

The role of the INGVterremoti blog in information management during the earthquake sequence in Central Italy

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Abstract

In this paper, we describe the role of the INGVterremoti blog in information management during the first part of the earthquake sequence in Central Italy (August 24–September 30). In the last four years, we have been working on the INGVterremoti blog in order to provide quick updates on the ongoing seismic activity in Italy and in-depth scientific information. These include articles on specific historical earthquakes, seismic hazard, geological interpretations, source models from different types of data, effects at the surface, and so on. We have delivered information in quasi-real-time also about all the recent magnitude $M \geq 4.0$ earthquakes in Italy, as well as on the strongest events that occurred in the Mediterranean and in the world. During the 2016, central Italy earthquake sequence, the INGVterremoti blog has continuously released information with three types of posts: i) updates on the ongoing seismic activity; ii) reports on the activities carried out by the INGV teams in the field and by other working groups; iii) in-depth scientific articles describing some specific analysis and results. All the blog posts have been shared automatically and in real time on the other social media of the INGVterremoti platform, also to counter the bad information, and to fight rumors. These include Facebook, Twitter and the INGVterremoti App on IOS and Android. As well, both the main INGV home page (www.ingv.it) and the INGV earthquake portal (<http://terremoti.ingv.it>) have published the contents of the blog on dedicated pages that were fed automatically. The work done day by day on the INGVterremoti blog has been coordinated with the INGV Press Office that has written several press releases based on the contents of the blog. Since August 24th, 53 articles were published on the blog, and they have had more than 1.9 million views and 1 million visitors. The peak in the number of views, which was more than 800,000 in a single day, was registered on August 24, 2016, following the M 6.0 earthquake.

I. INTRODUCTION

When an earthquake occurs, people look for easy and fast information on the web and social media. The INGV websites deliver information in quasi-real-time about all the recent earthquakes in Italy, the strongest events in the Mediterranean and in the world through the INGV home page (<http://www.ingv.it>) and the earthquake list web page (<http://cnt.rm.ingv.it>) of the INGV Centro Nazionale Terremoti (CNT, National Earthquake Centre).

In the aftermath, people look for more in-depth news, more specific and detailed information on the historical earthquake catalog, the seismic hazard and the evolution of the seismic sequence.

During the 2009 L'Aquila emergency and even more in the 2012 Emilia emergency, as well as classical information on websites, many people looked for information and updates on social networks. For this reason, from 2009 the INGV started to test different social media, such as YouTube, Twitter, Facebook, and developed an application for IOS and Android, to release earthquake information promptly. For all of these media, we observed relevant increases in the number of views and downloads corresponding to the important seismic events, when the attention was high [Amato et al. 2012, Nostro et al. 2012]. Social media and websites have proven to be very important for information sharing during crises [Earle et al. 2011; Bruns et al. 2012; Wendling et al., 2013].

For this reason, in the days after the May 20, 2012, Emilia main shock, we decided to open also a new blog (on WordPress), called **INGVterremoti**, to provide quick updates and in-depth scientific information. Providing timely information is particularly important when seismic sequences last for several weeks and are characterized by several earthquakes with magnitude $M \geq 4$. At the same time, we have worked to provide fast, but scientifically sound, information, constantly updated and distributed throughout the territory, also to counter the bad information, and to fight rumors which always arise during such crises. All the information published on the blog are shared on the INGVterremoti social media [Pignone et al. 2012]. The emergence of new communication channels (Facebook, Twitter, blogs, among others) represents an opportunity to spread information to different segments of the population in times of emergency. These technologies have the potential to prevent communication breakdown through reliance on just one platform and thereby to reinforce the diffusion of authoritative information.

II. THE SEISMIC DATA MANAGEMENT IN REAL TIME

A blog is a kind of website where the content is called "posts" and by default, they are displayed from newest to oldest -- on the homepage. All the blog posts arrive to people have subscribed to and are automatically shared on social media and other websites. That means every time a new post is published, many readers are

immediately alerted. This is exactly what you need especially during a seismic sequence.

The INGVterremoti blog was created using the well-known WordPress platform (<http://ingvterremoti.wordpress.com>), a free CMS hosting platform that makes it easy for anyone to publish online, also because it is not necessary to download software or manage a web server. WordPress.com has hundreds of themes with many functionalities and widgets and provides a few services including stats and the sharing function, which automates sharing to a few social networks.

The blog was opened on May 21, 2012, initially for internal testing, and then open to the public on May 29, 2012, during the 2012 Emilia seismic sequence [Pignone et al. 2012]. We initially decided not to allow comments on the blog, but then we opened the INGVterremoti Facebook page where the blog posts are shared with comments.

The official language is Italian, as the blog is mostly devoted to people living in the Italian region. The blog INGVterremoti is a place where people could find updates and explanations on the ongoing seismic activity in the dynamic posts and information in the static pages, the former being the predominant part. The dynamic section contains mostly posts organized in different categories. The static section includes pages about the INGV (Chi siamo/Who we are), earthquakes in Italy (I terremoti in Italia), seismic hazard (La pericolosità sismica), seismic monitoring (Il monitoraggio

sismico), and FAQ & Glossary (FAQ & Glossario).

When a magnitude $M \geq 4.0$ earthquake occurs, immediately we publish a post with the location of the earthquake, the magnitude and the list of the cities close to the epicenter. Then, when other earthquakes occur in the same area, we create a new category with the name of the zone where the seismic sequence is taking place.

In these four years, we have created, in addition to the category associated with the Emilia earthquake, nine categories associated to as many seismic sequences occurred in Italy. Some of them are linked to earthquakes with magnitude ≥ 5.0 (the 2012/10/25 earthquake (M5.2) in the province of Cosenza, "Pollino sequence"; the 2013/06/21 event (M5.1) in the province of Massa Carrara, "Lunigiana sequence"; the 2013/12/29 earthquake (M5.0) in the province of Caserta, "Monti del Matese sequence") and the others to sequences in Città di Castello e Gubbio (PG, Umbria), in Adriatic sea, in Garfagnana (Toscana) and in the province of Frosinone (Lazio).

In the last four years, we have worked to develop the blog with a series of static information pages and several thematic rubrics as, for instance, "Italy Earthquakes: Earthquakes of the month" (Italia sismica: I terremoti del mese) and The earthquakes in history (I terremoti nella storia).

Since its publication on line, in 52 months on the blog were published 464 articles that have had more than 14.5 million views and 3 million visitors. The peak in the number of views, which was more than 800,000 in a

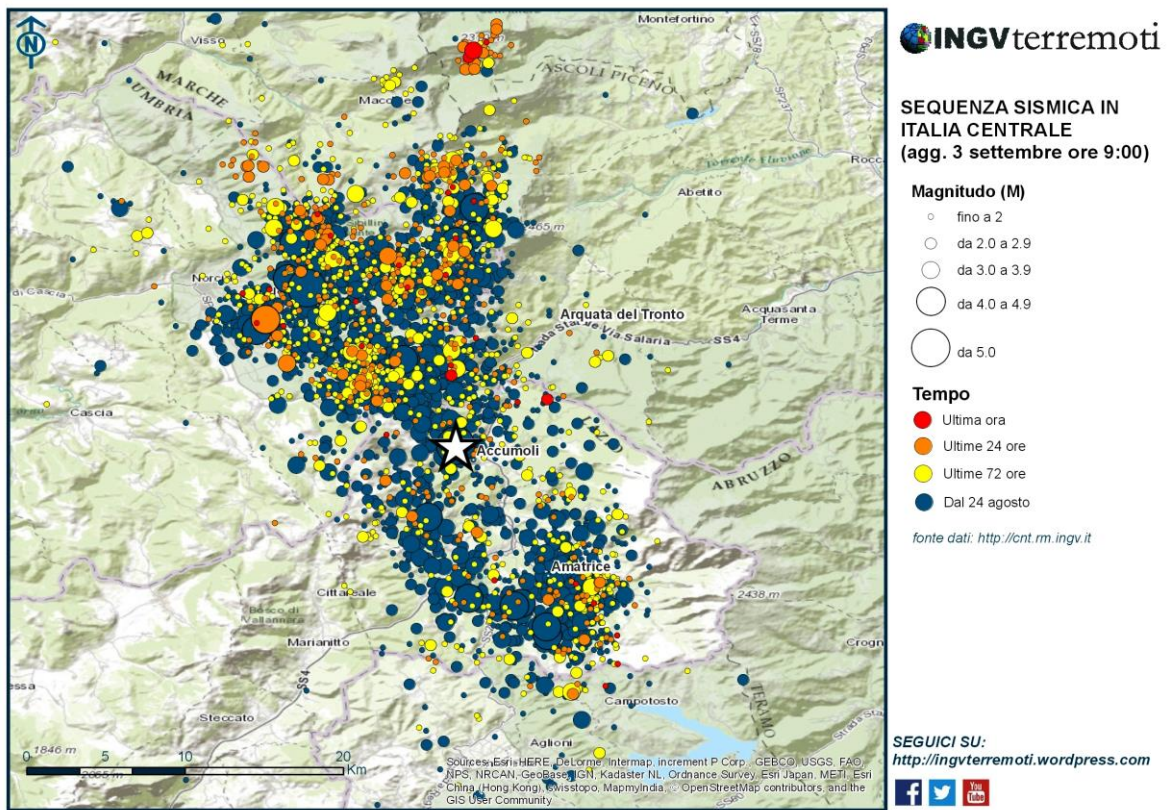


Figure 1: Map showing the spatial and temporal evolution of the seismic sequence published September 3, 2016 on the INGVterremoti blog. Red: last hour; orange: last 24 hours; yellow: last 72 hours; blue previous earthquakes (since August 24th).

single day, was registered on June 3, 2012, following the M 5.1 earthquake in the Po Plain region and on August 24, 2016, following the M 6.0 earthquake in central Italy. It is interesting to note that during “quiet times”, ie without relevant earthquakes, the blog has a monthly average of about 50,000 views.

III. THE 2016 CENTRAL ITALY EARTHQUAKE

The INGVterremoti blog has continuously released information on the 2016 central Italy seismic sequence with three types of posts:

- Updates on the ongoing seismic activity;
- Reports on the activities carried out by the INGV teams in the field and other working groups;
- In-depth scientific articles describing some specific analysis and results.

Week	number of posts	seismicity updates	in-depth news / emergency group / working groups	views	visitors
22 - 28 August	18	14	4	1358810	680890
29 August - 04 September	18	15	3	354520	191560
05 - 11 September	10	6	4	128400	66640
12 - 18 September	4	3	1	67320	36010
19 - 25 September	3	1	2	63960	33820
Total	53	39	14	1.973.010	1.008.920

Table 1: The number of posts, weekly views (*visite*) and visitors (*visitatori*) of the INGVterremoti blog, during 5 weeks, from August 22, 2016 to September 25, 2016.

The updates have followed regularly the evolution of the sequence, starting at 04:30, soon after the 24 August M6.0 main shock occurred at 03:36, with a release every 12 hours approximately in the first two weeks and every 24 hours in the following two weeks. Every article has been framed with a map showing in colors the temporal evolution of the seismic activity in the previous days and, of course, with symbol

size proportional to magnitude. The chosen symbology has been conceived to provide an immediate impact of the ongoing activity, and is analogous to the symbology adopted in the CNT web pages (<http://cnt.rm.ingv.it>) and in the INGVterremoti App on IOS and Android. Besides the map, each article contains a report on the recent activity, with some numbers and statistics on the number of events divided by magnitude classes. A

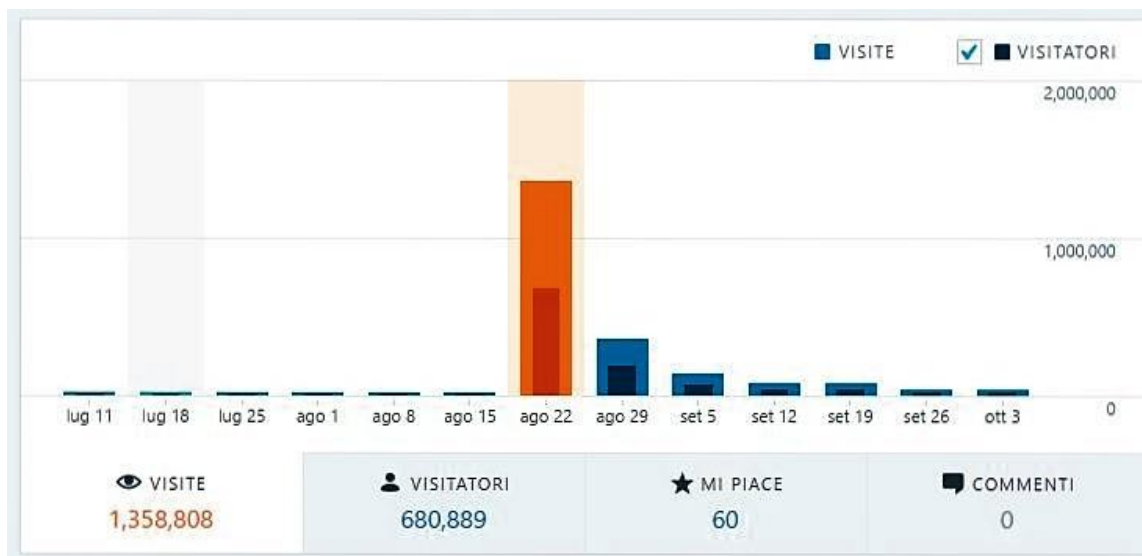


Figure 2: The number of weekly views (*visite*) and visitors (*visitatori*) of the INGVterremoti blog, during 13 weeks, from July 11, 2016 to October 3, 2016. The week 22-28 August (in red) shows the peak in the number of views (1,358,808) and visitors (680,889).

table of the strongest aftershocks was always inserted. The frequency of updates has decreased for one post every 12 hours in the first 12 days, to one every 24 hours later.

The second type of articles includes the report of the INGV working groups (on SAR, GPS, strong motion data, etc.) including the INGV emergency groups (SISMIKO, EMERGEO, QUEST, EMERSITO) with thematic maps, description of the activities, pictures, etc. The third type of posts includes scientific descriptions of some particular aspects of the ongoing research, such as source models from different type of data, effects at the surface, geological interpretations, shake maps, videos with wave propagation and epicentral locations, etc.

In particular, some “hot topic” has needed a specific in-depth article, when the public has shown to be confused on a particular issue. It happened, for instance, when a controversy on the magnitude of the August 24 event was raised by some bloggers, with many requests and criticism. The publication of an article explaining why there can be several different magnitude estimates by different Institutions, using different methods and data, was particularly useful as demonstrated by the use of the contents by mainstream media. All the blog posts have been shared automatically and in real time on the other social media of the INGVterremoti platform: Facebook, Twitter and the App on IOS and Android, through which it is possible to receive a notification with the news posted in the blog. As well, both the main INGV (www.ingv.it) and the INGV earthquake portal (<http://terremoti.ingv.it>) have pub-

lished the contents of the blog on dedicated pages which were fed automatically. The work done day by day on the INGVterremoti blog has been coordinated with the INGV Press Office that has written several press releases based on the contents of the published posts. As a consequence, maps and figures from our posts were largely used by TV news, newspapers and websites.

Some of the articles included links to the “Story maps”, a tool used in order to collect in a simple and interactive way all the information related to a specific phenomenon. In the case of the central Italy earthquake, these included the historical and recent seismicity, the seismic hazard map and so on. Since August 24th, on the blog were published 53 articles that have had more than 1.9 million views and 1 million visitors. The peak in the number of views, which was more than 800,000 in a single day, was registered on August 24, 2016, following the M 6.0 earthquake in central Italy.

IV. DISCUSSION AND CONCLUSION

It is well known that the attention of people towards a specific issue tends to decrease very rapidly after the event. In the immediate aftermath of the strong earthquake, a broad discussion was raised and maintained on the media, also thanks to a diffuse participation of scientists in television and radio shows, and to several interviews published on the newspapers, on the web and so on. The attention was focused first on the dramatic aspects of the earthquake, then on the scientific explanation of the seismic activity,

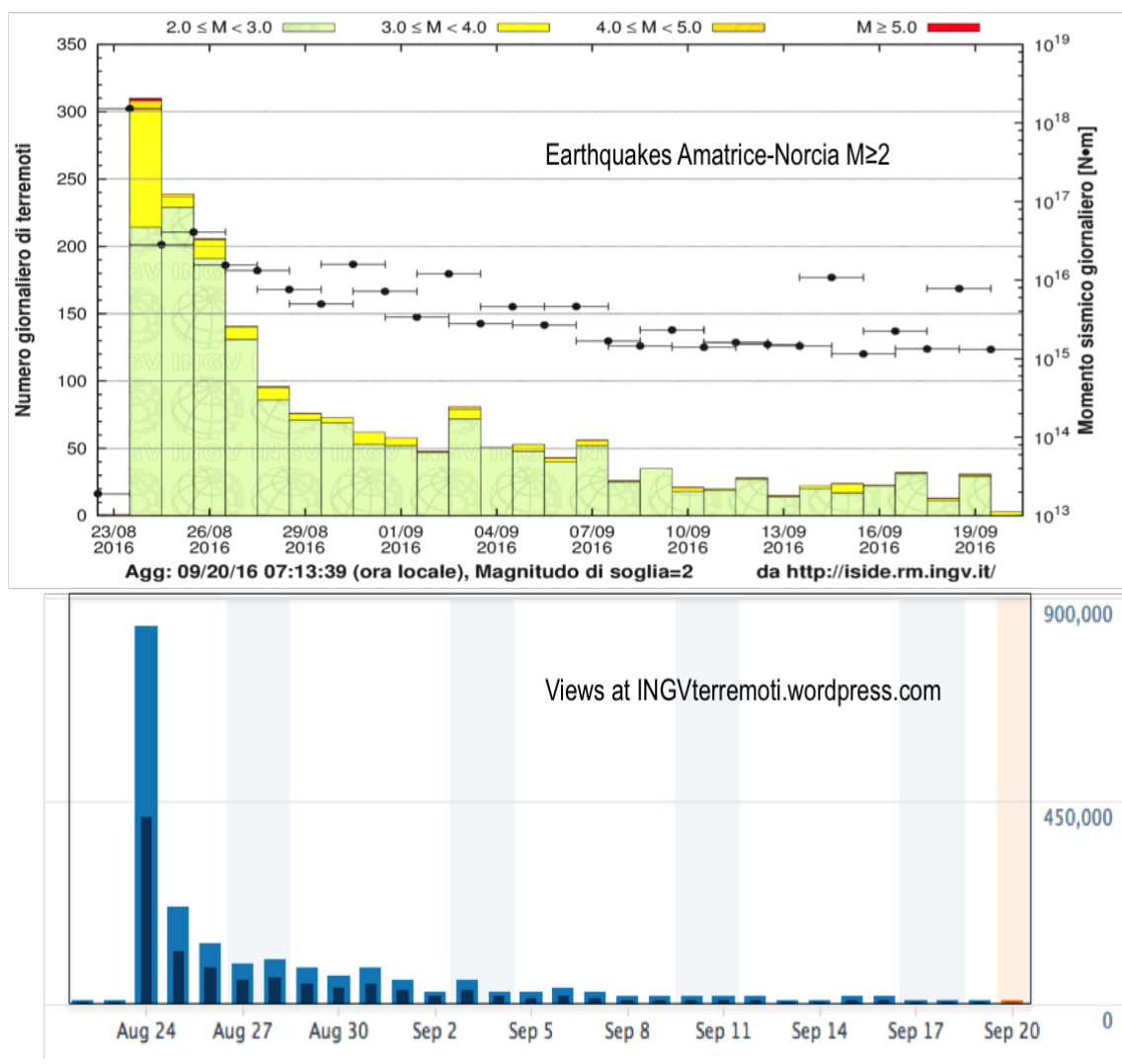


Figure 3: Comparison between the daily number of earthquakes and views (light blue, visitors are in blue) of the INGVterremoti blog, from August 22, 2016 to September 20, 2016. In August 24 there is the peak in the number of views (829,503) and visitors (547,923).

and soon after on the need of rapid and effective reconstruction and on the search for responsibilities of the disaster. However, as soon as the news with dramatic images disappear (collapsed buildings, desperate people, lucky recoveries, etc.), the interest on the earthquake has vanished quickly. For this

reason, we have tried to keep the attention high keeping on publishing updates and scientific analyses, although with lower frequency. This tendency is well evident if we compare the number of earthquakes with the views at the INGVterremoti blog. The visits reached more than 800,000 on August 24th,

then decreased in the following days, as expected, but remained at high level (around 50,000-100,000 for several days, to decrease dramatically after September 5, only ten days after the main shock. This is not unexpected, but shows very clearly how the people's interest for the seismic problem is strongly conditioned by the ongoing activity. A similar trend can be seen in other websites dealing with the earthquake, and in traditional media (A. Cerase, personal communication). For this reason, it is extremely important to keep working in scientific communication on earthquakes, both during a sequence like this and during "quiet times". In the future, we will try to analyze the impact of our communication differently and more systematically so that we can offer a service appropriate to the different situations.

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