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Macroseismic data in Italy. Early questionnaires and postcards: a brief history and commentary (19^{th} and 20^{th} centuries)

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ABSTRACT This paper is divided into two parts: the first presents a summary of the history of macroseismic collection data in Italy, from an initial experience in the mid-19th century, to the beginning of the use of macroseismic postcards and their evolution in the first decades of the 20th century; the second part analyses a number of specific aspects of the content of macroseismic postcards. An example of the reading difficulties that these postcards pose is illustrated together with a brief comparison between the Mercalli and Mercalli-Cancani-Sieberg scales, which serve to interpret macroseismic postcards. Both the historical and analytical parts of the paper, aim to improve the comprehension of the sources and, consequently, the knowledge on Italian seismicity.

Key words: Giuseppe Scarabelli, macroseismic postcards, microseismology, history of seismology, intensity scales.

1. Introduction

This paper begins from the considerations and insights that emerged during the review of Italian seismicity of the 1930s (Caracciolo, 2021). Initially, it summarises the history of the systematic collection of macroseismic information in Italy, from the mid-19th century up to the 1930s and, then, focuses on the characteristics of the Regio Ufficio Centrale di Meteorologia e Geofisica (UCMG) macroseismic postcards, one of the main historical sources for this period. The critical analysis of the source is a constitutive aspect of a historian's work, hence, it is customary for even the most reliable and secure source, i.e. macroseismic postcards, to be subjected to historical examination. Next, a number of aspects of the macroseismic postcards are analysed. Moreover, an example of the interpretative difficulties that these postcards pose is illustrated together with a brief comparison between the Mercalli (1897, 1902) scale and the Mercalli-Cancani-Sieberg (MCS) scale (Sieberg, 1930, 1933), functional to the reading of the macroseismic postcards.

2. An early macroseismic data collection

The Italian history of a systematic collection of macroseismic information begins with the earthquake of 16 June 1854 in Imola and the surrounding area (Rovida *et al.*, 2022). Shortly after the event, Giacomo Tassinari (1812-1900) and Giuseppe Scarabelli (1820-1905), two friends involved in the Italian Risorgimento and in naturalistic explorations, agreed to study the phenomenon. Tassinari was chief pharmacist at the hospital in Imola, while Scarabelli, considered one of the Italian founding fathers of geosciences, was already the author of several geological studies, had issued the first geological maps in Italy and was a member of the French Geological Society (Scarabelli, 1851, 1852, 1853, 1854). Moreover, they were amongst the founders of the Archaeological and Naturalistic Museum of Imola (now Giuseppe Scarabelli Museum).

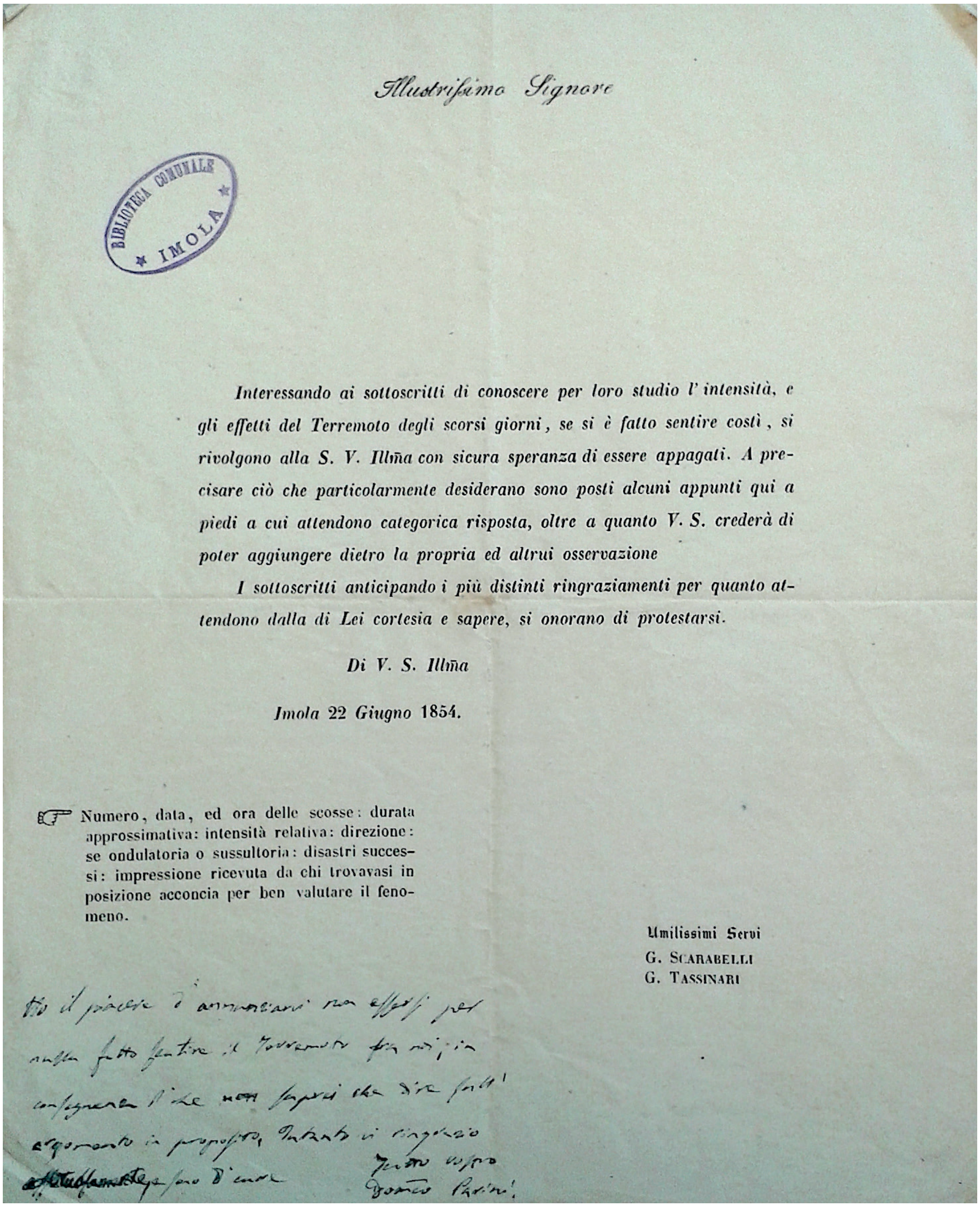
In the aftermath of the earthquake, Tassinari and Scarabelli printed a letter in which they expressed their interest in knowing the intensity and the effects of the earthquake. They sent the letter to friends, relatives, municipalities, priests, and scholars (Fig. 1a). To achieve greater precision in the description, they indicated a set of specific points on they requested an answer (Fig. 1b): "number, date, and time of the quakes; approximate duration; whether vertical [*sussultorio*] or horizontal [*ondulatorio*]; disasters that occurred; impressions received from those in a position to properly evaluate the phenomenon".

Briefly, it was a list containing questions that were further developed in future questionnaires. The number of letters sent by Scarabelli and Tassinari is unknown, however more than thirty responses, sent from an area expanding from Pavia to Senigallia, were collected and stored in the Imola Public Library (Tassinari, 1854). The results of the data collected were not published, and what became of their use remains unknown to this day. Fortunately, thanks to the data contained in them, it was possible to reconstruct the macroseismic scenario of the earthquake to which they referred (Caracciolo, 2020). The documentation collected is of extraordinary importance for the history of Italian macroseismology as it is possibly the first investigation into the effects of a single earthquake conducted through a list of questions.

Unlike the path taken by many seismology scholars during those decades, the data collection by Scarabelli and Tassinari appears extraneous to meteorological observations, despite many scholars at that time looking for correlations between earthquakes and meteorological phenomena (Perrey, 1848; De Rossi, 1879; Agnew, 2002). Presumably, Scarabelli, thanks to his frequent studies and field trips, was aware of other seismological currents. The links between meteorology and seismology were also present in institutions and research for many years. In 1859, Francesco Denza founded the Meteorological Observatory in Moncalieri (Italy), and during the 1860s, established a growing network of observatories. This network served to record seismic activity not only with primitive seismic instruments but also through direct observations. The traces of these overlapping observations have been present on seismic postcards since the 1870s. In fact, notes for each earthquake were transcribed from meteorological cards onto the new seismic cards printed in the 1890s (see below).

In the wake of meteorology, the widespread network of seismological observatories would have been of little use without a conceptual tool to measure and compare events. At this point, the significant contributions of Michele De Rossi, credited with drafting and publishing a macroseismic scale in 1874 (De Rossi, 1874), are worthy of note. In addition, since 1873, he organised a dense network of correspondents, whose observations were collected and published in the *Bullettino del Vulcanismo Italiano*, a publication founded and financed by De Rossi himself. This network comprised upper-class naturalists, driven by a passion for observing phenomena and often equipped with measuring instruments, such as seismoscopes installed inside their homes (Ferrari, 1990; Molin *et al*., 2008; Tertulliani, 2019).

The disastrous earthquakes in Casamicciola, southern Italy, (1881 and 1883) first, and the earthquake in Liguria, northern Italy, (1887) later, paved the way for a national seismic service. The service, established in 1876 as the Regio Ufficio Centrale di Meteorolgia (UCM; Royal Central Office for Meteorology), was originally located in the historic headquarters of the Roman College and, over time, changed its name as indicated below:



Illustrissimo Signore

Interessando ai sottoscritti di conoscere per loro studio l'intensità, e gli effetti del Terremoto degli scorsi giorni, se si è fatto sentire costì, si rivolgono alla S. V. Illma con sicura speranza di essere appagati. A precisare ciò che particolarmente desiderano sono posti alcuni appunti qui a piedi a cui attendono categorica risposta, oltre a quanto V. S. crederà di poter aggiungere dietro la propria ed altrui osservazione

I sottoscritti anticipando i più distinti ringraziamenti per quanto attendono dalla di Lei cortesia e sapere, si onorano di protestarsi.

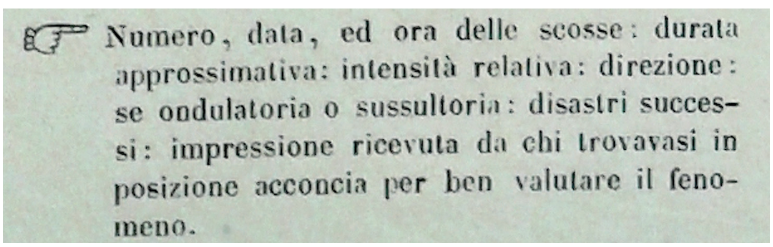
Di V. S. Illma

Imola 22 Giugno 1854.

☞ Numero, data, ed ora delle scosse: durata approssimativa: intensità relativa: direzione: se ondulatoria o sussultoria: disastri successi: impressione ricevuta da chi trovavasi in posizione acconcia per ben valutare il fenomeno.

Umilissimi Servi
G. Scarabelli
G. Tassinari

a



☞ Numero, data, ed ora delle scosse: durata approssimativa: intensità relativa: direzione: se ondulatoria o sussultoria: disastri successi: impressione ricevuta da chi trovavasi in posizione acconcia per ben valutare il fenomeno.

b

Fig. 1 - Circular letter (a), with detailed close-up (b), sent by Tassinari and Scarabelli requiring information on the earthquake of 16 June 1854 (Tassinari, 1854). Document retrieved in the Tassinari Collection, Imola Public Library. Permission for publication granted by the Imola Public Library, Registry. n. 23388/2023.

1887-1923 Regio Ufficio Centrale di Meteorologia e Geodinamica (UCMG; Royal Central Office for Meteorology and Geodynamics);

1923-1939 Regio Ufficio Centrale di Meteorologia e Geofisica-UCMG (Royal Central Office for Meteorology and Geophysics).

At this point, the seismic service was absorbed by the recently established National Institute of Geophysics (ING).

The social composition of the observers had also undergone a change from the original. From members of the upper classes who studied natural sciences and sent handwritten cards with a concise account of instrumental or observable earthquake effects, the role shifted to civil servants not necessarily trained in macroseismic observations.

In 1888, the network, overseen by the national seismic service, counted 492 observation points, the majority of which in telegraph offices (170), port authorities (155), thermo-rainfall stations (117), private houses (35), agricultural schools (8), and meteorological observatories (7) (Ferrari, 1990). According to Michele de Rossi, the significant number of telegraph offices can be attributed to the efforts of the Director of the Urbino Meteorological Observatory, Father Alessandro Serpieri. This well-known scholar, having observed particular phenomena in a number of telegraph stations during the earthquake in central Italy of 12 March 1874 (Marche Apennines), proposed to the telegraph network chief a collaboration consisting in the sending of information in the event of earthquakes. However, telegraphers were required to record electrical anomalies rather than macroseismic signals (De Rossi, 1879). As later explained, traces of this approach will be evident in some of the first macroseismic postcards. In the local context, specifically in the Bologna area (central Italy), Antonio Malvasia sent a circular letter to municipalities and parishes to involve them in a network of correspondents.

3. Macroseismic postcard development steps

At the beginning, information on earthquakes was entirely handwritten on slips of paper or written on meteorological postcards. In fact, various types of documents have been collected by the UCMG and now preserved in the Archivio Meteorologico Nazionale (AMN) of the Consiglio per la Ricerca in Agricoltura e l'Analisi dell'Economia Agraria (CREA): letters from municipalities or observatories, press clippings, slips of paper, telegrams, cards, some of which bear the stamp Servizio Geodinamico [Geodynamic Service], and meteorological postcards. A second corpus is kept in the macroseismic archive of the Istituto Nazionale di Geofisica e Vulcanologia (INGV).

In January 1889, seismic postcards, designed for both instrumental and non-instrumental observations, began to circulate (Fig. 2). These cards gave prominence to the environmental effects: the pre-printed form dedicated specific questions to the phenomena in the sea and in the lakes such as disturbances in water sources and wells, disorders of fumaroles, mofette, and 'sauces'; temperature variations of thermal waters and fumaroles; and effects on animal behaviour. The only question relating to the human artefacts concerned possible disturbances in the telegraph lines, probably due to Serpieri's interest in this type of observation, as previously described. At the bottom of the form, additional lines were added for reporting instrumental observations.

Worthy of note is the fact that, although these types of postcards are now commonly called questionnaires, at the time, this was a new word in Italian, and was not yet encountered in this context.

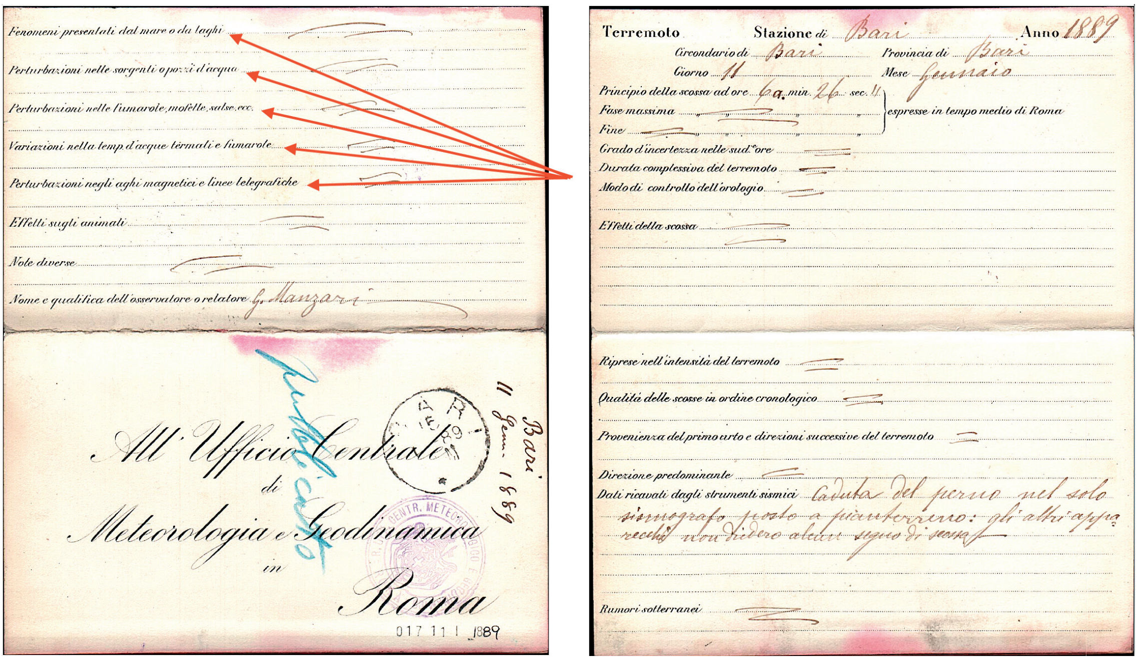
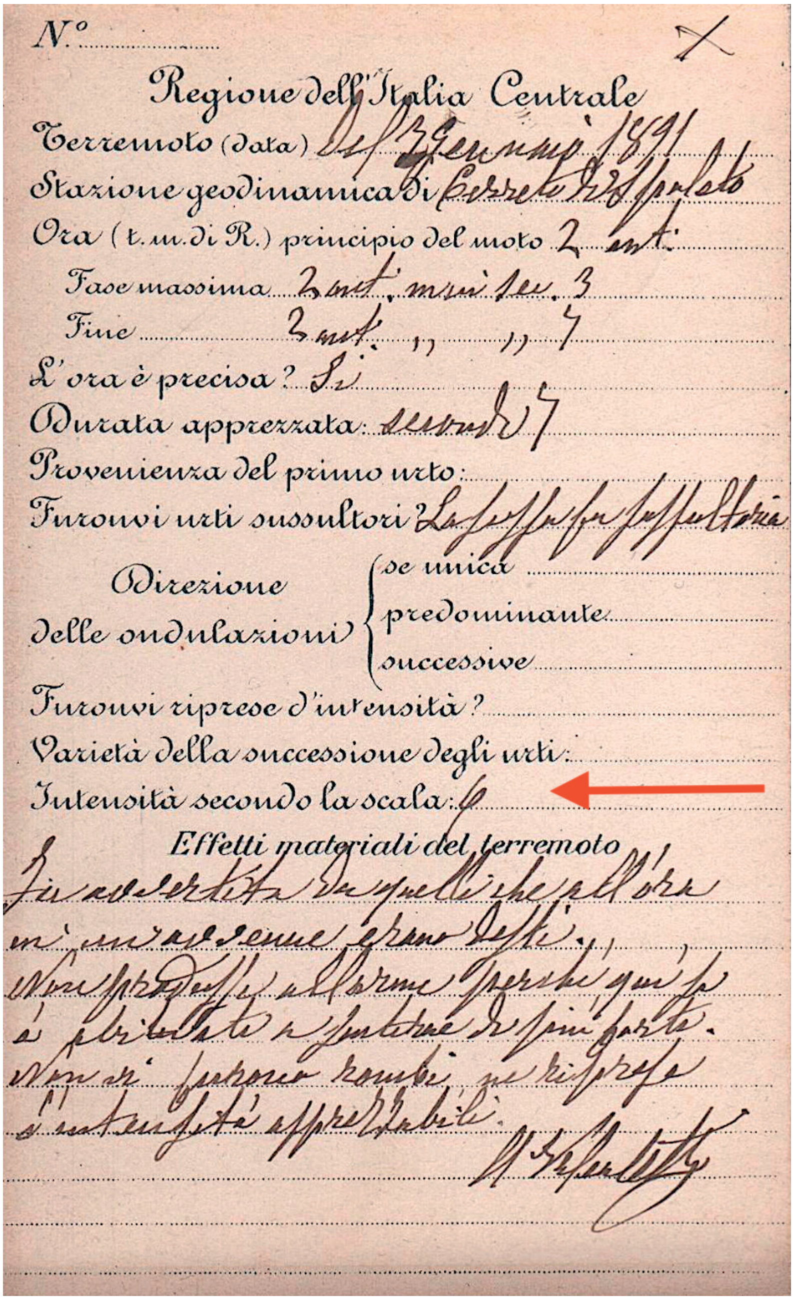


Fig. 2 - The new seismic postcard in circulation since January 1889, printed for both instrumental and non-instrumental observations by the UCMG. The questionnaire records a light earthquake in Bari, Apulia, on 11 January 1889 (CREA-AMN). On the left, the red arrows show the different variations or anomalies (*perturbazioni*) in the environment considered in the pre-printed form.

Another type of seismic postcard, which began to circulate in 1890, presented only a few items to be filled in: where (name of the place of observation, district, province) and when (day, month, year, hour, minute and second), the name of the observer and a few lines with no pre-printed indication. Exception made for a modified header, this is the same postcard that, years later, would be used for instrumental observations. On one hand, this was the most popular postcard circulating because of its generic character; in addition, this same postcard had also been used for the transcription of data collected during the previous decades (i.e. from 1871 onwards). On the other hand, the new postcards did not replace the old ones in a short period but postcards of different types circulated together; unsurprisingly this characteristic continued during the following decades.

The postcards mentioned were issued by UCMG, as printed on their covers. However, in 1891-1892, another macroseismic postcard began to circulate. Presented with a different heading, *Regione dell'Italia Centrale* [Region of central Italy], the postcard included two different pre-printed items for the compiler: "*effetti materiali del terremoto*" [material effects of the earthquake], and "*intensità secondo la scala*" [intensity according to scale]. This marks the first mention of a macroseismic scale in seismic postcards, and the one generally known at that time was the De Rossi-Forel scale (Musson *et al.*, 2010; Tertulliani, 2019). For this reason, the postcard was most likely printed by the Rocca di Papa observatory (central Italy), directed by Michele De Rossi himself (Fig. 3).

In the same period (1891-1892), the UCMG began to distribute another kind of postcard, which, in its pre-printed form, included questions for both instrumental and macroseismic data. It required information on the earthquake start, peak, and end, as well as data acquired by the instruments. Additionally, it requested information on the different effects produced by



N.°

Regione dell'Italia Centrale

Terremoto (data) Del 3 Gennaio 1891

Stazione geodinamica di Cerreto di Spoleto

Ora (t. m. di R.) principio del moto 2 ant.

Fase massima 2 ant.

Fine 2 ant.

L'ora è precisa? Si

Durata apprezzata: secondi 7

Provenienza del primo urto:

Furonvi urti sussultori?

Direzione delle ondulazioni { se unica / predominante / successive

Furonvi riprese d'intensità?

Varietà della successione degli urti:

Intensità secondo la scala: 6

Effetti materiali del terremoto

Fig. 3 - An alternative postcard most likely referring to the De Rossi-Forel scale (indicated with the red arrow). The questionnaire records a small earthquake in Cerreto di Spoleto, Latium (central Italy), on 3 January 1891 (CREA-AMN).

the earthquake from which its intensity could have been detected. While this was not a direct macroseismic indication, it allowed a broad spectrum of responses, such as: "general awakening from sleep; glass shaking", or, as seen in Fig. 4: "*scricchiolio delle soffitte e spostamento di mobili*" [creaking of ceilings and moving of furniture], typically macroseismic signals.

In the summer of 1893, this type of postcard was modified. The new model tentatively included an actual macroseismic guide for the observer in a footnote to the aforementioned

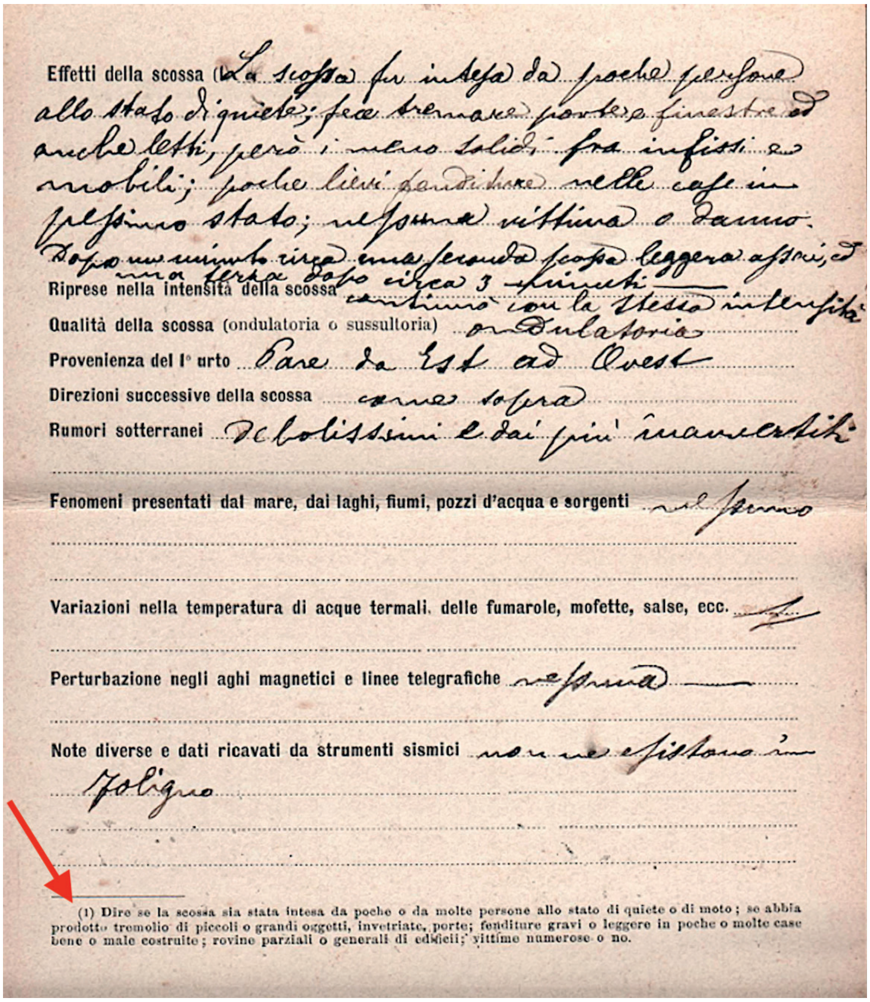
Fig. 4 - A new seismic postcard inquiring about details on the different effects produced by the earthquake from which its intensity could have been detected (indicated with the red arrow). The questionnaire records a small earthquake in Frosolone, Molise (central Italy), on 14 November 1891 (CREA-AMN).

seismic effects (*"effetti della scossa"*) (Fig. 5a): "*dire se la scossa sia stata intesa da poche o da molte persone allo stato di quiete o di moto; se abbia prodotto tremolio di piccoli o grandi oggetti, invetriate, porte; fenditure gravi o leggere in poche o molte case bene o male costruite; rovine parziali o generali di edifici; vittime numerose o no*" [report whether the tremor was felt by a few or by many people in a state of stillness or motion; whether it produced the shaking of small or large objects, windows, doors; large or slight cracks in a few or many well or badly built houses; partial or general ruin of buildings; numerous or no victims] (Fig. 5b).

It is unclear how this list was created and whether it was influenced by the definition from any scale. However, it does not seem to derive directly from the De Rossi-Forel scale and even less so from the Mercalli, published four years later (Mercalli, 1897; Tertulliani, 2019). In any case, this can be confirmed as the first purely macroseismic postcard.

The next step took place in 1901, when another item was added: at first stamped and, then, pre-printed on the postcard. Among the first questions, after reporting the time of the event, the local compiler is asked to assign a Mercalli scale degree (Fig. 6). It is worth mentioning that Giuseppe Mercalli proposed the scale at the end of 1897 and it was adopted by the UCMG in 1900 (Mercalli, 1897, 1902).

This indication would persist in the following years, albeit with a different graphic relevance. In the very last days of 1909, another postcard model began to circulate, and the Mercalli scale appeared on it twice: "*Vedi scala Mercalli*" [Refer to the Mercalli scale] was added at the end of the aforementioned list of diagnostic elements, as if it were a link between the list and the scale. At the same time, further details were added to the list of diagnostics: the ringing of bells, the proportion of people who felt the quake compared to the entire population, whether they were sitting, walking or working, and whether they were awake or asleep. Other diagnostics, such as the size of objects, or the position or activity of people, did not correspond with the


Effetti della scossa (1) La scossa fu intesa da poche persone allo stato di quiete; fece tremare porte e finestre ed anche letti, però i meno solidi fra infissi e mobili; poche lievi fenditure nelle case in pessimo stato; nessuna vittima o danno. Dopo un minuto circa una seconda scossa leggera assai, ed una terza dopo circa 3 minuti

Riprese nella intensità della scossa continuò con la stessa intensità

Qualità della scossa (ondulatoria o sussultoria) ondulatoria

Provenienza del I° urto Pare da Est ad Ovest

Direzioni successive della scossa come sopra

Rumori sotterranei Debolissimi e dai più inavvertiti

Fenomeni presentati dal mare, dai laghi, fiumi, pozzi d'acqua e sorgenti nessuno

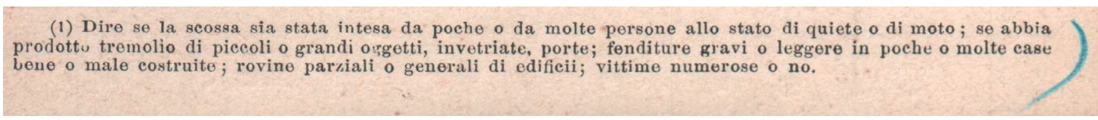
Variazioni nella temperatura di acque termali, delle fumarole, mofette, salse, ecc. —

Perturbazione negli aghi magnetici e linee telegrafiche nessuna —

Note diverse e dati ricavati da strumenti sismici non ne esistono in Foligno

(1) Dire se la scossa sia stata intesa da poche o da molte persone allo stato di quiete o di moto; se abbia prodotto tremolio di piccoli o grandi oggetti, invetriate, porte; fenditure gravi o leggere in poche o molte case bene o male costruite; rovine parziali o generali di edificii; vittime numerose o no.

a


(1) Dire se la scossa sia stata intesa da poche o da molte persone allo stato di quiete o di moto; se abbia prodotto tremolio di piccoli o grandi oggetti, invetriate, porte; fenditure gravi o leggere in poche o molte case bene o male costruite; rovine parziali o generali di edificii; vittime numerose o no.

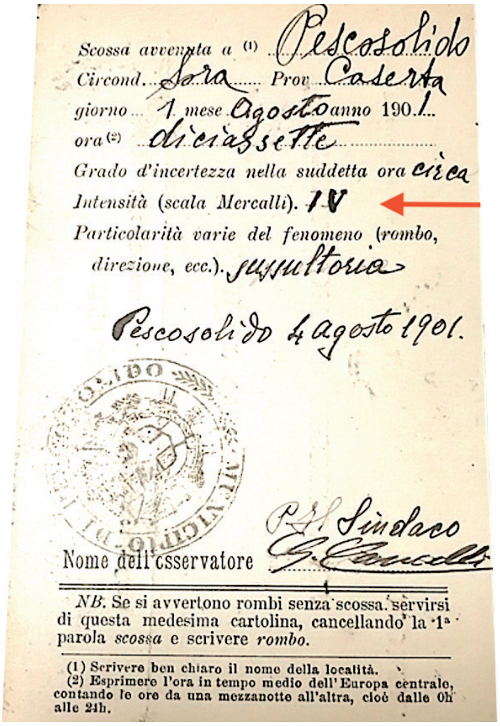
b

Fig. 5 - The new model included an actual macroseismic guide for the local observer: a) the image shows the postcard's verso of a moderate earthquake in Foligno (central Italy) on 2 August 1893 (CREA-AMN); b) detail of the macroseismic guide for the local observer.

Mercalli scale or were not mentioned, i.e. fear and alarm caused by the earthquake (Figs. 7a and 7b).

Furthermore, in this new postcard model, the item requiring an indication of a Mercalli scale degree was moved from the postcard recto to the verso, right after the description of the earthquake effects. This type of postcard was used until the 1960s and 1970s, with only a few other minor changes.

Aside from the history of macroseismic postcards, there was also a further change in the composition of the network of correspondents. The variegated composition described in the last years of the 19th century was transformed into one with considerably greater homogeneity. The network of correspondents was now largely composed of mayors and municipal secretaries. The

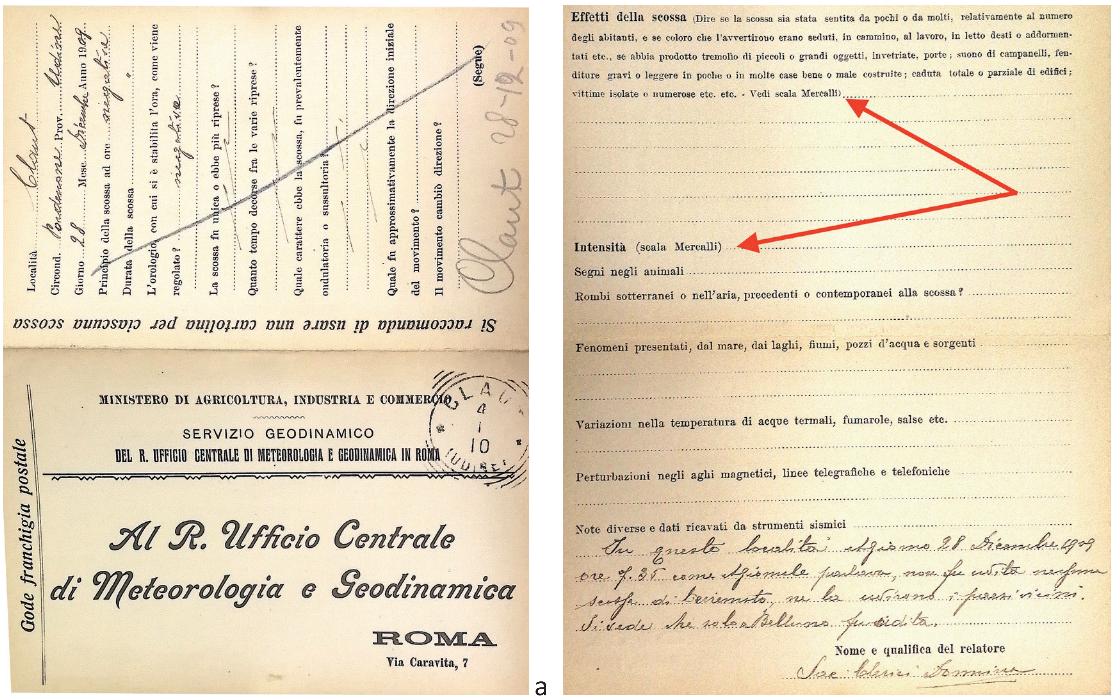


Scossa avvenuta a (1) Pescosolido
Circond. Sora Prov. Caserta
giorno 1 mese Agosto anno 1901
ora (2) diciassette
Grado d'incertezza nella suddetta ora circa
Intensità (scala Mercalli). IV
Particolarità varie del fenomeno (rombo, direzione, ecc.). sussultoria
Pescosolido 4 agosto 1901.
P. Il Sindaco
Nome dell'osservatore G. Cancelli

NB. Se si avvertono rombi senza scossa, servirsi di questa medesima cartolina, cancellando la 1ª parola *scossa* e scrivere *rombo*.

(1) Scrivere ben chiaro il nome della località.
(2) Esprimere l'ora in tempo medio dell'Europa centrale, contando le ore da una mezzanotte all'altra, cioè dalle 0h alle 24h.

Fig. 6 - The 1901 earthquake. The red arrow indicates the item with the Mercalli scale. The macroseismic questionnaire records a moderate earthquake felt in Pescosolido, Latium (central Italy), on 1 August 1901 (CREA-AMN).



Località Claut
Circond. Pordenone Prov. Udine
Giorno 28 Mese Dicembre Anno 1909
Principio della scossa ad ore negativo
Durata della scossa
L'orologio, con cui si è stabilita l'ora, come viene regolato? negativo
La scossa fu unica o ebbe più riprese?
Quanto tempo decorse fra le varie riprese?
Quale carattere ebbe la scossa, fu prevalentemente ondulatoria o sussultoria?
Quale fu approssimativamente la direzione iniziale del movimento?
Il movimento cambiò direzione?
(Segue)
Claut 28-12-09

Si raccomanda di usare una cartolina per ciascuna scossa

Gode franchigia postale
MINISTERO DI AGRICOLTURA, INDUSTRIA E COMMERCIO
SERVIZIO GEODINAMICO
DEL R. UFFICIO CENTRALE DI METEOROLOGIA E GEODINAMICA IN ROMA
Al R. Ufficio Centrale di Meteorologia e Geodinamica
ROMA
Via Caravita, 7

a

Effetti della scossa (Dire se la scossa sia stata sentita da pochi o da molti, relativamente al numero degli abitanti, e se coloro che l'avvertirono erano seduti, in cammino, al lavoro, in letto desti o addormentati etc., se abbia prodotto tremolio di piccoli o grandi oggetti, invetriate, porte; suono di campanelli, fenditure gravi o leggere in poche o in molte case bene o male costruite; caduta totale o parziale di edifici; vittime isolate o numerose etc. etc. - Vedi scala Mercalli)
Intensità (scala Mercalli)
Segni negli animali
Rombi sotterranei o nell'aria, precedenti o contemporanei alla scossa?
Fenomeni presentati, dal mare, dai laghi, fiumi, pozzi d'acqua e sorgenti
Variazioni nella temperatura di acque termali, fumarole, salse etc.
Perturbazioni negli aghi magnetici, linee telegrafiche e telefoniche
Note diverse e dati ricavati da strumenti sismici
In questa località il giorno 28 Dicembre 1909 ore 7.35 come il giornale parlava, non fu udita nessuna scossa di terremoto, né la udirono i paesi vicini. Si crede che solo a Belluno fu udita.
Nome e qualifica del relatore

b

Fig. 7 - a) The new version removes reference to the Mercalli scale from the postcard recto. The macroseismic questionnaire records "*Negativo*", indicating that the quake was not felt in Claut, in Friuli (north-eastern Italy), 29 December 1909 (INGV, Macroseismic Archive). b) The new version graphically links an updated 1893 guide with the Mercalli scale in the postcard verso (indicated with the red arrows). The macroseismic questionnaire records a "*non fu sentita*" [not felt] indication from Claut, in Friuli, 29 December 1909. The local compiler, a priest, stated that nobody felt the quake and that it seemed as if it were only perceived in Belluno (INGV, Macroseismic Archive).

number of employees of the technical office of the various municipalities, among those compiling the postcards, were not important, and those sent by observatory staff, priests, engineers, or other professionals became rather an exception. Furthermore, during the first years of the Fascist period, the democratically elected mayors were replaced by *podestà*, the head of the municipal administrations appointed directly by the government of Rome.

Before considering the analysis of macroseismic postcards, another source of macroseismic information, taken into account by the UCMG, is worth mentioning. In addition to postcards, telegrams, letters, and other documents, numerous newspaper clippings have been preserved in the archives since the end of the 19th century. Although Alfonso Cavasino expressed his distrust of newspapers (Cavasino, 1935), the seismic service did not snub the press as a source of information. Until the mid-1920s, the seismic service received clippings from its correspondents or, alternatively, its operators retrieved the news directly from local papers. Then, for a few years, the seismic service took over a press review service: *L'Eco della Stampa*, an agency from Milan still existing to this day, that would send news on earthquakes issued in Italian newspapers to the UCMG, in Rome (Fig. 8). This could partly explain the large amount of information collected in those years compared to that collected in the 1930s, when the number of earthquakes in the Seismic Bulletin decreased significantly.

4. How to read a macroseismic postcard

When examining macroseismic postcards, two or three different levels, that can be considered separately although closely intertwined, can be observed by through distinctive elements.

The first level is the pre-printed text, i.e. the form to fill out. The second is the text compiled by the local observer. The third, not always present in the postcards, consists of notes (usually in pencil) handwritten by staff members of the UCMG.

As for the first level, it should be borne in mind that the pre-printed text guides and conditions the answers. As mentioned earlier, in 1889 seismic postcards began to be used and they contained a pre-printed text highlighting the environmental effects. We can assume that those postcards did not encourage observers to describe the effects on buildings and, even less, on people (furthermore, the Mercalli scale considers environmental effects only in degree 10, while the MCS mentions them from degree 7).

In the new version of 1893, the pre-printed postcard guided the local operator to a more specific macroseismic observation, but without reference to any scale (while another type of postcard required an assignment of the intensity, probably in the Rossi-Forel scale, as previously seen).

In 1901, a new item was added to the macroseismic form: the Mercalli scale, which had been developed a few years prior (Mercalli, 1897). This dual indication was linked and reinforced in the new 1909 postcard, where just after the list of diagnostics, it reads *"Vedi scala Mercalli"* [Refer to the Mercalli scale], as if there were a direct relationship between the two indications. Thus, this new version created a discrepancy between the diagnostic queries listed in the postcard and the elements defining the different degrees of the Mercalli scale, which could confuse the local compiler when interpreting the earthquake and reporting on the pre-printed form. It is possible that the pre-printed list placed greater attention on the non-permanent effects, whereas the Mercalli scale provided greater details of the material effects on buildings.

The second level regarded the compilation by the local observer. Macroseismic information, collected by the UCMG from 1917 to 1936, is known to have been published in a seismic bulletin,

MILANO (112)
TELEFONO N. 64-301
Corrispondenza: CASELLA POSTALE 792 - Telegrammi: ECO
Corrispondenti in tutte le Principali Città del
Viareggio
VOCE DI BERGAMO - Bergamo
4 AGO 1928

...fica nomina, ... del riconoscimento del suo valore ... dato, di fascista e di colonizzatore.

Scosse di terremoto
sulla costa tirrena

GENOVA, 4.

Mandano da la Riviera di Levante che quelle popolazioni hanno avvertito leggere scosse di terremoto che non hanno destato panico. Le scosse sono state registrate anche a Viareggio e a Massa. Particolarmente sensibile è stata la scossa avvertita alle 0,40 che è stata segnalata anche alla Spezia e nelle vicinanze.

Reggio Emilia
L'ECO DELLA STA...
UFFICIO DI RITAGLI DA GIORNALI E RI...
FONDATO NEL 1901
(C. C. I. MILANO N. 77394)
DIRETTORE: UMBERTO FRUGIUELE
CORSO PORTA NUOVA, 24
MILANO (112)
TELEFONO N. 64-301
Corrispondenza: CASELLA POSTALE 792 - Telegrammi: ECO
...orrispondenti in tutte le Principali Città de...
IL SOLCO FASCISTA - REGGIO EMILIA
7 AGO 1928

...patica cerimonia che lasciò in tutti una gradita impressione.

Leggera scossa di terremoto

Verso la mezzanotte di venerdì furono avvertite leggerissime scosse di terremoto in senso ondulatorio.

CORSO PORTA NUOVA, 24
MILANO (112)
TELEFONO N. 64-301
Corrispondenza: CASELLA POSTALE 792 - Telegrammi: ECO ST...
...ispondenti in tutte le Principali Città del
VEDETTA FASCISTA - VICENZA
Montecatini III
5 AGO 1928

Scosse sismiche in Toscana

FIRENZE, 4 — Alle ore 0.10 stanotte è stata segnalata a Massa una scossa di terremoto in senso ondulatorio. La popolazione allarmata è uscita all'aperto. Scosse di terremoto sono state segnalate anche a Viareggio e a Montecatini, ma più leggere. A Fivizzano, precedute da boati, si sono avute varie scosse che hanno vivamente impressionato la popolazione che si è riversata all'aperto. I movimenti si sono verificati alle ore 0.20 fortissimo, alle 2 e alle 3 più leggeri; alle 4 forte e ancora alle 5 e alle 6 più deboli. Il panico fra la popolazione continua. Non si hanno a lamentare danni.

Corrispondenti nelle principali città del mond...
Direttore: Cav. LUCIANO NANNINI
ROMA (108) Corso Umberto I, 466
VEDI A TERGO
CORRIERE MERCANTILE - G...
Genova — 4 AGO. 1928

Sensibile scossa di terremoto in Lunigiana
Nessun danno

SPEZIA, 4.

(Fornelli). — *Questa notte a Fivizzano è stata avvertita una violenta scossa di terremoto in senso ondulatorio sussultorio. La popolazione, già provata dal terribile terremoto del settembre del 1920, che distrusse in parte la bella cittadina, è fuggita dalle abitazioni terrorizzata e si è accampata all'aperto. Ne sono seguite molte altre scosse, una delle quali assai violenta, stamane alle ore 5. La scossa è stata avvertita in tutta la Lunigiana e in special modo nei paesi di Casola, Comano, Licciana, Tavernelle e nella Garfagnana. Anche a Spezia, dopo la mezzanotte di ieri e stamane alle ore 5 sono state avvertite delle scosse di terremoto. Quella delle 5 ha prodotto un certo panico nella popolazione.*

...ondenti in tutte le Principali Città del Mon...
Giornale di Genova - Genova
Comano Tavernelle ?
6 AGO 1928

...spondenti della stessa Accade... I due eletti vengono ad occupare i posti lasciati vacanti dalla morte dei due astronomi A. Besti e Cerulli decessi nel passato anno.

IL TERREMOTO

Grande panico a Fivizzano...

FIVIZZANO, 4.

Questa notte, verso la mezzanotte, a Fivizzano veniva avvertita una violenta scossa di terremoto in senso ondulatorio e sussultorio. La popolazione, già provata dal terribile terremoto del 1920 è fuggita terrorizzata e si è accampata all'aperto. Molte altre scosse si sono susseguite nella nottata ed una violentissima stamane alle ore cinque. Le scosse sono state avvertite in tutta la Lunigiana, in special modo nei paesi di Casola, Comano, Licciana, Tavernelle e nella Garfagnana.

...e a Massa

MASSA, 4.

Stanotte, alle ore 24, una forte scossa di terremoto seguita da altre due minori si è fatta sentire a Massa. Molto panico, ma, per fortuna, nessun danno.

(C. C. I. MILANO N. 77394)
Direttore: UMBERTO FRUGIUELE
CORSO PORTA NUOVA, 24
MILANO (112)
TELEFONO N. 64-301
Corrispondenza: CASELLA POSTALE 792 - Telegrammi: ECO STAMPA
...pondenti in tutte le Principali Città del Mon...
Popolo di Brescia - Brescia
6 AGO 1928

S. E. Benuzz... dimento per i propositi ... ne di cui apprezza la collaborazione (Stefani).

Scosse di terremoto in Toscana

Firenze, 4. — Alle ore 0,10 di stanotte è stata segnalata a Massa una scossa di terremoto in senso ondulatorio. La popolazione, allarmata, è uscita all'aperto. Scosse di terremoto sono state segnalate anche a Viareggio e a Montecatini, ma più leggere. A Fivizzano, precedute da boati, si sono avute varie scosse che hanno vivamente impressionato la popolazione che si è riversata all'aperto. I movimenti si sono verificati alle ore 0,20 fortissimo, alle 2 e alle 3 più leggeri; alle ore 4 forte e ancora alle 5 e alle 6 più deboli. Il panico fra la popolazione continua. Non si hanno a lamentare danni.

Fig. 8 - The agency, *L'Eco della Stampa,* sent news about earthquakes to the UCMG. Shown are six clippings relating to the 3 August 1928 earthquake in Lunigiana, north-western Italy (Rovida *et al*., 2022; INGV; Macroseismic Archive).

the *Bollettino Sismico*, especially the *Macrosismi* appendix (Ingrao, 1927-1931; Cavasino, 1928-1937). As noted elsewhere (Caracciolo, 2021), Alfonso Cavasino himself, chief of the seismic service and editor of the bulletin as well, had expressed criticisms of the effectiveness of the method of gathering data from local observers. In fact, the data collection method was based on information that spontaneously arrived from local correspondents and on the explicit requests of the seismic service. These requests had the purpose of completing the information that had arrived spontaneously, either collected from newspapers or delivered from instrumental reports. In these cases, the seismic service would send an explicit request for news to the municipalities in the localities mentioned, or close to the area, accompanied by macroseismic postcards and a copy of the Mercalli scale. Nevertheless, the seismic service did not always, and not from all municipalities, receive answers.

In hindsight, it became clear that a system based on the propensity and ability of mayors or public administrators had not been sufficient to cover the national territory in a homogeneous and effective way. Furthermore, once the mayors were no longer elected by their citizens, but were chosen directly by the central government, they were, most likely, influenced, as occurred for the periodical press, to reduce the extent of the problems that arose from the earthquakes.

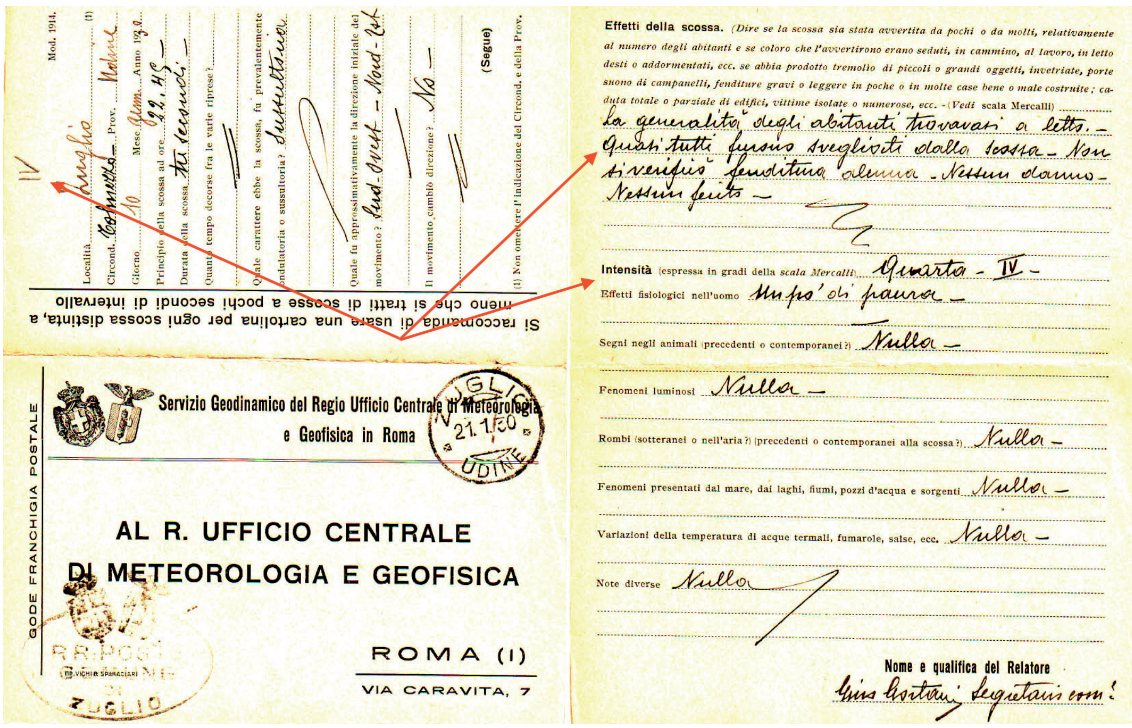
In any case, local observers filled the macroseismic postcards in different ways. The postcards were often not completed in full: time of the event (hour, minutes, and seconds); length, kind of quake, direction of the movement, etc. were not always compiled. However, this depended not only on the intensity of the quake but on the accuracy of the local compiler as well. More complicated is the case when different postcards, presumably referring to the same event (collected in the same bundle in the archive), provide very different temporal parameters: different hour, and even different day. Difficulties are greater when a sequence of quakes rocked a locality and the local compiler did not distinguish each of them, thus, providing an overall description of the effects.

Usually, the descriptions of the effects were short, and consisted only in a few words. Among the diagnostics indicated in the postcards, in the answers, there were a couple, at times only one: “the quake woke up a large number of people” or “it’s been felt by quite a few people”. That is barely enough for assigning an intensity value and does not give the optimum level of certainty either. At times, the local observer underlines the diagnostics of the pre-printed text that fit with the observed effects. Other times the compiler literally copies the definition of a Mercalli degree: it avoids any ambiguity about the degree to assign, but it raises doubts about the actual earthquake effects. Sometimes the local observer has provided a description of the effects that does not coincide with the degree on the Mercalli scale assigned by the observer himself. The worst case is when the compiler only indicates the Mercalli intensity value, therefore providing no possibility of comparison with any description. Furthermore, to date, it is not possible to know to which extent local observers were familiar with the Mercalli scale. When the seismic service sent the macroseismic postcards to the municipalities, it usually also sent the scale, nevertheless sometimes local observers claimed they did not receive it or were not familiar with it.

The posting date of the macroseismic postcard, usually visible in the postmark, can also be considered in this second level. The postcard may have been mailed the same day, a few days or weeks after the earthquake. Naturally, the longer the time elapsed, the less reliable the content of the postcard (Cecić and Musson, 2004).

At this point, the third level of the postcards can be examined. The limits and problems already encountered in the second level represent the difficulties that the seismic service staff had to face when interpreting the macroseismic postcards that arrived at the UCMG in Rome. Lacks and contradictions should be interpreted, corrected, and even completed. Generally, the seismic service staff left traces of their choices with a coloured pencil mark. At times they asserted a determined interpretation and other times they left a margin of uncertainty, frequently indicated with a question mark. In the 1930s, an operator also left a black pencil mark at the top of the postcard: the assignment of his own intensity value. The intensity value assigned could, or might not, coincide with that assigned by the local observer, and, so, the seismic service operator would correct the value with his own. On the contrary, the value assigned by the operator, almost always, coincided with the one published in the appendix, *Macrosismi*, of the seismic bulletin. However, the intensity provided by the seismic service staff does not always coincide with the effects described by the local observer. For example, degree 4 assigned to Zuglio in Friuli, due to a quake in January 1930, does not correspond to the general awakening of the people, which indicates a degree 5 in the Mercalli scale (Fig. 9).

Yet, it should be noted that, occasionally, a question mark accompanies the intensity value left by the operator (Fig. 10). This mark, together with the aforementioned limits and difficulties that the seismic service staff encountered, are sources of uncertainties that were only minimally transferred to the *Bollettino Sismico - Macrosismi*, which represents the ultimate interpretation of the UCMG macroseismic postcards.



IV

Mod. 1914.

Località Zuglio (1)

Circond. Tolmezzo Prov. Udine

Giorno 10 Mese Genn. Anno 1930

Principio della scossa ad ore 22,45 –

Durata della scossa tre secondi –

Quanto tempo decorse fra le varie riprese?

Quale carattere ebbe la scossa, fu prevalentemente ondulatoria o sussultoria? Sussultoria

Quale fu approssimativamente la direzione iniziale del movimento? Sud-Ovest – Nord-Est

Il movimento cambiò direzione? No –

(Segue)

(1) Non omettere l'indicazione del Circond. e della Prov.

Si raccomanda di usare una cartolina per ogni scossa distinta, a meno che si tratti di scosse a pochi secondi di intervallo

Servizio Geodinamico del Regio Ufficio Centrale di Meteorologia e Geofisica in Roma

ZUGLIO 21.1.30 UDINE

FRANCHIGIA POSTALE

AL R. UFFICIO CENTRALE DI METEOROLOGIA E GEOFISICA

ROMA (I)

VIA CARAVITA, 7

Effetti della scossa. *(Dire se la scossa sia stata avvertita da pochi o da molti, relativamente al numero degli abitanti e se coloro che l'avvertirono erano seduti, in cammino, al lavoro, in letto desti o addormentati, ecc. se abbia prodotto tremolìo di piccoli o grandi oggetti, invetriate, porte suono di campanelli, fenditure gravi o leggere in poche o in molte case bene o male costruite; caduta totale o parziale di edifici, vittime isolate o numerose, ecc.* - (Vedi scala Mercalli) La generalità degli abitanti trovavasi a letto. – Quasi tutti furono svegliati dalla scossa – Non si verificò fenditura alcuna – Nessun danno – Nessun ferito –

Intensità (espressa in gradi della *scala Mercalli*) Quarta – IV –

Effetti fisiologici nell'uomo Un po' di paura –

Segni negli animali (precedenti o contemporanei?) Nulla –

Fenomeni luminosi Nulla –

Rombi (sotterranei o nell'aria?) (precedenti o contemporanei alla scossa?) Nulla –

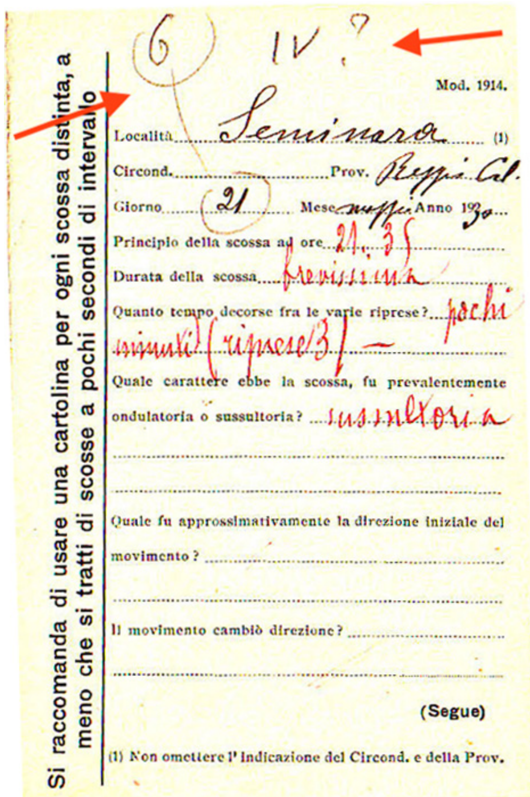
Fenomeni presentati dal mare, dai laghi, fiumi, pozzi d'acqua e sorgenti Nulla –

Variazioni della temperatura di acque termali, fumarole, salse, ecc. Nulla –

Note diverse Nulla

Nome e qualifica del Relatore

Fig. 9 - Red arrows show the discordance between the description and intensity assigned by the local observer, confirmed then by the seismic service (4 Mercalli). The local observer states: "*la generalità degli abitanti trovavasi a letto. Quasi tutti furono svegliati dalla scossa. Non si verificò fenditura alcuna. Nessun danno. Nessun ferito*" [the majority of the inhabitants were in bed. Almost everyone was awoken by the tremor. No cracks occurred. No damage, no injuries]. Then, another effect: "*un po' di paura*" [a little fear]. The macroseismic postcard records an earthquake felt in Friuli (north-eastern Italy), on 10 October 1930 (Rovida *et al*., 2022; INGV, Macroseismic Archive).


Si raccomanda di usare una cartolina per ogni scossa distinta, a meno che si tratti di scosse a pochi secondi di intervallo

(6) IV ?

Mod. 1914.

Località Seminara (1)

Circond. .... Prov. Reggio Cal.

Giorno 21 Mese maggio Anno 1930

Principio della scossa ad ore 21.35

Durata della scossa brevissima

Quanto tempo decorse fra le varie riprese? pochi minuti (riprese 3) —

Quale carattere ebbe la scossa, fu prevalentemente ondulatoria o sussultoria? sussultoria

Quale fu approssimativamente la direzione iniziale del movimento? ....

Il movimento cambiò direzione? ....

(Segue)

(1) Non omettere l'indicazione del Circond. e della Prov.

Fig. 10 - The third level in the postcard. Traces on the macroseismic questionnaire left by the seismic service operator: a correction to the date and an indication of uncertainty on the intensity. The macroseismic questionnaire records an earthquake felt in Seminara, Calabria (southern Italy), on 6 May 1930 (Rovida *et al.*, 2022; INGV, Macroseismic Archive).

5. A complicated case

The following example illustrates the above-mentioned problems faced by the seismic service operators in interpreting the postcards compiled by local observers. In late October 1930, a modest sequence of earthquakes was felt in the provinces of Modena and Bologna (central Italy), as well as in other localities. The Italian Parametric Catalogue of Italian Earthquakes (CPTI15) (Rovida *et al.*, 2022) considers the sequence in accordance with the study by Camassi and Molin (1994), which likely aligned with the *Bollettino Sismico - Macrosismi* (Cavasino, 1932). According to the bulletin, the three most important quakes occurred on 24 October at 00:52, and on 26 October at 7:14 and 7:31 (GMT) (see Table 1).

Despite the area in question being indicated as the Tuscan-Emilian Apennines, the epicentre of the first earthquake (24 October) was located in the foothills of Bologna, while the second (26 October at 7:14) was in the Bologna Apennines. The last earthquake (26 October at 7:31) was located in the hills of Modena. How did the epicentre 'migrate' to this new location? According to the Boxer method (Gasperini *et al.*, 2010; Rovida *et al.*, 2022), the epicentre depends on the geometry of the macroseismic scenario, particularly on data points with the highest intensity. Notably, Firenzuola (Province of Florence, central Italy) plays a crucial role, having been assigned the highest intensity for the first two shocks (I = 5 MCS) and only an "SL" (slightly perceived) for the last one. Its macroseismic postcard represents a good example of interpretation problems.

There is only one macroseismic postcard from Firenzuola for the entire sequence, i.e. for the period between the 24 and 26 of October (Fig. 11). The generic indication of these days is the only time parameter that the postcards provide, with no other indication of the precise time

Table 1 - The October 1930 Tuscan-Emilian seismic sequence, according to the CPTI15 (Rovida *et al.*, 2022). NMDP = number of macroseismic data points. *Io* MCS = epicentral intensity in the MCS scale. *Mw* = moment magnitude.

Day Month Year	H:Min	Area	NMDP	*Io* MCS	*Mw*
24 October 1930	00:52	Tuscan-Emilian Apennines	12	4	3.97
26 October 1930	07:14	Tuscan-Emilian Apennines	14	4	4.21
26 October 1930	07:31	Province of Modena	11	4	4.12

of each quake. Yet, the description matches with degree 5 of the Mercalli scale. Under these circumstances, the operator of the seismic service in Rome completed the missing information, and in doing so made two choices, which would, later, prove crucially misleading. The first choice consisted in identifying the quakes felt in Firenzuola as those felt in some localities concentrated between Modena and Bologna. The second one consisted in associating the description and assigning the relevant degree 5 Mercalli only to the earthquakes of 24 October and to the first of the 26 October, but not to the second of this day, despite there being no indication for such a choice in the postcard. In fact, the *Bollettino* indicates a question mark for Firenzuola only for the third quake, later modified to *I* = 2-4 MCS by Camassi and Molin (1994), and, then, transcribed as "SL" in the CPTI15 (Rovida *et al.*, 2022). This interpretation may, in part, explain the mentioned 'migration' of the epicentre of this quake.

Fig. 11 - Sequence from 24 to 26 October 1930. The macroseismic postcard records the earthquakes felt in Firenzuola, Tuscany (central Italy), on October 24 to 26 1930 (Rovida *et al.*, 2022; INGV, Macroseismic Archive). The questionnaire describes the effects of the quake: "*scosse avvertite generalmente nelle case, ma da pochi nelle strade; con risveglio di persone addormentate, con spavento di alcuni, sbattere d'usci, suono di campanelli, oscillazione piuttosto ampia di oggetti sospesi, arresto d'orologi*" [shocks generally felt in the houses, but by few people in the streets; with the awakening of those asleep, the frightening of some, slamming of doors, ringing of bells, rather large swaying of suspended objects, stopping of clocks].

Another factor that has ‘shifted’ the epicentre of the shocks on 26 October 1930 refers to the locality of Barga, in the Province of Lucca (Tuscany). I mention this as the case is similar to that of Firenzuola, yet it does not depend on a macroseismic postcard, but was introduced by Camassi and Molin (1994), probably based on newspaper information. In fact, my finding of a news report issued in Livorno (Il Telegrafo, 27.10.1930), which only refers to the earthquake on the morning of the 26 October, also mentions that quakes were felt for two days “throughout the Tuscan-Emilian Apennine”. Certainly, Camassi and Molin could not include Barga among the localities on 24. Actually, the main features of this short sequence (i.e. *Imax* and epicentre), are, however, the product of a weakly based interpretation on a macroseismic postcard (and press clipping). Therefore, it is possible to conclude that not much is known about this sequence.

6. A short note on postcard interpretation and macroseismic scales

The last part of this work introduces another aspect of the interpretative task of this work. Macroseismic postcards and the mentioned appendix, *Macrosismi*, share the Mercalli scale as an instrument for estimating intensities. Nowadays, however, all data should be interpreted from the point of view of the MCS scale (Sieberg, 1930, 1933), and the EMS -98 scale (Grünthal, 1998). While some scholars have noted certain differences between the Mercalli and MCS scales when dealing with low degrees (Musson *et al.*, 2010), in practice, these differences are frequently not considered or are considered irrelevant (Molin *et al.*, 2008). It should be noted that this could be true and useful when considering the degrees as an overall value, but not when each single diagnostic value is taken individually. The limitations of local observers in describing the effects, very often with very few diagnostic elements, require a detailed verification of the few differences between the formulation of the Mercalli and MCS scales. These differences are crucial when assigning location intensity and depends on one or a few diagnostic elements. As for the quake effects on people, diagnostics are characterised by determiners that are slightly different for the same degree of the Mercalli and MCS scales (Table 2). For example, with regards to the perception within houses, both scales almost coincide in degree 4. While the Mercalli scale indicates that the earthquake was “generally not felt, but felt by many people indoors, though by few on the ground floor, without causing any alarm” (Mercalli, 1897; Davison, 1921), according to the MCS scale, the earthquake “is recognised by a great number” of people. The case is different for people outdoors: the Mercalli scale suggests that the quake is not felt outside the houses, while the MCS scale hints that it is felt by few (although with a negative formulation: “is not felt by many people outdoors”) (Sieberg, 1930, 1933). Actually, the latter diagnostic, included in degree 4 of the MCS scale, matches with degree 5 of the Mercalli scale, which states that the quake is “felt outdoors by few” (Musson *et al.*, 2010).

In degree 5 of the Mercalli scale, the earthquake is “generally felt indoors, and only by few outside” (Mercalli, 1897; Davison, 1921). Conversely, in the MCS scale, the earthquake is felt by many people everywhere: “in the midst of daily activities, the earthquake is perceived by many people in the streets and, if sensitive, also in the open field” (Musson *et al.*, 2010).

Again, on the lower degrees and human perception, there is another diagnostic element which does not coincide in the two scales, although it is important in many cases: the awakening of sleepers due to the quake. For earthquakes that occur at night, waking up is an important signal. In the Mercalli scale it occurs in degree 5 with a generic “awakening of sleeping people”. Instead, in the MCS scale, awakening appears twice: the first time in degree 4: “in rare cases sleepers wake up”; the second in degree 5: “almost all sleepers wake up”. It is at the discretion

Table 2 - Comparison of some diagnostic tools in the lower grades of the Mercalli and MCS scales. The English version of the excerpts is extracted from Davison (1921) and Musson *et al.* (2010).

Effect	Degree	Mercalli	MCS
Earthquake felt outdoors	4	Not mentioned	"Few people"
	5	"but by few outside…"	"Even during the busiest hours of the day, the earthquake is felt by many people in the open air"
Earthquake felt indoors	5	"felt generally indoors, but by few outside"	"Indoors, the shaking of the whole building is generally noticed"
Awakening of sleepers due to the earthquake	4	Not mentioned	"In rare cases sleepers wake up"
	5	"awakening of sleeping people"	"Almost all sleepers wake up"
Oscillation of the pendant and other objects	4	"slight oscillation of the pendant"	Not mentioned
	5	"rather large oscillation of suspended objects…"	"Freely hanging objects, such as curtains and lamps, but not heavy chandeliers oscillate…"

of the seismic service operator how to proceed when the macroseismic postcard states that "almost half of the population has woken up", or a more generic "people have awakened". Moreover, when an earthquake occurs in the middle of the night, a "not felt" could conceal a low degree of perception, i.e. degree 3 MCS or even degree 4 MCS.

As for the transitory quake effects on objects, the "slight oscillation of the pendant" is reported in degree 4 of the Mercalli scale, while an analogous phenomenon ("hanging objects such as lamps, curtains, not too heavy chandeliers oscillate") is only mentioned in degree 5 MCS (on the contrary, in the EMS-98 scale, the slight oscillation is indicated in degree 3).

With regard to building effects, the macroseismic practice has established that, both the Mercalli and MCS scales, degree 6 represents the damage threshold. However, by reading the macroseismic postcards, it becomes clear that some local compilers interpreted the Mercalli scale in a different way, attributing importance to other diagnostic elements of this degree. Two explanatory examples are given in the following. The first is the postcard referring to Sellano (Umbria, central Italy) for the earthquake of 21 May 1930. The local compiler reported that the shock produced the trembling of large objects and windows, but above all that it was "felt by everyone, regardless of what they were doing" [*"avvertita da tutti in qualsiasi occupazione si trovassero"*]. Then, the compiler claimed that the shock "falls within both V and VI" [*"partecipa e della V e della VI"*] of the Mercalli scale (Fig. 12). In fact, the reaction of all people coincides with the description of degree 6 Mercalli, while according to degree 5 Mercalli, the earthquake is generally felt (but not by everyone) indoors and only by a few outdoors. In macroseismic practice, these diagnostics move to a secondary level, revealing a hierarchy between diagnostic signs of the same degree. In fact, the seismic service operator crosses out degree VI. The case of Cavazzo Carnico, Friuli in north-eastern Italy, (Fig. 13) is clearer when, after the earthquake of 25 December 1931, the local observer indicates that the shock was "*molto forte. Grado VI scala Mercalli*" [very strong. VI degree Mercalli], and then it follows with the effects on the people: "*spavento e fuga all'aperto*" [fright and escape outdoors]. On this occasion, the observer provides no evidence of material damage, and the only diagnostic element provided actually corresponds to degree 6 Mercalli. The bulletin confirms the same degree, which is later included in an isoseismal map of Iaccarino and Molin (1978), and then included in the CPTI15 (Rovida *et al*., 2022). However, with the current criteria, Cavazzo Carnico should be assigned a degree 5 in the Mercalli scale as well as in the MCS scale.

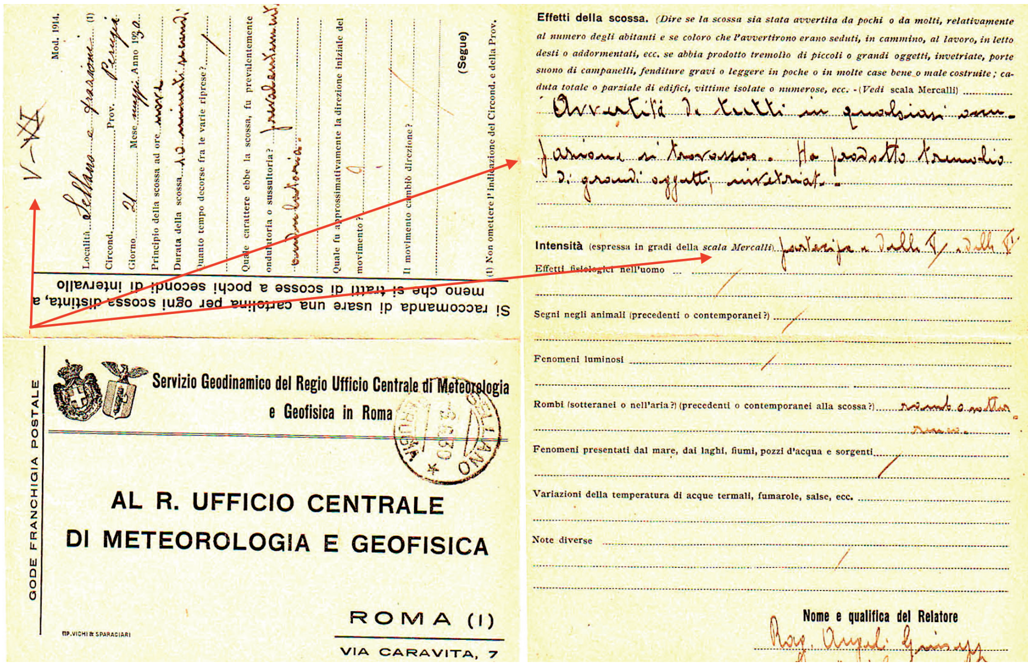

Effetti della scossa. (Dire se la scossa sia stata avvertita da pochi o da molti, relativamente al numero degli abitanti e se coloro che l'avvertirono erano seduti, in cammino, al lavoro, in letto desti o addormentati, ecc. se abbia prodotto tremolio di piccoli o grandi oggetti, invetriate, porte suono di campanelli, fenditure gravi o leggere in poche o in molte case bene o male costruite; caduta totale o parziale di edifici, vittime isolate o numerose, ecc. - (Vedi scala Mercalli)
Intensità (espressa in gradi della scala Mercalli)
Effetti fisiologici nell'uomo
Segni negli animali (precedenti o contemporanei?)
Fenomeni luminosi
Rombi (sotterranei o nell'aria?) (precedenti o contemporanei alla scossa?)
Fenomeni presentati dal mare, dai laghi, fiumi, pozzi d'acqua e sorgenti
Variazioni della temperatura di acque termali, fumarole, salse, ecc.
Note diverse
Nome e qualifica del Relatore
Servizio Geodinamico del Regio Ufficio Centrale di Meteorologia e Geofisica in Roma
AL R. UFFICIO CENTRALE DI METEOROLOGIA E GEOFISICA
ROMA (I)
VIA CARAVITA, 7
GODE FRANCHIGIA POSTALE
Si raccomanda di usare una cartolina per ogni scossa distinta, a meno che si tratti di scosse a pochi secondi di intervallo

Fig. 12 - The questionnaire provides the interpretation of the Mercalli scale by the local observer: the red arrows point to the diagnostics, his interpretation, "*partecipa e della V e della VI*" [falls within both V and VI], and the degree chosen by the seismic service operator. The macroseismic postcard records the earthquake felt in Sellano, Umbria (central Italy), on 21 May 1930 (INGV, Macroseismic Archive).

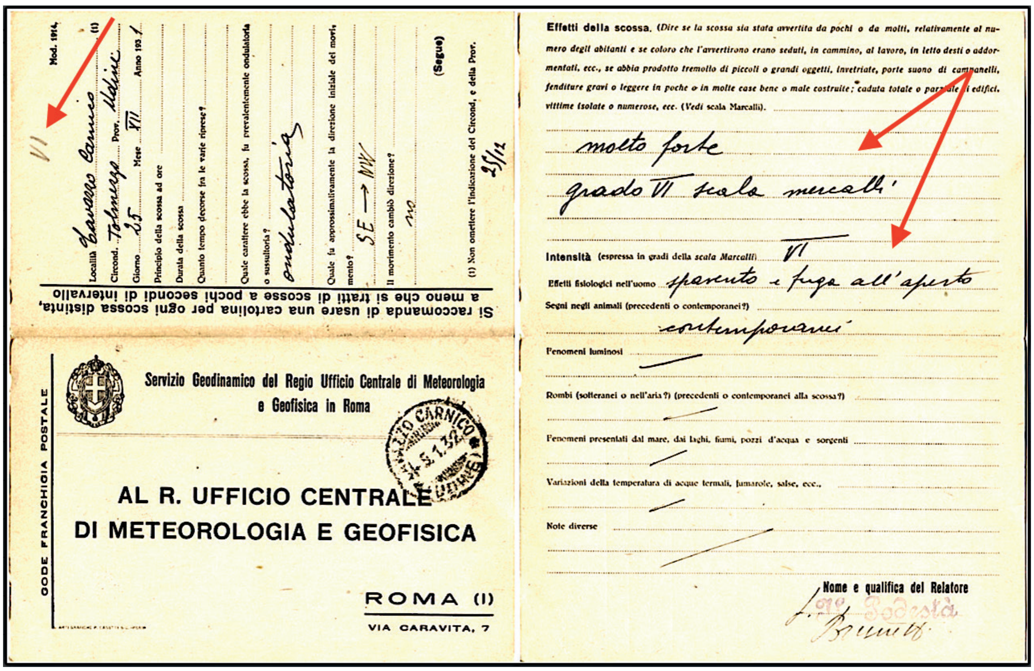

Effetti della scossa. (Dire se la scossa sia stata avvertita da pochi o da molti, relativamente al numero degli abitanti e se coloro che l'avvertirono erano seduti, in cammino, al lavoro, in letto desti o addormentati, ecc., se abbia prodotto tremolio di piccoli o grandi oggetti, invetriate, porte suono di campanelli, fenditure gravi o leggere in poche o in molte case bene o male costruite; caduta totale o parziale di edifici, vittime isolate o numerose, ecc. (Vedi scala Mercalli).
molto forte
grado VI scala mercalli
Intensità (espressa in gradi della scala Mercalli) VI
Effetti fisiologici nell'uomo spavento e fuga all'aperto
Segni negli animali (precedenti o contemporanei?) contemporanei
Fenomeni luminosi
Rombi (sotterranei o nell'aria?) (precedenti o contemporanei alla scossa?)
Fenomeni presentati dal mare, dai laghi, fiumi, pozzi d'acqua e sorgenti
Variazioni della temperatura di acque termali, fumarole, salse, ecc.
Note diverse
Nome e qualifica del Relatore
Servizio Geodinamico del Regio Ufficio Centrale di Meteorologia e Geofisica in Roma
AL R. UFFICIO CENTRALE DI METEOROLOGIA E GEOFISICA
ROMA (I)
VIA CARAVITA, 7
GODE FRANCHIGIA POSTALE
Si raccomanda di usare una cartolina per ogni scossa distinta, a meno che si tratti di scosse a pochi secondi di intervallo

Fig. 13 - Degree 6 Mercalli according to the local observer and confirmed by the seismic service operator (see red arrows). The macroseismic postcard records the earthquake felt in Cavazzo Carnico, Friuli (north-eastern Italy), on 25 December 1931 (Rovida *et al.*, 2022; INGV, Macroseismic Archive).

7. Conclusions

Discovering new documents from the past and analysing already-known sources are two aspects of historical works. In this article, both endeavours have been pursued with the aim of enhancing the understanding of Italian seismicity. On one hand, with the Scarabelli and Tassinari questionnaires, another element has been added to the history of seismology, delving into (until now) its earliest macroseismic data collections. On the other hand, the examination of the evolution of macroseismic postcards has contributed to a deeper comprehension of this crucial historical source.

Primarily, the study reveals that a macroseismic postcard is not a straightforward record testifying to the effects of a single earthquake in a specific location. Instead, it is a complex document, with multiple levels, encompassing a pre-printed form, input data from a local observer, and additional notes from operators of the seismic service in Rome.

This article highlights, on one hand, the significance of recognising that the pre-printed form influenced, to some extent, the manner in which the postcards were filled out. On the other, it points out that the levels interact, potentially resulting in postcards that contain gaps, ambiguities, or contradictory information.

This work, clearly, does not seek to diminish the importance of macroseismic postcards. Quite the opposite, these represent a valuable source for the reconstruction of seismic events and, as such, deserve an in-depth analytical examination of the historiographical practices and methods adopted.

Furthermore, the *Macrosismi* appendix of the *Bollettino Sismico* was observed to be not merely a summary of the macroseismic postcards and other documents sent to the seismic service, but also an important source for the interpretation of such postcards. An example illustrates how these interpretations can sometimes lead to a misreading of seismic sequence reconstructions.

Lastly, the paper compares the lower intensities of the Mercalli and MCS scales, and demonstrates how certain elements (or diagnostics) do not always align at the same degree, potentially leading to misunderstandings when attempting to convert intensities of two different scales.

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