Investigation And Field Observation On The Effects Caused By The Earthquake On 12th May 2008 In Sichuan Province

(Field trip from 18th August 2008 – 23rd August 2008)

Reported by

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Introduction

A massive earthquake struck Sichuan province in the afternoon on 12th May 2008 at 14:28 that caused 70,000 casualties and many missing. The epicentre of this earthquake was located at 映秀鎮 (Yingxiu Town) of Wenchuan County (Latitude 31 and Longitude 103.4 with shallow epicenter of approximately 14km in depth).

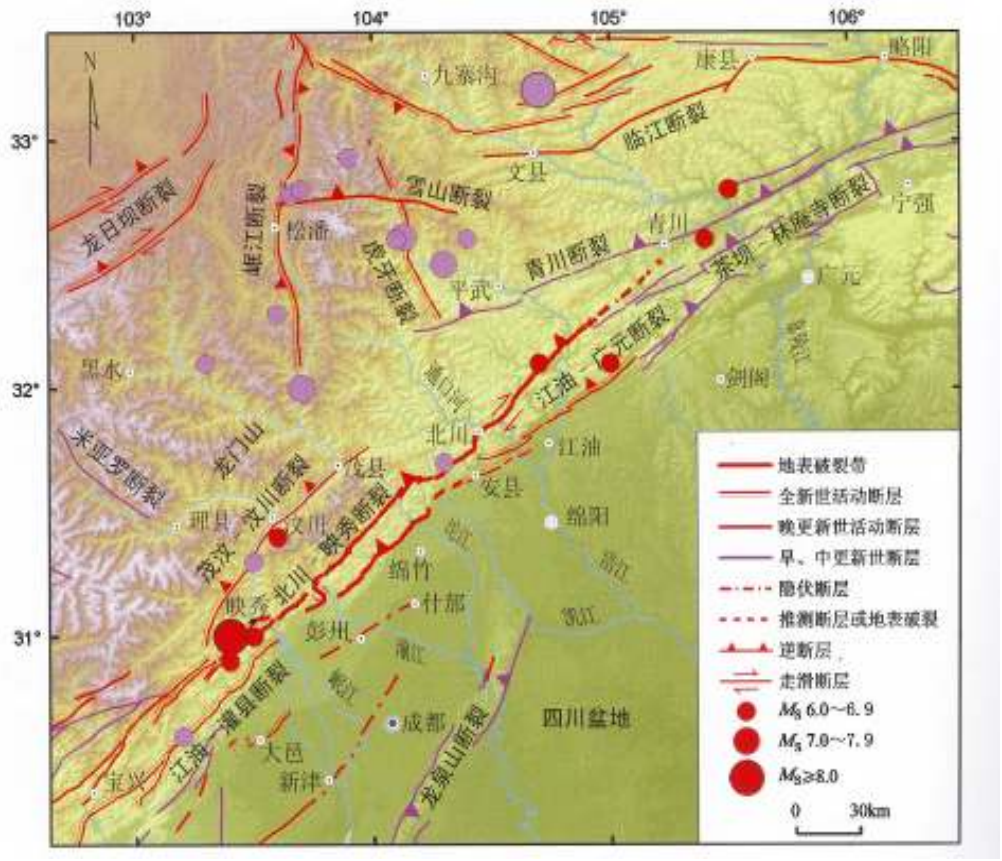


Figure taken from Seismology and Geology, No. 3, Vol. 30, September 2008: Fig.1, P806.

The trip to Sichuan started on 18th August 2008 for 6 days. The team members included Dr. WONG H C, Mr. LEE C. M., Mr. LIN H. Y., Ms CHENG P. F. Fion, Mr. YUEN K. M. Dennis set out from Hong Kong to Chengdu to meet Dr. LIN Pang of Tsing Hua University and Professor ZHANG Lin of Sichuan University. This report concluded the observations during the course of our geological investigation in Sichuan Province with respect to the effect of the 512 Earthquake. With the help of photographs, we would be able to recall what we had experienced during the fieldwork and the readers may be able to learn more about the effects of the earthquake.

Daily items were particularly useful in the fieldwork that would not be available in Sichuan. They included heavy duty field-clothing, walking boots,

battery torch, mosquito “off” spray, vitamin tablets, medical kit; instrument and equipments such as camera, binoculars, GPS, measuring tape, maps, laser measuring device, computer (notebook), walkie-talkie, batteries; personal items (tissues, hat, gloves, raincoat/umbrella, sun-screen, food and snacks included biscuits, Pocali sweat powder etc). Drinking water was most important especially under hot weather, so that we had prepared the bottled distilled water from Chengdu.

We were arranged to stay at the 科华苑賓館 (Kehuayuan Hotel) which was reasonably comfortable especially when we returned from the day-long fieldwork. Breakfast at the hotel was provided every morning and we could fill up our stomachs for the whole day of fieldwork.

Day 1 - Arrival at Chengdu (18th August 2008)

Professor ZHANG Lin had kindly spared her time briefing us her work at the Sichuan University when we arrived on 18th August 2008. She provided very useful information for our trip in the next few days.

We also visited the laboratory of Sichuan University where there equipped with an incredible apparatus (MTS) for measuring triaxial loading in 3D at huge applied stress and it was a very powerful instrument for simulating rock tests at selected depths of the earth crust. Dr. XU Jin of the Sichuan University introduced all sorts of details about the instruments.

Our fieldwork in Sichuan started on 19th August 2008. We were accompanied by Dr. XU Jin for the first two days and Dr. LIN Pang of Tsing Hua University during the whole trip. They assisted us in all aspects during the trip.

Day 2 - Fieldwork (19th August 2008)

On the first day of fieldwork, our first destination of geological investigation was at 映秀鎮 (Yingxiu town) which was one of the disastrous regions caused by the 512-Earthquake. The weather was not good in the morning that rained hard at times and crowds of people wearing raincoats in reds and yellows riding

bicycles on the streets during rush hours. Our vehicles continued driving through the rains in the direction of 映秀鎮. Unexpected numbers of huge landslips triggered by the earthquake, roads turned up, large debris flow tracks were seen on the surface of mountains as well as broken road bridges and fallen parts of columns were observed on the way. We were brought to a halt at the road junction to 映秀鎮 in front of the 寿江大桥 (Shou Jiang Bridge) for security inspection and checking of valid entry documents by the police.

We were held up for around one hour during which Dr. LIN and Dr. XU tried their efforts to contact the local officials for getting permits to enter 映秀鎮 for carrying out our geological investigation. There were also police deployed from other provinces including those from GuangDong Province. According to the local information, the town was one of the most seriously affected areas caused by the earthquake and was temporarily closed for outsiders. We were eventually allowed to continue our trip to 映秀鎮 after the efforts of Dr. LIN and Dr. XU.

Our vehicles drove on through the 寿江大桥 towards 映秀鎮 and we were shock by what we saw. Many houses were rocked down on ground with roof tiles of and bricks of wall totally turned into tiny pieces. My observation to this phenomenon was that the very tiny roof tiles and bricks were produced when they fell on the ground and continued suffering ground vibration for some time due to the earthquake. We could feel the power of this earthquake.

Our first site of investigation was the landslide adjacent to 白花大橋 (Bai Hua Bridge) where a highway bridge had collapsed with separated columns and segments of road bridge, some of them were thrown into the river bank of 白水河(Bai Shui He). People, by looking at this, could feel the huge extent and effects caused by the 512-Earthquake with Magnitude 8. At the hillside of the road, some traces of fault were observed, i.e. slickenside on the ruptured surface of the coal-bearing siltstone/shale. No hammering was tried on the slope in fear of triggering slope failure and rock fall. The views of many landslip scars were captured by the cameras that became not new to us as our vehicles proceeded because they could be seen everywhere. Blue colored tents were set up by the roadside to accommodate people in need and for the use as medical reception.

汶川縣映秀鎮 Yingxiu Town

As we drove along and on the way to the 漩口小学 (Xuan Kou Primary School) at 映秀鎮, collapsed houses, factories and buildings became commonly seen. The whole town was just like dead; no people, no chickens or dogs running around, only a few soldiers posted at the entrance of village and outsiders were not allowed to enter the village.

At 漩口小学, only one and a half storey (out of the original several storey school building) remained tilting above ground. The houses and factories in the vicinity of the school had all damaged to great extent. People with a clear mind would agree that there were still bodies beneath the wreckage.

We had the haunted feeling as if we were at the moments of the earthquake. The boundary wall of the school at the front entrance was also forced to turn in an anti-clockwise direction for approximately 50mm due to shearing stress generated by the earthquake which was also evidenced from orientated fractures on the ground. The National flag at the school was however still flying.

Further deep inside the village road by way of the temporary steel bridge {The original 百慈大橋 (Bai Ci Bridge) had been torn apart} which could allow the loading of a full-loaded truck, we could only slipped in the access road for about 200m from the entrance of the devastated town. One soldier followed closely at our heels. The road surface was uplifted at the side of the shattered houses and factories and the mountain behind showed graffiti-like landslip tracks.

<u>紫坪鋪埧 (Zi Ping Pu Dam)</u>

We then headed to 紫坪鋪埧 which was the most famous dam that had resisted the 512 Earthquake. We were impressed by the favourable conditions of the dam that had no significant damages after the earthquake. The road leading to the main dam showed a few cracks on the pavement and some minor cracks on the dam surface had been repaired and were considered insignificant to the integrity of the dam structure at the time of our visit.

We recalled the briefing by Professor ZHANG on 18th August 2008 at the Sichuan University about the design of the main dam. Large numbers of rock bolts were installed on the slopes adjacent to the main dam proved effective after the

512-Earthquake with such large magnitude. There were only one or two places where minor landslides were observed at the side of the reservoir.

[According to Professor Chen Zuyu of the Institute of Water Resource and Hydraulic Research who gave a presentation on indirect consequence of Wenchuan Earthquake at the University of Hong Kong on 20th September 2008 that two horizontal expansion joints were constructed on the dam due to its huge size. According to the experts, the dam seemed to be in good conditions with very minor but totally acceptable damages. He also showed us the slope stabilization treatment to the dam with rock bolts. Settlement and lateral displacement were insignificant and in acceptable conditions.]

都江堰紅口鎮 (Hong Kou Town)

八角廟 (Ba Jiao Temple) and 解放軍訓練中心 (PRC Army Training Centre) at 紅口鎮 were our next investigation localities for the rest of the day. Large boulders of approximately 3m high was occasionally encountered on the roads.

A moderate walk to the opposite side of the valley through the bush after alighting from the vehicles at 八角廟, a surface rupture of coal-bearing shale was observed on a slip scar covered by a taupaulin sheets to protect it from weathering.

The surface rupture there was the result of an uplift of ground caused by the 512-Earthquake. There were very clear slickensides seen on the surface rupture some time ago but it became bearly visible due to the effect of rain.

Photograph provided by Mr. LEE C.M.

Fossils of plant root and stem were discovered from the exposed outcrop by Mr. LEE C.M. in early August 2008. A thick layer of debris flow deposits was identified above the coal-bearing shale. We examined the vicinity of the slip scar and observed that there were many pitch-black outcrops of coal-bearing shale along the side of 白沙河 (Bai Sha He). The vertical displacement caused by the slip was measured to be 4.5m.

Just a few minutes walk up the hill, we reached the used-to-be 解放軍訓練中心. We were fortunate to be allowed to see the damages inside the building.

When looking at the entrance of the 解放軍訓練中心 at the front gate, the building was slightly leaning to one side causing windows distorted and shearing cracks were generally generated across the window corners.

Inside the courtyard of the 解放軍訓練中心, a few widely opened tension cracks were running parallel to each other on ground across a wrecked building with maximum separation of 1.1m and the tension cracks were sloping to the downthrown side of the fault.

It was worth-noting that some trees in the courtyard along the wrecked buildings were wilted due to lost of groundwater after the earthquake.

<u>深溪溝 (Shenxigou)</u>

A walk through a narrow village road about 2 km up in the mountain and the altitude that we were was 980 to 1009 mPD (measured by GPS). We observed some ground disruptions with vertical and lateral displacement along the road; water ponds were dried due to ground ruptures.

At the mid-level of the road, the kitchen of a house had been separated with 5.2m laterally due to fault movement and the roof tiles were completely shattered to tiny pieces on ground.

Due to the damages on the narrow village road, villagers had to walk home carrying their stuff in baskets on their back. Some people was carrying the heavy and tall building materials at their back for erecting prefabricated temporary houses which were located further up the damaged road.

As we continued to walk up the road, it became more tilted to one side, truncated and buckled to a large extent and we were difficult to proceed. A car was trapped on the buckled road. The local villagers told us that there were still some ground disruptions further up the mountain about 6 km away from where we stopped.

[We left the 深溪溝 and headed back to Chengdu to avoid driving in the narrow winding country roads when the sky turned dark. We eventually returned to the hotel for dinner at eight and the chef was still available. Cleaning ourselves and briefly jotted down notes of the fieldwork during the day and got the batteries charged up for cameras were "a must" before going to bed.]

Day 3 - Fieldwork (20th August 2008/9/28)

<u>彭州市小魚洞鎮 (Xiao Yu Dong)</u>

After breakfast, we met Dr. DAI Fu Chu of China Science Academy and his students at Sichuan University who were also going to the places that we planned, so we kept him company for the rest of the days. We set off to the first locality at 小魚洞橋 (Xiao Yu Dong Bridge). It took roughly 3 hours drive from Chengdu city to the broken highway bridge site at 小魚洞鎮.

Three giant figures "5" "1" "2" (each with approximately 5m high) could be seen at a distance reminding the horrible earthquake occurred on 12th May 2008. There were approximately 1,100 causalities including 161 missing at this county according to the information provided on the spot.

It was an important road bridge connecting 彭州 (Peng Zhou) and 白水河 which was completed in 1999.

In this earthquake, the highway bridge was totally collapsed into several sections, the bridge columns were detached, joints dislocated with some of the steel reinforcement distorted and exposed; the road surface of the bridge was cracked and offset.

There were upheavals of ground on the maize field where we measured the trend, vertical and lateral displacement and identified the types of fault. It was reckoned to be a fault with a vertical displacement of 1.1m dextrally. In order to maintain a living at this critical moment, some local villagers moved their market to the deck of the broken highway bridge and a little dog be seen running around for food though.

With about 20 minutes drive from 小魚洞 bridge, we arrived at 小魚洞鎮 where the fault was recognized running through the ruins of houses. The totally shattered roof tiles and bricks on ground reflected the high intensity level caused by the earthquake. The strike of the fault continued along the ruins of houses into the maize fields and to the river.

The rolling shutter gates of shops could not be closed completely due to the uplift and tilting of ground (approximately less than 1m) at their doorsteps. The fellow villagers were very nice to tell us what they felt about the earthquake and its damages to the village on the whole.

When we traced along the fault in the maize field, Dr. Dai of China Science Academy used his electronic instrument to record the uplift of ground where the displacement was less than 1m.

On one locality along the trace, a parapet wall of approximately 5m long outside a house were found collapsed to one side which was considered to have caused by shearing effects of the earthquake.

Our trace of the fault had ended several kilometers from the village to a river that was almost dried up where the ground uplift could still be seen in the river bed. The fault had run into a mountain where some fallen trees were identified on the slopes of the mountain with the help of our binoculars.

<u>銀廠溝 (Yin Chang Guo)</u>

At about 3:00 p.m., our vehicles were heading towards 銀廠溝 which could have been named after its steepness and depth of the gorge. A road bridge was seen collapsed and landed on the riverbed of the gorge. The road condition became worse due to the damages caused by the landslide as our vehicles proceeded.

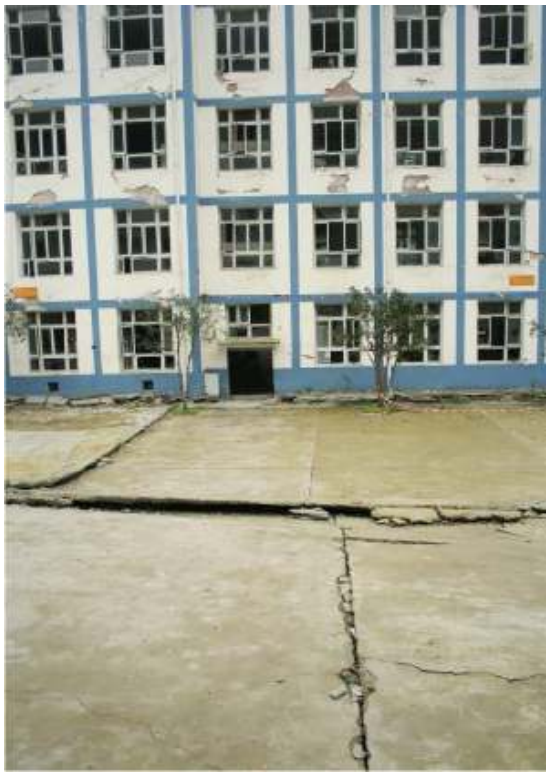
Accidentally, we saw some large boulders (2m – 3m high) settled on the roadside. Our drivers had done a good job keeping their vehicles in one piece. Shattered and collapsed houses were commonly seen along the winding road.

Our vehicles eventually stopped in front of an unbelievably huge landslide site where the landslide was believed to have started from some 5km up the mountain and the debris stopped by the river. The debris flow killed some 50 people at the foot of the mountain.
It was speculated that a layer of "air-blanket" between the original ground surface and the debris of boulders and rubbles transported such huge quantity of debris to a great distance until it eventually settled by the river.

<u>彭州白鹿鎮白鹿中学 (Bai Lu High School)</u>

After leaving 銀廠溝, we hurried to the earthquake site of The Sino-French Bridge near the 白鹿中学校 before it was too dark in the evening. The bridge was built as an access to the school across a river but it was collapsed during the earthquake. The local villagers had then built their own temporary bridge by putting 7 thick bamboos together across the river.

白鹿中学 was a remarkably worth visiting site which symbolized a type-locality of a sinistral reverse-fault of the 512-Earthquake. The earthquake had produced a vertical displacement of 2.2m to 2.3m and displaced sinistrally 4m at the school site.



The school building on the up-thrown side of the fault remained intact and surprisingly found no damages whereas the school building on the opposite side on ground suffered broken windows and diagonal shearing damages. The houses at both ends of the school buildings were however all torn down to rubbles due to the earthquake.

[We were treated with some typical Sichuan dishes for dinner in the evening as the godparent (乾爹) and relatives of Mr. LIN H. Y. (home at Chengdu) had come all their way to see him and many thanks that we were guests for the dinner]

Day 4 - Fieldwork (21st August 2008)

<u>漢旺 (Han Wang)</u>

It was a rainy morning with a little traffic congestion when we set off for fieldwork. It took roughly 3 hours to reach 漢旺 which was one of the seriously stricken city due to the earthquake.

Before arriving 漢旺, some blue roof wooden prefabricated temporary houses, which would accommodate the villagers affected by the earthquake, and temporary tents were seen erected by the roadside. Within 2 minutes of drive, we arrived at the clock tower. The clock would never give a ticktack any more which stopped at the time of the earthquake at 14:28. The clock tower would be remained as it was for the memory of people who died and suffered in this disastrous earthquake.

The police building could not escape from damages, nor did the 天桥小食 (Tian Qiao Xiao Si) which was tilted and damaged. We were not allowed to enter the city of 漢旺 because it was claimed as a disastrous city and restricted area after the earthquake. Our vehicles brought us to the riverside where 漢旺 could still be seen from a distance and surface ruptures due to uplift of fault was observed. The road surface was buckled up and no one could recognize a complete house in its vicinity. At the far side to the mountain next to 漢旺, nearly the entire mountain was stripped to brown soil by the landslide. A collapsed highway bridge together with a cargo train blocked by the landslide at the time of the earthquake, vaguely seen through the misty sky, were the witnesses of the earthquake.

We then left 漢旺 for 紅白鎮. (Hong Bai Town) At a glimpse in our vehicles, we saw some people moving home and carrying their remaining furniture on a tricycle; there were roadside market where thermal flasks, rice cookers, gas cookers, TV antenna (disk types) etc. available. We stopped in town for some noodle at a food stall and unfortunately the cooking utensils in the food stall were found rusty and not considered suitable for having lunch there, we had bread with canned vegetable for lunch instead.

紅白鎮 (Hong Bai Town)

Our vehicles drove on for 紅白鎮 after the quick lunch and the road was blocked by ponds of water caused by the nearby landslips. Our 4WD vehicles functioned well when getting through the water although we had no idea of the depth of the water.

The locality for investigation was a broken road bridge adjacent to the "Petro China" at which the road bridge had fallen into the river. Tension cracks were seen on the ground where we were standing. Looking at the opposite side of the slope, the exposure of sedimentary rock with bedding inclining at an angle of approximately 50 degrees was slightly folded. Traffic to the other side of the river was hampered.

Heading back to the other side of the village, we alighted the vehicles and walked along the railway track for about 2 km where the railway track was truncated by a landslide. Due to the soft debris on the truncated railway track and in view of the unstable boulders hanging above the slope, we could not get through to another investigation locality of a fault on the opposite side of the landslip.

It was a surprising bonus though that some fossils of Triassic leaves were discovered in boulders of mudstone that fell from slopes during landslide and settled on the railway track. The fossils provided some information in geology that the area was once a swamp with plenty of leaves fallen from trees onto the mud. The leaves were believed to have preserved under a quiet depositional environment in such way they were delicately preserved.

On the way back to the vehicles along the railway track, we not only saw some villagers, but also a few "yellow" cows and they seemed looking for their way home which would have been damaged during the earthquake. We met a local villager who was carrying a large container of cooking gas in his basket on his back climbing up the hill some 6 to 8 km to his home. We treasured our experience in this trip by learning the hardship of the local people and that they were leading the simple life style which they satisfied.

金花镇 (Jin Hua Town)

We arrived at 金花镇 just past 3 o'clock in the afternoon. We had no idea why the village was called 金花镇 as there were not any flowers nor any plants with golden colour. Houses were rocked to the ground, what remained there were heaps of roof tiles and bricks along both sides of the road. One possibility of how the name came from was the colour of maize trees in the field in which the maize, when at harvest seasons, showed golden yellow colour. The local villagers also used to hang the surplus maize around their houses to dry them up for feeding pigs.

Our vehicles stopped where there was an upheaval on the road caused by a fault and many houses in their vicinity had collapsed. We could trace the upheaval of ground into the maize field where there was a vertical displacement measured to be 1.6m. With the help of binoculars, a few debris flow tracks were seen on the slope surface of the mountain. In order to know what exactly caused the damages, we drove up the mountain but we were blocked half way up. We eventually bravely stepped into the soft debris of the

recent landslip that was still risky of collapsing and we then marched up the road.

Up on the way, there were many road ruptures. Nearly one third of the road surface were truncated at one locality and part of it fell into the steep valley. The road markings were also transected or shattered. A huge landslide was also seen along the road. We met a local villager on the way up the mountain who told us that he ran out of his house immediately when the ground shock without bringing any of his belongings. He still had to walk another 6 to 8 km to his home from the landslide to fetch his stuff to the recently allocated temporary prefabricated house at the foot of the mountain. He would share a room with 3 other villagers.

We found a little stepped path down to the devastated town and noticed that many houses were totally damaged to rubbles with abandoned furniture like sofa, broken table etc. At the foot of the mountain, we met four village women who nicely invited us to sit down and take a rest and started chatting to us in Sichuan ascent.

Some of us took off their muddy boots and socks and washed up. We also saw some bunches of maize hanging outside their houses like golden flowers. Our vehicles started heading to 綿陽(Mien Yang) at around 6:00 p.m. We stayed there for the night and the journey took us two and a half hours before we could settle down and had dinner. We were lucky to be able to watch the women volleyball semi-final of the 2008 Beijing Olympics at the restaurant.

Day 5 - Fieldwork (22nd August 2008)
平武縣平通鎮 (Ping Tong Town)

Our scheduled destinations of the day were 平通鎮 and 北川 (Beichuan). The vehicles left 綿陽 (Mien Yang) town at around 08:30 a.m.. It was a nice sunny day and we took a lot of photographs to most of the features caused by the earthquake along the way. We passed 猿王洞 (Yuan Wang Dong) and saw an impressive thickly bedded sedimentary rock exposure on the other side of the river; a village with houses not much affected by the earthquake and landslides not much seen along the road.

Not until we arrived at 平武縣 (Peng Wu County) (noted from the banner across the road), the story was different. Many houses and slopes were damaged, road bulged up and truncated. Some temporary shelters were erected at the side of the road, which provided daily needs for the villagers; some of these shelters were used as medical centre. It was nice to see the logos from some of the tents that they were donated by organizations of Hong Kong.

A rather unpleasant event happened when we were investigating the features caused by the fault in town, a person came to us and interfered our work. He claimed himself as the government official without showing his identity. We were asked to spare some time to his office and said that he was trying to protect us from being bullied by the local people. We emphasized that local villagers treated us well wherever we went in this town as well as in other towns and the local villagers had provided very useful information about the earthquake as such they assisted our investigation. The professors showed him their identity of the Universities and with great efforts explaining our geological investigation, we were allowed to go about half an hour. We all felt sorry for his act.

We met another local villager at mid-level of the hill where there had been a major landslide near his house. Fortunately, his house was still standing with no major damages, only the roof tiles required replacement. His farmland located another few kilometers up the hill remained intact. He was a lucky fellow indeed.

A fish/duck pond was dried up due to the uplift of ground caused by the fault. It was obvious that the ponds adjacent to it were still with water. Landslip traces like graffiti on the mountain surface were commonly seen over this region.

When we continued to walk towards the river Bay Shui He (白水河), a light-duty suspension bridge was found slightly damaged at the connections with both river banks. The main body of the bridge was made of steel. It was restricted to a maximum five persons to use the suspension bridge at the same time.

On the other side of the river, there was a major debris flow made up by hundreds of tonnes of rubbles and boulders that had buried some houses at the foot of the mountain. The local villagers told us that the debris we were stepping on was still soft which had run down from the mountain the night before. The house in the far end of the photograph was not damaged by the debris flow and the villager mentioned that the people of the house had just escaped from being buried.

Mr. Lee and I kept going inside the village for some 200m and found that no complete houses could be recognized because they were all rocked down by the earthquake, only some broken wardrobe, sofa, shrine and the debris of houses etc. remained in the rubbles. From geological point of view, the damages were caused by an uplift of ground with vertical displacement of 2m to 3m. We could not continue further because the collapsed houses blocked the path.

The professors went to the riverbank and discovered some uplift disruptions. Part of the riverbed and riverbank were uplifted and damaged. The vertical displacement of the disruption was measured to be 1.5m and the strike of the fault was trending N**45˚ - 50˚**.

Back to the city, we had lunch at the roadside food stall. We believed that this food stall should be reliable because they had boiling water. This was the first time that we had lunch with rice noodle and dumplings at a food stall on the last day of the trip. After lunch, we continued to 北川 and realized that Typhoon signal No. 9 was hoisted in Hong Kong at about 2:30 pm at the bus stop called 招呼站 (Zhao Hu Zhan) and we had some concerns of the arrangement of catching our flight back to Hong Kong on the next day.

北川 (Beichuan)

When we arrived at 北川, it was at around 4:00 pm. The whole city was strictly restricted from entering. We were permitted to walk up to the top of the hill on the narrow road and looked down to the devastated town. It was so painful to see this totally devastated town that killed 10,000 people as a result of the earthquake. No signs of life were felt in the town, even the water in the river barely moved. Most of the buildings were leaning to each other, some fell and others lost a few floors.

On the other side of the river, a tremendous landslide roared from the mountain next door to the whole village, all the houses were hit violently into pieces and we believed that most of the villagers had been buried instantly.

We could tell the approximate location of the fault by looking at the distribution of damaged buildings/houses. The houses/buildings were less damaged which were farther away from the fault while those along the fault line turned into

rubbles.

Although many villagers had died and those alive had left the town, the town was still in danger due to the hidden risks by the presence of quake lakes when heavy rain persisted for a few days. At the top of the hill, some of the names of the dead were written on strips of cloth tied up at the railing and fence on the slope edge overseeing their houses, incants were also placed on the verge of the slope where we were standing. We felt sorry for the dead and sorry for standing on their "home" which we did not mean to. Considering the journey back to Chengdu would take 3 hours, we left 北川 at about 5:00 p.m.. Occasionally on the way back, we were able to see the special arrangement of troops in trucks with large red silk-flower (花球). The villagers told us that some of them were retreating from the town after staying there over 100 days.

Day 6 – Return to Hong Kong (23rd August 2008)

We stayed in Chengdu for the morning packing up baggage and preparing for the flight to Hong Kong at noon. On the street, there was not a single person rushing for work; tea-houses opened late in the morning and the people's pace was very slow as compared with that in Hong Kong. Our team members had finally felt how relaxing life would be if we were to live in Chengdu.

CONCLUSION

We had never ever come across such passionate grief that was caused by the earthquake and it was very sad to see such natural disaster happened taking away so many lives. The destruction caused by the earthquake also made tremendous loss of properties in terms of economy, natural forests and wild life ecosystems including our valuable pandas living in Sichuan region. We undoubtedly cannot avoid this kind of natural disasters to happen but we may make the best use of the available technology to study the cause of natural disasters and try to alarm people as early as possible when it happens in future so that minimum loss will be anticipated. What we may consider to do is to minimize damages and loss of life which in fact can be at least of three folds: (a) To avoid densely populated cities be built near or at the earthquake prone regions. (b) To prepare sufficient resources for teams of geoscientists to carry out research on prediction of natural disasters using advanced technology. (c) To build houses and buildings that can resist damages from earthquake as far as possible.

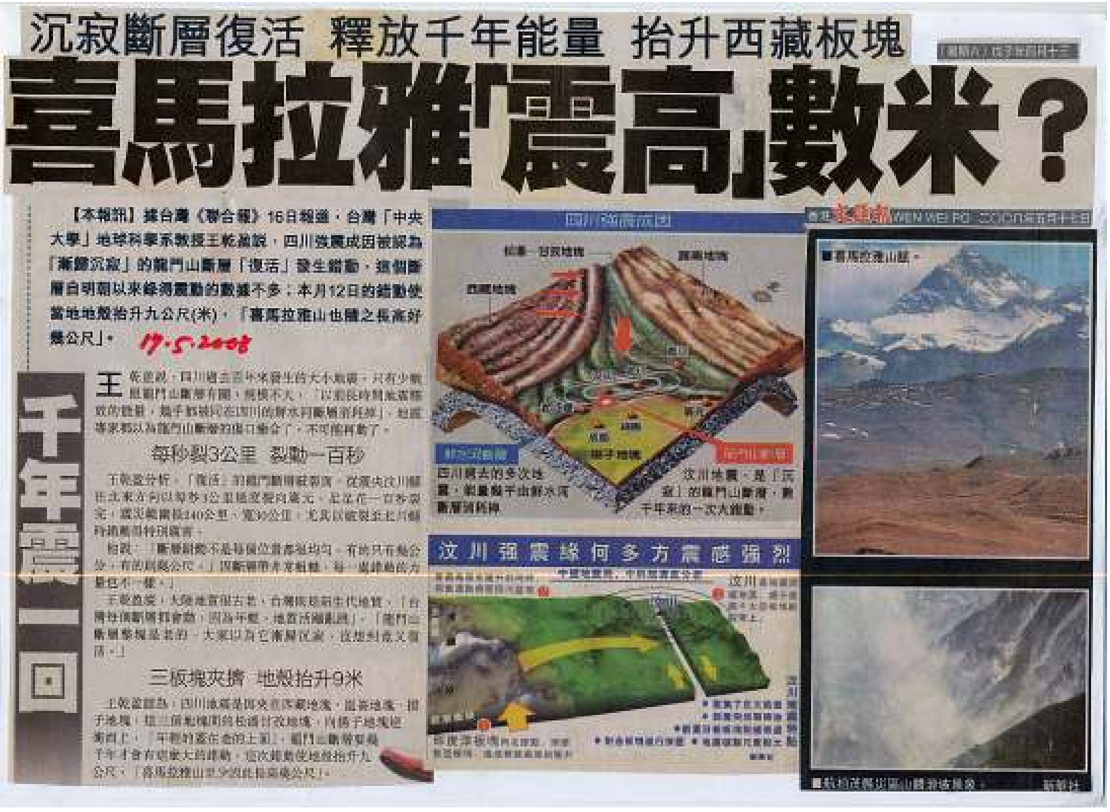
We appreciated the gratitude of Professor ZHANG Lin who had made such great arrangement for our accommodation at 科华苑賓館 (Kehuayuan Hotel) and the vehicles that were most suitable for the road conditions during our visits to earthquake affected areas. We would also like to thank Ms YANG Xue Ting who assisted Professor Zhang to arrange everything for our visit and greeted us at 双流机場 (Shuang Liu Airport). Dr. LIN Pang had provided lots of assistance during our trip in all aspects including enquiries to the local villagers with local dialect about the earthquake, and localities of most affected areas of the villages. They were very useful information. Dr. DAI Fu Chu and Dr. XU Jin had spent much effort in searching for the faults and their associated geological features for investigation during the trip. All of us were very enthusiastic in recording all sorts of useful data obtainable from the earthquake localities. Mr. LEE C. M. shared his experience and knowledge that he provided his expertise advice; Ms CHENG P. F. took measurements on co-ordinates and level of ground using GPS and the trend/strike of faults by compass at every investigated locality. Mr. LIN H. Y. contributed most of his time taking video recording to all features that we encountered in the trip. I myself had taken many photographs and recorded geological features that are also very useful for making summary of the findings during the trip.

The above content of the report have concluded our observations during the field trip to Sichuan Province for geological investigation caused by an earthquake with Richter scale M8 earthquake at 14:28 on 12th May 2008.

Team members participating and assisting the geological investigation In Sichuan Province from 18th to 23rd August 2008

Participants in the Sichuan Trip (18th August 2008-22nd August 2008)	Organization
Dr. WONG H. C.	Hong Kong Polytechnics University
Mr. LEE C. M.	Hong Kong Polytechnics University
Mr. LIN H. Y.	Hong Kong Polytechnics University
Ms CHENG P. F. Fion	Hong Kong Polytechnics University
Mr. YUEN K. M. Dennis	Housing Department, HKSAR
Professor. ZHANG Lin	Sichuan University
Dr. XU Jin	Sichuan University
Ms YANG Xue Ting	Sichuan University
Dr. LIN Pang	Tsing Hua University
Dr. DAI Fu Chu	China Science Academy

Photograph taken for members of the Sichuan Trip on 18th August 2008 at Sichuan University (From Left of photograph: Mr. LEE C. M., Mr. YUEN K. M. Dennis, Ms CHENG P. F. Fion, Dr. WONG H. C. Robina, Mr. LIN, H. Y., Mr. LIN Pang)


沉寂斷層復活 釋放千年能量 抬升西藏板塊

喜馬拉雅「震高」數米？

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17.5.2008

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每秒裂3公里 裂動一百秒

三板塊夾擠 地殼抬升9米

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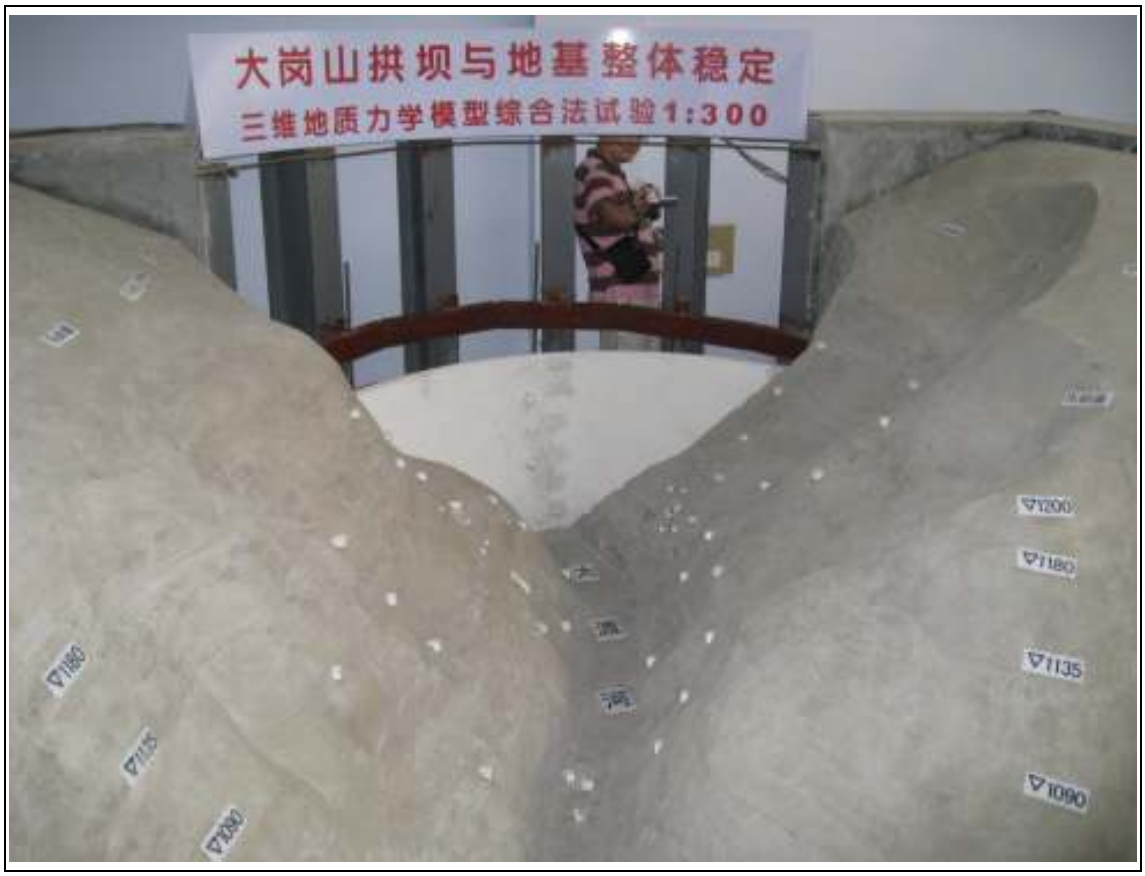
A2: Visit to Sichuan University - Hydroelectric Engineering Department right after arrival..



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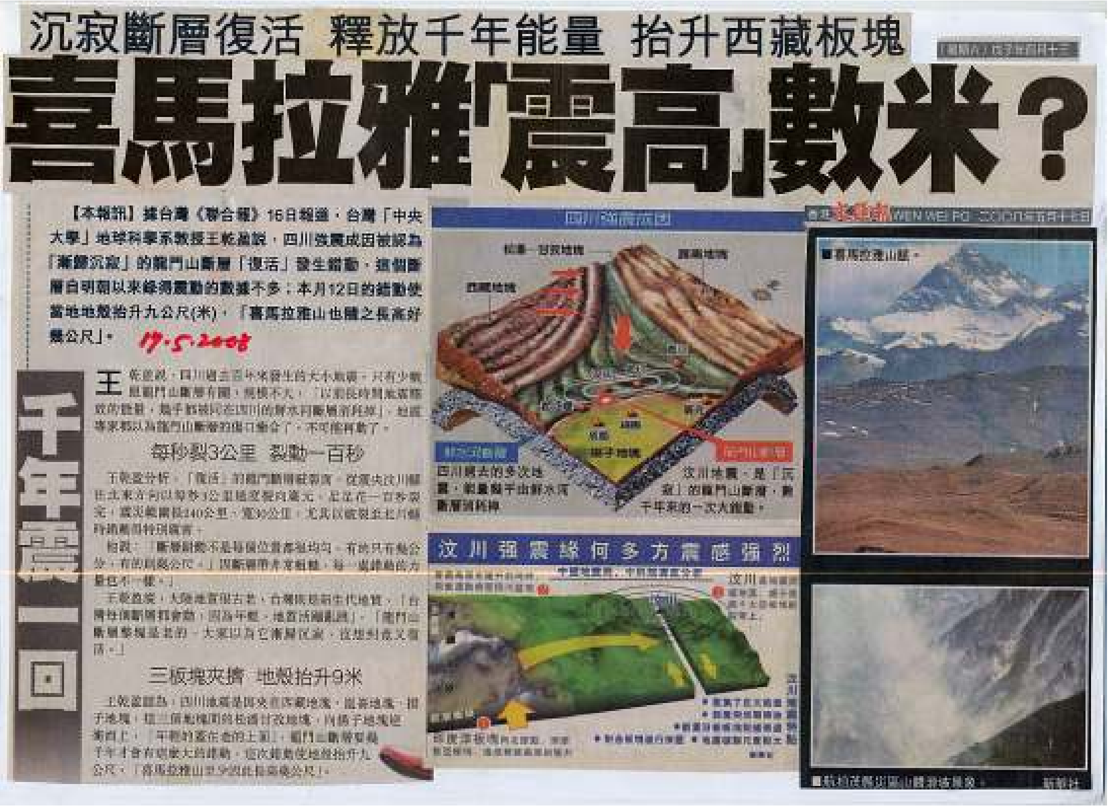

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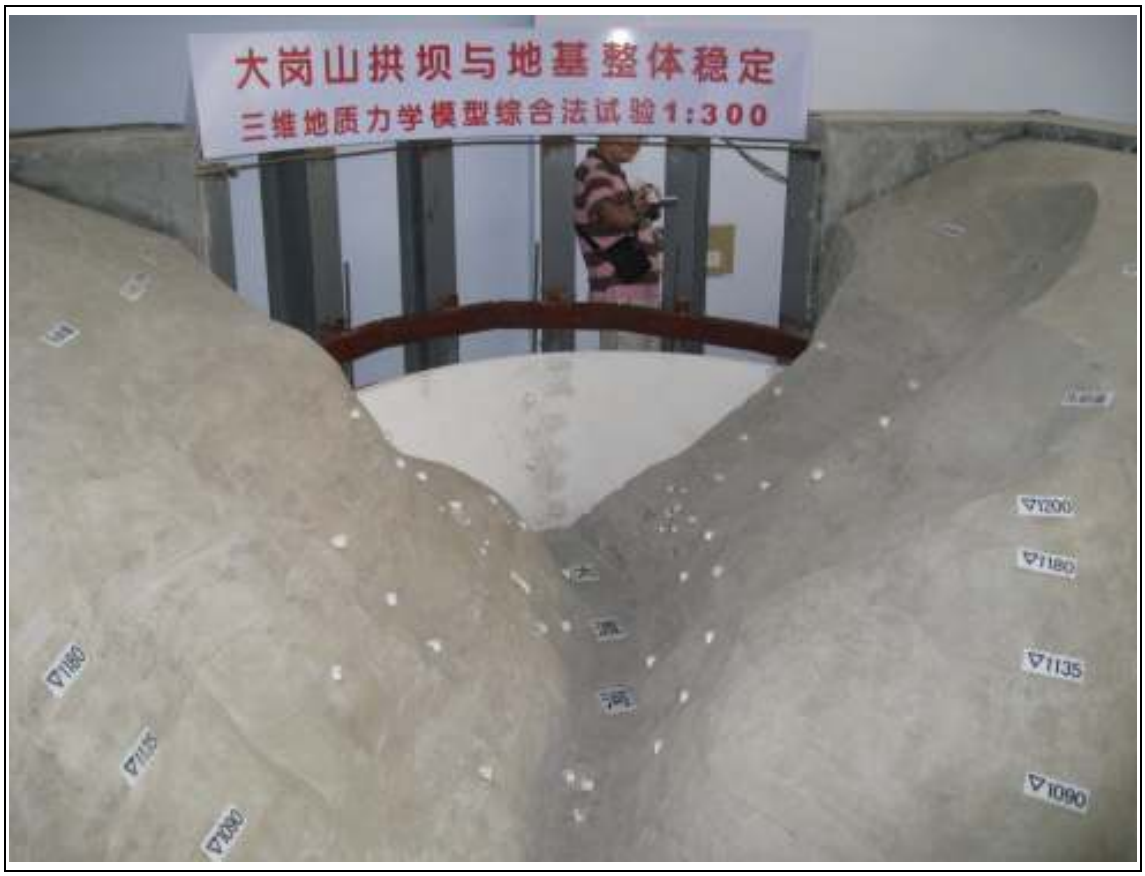

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B1: Plenty of landslips were encountered on the way from 都江堰 to 映秀.

B2: Large scale landslips could commonly be seen on the way to Wenchuan. Note that most landslips occurred near top of mountains.

B3: Surprising to see such large scale landslip producing huge amount of debris flow.

B4: Large scale landslips as if graffiti on the mountains.

B4a: A highway bridge (白花大橋) was collapsed during the earthquake. The bridge deck was lying flat to ground.

B5: The collapsed deck and columns of the highway bridge (白花大橋) were detached (adjacent to 白水河).

B6: 白花大桥 fell into 白水河.

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B26_The mountain was totally stripped off and the river bed was disrupted in 映秀 Town. 百慈大橋 was collapsed. A temporary steel bridge was erected for the transportation of daily needs to the villagers.

B27: A soldier was following at our heels when we had our geological inspection 100m from the restricted area in 映秀 Town

B28: Collapsed buildings and houses were readily captured through camera lens in 映秀 Town

B29: It was a common scene that large boulders from slopes landed on the highways to 八角廟

B30: a surface rupture of coal-bearing shale was observed on a slip scar covered by a taupaulin sheets to protect it from weathering for inspection

B31: Coal-bearing altered shale where slickensides were observed at 八角廟. The surface rupture was the result of an uplift of ground caused by the earthquake.

B32: Geologists were seriously determining the material from the landslip at 八角廟.

B33: 紫坪埧大橋_Main dam was reported to have no significant damages

B34: Numerous rock bolts were planted on slope next to the main dam of 紫坪埧大橋 had proved that the dam had resisted the earthquake of such great magnitude.

B35: Close-up photograph of rock bolts installed at the dams of the 紫坪埧大橋.

B36: 解放軍訓練中心 (PRC Army Training Centre) at 紅口鎮 - Buildings were detached and shearing stress demonstrated notably near windows.

B37: 解放軍訓練中心 (PRC Army Training Centre) at 紅口鎮 - The dog still survived between tension cracks

B38: 解放軍訓練中心 (PRC Army Training Centre) at 紅口鎮 - The structure were seriously damaged by the quake leaving behind the wide and deep tension cracks on ground.

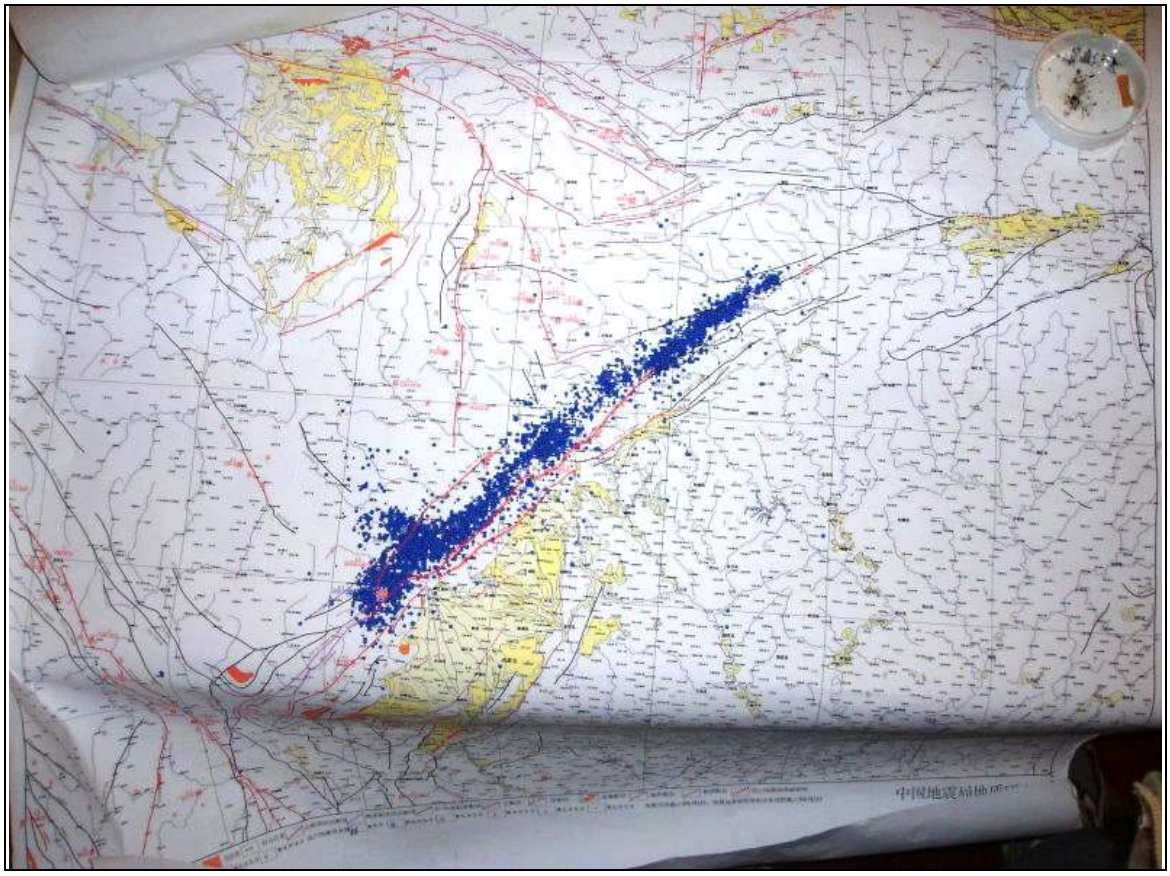
B39: 解放軍訓練中心 (PRC Army Training Centre) at 紅口鎮 - The trees adjacent to the fault disruption were wilted with brown colour, other trees unaffected remained green.

B46: 深溪溝 (Shenxigou) - The access road to villages in the mountain was tilted and “buckled”.

B47: 深溪溝 (Shenxigou) - The degree of tilting of the road was great making it not possible to walk through.

C11b: 小魚洞鎮 – Damaged houses.

C12: The wreckage of houses indicated that the fault passed underneath them.



C1: A field map showing the frequent earthquake occurrences along the fault regions in Sichuan.

C1a: Memorial Figures of the 512-Earthquake at 小魚洞大橋.

C2: Dislocation of the 小魚洞大橋

C3: Brief map showing principally 3 major faults in the region. Location of 小魚洞大橋 at red dot while the yellow circles indicated the epicentre of the 512-Earthquake.

C5: The highway bridge.(小魚洞大橋) was collapsed into several sections, the bridge columns were detached, joints dislocated with some of the steel reinforcement distorted and exposed; the road surface of the bridge was cracked and offset.

C6: Distorted reinforcement of the 小魚洞大橋

C7:The broken highway bridge viewed from a distance –小魚洞大橋

C8: Geological investigation for fault trending, dip and type of fault causing the huge damage to 小魚洞大橋.

C9: 小魚洞鎮 - Villagers moved their market to the damaged bridge at 小魚洞大橋 in order to earn for a living.

C10: 小魚洞鎮 - The collapsed houses were the footprints of the earthquake.

C17: Professor Dai of Chinese Academy of Science was taking vertical displacement measurement of the fault at 小魚洞鎮.

C17a: 小魚洞鎮 - An uplift of ground next to a tree

C18: A collapsed bridge was found in the river at 深溪溝 (Shenxigou).

C19: On the way to 深溪溝 (Shenxigou), highways were often blocked by landslips and part of the road had been fallen into the gorge.

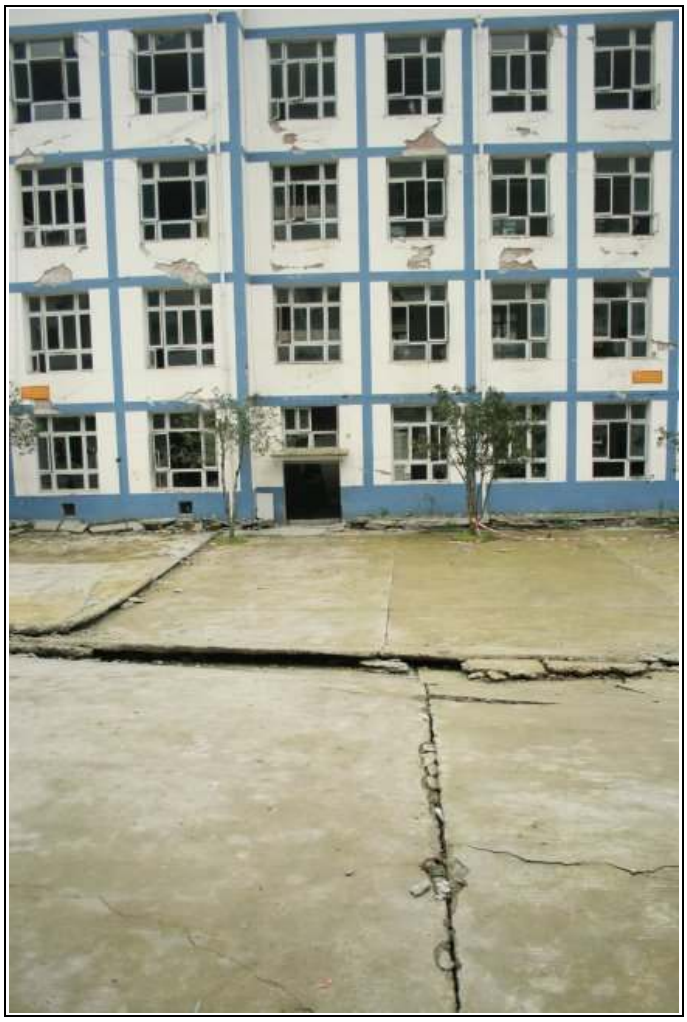
C20: Large quantity of debris could be seen from the road at 深溪溝

C21: 深溪溝- Huge landslide site where the landslide was believed to have started from some 5km up the mountain and the debris stopped by the river. The debris flow killed some 50 people at the foot of the mountain (according to the local people).

C22: There wree 2 school buildings in 白鹿中学 separated by the sinistral fault. The school building on the downthrown side of the fault had minor damages while the school buiding on the upthrown side remained intact.

C22a: The Sino-French Bridge near the 白鹿中学校 built as an access to the school across a river was collapsed during the earthquake. The local villagers had then erected their own temporary bridge by putting 7 thick bamboos together across the river.

C23: The front view of the school building on the up-thrown side of the fault. This is type-locality of a sinistral reverse-fault caused by the earthquake. It had produced a vertical displacement of 2.2m to 2.3m and sinistrally displaced 4m at the school site.



C26: The school building on the up-thrown side of the fault remained intact and surprisingly found no damages whereas the school building on the opposite side only suffered broken windows, diagonal shearing damages on the building. The houses at both ends of the school buildings were however all torn down to rubbles due to the earthquake. From the view of this picture, the fault had a sinistral displacement.

C25: The upthrown side of the school remained intact whereas the school at the downthrown side was slightly damaged

C24: This is the intact poster remained on wall of the school. Surprisingly, the school had no major damages.

C27: 彭州白鹿鎮白鹿中学 - The low-rise houses at both sides of the school buildings were shattered to ground.

C26a: 彭州白鹿鎮白鹿中学 - The ground adjacent to the school building was disrupted.

D13: 金花镇 (Jin Hua Town) – Large scale Landslips.

D14: 金花镇 (Jin Hua Town) - A landslip noted at mid-level of mountain.

D15: 金花镇 (Jin Hua Town) - Villagers came back to their devastated houses. Note that their dried sweet corns were still hanging for feeding pigs.

D16: 金花镇 (Jin Hua Town) - Muddy boots from stepping in the fresh debris.

D5: The police office at Hon Wang (漢旺) was also damaged.

D6: The restaurant at (漢旺) could not escape the from being collapsed.

D7: We were heading to 紅白鎮 (Hong Bai Town) and needed to cross a watercourse, the 4WD vehicle had performed very effective.

D8: At 紅白鎮 (Hong Bai Town), a road bridge across a river was collapsed and the access to the opposite side of the town was hampered.

D9: Due to the railway track at 紅白镇 (Hong Bai Town) was damaged, walking to the landslips & faulted areas about 2km from the road was the only alternative

D10: 紅白镇 (Hong Bai Town) - The railway bridge was also damaged.

E10: “Quake-lake” was formed. The landslips also buried lots of houses or totally shaken to ground.

E11: Fault trends can vaguely be identified among the rubbles and the undamaged buildings.

E1: Large scale of landslips on mountains viewed from the highway on the way to 平武縣平通镇 (Ping Tong Town).

E2: 平通镇 (Ping Tong Town) - A fish/duck pond was dried up due to the uplift of ground caused by the fault..

E3: Construction of prefabricated houses for the villagers

E5: People living in this house had narrowly escaped from being buried by the imminent debris throw.

E4 Local people used this simple suspension bridge as access to the opposite side of the river.

E4a: During the earthquake, part of the bridge was damaged.

E6: 平通鎮- All houses were totally damaged, leaving broken roof tiles and bricks together with some furniture.

E7: 平通鎮 – Collapsed houses.

E8: 北川 – The village was closed by the officials.

E9: General view of 北川. Since the town was closed, there were incants for the dead at the verge of the slope at hill top meaning some respect to them.