THE 1933 MAJELLA EARTHQUAKE (CENTRAL ITALY): A REAPPRAISAL OF THE INTENSITY DISTRIBUTION

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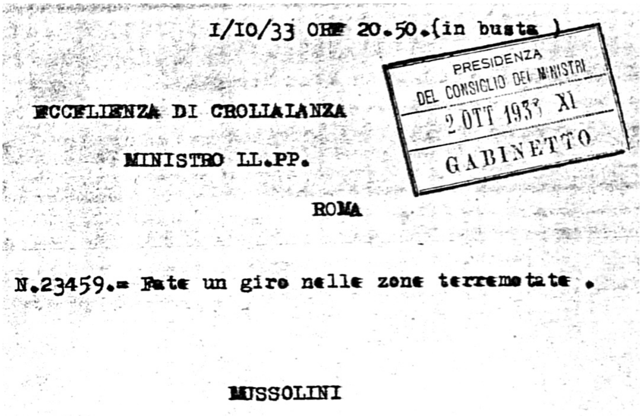
Introduction. At dawn of September 26, 1933, a strong earthquake struck the southeastern area of the Majella massif, in Abruzzo, damaging heavily several villages, with extensive destruction in Lama dei Peligni, Taranta Peligna and Civitella Messer Raimondo. In the past, this area was hit by a powerful earthquake (1706; Mw=6.6), with a similar mesoseismic area, although with much higher site intensities. Therefore, it is likely that the two events share the same seismogenic source that has remained unknown, so far.

The 1933 mainshock occurred at 4:33 AM local time, and was providentially preceded by two foreshocks that alarmed the inhabitants, prompting most of them to escape from their houses. Notwithstanding the large amount of collapses and destructions (Fig. 1), this yielded a relatively little death toll (12 casualties, and less than two hundred injured).

In order to enhance the knowledge concerning the highest intensity distribution (Is≥7 MCS), and thus indirectly enlighten the rough location of the causative fault, here we carried out a review of the data collected in the Catalogue of Strong Earthquake in Italy (CFTI4Med; Guidoboni *et al.*, 2007). As the main source in all the previous studies were the information listed in the newspapers and the works of Cavasino (1935a, 1935b), we performed original archive researches that allowed us to collect new reliable data.

Fig. 1 – View of the severe damages in one of the villages east of the Maiella massif (photo Keystone-France/Abruzzes/gettyimages).

Data and materials. The most important and novel data in our study derives from the sources collected by Ridolfi (2005), which was not previously considered in any seismic compilation. This work is entirely devoted to the effects of the 1933 earthquake on the region surrounding the Maiella massif (Abruzzo side). Indeed, Ridolfi (2005), after a thorough research in several archives and libraries, describes the effects of the earthquake and its consequences both in the social and economic context of the time. Data were mainly collected in the: Central State Archive; Banco di Napoli historical archive; historical Archive of the municipality of Avezzano; State Archive of Chieti; State Archive of Pescara; Superintendency of Public Works; Library of the Chamber of Deputies; Library of the Ministry of Agriculture; Library of the Bank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PRESIDENZA DEL CONSIGLIO DEI MINISTRI
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GABINETTO

ECCELLENZA DI CROLLALANZA

MINISTRO LL.PP.

ROMA

N.23459.= Fate un giro nelle zone terremotate .

MUSSOLINI

Fig. 2 – The telegram sent by Benito Mussolini to Araldo di Crollalanza, Minister of the Public Works. It is quite clear the intent to minimize the effects of the earthquake.

of Italy; Chamber of Commerce, Industry, Agriculture and Crafts of Chieti.

Thanks to these huge amount of valuable information, it was possible to estimate the number of building affected by different levels of damage, such as light and severe damage, or irreparable buildings (including collapses), and thus evaluate the MCS intensity degree (Sieberg, 1930). To do this, we analytically applied the method suggested by Molin (2009), that considers the percentage of each damage level as representative of every MCS degree.

In order to complete the information concerning the damage within each municipality, we use all the additional data concerning single public buildings, churches and the industrial and commercial activities. Moreover, we carried out an extensive reading of contemporary newspapers at the National Library of Rome. Here we have found useful information inside 15 Italian newspapers (i.e., Il Mattino; Il Giornale d'Italia; La Nazione; Il Popolo d'Italia; Il Popolo di Roma; Il Regime Fascista; il Corriere della Sera; La Tribuna; l'Osservatore Romano; la Gazzetta del Popolo; Roma; L'Avvenire d'Italia; il Lavoro Fascista; il Tevere; il Messaggero), with a total of 58 articles. Obviously, information deriving from the newspapers are often qualitative, reporting just the number of victims in each village, the number of injured, a rough framework of the destroyed houses and of those still inhabitable. It is worth noting that, similarly to what happened after the 1930 "Vulture" earthquake, press-reporters widely emphasized the prompt rescue and assistance provided to the inhabitants by the Fascist government and by the local authorities. However, notwithstanding the severe damage scenario, the whole national press suddenly minimized the event, which soon disappeared from all the newspapers pages. The spirit of the times is well condensed in a telegram sent on October 1 by the Italian prime minister to the Minister of the Public Works: "Make a tour in the earthquake zone - Mussolini" (Fig. 2).

Last, but not least, inside the archive of the Civil Protection Department - besides a large amount of telegrams sent by the Prefects to the Interior Ministry, mostly containing the early news on the earthquake effects - we have found a huge quantity of documents attesting the requests of economical support sent by single citizens, the related technical expertise, and the answers provided by the authorities in the following years.

Results. First of all, we computed the percentage of buildings affected by the different levels of damage that we mainly deduced from the analytical data derived from Ridolfi (2005). We also filled some information gaps with the information collected from newspapers, telegrams and other primary sources found in the archive of the Civil Protection Department. Then we transformed these percentage in MCS degree (Sieberg, 1930), considering damage levels 2-3 (from moderate to severe damage), 4 (destruction, and/or irreparable damage), and 5 (collapse) in the percentage progression proposed by Molin (2009). This allowed us to obtain robust intensities estimates that generally move away from those in Guidoboni *et al.* (2007) by 0.5-1 degrees or, exceptionally, 1.5.

In the previous studies, many intensity datapoints of this earthquakes were derived tout court from a crude list published by Cavasino (1935) - who likely estimated the MCS intensities on the basis of the fresh information gathered from the local authorities of the time. Therefore, here we calculated a kind of linear regression between our site intensities (Is) and those of Cavasino in order to calibrate his values and fill our lacking datapoints, mainly the lowermost Is.

The new areal distribution of the highest intensity datapoints (Fig. 3) provides a slightly different image of the mesoseismic area which remains strongly focused on the Maiella massif, with a macroseismic epicenter falling close to Lama dei Peligni (black rhomb in Fig. 3).

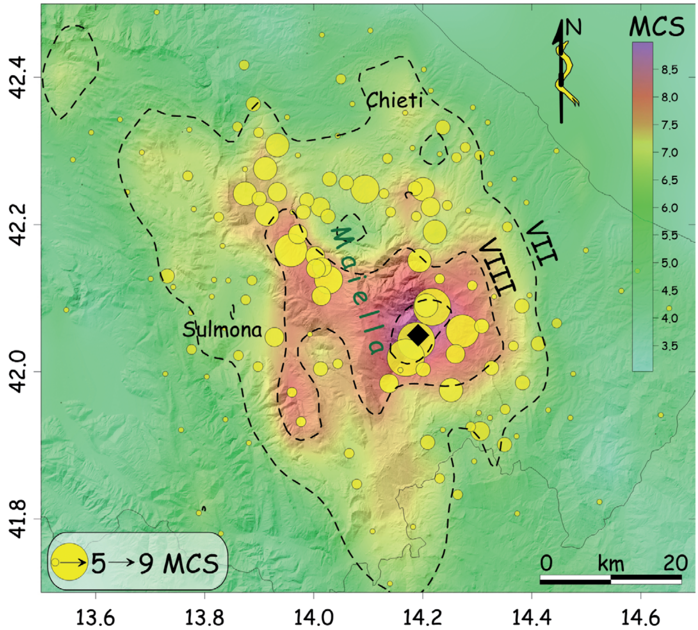

Fig. 3 – Distribution of the highest intensities distribution re-evaluated for the 1933 earthquake (yellow circles proportional to Is V-IX MCS). Dashed lines are the isoseismal lines from VII to IX MCS. Image colors indicate the areal distribution of the intensities; black rhomb is the macroseismic epicenter.

The epicentral intensity can be evaluated around Io IX MCS. In turn, the equivalent magnitude that we have calculated by applying BOXER4 algorithm (Gasperini *et al.*, 1999) is Mw 6.01±0.07, with a source length of 13 km striking N30°±13°, that is perpendicular to all the main extensional, NW-SE fault of the Apennine. As a concluding remark, it is worth noting that this possible fault bearing fits with most of the focal mechanism calculated by Palombo (2010) on the basis of the analysis of historical seismograms, suggesting the possibility that the 1933 earthquake was generated by a roughly right strike-slip fault.

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