

Draft of the minutes

De Bernardinis (Vice department head of National Civil Protection) opens the work bringing the greetings from the Head of the Department of Civil Protection. Today's meeting is necessary to examine the seismic phenomenology underway since several months in the territory of the Province of Aquila, which culminated with the 4.0 magnitude quake 30.03.09. The meeting is attended by the highest scientific authorities of the seismic sector, able to provide an updated and reliable picture of what is happening.

Mauro Dolce (National Civil Protection): From six months on, a seismic sequence is occurring in central Italy with more than 200 shocks, particularly in Sulmona and in L'Aquila. The most relevant and recent earthquakes are:

28 March 2009 21:31 - Magnitude 2.3 - L'Aquila
29 March 2009 10:43 - magnitude 3.8 - Campo di Giove, Sulmona
30 March 2009 15:38 - magnitude 4.0 - L'Aquila
30 March 2009 15:43 - magnitude 3.5 - L'Aquila
30 March 2009 19:11 - magnitude 2.7 - L'Aquila
30 March 2009 21:32 - magnitude 2.4 - L'Aquila
30 March 2009 23:57 - magnitude 3.3 - L'Aquila

From Regional Civil Protection information there are few damage. Three schools have been precautionary closed out of 50 verified. The problem is aggravated because the people is worried and alarmed from uncontrolled voices. These voices may lead to panic. We have to understand what is going on from a scientific point of view and provide reliable news. **Dolce** provides a first picture of the problem to discuss, referring about the situation that comes out from strong motion data, INGV evaluation, from the monitoring system, and from the news provided by Regional Civil Protection about the damage to the buildings. **Dolce** distributes a DPC document containing strong motion recordings from the National Accelerometric Network and some elaborations. **Dolce** underlines that the earthquake that occurred yesterday has been preceded by a seismic swarm that lasts from six months characterized by low magnitude earthquakes not larger than 2.7. The 4.0 earthquake has been followed by a series of aftershocks, the first one of magnitude 3.5, followed by smaller ones. **Dolce** underlines that high PGA have been recorded with respect to the observed magnitude, up to 0.14g. The recordings are characterized narrows spectra with a pick a very low periods and a short duration.

Altero Leone (Regional Civil Protection) informs that people claiming with a megaphone in the street for an imminent earthquake have been identified by police

Boschi (INGV President). We are looking at a seismic sequence that involves two different seismogenic structures: L'Aquila and Sulmona. These two areas have been activated in the past by two large earthquakes, the 1703 earthquake in the northern part and the one occurred in 1349 located in the southern part, in between the two seismogenic structures (He shows the map of the seismogenic faults with the historical seismicity and the seismic sequence). The earthquake that occurred the 29 of March, in Sulmona, that had magnitude 3.8, is interesting because it is located in a well known structure that is characterized by the longest delays. The sequences are located within these two red belt (He shows the seismogenic map) that are the most seismic areas of Italy. We observe that this activity is located in boundaries zones of the segments and it worth

to pay more attention. We are worried because in that regions there have been very large earthquakes, anyway not larger than magnitude 7.0. If we observe the map (the seismogenic map), we see that is all segmented. We believe that we know all the seimogenic faults in Abruzzo. The recurrence period are on the order of 2-3000 years with a degree of uncertainties. The recurrence period of large earthquakes in Abruzzi are very long. There is a low probability of a large earthquake in the short term, as the 1703 earthquake, but this can not be excluded in a definitive way.

Selvaggi (showing the INGV report). He shows the INGV technical documentation. The swarm started in October 2008, in L'Aquila and in Sulmona, and they are very interesting. We are not underestimating their importance and we are following them with extreme attention. The area is characterized by numerous earthquakes (about 230 in the past three monts) but all of low magnitude. In 2003 and in 2004 there have been other swarms with very low magnitude. We are, nevertheless, in a highly seismic zone. The area that goes from Avezzano to L'Aquila has been characterized by scarce instrumental seismicity in recent times. We record earthquakes down to magnitude 1,0. The swarms are concentrated along two faults segment: Sulmona and L'Aquila.

Boschi. I want to say to the Regional Civil Protection head (Stati) that since INGV exists we study Abruzzo with much attention and what we know allows us to make reliable statements.

Barberi. I am here as Vice President of the High Risk Commission as the President is absent. I, therefore, take the leading of this meeting.

The commission must evaluate two questions:

- 1 To make an objective evaluation of the ongoing seismicity also in terms of what can be forecasted
- 2 discuss and provide indications on the alarms that people is suffering

As far as the first point, I agree on how extremely difficult is any temporal forecast on the evolution of seismic phenomena. We can refer to the historical seismicity, from which we learn the high seismicity of Abruzzo. We know the Abruzzo is a high seismic region. In the past there has been seismic sequences similar to those we are observing today. What can you say?

I heard the head of civil protection declare to media, although he is not a geophysics that when there are seismic sequences there is a discharge of energy and there are more probability that the large shock do not arrive. What can you say?

Eva.

There not so many examples in the catalog also because so small earthquakes where not reported in the past. In recent times there has not been large earthquakes but numerous swarms that have not preceded large earthquakes (like in Garfagnana). Obviously, as L'Aquila is a seismic zone, we can not make a statement that there will not be large earthquakes. I am worried by those earthquakes without these precursors (ex. Friuli, Irpinia, Umbria-Marche, Molise). I agree with Boschi that these swarms are located along to different seismogenic structures (Sulmona and L'Aquila).

Note. *In the signed minutes, it is reported a sentence made by Selvaggi at this moment. The sentence was written by Dolce that integrated this minute later. The sentence is:*

"I underline that even in recent times, some earthquakes have been preceded by swarms, days or week before, although most of the seismic sequences end without a large earthquake."

Boschi. (showing the hazard map and the seismic zonation).

In an active seismic zone, there is always the possibility to have earthquakes, and when they occur there is the impression that something is activating. In reality, the area is always active and there are processes like creeping or stick slip. We may have a silent creeping or many small earthquakes concentrated near the location of a large earthquake. Everywhere in Abruzzi there is this kind of activity. If we had the recording of all these earthquakes we will discover that large earthquakes have been with (...the sentence is unclear). We have increased our monitoring system but, nevertheless, we can not forecast earthquakes. I would exclude that a swarm is preliminary to events.

We would be able to forecast earthquakes when we will know in detail the seismicity of the Apennines and of the entire planet. For example, the 2004 Indonesian earthquake, that generated a large tsunami, redistributed from a seismic point of view the stress all over the earth system. In Abruzzi we record 800 earthquakes per year.

L'Aquila in the seismic zonation is at the second class and it has a high hazard (violet colour, showing the hazard map of Italy). Earthquakes can not be forecast, but they can be mitigated and so it should be appropriate to make prevention (resistant buildings). This statement should be included in the drafting "Decreto Casa".

Calvi.

The strong motion recordings of the M 4 earthquake show PGA equal to 0.14 g, a very high ground acceleration not consistent with a magnitude 4. Spectral displacements are equal to about 2 mm, consistent with the earthquake and no seismic engineer would worry about this number because it is irrelevant for the stability of a building. The human sensitivity is very high. The earthquakes occurred in this sequence should have not made damage.

Barberi.

We here represent the scientific situation, it is responsibility of the Civil Protection Department and to Abruzzi Regional Administration to define the actions.

Swarms tend to have the same magnitudes and it is highly unlikely that in the same swarm there is an increase of the magnitude. This does not mean that all the buildings may suffer damage especially to the non structural parts.

I agree with Selvaggi that there are more frequent seismic sequences than large shocks, obviously we can not say if there will be or not a large earthquake.

Stati (Head of Regional Civil Protection).

I would like to make a question. Today distinguished experts explained us what could happen. We, I and the Major, must also give political answers to people through the media. We would like to know if we have to believe to those people that goes around creating alarmism.

Barberi.

Stati has anticipated a question whose answer will be possible after the second part of the discussion. There is also someone that would claim forecasts with a gas sensor. This could be useful in the future but surely not today. There is no instrument that warns about an

earthquake. Surely during the preparation of earthquakes there are geochemical phenomena whose complexity is so high that we can not use them as precursors. So, today, there are no instruments to make forecasts and any forecast has no scientific base. It does not worth that the Commission discuss about this, we have discussed about this many times in the past. On the contrary, it is worth to say that any forecast has no scientific base. This seismic sequence does not tell anything but surely focuses again the attention on a seismogenic zone where, sooner or later, a large earthquake will occur. We now tell to the Civil Protection and to the Regional Administration that the only protection today is to increase prevention activities (reinforce building) and planning. Summarize what have been done and invest in these fields. Missing investments in these fields in the long term has a cost.

Dolce underlines the vulnerability of non structural part of buildings and underline the importance in the future verifications of school buildings that the technicians should take care mostly to the non-structural parts like ceilings, chimneys, balconies etc..

Stati.

Thank for your statements, they allows me to reassure the population through a press conference.

The **Major** communicates that also tomorrow the schools will remain closed.

At the end of the meeting Stati, the Major of L'Aquila, De Bernardinis and Barberi hold a press conference in the Auditorium with Simona Bernacchi (DPC) and Carlo Gizzi (Abruzzi Regional Administration).