

Theme 2, workshop 4a “The role of scientists in the Public Communication”

Communication and natural hazard: dealing with complexity in emergency. The experience of the 1997 Umbria-Marche earthquake in Italy.

Tiziana Lanza

Abstract

The Earth is a complex system. Earthquakes are the outer expression of its internal complexity. Whenever an earthquake occurs, seismologists are not able to say how long the seismic sequence is going to last and how many aftershocks will take place. To give a precise answer to these questions, seismologists should be acquainted with so many details of the Earth complex system. Even if significant advancements have been made in understanding physical processes occurring during an earthquake, at the same time it has been demonstrated that even a very simple non linear system exhibits a very complex behaviour so that, in the case of earthquakes, it is impossible to predict an event on a short time scale. On the other hand, a human being is a so far complicated system. A person experiencing a seismic sequence, especially an important one, is suffering a stress-related disorder (ASD, PTSD). Psychologists agree in recognising in disaster victims the same psychological damages and stress consequences of patients suffering for other different types of trauma (i.e. lethal diseases, accident). The earthquake is therefore a further

example of how communication in some critical circumstances requires a common and very well studied strategy in order to avoid serious consequences such as, in the case of natural hazard, the social amplification of risk. At the same time, the community preparedness could facilitate the difficult task of interacting with people when rapid decision must be made within a short time frame. The last important seismic sequence occurred in Italy (Umbria-Marche, 1997) has shown that in our country such a strategy does not yet exist. Experts, journalists, policy makers are now moving the first step towards a common strategy of interaction with the public.

Istituto Nazionale di Geofisica e **Vulcanologia**

Via di Vigna Murata, 605

00143 Rome, Italy

tel:++39 06 51860218

e-mail: Lanza@ingv.it

1 - Earthquakes are the outer expression of earth' s internal complexity

The Earth is a complex system and studying its internal properties is an hard task. Variations in the observed neutrino flux may provide information about the Earth' s internal structure.

[Fig. 1.1](#) shows an example of how neutrinos can be used to this purpose. Using neutrinos would allow to obtain further information about the Earth without waiting for earthquakes to occur. Up to now, seismologists have been studying the properties of seismic waves' propagation following earthquakes ([Fig. 1.2](#)), such as velocity, amplitude, frequency, to obtain 3D models of the earth' s interior. But there are regions of the Earth where earthquakes do not occur for long periods of time and places where do not occur at all. Moreover, the first instruments for measuring and observing the tremors of the earth were built around 1873 so that for most of the past earthquakes there are no records of the seismic signals produced. However, historical sources (i.e. chronicles, epigraphs) are used by seismologists to collect past events. In [Fig. 1.3](#) you can see the map of the maximum intensities recorded in Italy during the past 1000 years. Paleoseismology goes even farther backwards, by identifying, characterising and dating past earthquakes in the geological records.

The study of the internal structure of the Earth is not enough to understand all the aspects of the phenomenon. Earthquakes are

characterised by a series of physical processes taking place before, during and after the event. Even if resorting to the earthquakes of the past is often the only means of understanding the country' s long-term earthquake potential, understanding the phenomena taking place at the earth' s surface requires more and more accurate investigation of the physical processes connected to earthquakes. Talking about the physics of earthquakes, with reference to earthquake prediction, Hiroo Kanamori defines the Earth' s crust and mantle “highly heterogeneous” , while saying that significant advancement have been made in understanding physical processes taking place during an earthquake, such as rupture dynamics, interaction between faults, fault-zone structures and non-linear dynamic. Many recent studies, however, have demonstrated that even a very simple non-linear system exhibits very complex behaviour. Kanamori concludes that there is no way to predict a specific earthquake on a relatively short time scale (Kanamori, 1996).

Having earthquakes a chaotic behaviour, unexpected events can occur. An example is given by the last important seismic sequence occurred in Italy (Umbria-Marche 1997, see [Fig. 1.4](#)). The 26 September 1997, at 2:33 a.m., an earthquake occurred with a Magnitude (M) = 5.6 (intensity VIII of the MCS,

[Mercalli-Cancani-Sieberg scale](#)) and the epicentre in Colfiorito.

In a very preliminary phase, seismologists considered it the main shock. Usually after a shock of great intensity the seismicity pattern of a sequence tends to decrease. Instead, the same day at 11:40 a. m. , 3 km far from the epicentre, a larger shock occurred (M=5.8, VIII-IX) (see [Fig.1.5](#)). Seismologists recognised, *a posteriori*, that, even if rare, such events can occur. The Colfiorito Plain is an example of what seismologists call a seismic gap: an area not struck by earthquakes for a long period of time. At present, the 1997 Umbria Marche seismic sequence is still under detailed investigation thanks to the 11.000 events recorded during the whole sequence. The study of seismic gap is important especially for seismic hazard assessment.

2 - A person experiencing a seismic sequence is at risk of Ptsd

Besides being unexpected for seismologists, the 26 Sept. 11:40 a. m. earthquake has become notorious for having seriously damaged the San Francesco Basil in Assisi and killed 4 people. Two of them were technicians surveying the effects of the previous shock. The event has contributed to stress even more the population. A person experiencing a seismic sequence as all people experiencing

life-threatening events is at risk of PTSD (Post Traumatic Stress Disorder), a series of psychiatric disorders that can seriously injury health and last for several years, if the person is not appropriately treated. In [table 2.1](#) you will find a list of the traumatic events that can cause a psychopathology including PTSD and other disorders such as depression, anxiety and substance abuse.

For the first time in Italy, an equipe of psychologists have been operating in the regions struck by the earthquake. [Fig. 2.1](#) is a page of a [booklet](#) distributed to the population by the Counselling Centre of Nocera Umbra, elaborated by psychologists with the aim of giving advise to disaster victims for coping with the stress provoked by an intensive emotional chock. The figure shows all the mental and physical inconveniences normally experienced by trauma victims immediately after the event. On the bottom we can read that all these inconveniences can disappear or decrease. However, some disaster survivors may experience severe stress symptoms as listed in [table 2.2](#), which may lead to lasting PTSD.

In the US, careful research and documentation of PTSD started on combat veterans of World War II and Vietnam World, while in Italy has recently started. [Fig. 2.2](#) is the cover of a book issued in

1997 on PTSD, written by M. Sgarro, a clinical psychologist of the Cto in Rome who has recently gathered an interdisciplinary group of experts with the aim of studying the clinical and psychopathological aspect of PTSD in a social context. No wonder though if only following the Umbria–Marche earthquake, emergency management models have started to be implemented and tested in a real situation (M. Grignani, A. Toni 1998 e M. Moroni et alii 2000). In a recent meeting (Chiusi, Nov. 2000) organised by Psicologi per i Popoli, an association born recently and specialised in Emergency Psychology, the need of developing a community information management has been clearly expressed, as a fundamental part of an emergency strategy.

3- Towards a common strategy of communication

[Fig. 3.1](#) is the cover of a magazine issued the 8 October 1997. The picture shows two photo grams of a video recorded by a video amateur in the San Francesco Basil during the 11:40 shock and sold to the Italian TV Channel Canale 5. The second photo gram, that appeared in the front page of almost all the newspapers issued the day after the event, has become a symbol of the 26 Sept. 1997 earthquake. The Canale 5 13.00 p.m. news showed to Italians the collapse of a part of the Basil vault, the disintegration of some

Giotto and Cimabue frescoes and four people dying. The scoop of Canale 5 has transformed the Umbria-Marche seismic sequence in a mediatic event (see [Fig. 3.2](#)) with all the negative consequences arisen in the absence of a communication strategy common to all the forces involved. The forces involved were scientists (seismologists and psychologists), journalists and disaster-victims.

Seismologists had to face the difficulties of convincing, in a short time-frame, people of the complexity of what they were investigating in a preliminary phase. The fact that population was pre-eminently old-aged has worsened the situation since only in recent years Italian Institutions have started earthquake education programs. Superstitions and legends were in some circumstances the only way to attribute a meaning to a

“never-ending earthquake” that from time to time was producing important events within a radius of about 50 km from the epicentre of the 26 Sept. shock. No wonder thought if the most Frequently Asked Questions were: “when is the earthquake going to finish”, “how many aftershocks will occur”. For people experiencing a life-threatening event, the reliability of the source of information is fundamental especially in the absence of community preparedness. Unfortunately, advice given by the experts in the

early morning – too optimistic for considering the 26 Sept. 2:33 a.m. event as the main shock of the sequence – would have been contradicted by reality within the next few hours. Journalists have worsened even more the situation by writing polemic articles. In the absence of a common strategy to be discussed also with psychologists, journalists were underestimating the psychological consequences of their action, contributing to the social amplification of risk by writing articles with scaring titles such as “Nobody tells us but a volcano is emerging from the bowels of the Earth” , or articles dealing with subjects inappropriate to the ongoing situation (an emergency), such as the possibility of a future Italian “Big-one” (See [Fig. 3.3](#)) In other countries where a natural hazard education is already rooted and a deep knowledge of traumas and their consequences already exists, interdisciplinary studies such as the one following the 1995–96 Ruapehu eruption in Australia (Paton, 1996) are already carried out. The US psychiatrist and well-known PTSD expert Frank M. Ochberg, who is a journalist as well, says that whenever a reporter meets a survivor of traumatic events there is a chance that the journalist will witness and may even precipitate a PTSD. Therefore, it is important that working journalists anticipate PTSD, recognise it and report it. The

recognition of PTSD and related conditions enhances not only a reporter' s professionalism, but also the reporter' s humanitarianism ([Ochberg](#), 1996).

Conclusion

A good strategy of communication is an important step towards a successful emergency management. Seismologists should be efficaciously involved in earthquake education programs of the population. Their language should be as simple and their attitude as gentle to enhance the community preparedness at large, while earning the respect of the public. At the same time they should be available for an interdisciplinary research to be carried out together with psychologists and science communicators and leading to a concerted strategy of communication. In this framework the role of Psychologists should be that of promoting an anti-trauma culture by supporting studies in this direction and addressing their results to a wider public. Finally all the operators involved in the public communication, especially journalists, should take into serious account the results of this interaction being aware that communication in critical circumstances such as natural hazard must be controlled and subjected as less as possible to the Mass-media strategies.

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