably.
12. Beams / timber / other wooden parts / furniture creaked or squeaked.
13. Water or other liquids vibrated in containers / were spilled from full containers.
14. Indoors animals were not restless / were restless.
15. Farm animals, also those outdoors, were not restless / were restless.
16. Light / heavy furniture was shifted / tipped over.
17. Cracks appeared in the chimneystack / firewall / walls.

Other damages: _____

C Additional information about the earthquake

_____

_____

_____

D. The respondent: _____

Address: _____ Tel.:_____

_____

Thank you for the information!

Institute of Seismology, P.O.B. 26, 00014 University of Helsinki, tel. 09-191 44443