Were Explosives the Source of the Seismic Signals Emitted from New York on September 11, 2001?

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ABSTRACT

The seismic signals propagating from New York on September 11, 2001, recorded at Palisades (34 km) and published by the Lamont-Doherty Earth Observatory of Columbia University (LDEO), have here been subjected to a new critical study concerning their sources. The aim of this paper is to demonstrate that the nature of the waves, their velocities, frequencies, and magnitudes invalidate the official explanations which imply as sources the percussion of the twin towers by planes and the collapses of the three buildings, WTC1, WTC2 and WTC7.

First of all, we show the contradictions in the official explanation between the seismic data and the timing of the events. Then we point out that it is strange that identical events (percussions of identical towers on the one hand, and collapses of identical towers on the other hand) at the same location would have generated seismic sources of different magnitudes. We demonstrate that only strong explosives could be the cause of such seismic waves, in accordance with the observed low frequencies. According to the nature of the recorded waves (body and surface waves), we can propose a location of each explosive source. According to the presence of shear waves or the presence of Rayleigh waves only, we hypothesize a subterranean or a subaerial explosion. The magnitude of an aerial explosion is insufficient to provide seismic waves at 34 km.

The witnesses and video observation confirm our conclusions of subaerial explosions close to the times of aircraft impacts on WTC1 and WTC2, a strong subterranean explosion closely correlated with the WTC1 collapse, and subaerial explosions closely correlated with the WTC2 and WTC7 collapses, WTC7 not having been hit by a plane. As a consequence, we draw the conclusion that the three buildings were demolished by a controlled process.

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INTRODUCTION

When major shocks occur at the Earth's surface or at depth, waves of different types, magnitudes and speeds may move out from the source location. Such waves can be detected by seismometers located at recording stations and the data from the recordings can be analyzed to learn many details of the source events. Seismic signals were recorded at stations in New York and four neighbouring states on September 11, 2001 during the period when the North and South Towers (WTC1 and WTC2, respectively) were struck by airliners and collapsed, as well as during the collapse of Building 7 of the WTC, which had not been hit by a plane.

Data from the Palisades, NY recording station, located 34 km north-north-east of Manhattan, published by the Lamont-Doherty Earth Observatory of Columbia University (LDEO), provide the most detailed seismic waveforms for analysis, particularly for the determination of the locations (surface or underground) and timing of the events that created the seismic waves.

Some authors have been puzzled in their analysis of signals recorded for the events at the World Trade Center, as the contradictions are significant. They are particularly intrigued by the presence of seismic "peaks" before the collapses. (See MacQueen, 2009). This text focuses on the study of the seismic signals from Palisades. The new interpretation presented here renders the assertions of the seismic analysis of the events at the WTC, as presented by the government in the NIST and other reports, null and void. On the contrary, all the documented evidence points to explosions as the source of the recorded seismic signals.

COMPOSITION OF DIFFERENT WAVEFORMS

Five waveforms will be analyzed below. They are attributed by the LDEO team to specific causes, as follows:

1. the signals that, according to LDEO, match the moment when the planes hit WTC1 and WTC2, respectively, shown in figures 1a and 1b;
2. the signals that match the collapses of WTC1 and WTC2, respectively, shown in figures 2a and 2b; and
3. the signal that shows the collapse of WTC7, shown in Figure 2c.

The analysis presented here will question LDEO's identifications of the causes of the waveforms.

Determination of the Timing of the Signals' Origins

In these five cases the origin of the signals was attributed, by the seismologists who published the data, to the impacts of the planes or the collapses of the buildings (Kim et al. 2001; Irvine, 2001; Hoffman, 2006). Normally in this type of study the time of origin is known with great precision (to the millisecond), which is necessary in order to calculate the propagation speed of the different waves. Unfortunately, that precision is not possible for the events at the WTC. In this case, timing of the waves must be correlated as well as possible utilizing video evidence.

The video used in this study for the North Tower (WTC1) was from a recording made by CNN with a time stamp on the screen (Hoffman, 2006), and the results were compared with the method utilized by LDEO (Kim et al. 2001). LDEO's method consisted of assigning an estimated speed of 2km/s for a Rayleigh wave (a type of surface seismic wave) that traversed several stations (see Figure 3) situated at various distances from the point of origin. The major inconveniences of this method are that the stations are not situated on a straight line, and that the surface terrain in which the surface waves move varies. The waves do not have the same speed of propagation as they pass through different materials.

The Hudson River is located on a fault line that separates predominantly sedimentary terrain on the west from crystalline and metamorphic rock on the east. These eastern formations permit more rapid surface wave propagation than those found to the west, which explains why the path WTC-MANY (Fig. 3), the only site to the east of the Hudson, was more rapid than all the other paths, situated to the west. In contrast, the stations at Palisades (34 km), at ARNY (67.5 km) and at TBR (51 km), provide similar results because they are situated on similar geological formations. Finally, the enormous indeterminacy of 2 seconds in the calculations attempting to fix the time of origin of each of the signals, admitted by the LDEO authors themselves (Kim et al., 2001), oblige us to view the official conclusions critically.

Waveforms Attributed to the Planes Crashing Into the Towers

The waveforms that the LDEO team attributes to the impacts of the airliners into the Twin Towers are shown in figures 1a and 1b. Although the waveforms look somewhat similar, they are sufficiently different to raise questions about LDEO's analysis. Although the cause of the two signals is similar -- the crashing of a plane, according to LDEO -- the magnitude (reflected by the amplitudes, or distribution on the vertical axis) of the two signals is different. Further, the waves generated by the two events do not have the same apparent velocity. The calculation of the propagation speeds, derived from the times measured in the graphs of Figures 1a and 1b between the origins fixed according to the corresponding crashes and the first wave arrivals – namely, respectively 11.7 and 15.8 seconds - indicates roughly 2900 m/s for WTC1 and 2150 m/s for WTC2.

A more serious difficulty with LDEO's attribution of the waveforms to plane impacts at the Twin Towers is that even if the impacts had been considerably more energetic, these

signals could not have been generated by such impacts. The actual waves generated by the crashes had to have been deadened before hitting the ground. Frequencies of waves generated by explosions are on the order of 1 Hertz (1 Hz, or one cycle per second) -- which is the case with the Rayleigh waves shown in figures 1a and 1b -- while those of crash impacts are above 10 Hz and are often around 100 Hz. Furthermore, the range of the recording instruments (0.6-5 Hz) cited does not allow for the recording of the high-frequency waves that would be created by plane impacts. As to the theory of the oscillation of the Towers to explain these signals, as defended by Irvine (2001), it is inadequate because in such a case we would have had a "square" signal of long duration and a constant amplitude, while in actuality we observe a "bell-like" signal, representing a strong and brief explosion, which is particularly evident in the case of WTC2.

Given that it is geophysically impossible to have two different propagation speeds for two waves of the same type at the same frequency travelling the same path only a few minutes apart, one must bow to the evidence that the supposed origins of the recorded waves are incorrect, and that they are not linked to the plane crashes but to another origin. The waveform data, far from suggesting the conclusion of LDEO that they were caused by plane impacts into the Towers, suggest instead two explosions with different time displacements from the moments of plane impact at each building. Further, the difference in the magnitude of the two signals can only be linked to differences in the volume of explosives and/or their distance from the surface.

Waveforms Attributed to the Collapse of the Towers

While the Twin Towers had approximately the same mass, the same height and size, and the same type of internal structure (as well as essentially identical points of origin of the seismic wave-data in terms of distance to the recording station), the signals attributed to the collapses of WTC1 and WTC2, instead of being similar as one would suppose from the official thesis, are in fact very different. They differ in their form, their composition, and especially in their apparent propagation speed, as calculated from the official origin time.

In fact, the recording for WTC1 (Fig. 2a) demonstrates the three types of wave characteristic of a brief explosive source confined in a compact, solid material: a P wave with a speed of 6000 m/s, the typical value for a very consolidated crystalline or sedimentary terrain (which is the case in the bedrock of Manhattan), an S wave with a speed of 3500 m/s, and a surface wave with a speed of 1800 m/s (a Rayleigh wave). These values match those registered from an earthquake or seismic prospecting (see for example Kim et al. 2001).

On the other hand, the recording linked to WTC2 (Fig. 2b) does not show the P or S body waves observed for WTC1 but only the surface Rayleigh wave, for which the spreading of the amplitudes over the duration is different from that of WTC1. The propagation speed of 2125 m/s is also markedly different from that of WTC1. Further, this wave seems to be followed by a second Rayleigh wave four seconds later.

We find the same thing for WTC7 (Fig. 2c), where the calculation of the speed of the wave according to the determined origin time indicates a Rayleigh wave with a 2200 m/s speed. Note that the amplitudes are comparable to those of the waves emitted at the time of the crashing of the airplanes into the Towers. This wave seems to be followed by a second Rayleigh wave 6 or 7 seconds later.

In the three cases, the bell-like form points to an impulsive source of energy, not percussion on the ground due to the fall of debris. The total mass and the average mass of individual building fragments were relatively small and fell to the ground over a period of more than ten seconds (which is a very long time in geophysics). Also note that the duration of a seismic signal does not tell anything about the source, in distinction from the amplitude and, particularly, the frequency.

TIMING DISCREPANCIES

The problem of the "displacements" between the times of origin of the seismic waves and the times at which the planes crashed into the Towers, particularly that for WTC1, is certainly a key question and one that is emblematic of all the contradictions of the official version of September 11, 2001, as already pointed out by Furlong and Ross in 2006. The LDEO published two different timetables of wave-origins (Kim et al. 2001), which are presented in the table below. The first timetable (LDEO [1]) is that furnished with the published graphs. Then the LDEO modified its timetable (LDEO [2]). The widely varying but still, somehow, official times given by the 9/11 Commission and by the National Institute of Standards and Technology (NIST) are also presented in the table.

What are the indisputable data here? There are two: the time that the waves reached the Palisades station, which is relatively easy to determine, and the distance from the WTC to Palisades (34 km). If the recorded wave is actually a Rayleigh wave, its (group) velocity is around 2000 m/s. Therefore, this wave was created 17 seconds before its arrival at Palisades. Where the problem deepens for the defenders of the official version is that the time for the source of the Rayleigh wave attributed to the crash into WTC1, which officially arrived at Palisades at 8.46.42+/-1, must in fact be 8.46.25+/-1. Compare that time with the times given in the first column of the table below. Only the revised LDEO timetable (LDEO [2]) comes close.

	WTC1 impact[]	**WTC2 impact**	**WTC1 collapse**	**WTC2 collapse**	**WTC7 collapse**
9/11 Commission	8.46.40	9.03.11 (NORAD: 9.02)	10.28.25	9.58.59	
LDEO [1]	8.46.30	9.02.55	10.28.30	9.59.07	17.20.40
LDEO [2]	8.46.26+/-1	9.02.54+/-2	10.28.31+/-1	9.59.04+/-1	17.20.33+/-2
NIST	8.46.29+/-2	9.02.57+/-4	10.28.34+/-2	9.59.07+/-2	17.20.42+/-4

The times put forward by the 9/11 Commission come from radar at ground level and are based on the National Transportation Safety Board (NTSB) and Federal Aviation Administration (FAA) data. They are the only reliable times because they are based on ground radar data which do not involve any hypothetical assumptions. They are considered to be reliable to one second.

For the time of the impact of the plane into WTC1 furnished by the Commission, 8.46.40 (*9/11 Commission Report*, p. 7; Ritter, 2002), *there is a hiatus of 15 seconds between the plausible time of the origin of the Rayleigh wave based on the Palisades data and the time -- afterwards -- of the crash of the plane into WTC1 based on the ground radar data*. What else but an explosion could be the origin for this seismic wave in the absence of an earthquake? A similar discrepancy exists in the data for the seismic wave and impact times for WTC2.

Also, the crash of the plane into WTC2 cannot be the cause for a camera, solidly on the ground and probably mounted to a tripod, which is filming WTC1 (see 911Blogger.com, 2006) to strongly shake one second before the fireball following this impact and shake again five seconds later: Only strong explosions can cause such shaking. This has been discussed at length by MacQueen (*Journal of 9/11 Studies,* 2009)

SEISMIC WAVE-GENERATION FROM IMPACTS, COLLAPSES AND EXPLOSIONS

Attributing the transformation of kinetic energy into seismic waves to the crash of a jet into a building would make sense only if such a crash involved two full, solid and non-deformable objects. In this case, the kinetic energy of the moving body would in part be transformed into heat and the rest would be transmitted to the stricken object in the form of vibrations, that is, seismic waves. However, that is not the case here because we have two hollow and deformable objects. During the crash, the whole of the energy is transformed into heat and the envelopes (exterior walls) are deformed. In the case where a little mechanical energy would remain, the waves created in the pierced envelope would be quickly dispersed because of the absence of continuity in this envelope due to the spaces between vertical and horizontal structural members, such as rooms and windows. The necessary condition for the creation of seismic waves by such a crash would be the direct impact into the central columns by a full body. Even if a Boeing engine had hit a core column, it would have been with an energy lessened by passage through the building's envelope. In conclusion, even if a seismic wave could be created in a steel column, it would hit the ground only in the form of seismic noise, and as the passage from metal to rock is a refraction that absorbs energy, there would not be much left to propagate in the ground.

Could the collapse of the Towers be the source of seismic waves as claimed by LDEO and other defenders of the official account? The enormous mass of the Twin Towers could hypothetically be taken into account if the Towers had fallen in a compact block, like a meteorite. But in fact, it was mostly scattered shards, not coherent blocks, that fell, largely transformed into dust, and the fall spanned several seconds. This form of collapse

could only produce a force far below that necessary to create seismic waves; in this case, the magnitudes simply do not add up, and the result is a noise of various magnitudes and frequencies.

Given that neither the crashes into the towers, nor their vibration, nor the fall of debris can be the source of the seismic waves registered 34 kilometres away, as well as the fact that the low frequencies of those waves could not have been generated by such phenomena, we must search for the actual causes of the waveforms observed. Only explosions could produce the waves observed but various possible explosive configurations must be considered. We must distinguish between 1) subterranean explosions, 2) aerial explosions and 3) subaerial explosions (close to the ground without touching it).

Subterranean explosions are similar to earthquakes in that mechanical energy is transmitted to the earth in the form of body waves of two types, P and S (for "primary" and "secondary," or "pressure" and "shear"), and surface waves (either Rayleigh or transverse L) when the signal reaches a solid-fluid interface (for example, the atmosphere at the surface). Another name for Rayleigh waves is ground roll.

Aerial explosions release all of their energy in the air (as P waves, which in the atmosphere are simply sound waves), and what remains upon hitting the ground is thus too weak to create body waves in the solid earth (although there can be surface waves over a small distance).

Subaerial explosions give off energy that splits into sound waves, mainly in the air, and surface waves in the ground.

EXPLOSIONS THE SOURCE OF 9/11 SEISMIC WAVEFORMS

A subterranean explosion might not be heard, but the ground would shake and initiate a series of waves (body and surface waves). If we distinctly hear an explosion, it is either aerial, which does not give a seismic signal, or it is subaerial, in which case surface waves could be generated. The seismic wave data provided by Palisades prove the occurrence of surface waves radiating outward from the World Trade Center. In addition, witnesses reported hearing explosions very close to the times at which planes struck the Towers and when they collapsed (see particularly MacQueen, 2006).

Given these two types of evidence we can affirm that subaerial explosions occurred close to the base of the Towers almost or quite simultaneously with the crashes into the Towers by the planes. The sound coming from these explosions would have been mixed with the sounds generated by the impacts of the planes. The explosion at the base of WTC1 was heard and reported by William Rodriquez (Spingola, 2005).

The employees of the Secret Service, whose offices were in WTC7 wholly separated from WTC1, noticed this event: “On September 11, like any other morning, most of the Secret Service employees were either settling into their offices or still making their way

to work. Others were about to attend meetings to prepare for the upcoming meeting of the United Nations General Assembly. At 8:48 a.m. their offices in Building 7 shook and the lights flickered. Most of them stopped for a quick moment but quickly returned to their work" (Congressional Record, 107th Congress (2001-2002)). As a simple impact against a tower cannot be transmitted to a separated building, an explosion was the likely source of the shock in the offices.

The waveforms produced by the collapses of WTC2 and WTC7 were of a different type than that generated by the collapse of WTC1. Based upon the kind of waves coming from WTC2 and WTC7, they each underwent one or more very large subaerial explosions, heard and reported by witnesses. For example, in the case of WTC2, a fireman witnessed an explosion before the building collapsed into an enormous cloud of dust (see Testimony [1], below), apparently not too far from the base of the Tower, accompanied by flashes of light and noise, according to an "Assistant Commissioner" (see Testimony [2]). Another fireman, present at the base of WTC2, stated there was a large explosion about 20 floors below the impact zone of the plane just before the upper portion of the Tower began to collapse (Testimony [3]). These explosions were too high above the surface to generate body waves in the ground, and the Rayleigh wave recorded probably comes only from the explosion closer to the surface. Among the other explosions heard at the base of WTC2 (WhatReallyHappened.com, 2009), one of them generated the second Rayleigh wave recorded four seconds after the first. The same thing happened at WTC7. A witness watching this building heard something like a "thunderclap" that caused the windows to explode outwards, while the base of the burning building gave way a second later, before the whole building followed the movement (Testimony [4]), aided by a second explosion, which generated the second Rayleigh wave 6 to 7 seconds later.

The WTC1 collapse began *after* that of WTC2 in spite of the fact that it had been hit earlier, and a subterranean explosion preceded its collapse. This subterranean explosion was therefore not heard by the witnesses outside at 10:28 EDT, except for those located next to the Tower (Testimony [5]), but it was "felt" by a camera filming the tower that was solidly on the ground (probably 150 m from the tower at the Bankers Trust Building after the southward direction of the antenna fall) and was shaken by the vibration of the ground at the moment of the explosion (see [6]). On the other hand, it is also logical that the many explosions shown in videos of the upper floors before and during the collapse did not provoke any seismic waves, because of the aerial locations and the fragmentation in time of the detonated energy in the series of successive sources, each of which had only a limited force, insufficient to generate seismic waves in the ground.

Even if standard controlled demolitions do not create seismic waves (because the explosions are aerial), it is useful to compare the data from the World Trade Center on 9/11 with seismic data obtained during the controlled demolition of other buildings such as the Kingdome in Seattle (Pacific Northwest Seismograph Network, 2000) and at Oklahoma City (US) (Holzer et al., 1996). The case of the Kingdome is particularly interesting because seismologists expressly asked that the explosions be measured (in order to take advantage of the occasion to gather research data), and those in Oklahoma City were part of a reconstruction, using explosives, of the partially destroyed Alfred P.

Murrah Federal Building. These two examples involved a powerful subaerial explosion and the emitting of Rayleigh waves. Furthermore, the falling of the debris had no seismic consequences, even at distances well below 34 km (less than 7 km and 26 km respectively). Only the seismic equipment situated close to the source during the reconstruction of the bombing in Oklahoma City was able to record the seismic energy created by the collapse of the building.

The local magnitudes (M_L) that the LDEO seismologists calculated from the surface waves gave results that consolidate our analysis. They were higher than 2 on the Richter scale for the waves emitted at the moments of the collapses. It is impossible to get such a magnitude from the falling of the building debris alone, especially falling over a duration of ten seconds. Even if an entire Tower had been compacted into a tight ball, it would have necessitated a higher speed than could be caused by the Earth's gravity to even approach such a magnitude. Moreover, we must note that the magnitude attributed to the subterranean explosion at the WTC1 is M_L=2.3 -- comparable to the earthquake that hit New York on January 17, 2001 (ML =2.4) -- while the magnitude coming from the WTC2 explosion is M_L =2.1, thus weaker. This disparity is consistent with the explosions described **in this study** and is particularly appreciable given the logarithmic scale used to designate event magnitudes. Given that the Twin Towers were of similar height and mass, the falling debris from the collapsing Towers should have generated similar magnitudes, if they were indeed the sources of the waves.

Applied geophysicists know how to generate seismic waves in the ground using non-explosive techniques such as "weight dropping" -- which consists of letting a heavy mass such as a three-ton weight fall to earth -- or using vibrators attached to the ground. But the energy of the waves developed in the ground by such methods is too low for the waves to go further than several hundred meters. On the other hand, similar seismic waves are commonly recorded from mining operations, generated by subterranean blasts of ammonium nitrate, and a few tons are enough to develop a magnitude of 2 to 2.5 on Richter scale.

THE RELATION BETWEEN THE SEISMIC WAVES AND THE PROCESS OF COLLAPSE

Observation from videos of the destruction of the Towers shows the processes differed, and this correlates with the differences between the corresponding seismic waves.

The collapse of WTC7 is the one that comes closest to a classic controlled demolition, with the successive collapsing of the floors starting from the base, which had been weakened by a strong subaerial explosion. As for the Twin Towers, it appears they were first weakened by explosions at their base at the moment the airplanes crashed into them. After that we must distinguish between the parts of the building above the impact zone of the planes and those located below. If the seismic waves could not have been generated by the explosions visible in the floors (which allowed for the gradual collapse upwards above the impact zone and downwards below this zone), then only a powerful explosion at the base of WTC2 and a subterranean one under WTC1 could have produced the

observed seismic waves. These basal explosions would facilitate the total, rapid disintegrations of the buildings.

In the case of WTC1, the Federal Emergency Management Agency (FEMA) implicitly confirmed this scenario. They noted, "Review of videotape recordings of the collapse taken from various angles indicates that the transmission tower on top of the structure began to move downward and laterally slightly before movement was evident at the exterior wall. This suggests that collapse began with one or more failures in the central core area of the building" (FEMA, *World Trade Center Building Performance Study*, Chapter 2). This transmission tower was supported by a lattice of large diagonal I-beams, called a "hat truss," that connected the walls of the perimeter of the building to the central structure between the 107th floor and the roof, and therefore reinforced the central structure. Contrary to official findings that it was the hat truss that transferred the instability of the central columns to those of the perimeter, which then gave out after they were deformed because of the pulling of the floors, the logic of the events forces us to consider that the rupture of the central columns came from an explosive event at the base of the building prior to its collapse.

CONCLUSION

Near the times of the planes' impacts into the Twin Towers and during their collapses, as well as during the collapse of WTC7, seismic waves were generated. To the degree that (1) seismic waves are created only by brief impulses and (2) low frequencies are associated with energy of a magnitude that is comparable to a seismic event, the waves recorded at Palisades and analyzed by LDEO undeniably have an explosive origin. Even if the planes' impacts and the fall of the debris from the Towers onto the ground could have generated seismic waves, their magnitude would have been insufficient to be recorded 34 km away and should have been very similar in the two cases to one another. As we have shown, they were not.

The types and magnitudes of the seismic signals show significant differences. The greatest differences occur in their propagation speeds, even though their paths were essentially identical under identical conditions. This difference is physically unexplained in the interpretation of the events offered by the LDEO researchers, the 9/11 Commission and NIST. Therefore, we must question their calculations of wave propagation speeds based on their assumption that the wave origins are shown on the video images of impacts and collapses. We can only conclude that the wave sources were independently detonated explosives at other times, thus accounting for the variable discrepancies for each wave origin in relation to the videos.

The composition of the waves is revealing both in terms of the location of the source and the magnitude of the energy transmitted to the ground. The subterranean origin of the waves emitted when WTC1 collapsed is attested by the presence of the P and S body waves along with the Rayleigh surface waves. The placement of the source of the four other explosions is subaerial, attested by the unique presence of only Rayleigh waves.

The aerial explosions visible on the videos of the upper floors of the Twin Towers do not produce seismic waves 34 km from the source.

There is a factor of ten between the power of the explosions at the time of the plane impacts on the Twin Towers (as well as at the time of the collapse of WTC7) and the strength of those more powerful explosions at the times of their collapses, the subterranean explosion under WTC1 being the one that transmitted the most energy to the ground.

Note that in accordance with the degree of dispersion of the surface waves (i.e., their speeds depend upon their frequencies), the duration of the recorded signal is not representative of the duration of the signal at the source.

Finally, controlled demolition of the three towers, suggested by the visual and audio witness testimony as well as by observations of video recordings of their collapses, is thus confirmed and demonstrated by analysis of the seismic waves emitted near the time of the plane impacts and at the moments of the collapses.

Testimonies from Witnesses

Note: Testimonies 1, 2, 3 and 5 are taken from "Oral Histories from Sept. 11 Compiled by the New York Fire Department," *The New York Times* (2005). (http://graphics8.nytimes.com/packages/html/nyregion/20050812_WTC_GRAPHIC/met_WTC_histories_full_01.html)

(1) Interview of fireman Richard Banaciski, who was in the street facing WTC2

I just remember we were -- initially we were out by the street and they started having jumpers, so they all kind of moved back towards the parking garage, towards the building, so nothing would come down on us.

We were there I don't know, maybe 10, 15 minutes and then I just remember there was just an explosion. It seemed like on television they blow up these buildings. It seemed like it was going all the way around like a belt, all these explosions. Everybody just said run and we all turned around and we ran into the parking garage because that's basically where we were. Running forward would be running towards it. Not thinking that this building is coming down. We just thought there was going to be a big explosion, stuff was going to come down.

There was just a tremendous cloud that came into the parking garage.

(http://graphics8.nytimes.com/packages/pdf/nyregion/20050812_WTC_GRAPHIC/9110253.PDF)

(2) Interview of Assistant Commissioner Stephen Gregory, who was in the street facing WTC1

At that point in time we heard a rumble, we heard a noise, and then the building came down. ...

[Lt. Evangelista and I] both for whatever reason -- again, I don't know how valid this is with everything that was going on at that particular point in time, but for some reason I thought that when I looked in the direction of the Trade Center before it came down, before No. 2 came down, (...) I saw low-level flashes. In my conversation with Lieutenant Evangelista, never mentioning this to him, he questioned me and asked me if I saw low-level flashes in front of the building, and I agreed with him because I thought -- at that time I didn't know what it was. I mean, it could have been as a result of the building collapsing, things exploding, but I saw a flash flash flash and then it looked like the building came down.

Q. Was that on the lower level of the building or up where the fire was?

A. No, the lower level of the building. You know like when they demolish a building, how when they blow up a building, when it falls down? That's what I thought I saw. And

I didn't broach the topic to him, but he asked me. He said I don't know if I'm crazy, but I just wanted to ask you because you were standing right next to me. He said did you see anything by the building? And I said what do you mean by see anything? He said did you see any flashes? I said, yes, well, I thought it was just me. He said no, I saw them, too. I don't know if that means anything. I mean, I equate it to the building coming down and pushing things down, it could have been electrical explosions, it could have been whatever. But it's just strange that two people sort of say the same thing and neither one of us talked to each other about it. I mean, I don't know this guy from a hole in the wall. I was just standing next to him. I never met the man before in my life. He knew who I was I guess by my name on my coat and he called me up, you know, how are you doing? How's everything? And, oh, by the way did you ... It was just a little strange.

Q. On the television pictures it appeared as well, before the first collapse, that there was an explosion up on the upper floors.

A. I know about the explosion on the upper floors. This was like eye level. I didn't have to go like this. Because I was looking this way. I'm not going to say it was on the first floor or the second floor, but somewhere in that area I saw to me what appeared to be flashes. I don't know how far down this was already. I mean, we had heard the noise but, you know, I don't know.

(http://graphics8.nytimes.com/packages/pdf/nyregion/20050812_WTC_GRAPHIC/9110008.PDF)

(3) Interview of fireman William Reynolds who was in front of WTC2

After a while, and I don't know how long it was, I was distracted by a large explosion from the south tower and it seemed like fire was shooting out a couple of hundred feet in each direction, then all of a sudden the top of the tower started coming down in a pancake. ...

[The fire] appeared somewhere below [the upper levels where it started collapsing]. Maybe twenty floors below the impact area of the plane. I saw it as fire and when I looked at it on television afterwards, it doesn't appear to show the fire. It shows a rush of smoke coming out below the area of the plane impact.

(http://graphics8.nytimes.com/packages/pdf/nyregion/20050812_WTC_GRAPHIC/9110288.PDF)

(4) 9/11/2001 radio broadcast, "9/11 Videos: The Controlled Collapse of WTC7"

I was just standing there, ya know... we were watching the building [WTC 7] actually 'cuz it was on fire... the bottom floors of the building were on fire and... we heard this sound that sounded like a clap of thunder... turned around - we were shocked to see that the building was... well it looked like there was a shockwave ripping through the building and the windows all busted out... it was horrifying... about a second later the bottom floor

caved out and the building followed after that... we saw the building crash down all the way to the ground... we were in shock.

(http://whatreallyhappened.com/WRHARTICLES/wtc7.html)

(5) Interview of EMS Lieutenant Bradley Mann

We were in the staging area the entire time. Shortly before the first tower came down I remember feeling the ground shaking. I heard a terrible noise, and then debris just started flying everywhere. People started running towards the staging area. ...

By the time the debris settled from the first collapse, we started to walk back east towards West Street and a few minutes later -- I really don't remember the time frames because we were so busy in trying to account for who was in the staging area and who wasn't -- we basically had the same thing. The ground shook again, and we heard another terrible noise and the next think we knew the second tower was coming down. And again we were running for our lives on Vesey Street.

(http://graphics8.nytimes.com/packages/pdf/nyregion/20050812_WTC_GRAPHIC/9110194.PDF)

(6) Video proving the existence of an explosion at the base of WTC1

"This 2.6 wmv video…shows the collapse of WTC1…The camera was not hand held, it was directly connected to the ground via a tripod, and this allowed the camera to visually capture a ground shake which occurred ~13 seconds before the building collapsed. The video also shows an object fall from the right hand side of the building moments before the camera begins to shake. The close timing of these two events indicates they are linked."

(http://whatreallyhappened.com/WRHARTICLES/shake.html)

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Figures

Figures are shown as published by the LDEO without modification of their scales, which are not uniform.

Captions of Figures 1 and 2 :

- the "start time" is expressed in Universal Time with the date; the time in bold print is the local time
- the horizontal axis is the wave propagation time axis in seconds ("s")
- the vertical axis represents the ground displacement (here horizontal) indicated on right by the marks 0 to 10 (Figures 1a, 1b and 2c) or 0 to 100 (Figures 2a and 2b)
- PAL : Palisades station ; E : short periods ; H : high gain ; E : compound east
- Filter : 0.6-5 Hz.

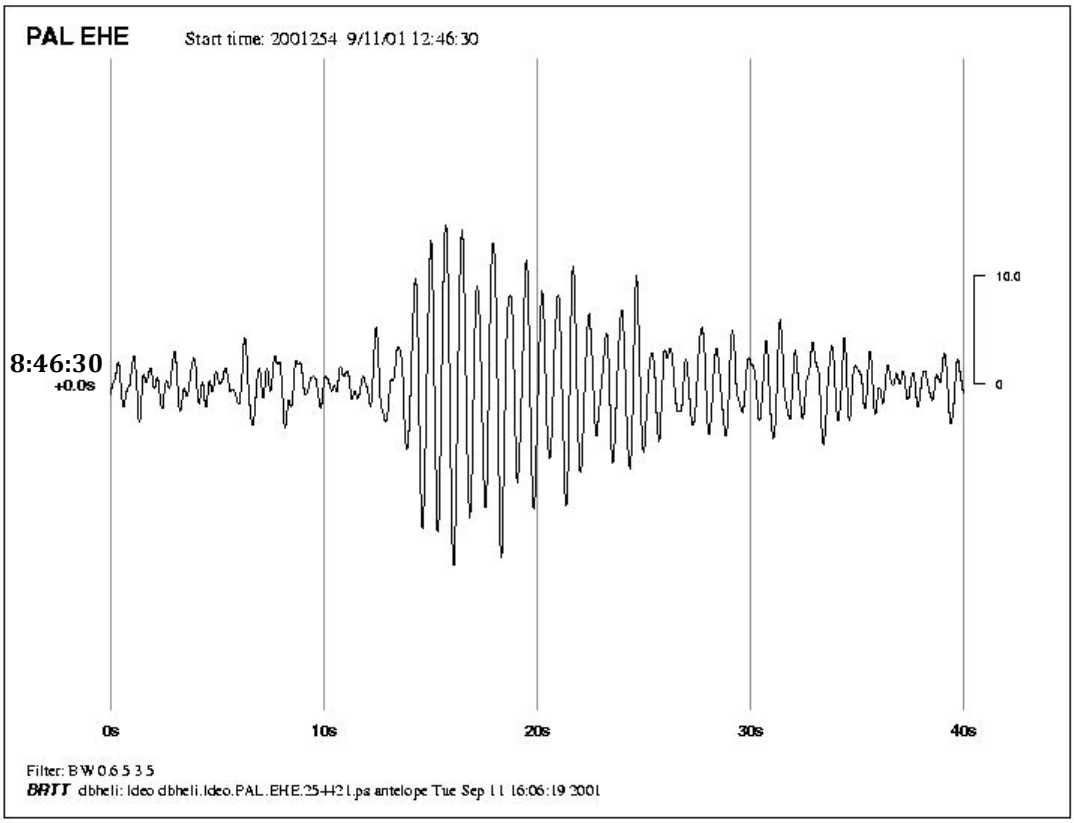

Figure 1a: Seismic waves recorded at Palisades closest to the time of aircraft impact on WTC1

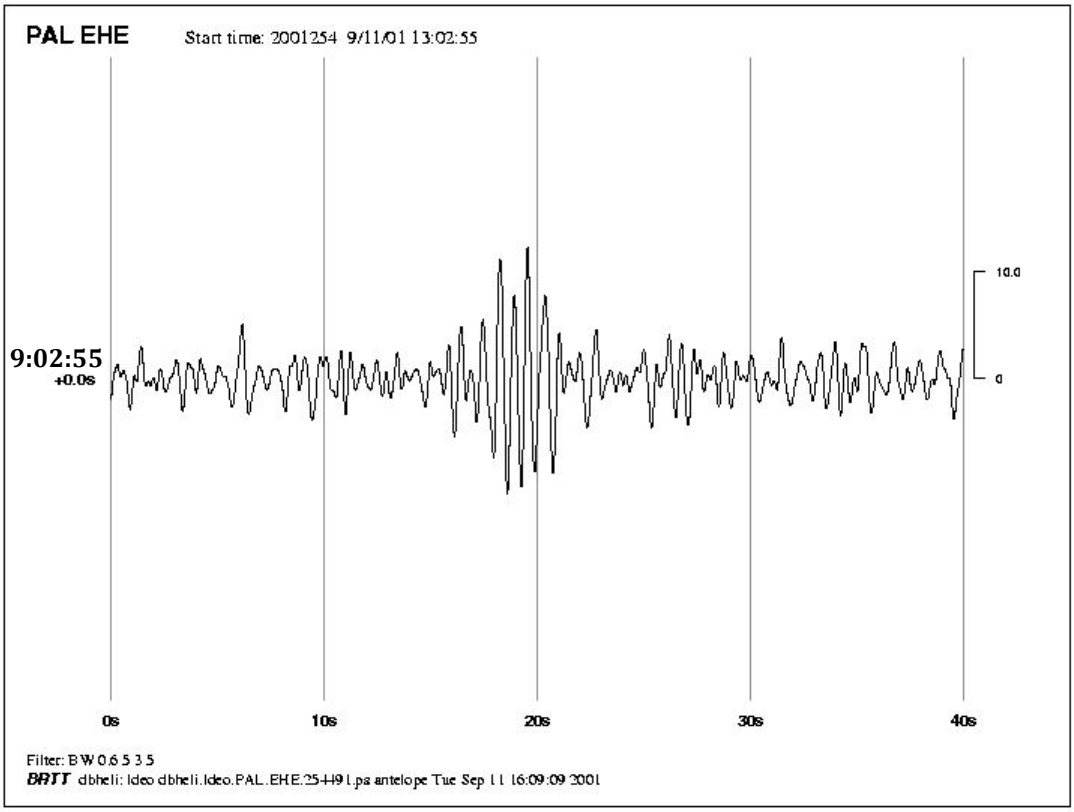

Figure 1b: Seismic waves recorded at Palisades closest to the time of aircraft impact on WTC2

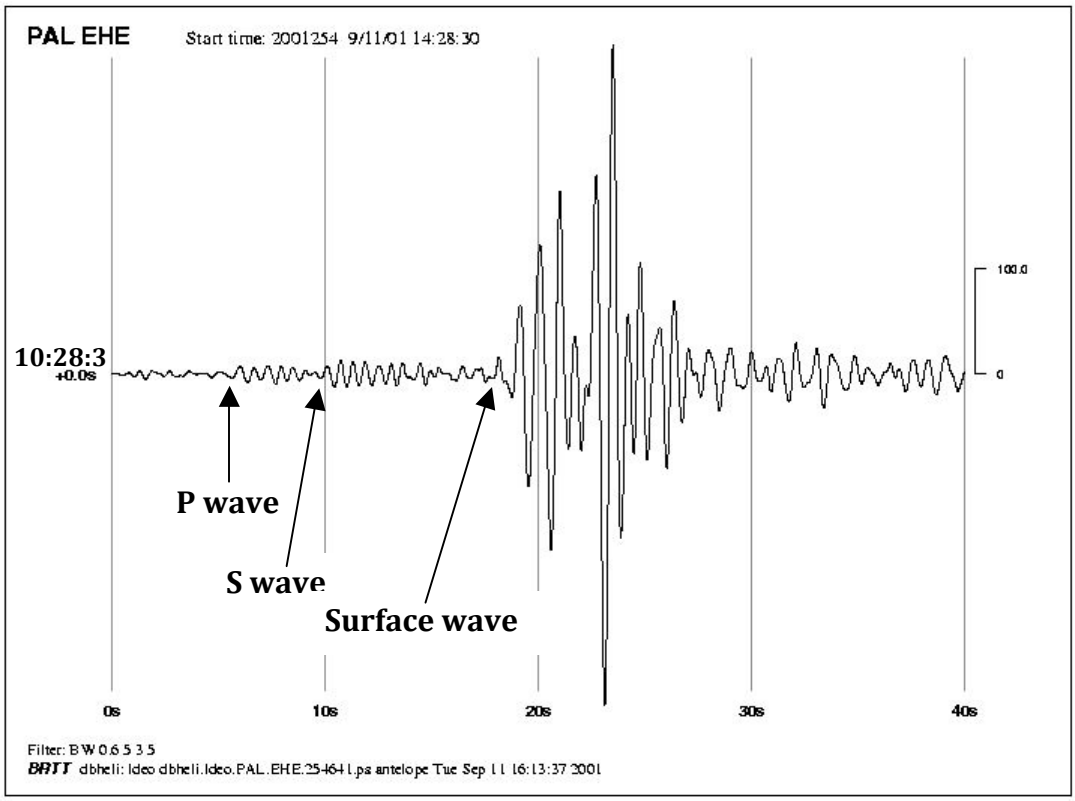

Figure 2a: Seismic waves recorded at Palisades that most closely correlated with the time of the WTC1 collapse

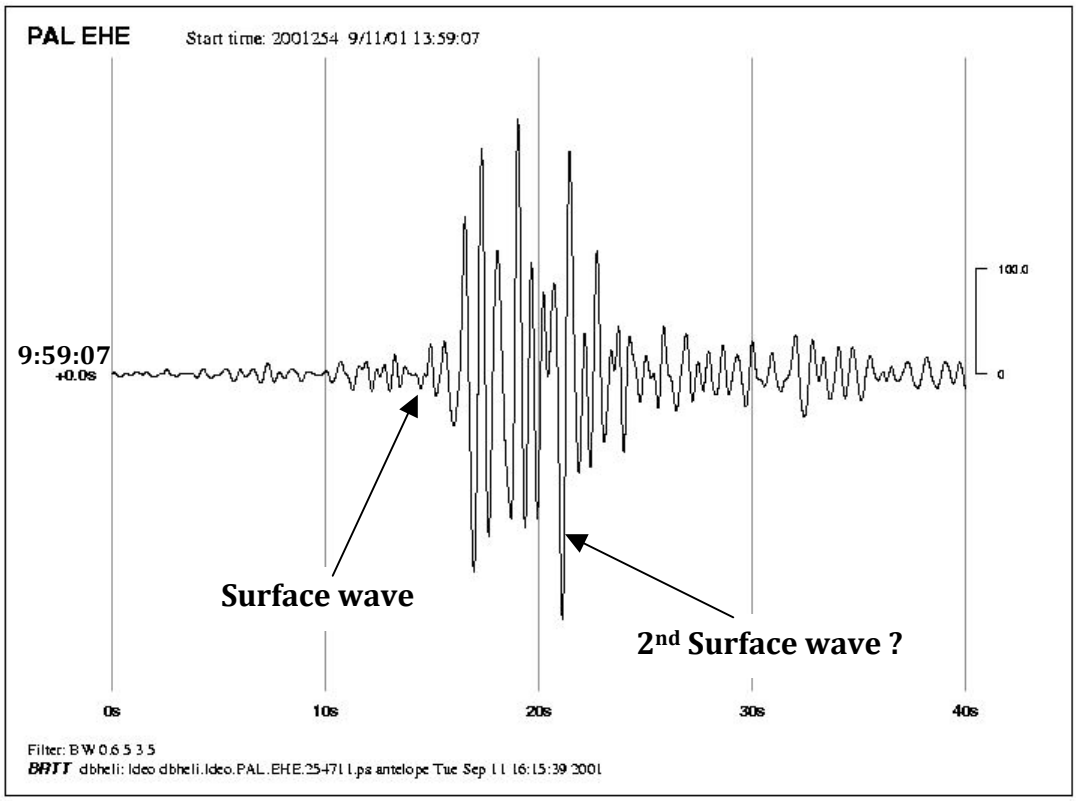

Figure 2b: Seismic waves recorded at Palisades that most closely correlated with the time of the WTC2 collapse

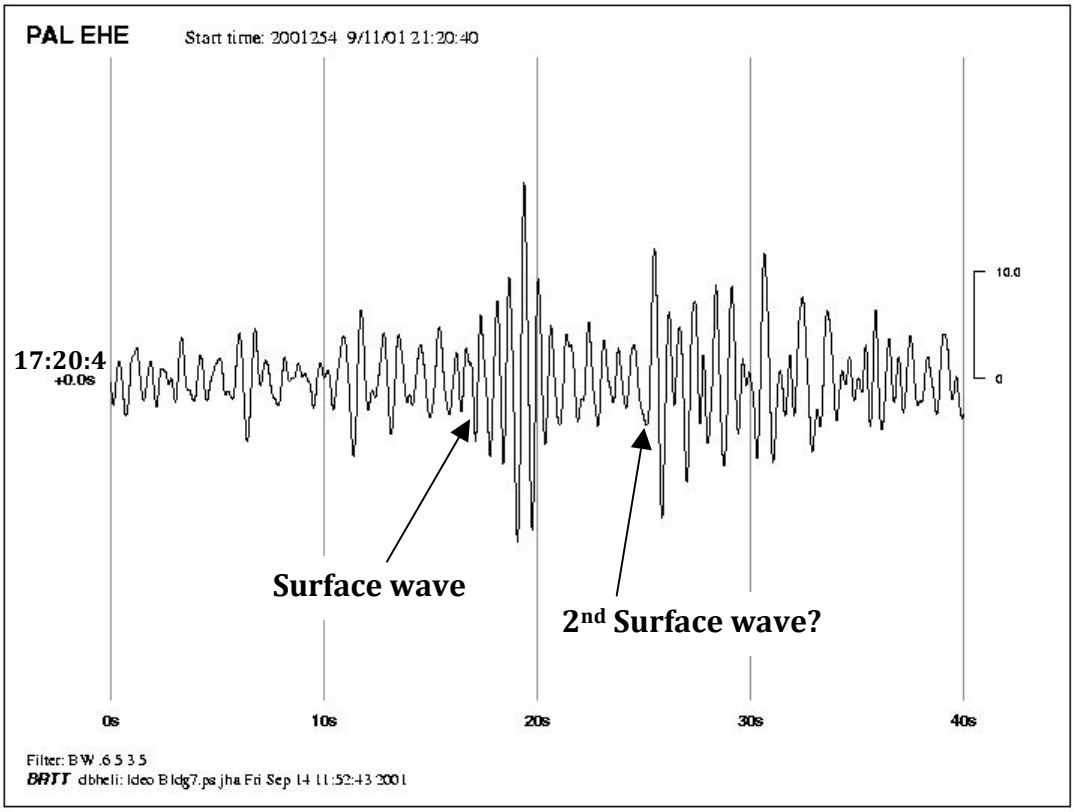

Figure 2c: Seismic waves recorded at Palisades that most closely correlated with the time of the WTC7 collapse

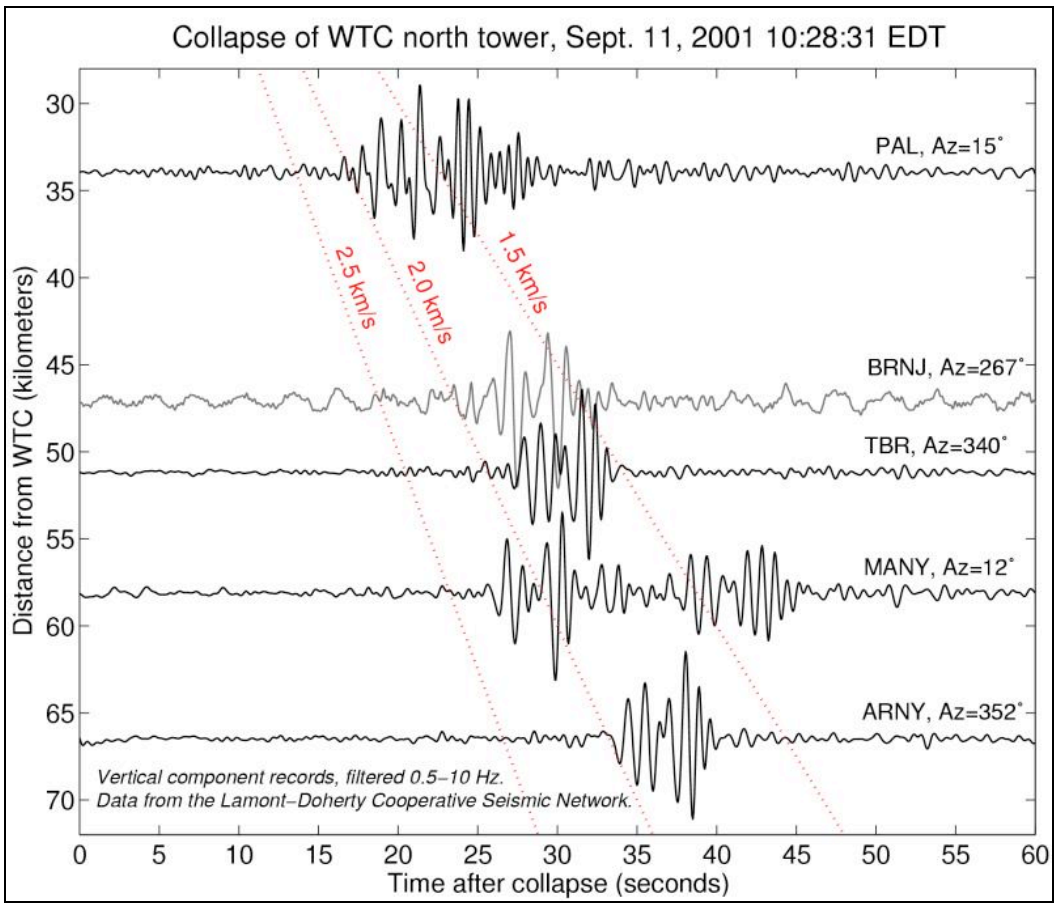

Figure 3: Research of the origin time for the signal emitted during the collapse of the north tower

EDT : local time
Az =azimut
Station PAL : Palisades,
BRNJ : Basking Ridge, New Jersey
TBR : limit NewYork-New Jersey
MANY : State of New York
ARNY : State of New York

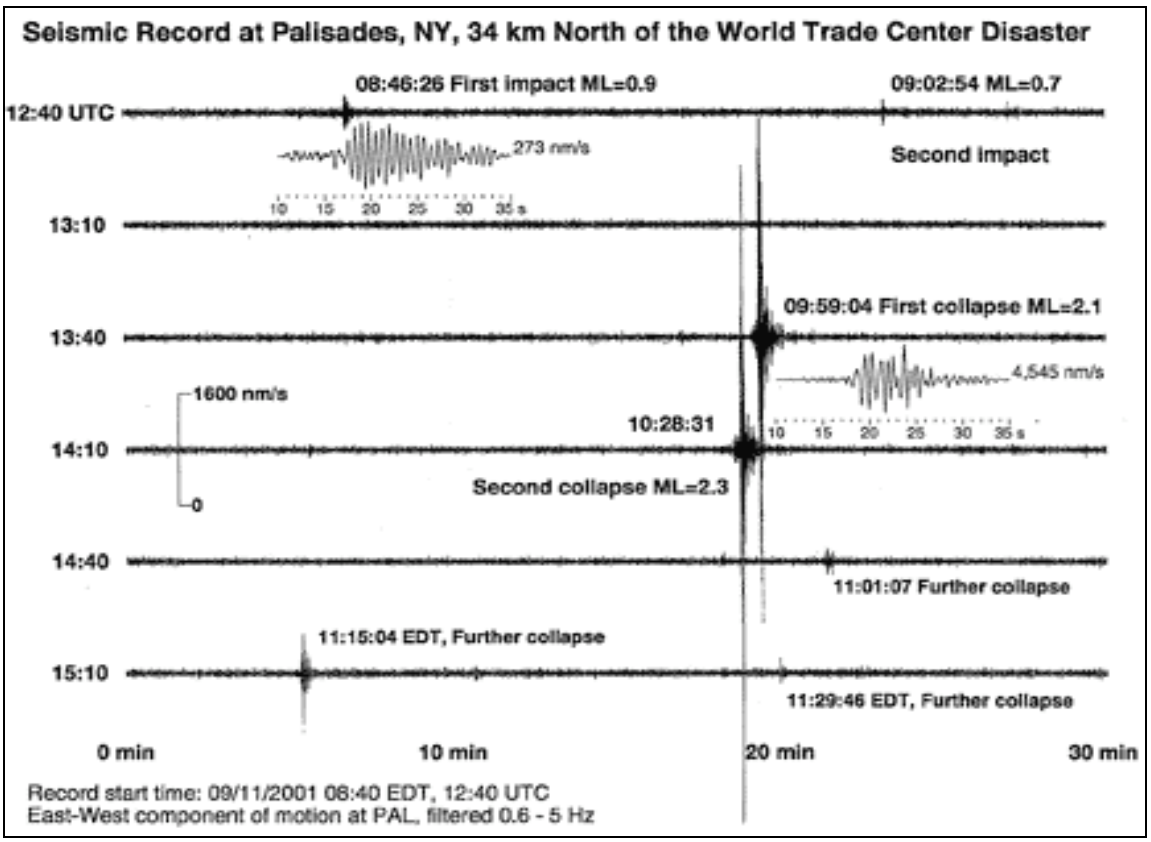

Figure 4: The seismic "peaks"

UTC : Universal Time

EDT : local time

ML : local magnitude

Vertical axis nm/s: ground displacement (horizontal here) in nanometers by second